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Ecological Economics in Four Parables

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Introduction

Economist Joseph Schumpeter stated that analysis must be preceded by a pre-analytical cognitive act that he called "vision," in order for analysis to have something to analyze. Visions can be clarified by parables. A parable of course is a little story that teaches a big lesson that opens one's eyes. Parables do not have to be historically true stories, but the ones here considered are.

Part I contrasts the pre-analytic vision of ecological economics with that of conventional economics by recounting a true story about the drafting of the World Bank's *World Development Report* for 1992. That story serves as a basic parable by which to envision ecological economics as the study of the relationships between the economic subsystem (the economy) and the ecological parent system (the biosphere). Conventional economics sees the economy as the whole system, with nature fitted in as separated components---forests, fisheries, croplands, mines, garbage dumps, etc. Ecological economics sees nature, the biosphere, as the containing whole system into which the economy must fit and adapt, either well or badly.

Part II provides the beginning analysis of the ecological economics vision, how the parts combine to function as a whole, the metabolic dependence of the economy on flows of matter and energy from and back to the biosphere, on their scale relative to the containing biosphere, and the very radical policy conclusions and sequence that analysis reveals. Here the instructive parable is provided by the story of Samuel Plimsoll and the maritime institution of the load limit represented by the "Plimsoll line", and the absence in conventional economics of an analog to the Plimsoll line. What would such an economic analog look like?

Part III tells a tragic story about chemical engineer, Thomas Midgley, Jr., and the too eager reliance on technology as the sufficient solution to the problems revealed by analysis of the ecological economic

[1] Below is the email with which Herman Daly submitted this paper about three weeks before he died.

> Dear Edward,
>
> I hope that you are well and surviving still in our disintegrating world. RWER continues as a voice of sanity.
>
> I am still kicking, but slowly, which has its benefits.
>
> Attached is an article that I am submitting to RWER. Suggestions welcome.
>
> All good wishes,
>
> Herman

paradigm. It is a cautionary parable about the prevalence of unintended consequences, and the problems of ignorance and haste.

Part IV considers the philosophical and ethical foundations needed to support the radical policy reversals indicated by a scale-limiting economic analog to the Plimsoll line. Are there convincing ethical arguments to persuade the public to accept the needed policies? To what can one appeal in an effort to persuade? Here relevant parables are provided by the story of Alfred Russell Wallace vs Charles Darwin on the basic difference (as well as the many similarities) between humans and other creatures, and by the Leopold -Loeb 1924 “trial of the century.” These stories are parables in that they dramatically depict the morally unacceptable logical consequences of the denial of objective value that has become firmly embedded in the paradigms of biology (materialist Neo-Darwinism) and economics (individualistic subjectivism) separately, and now together are eroding the moral foundations of the combined field of ecological economics.

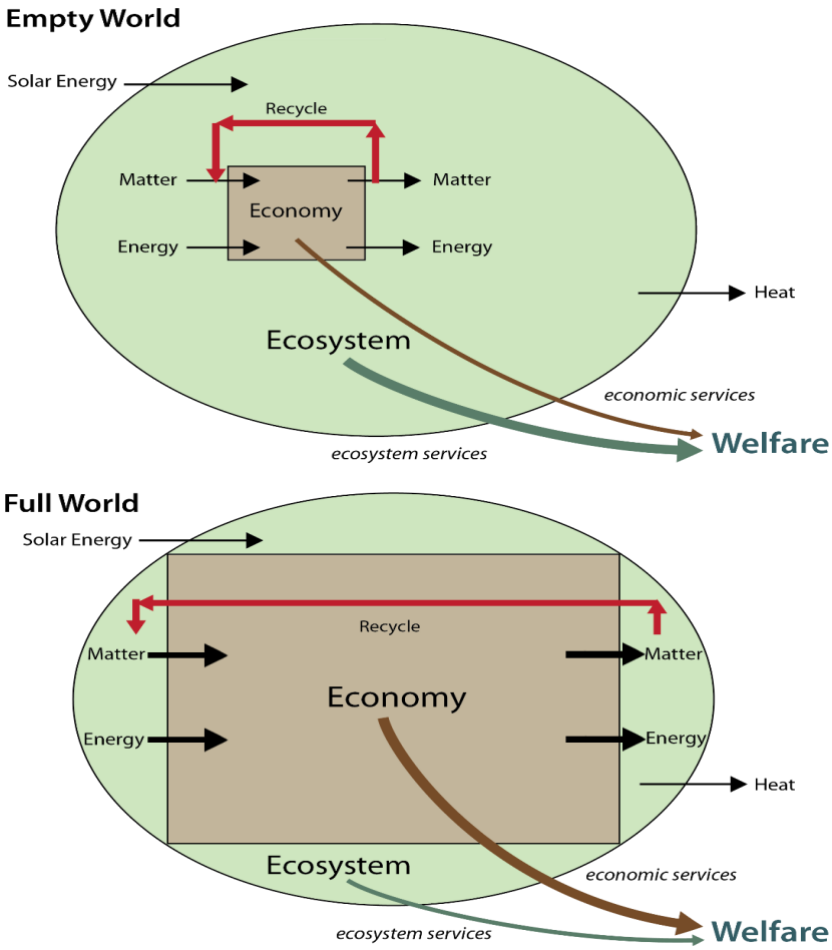
Part I: Pre-Analytic Parable: The World Bank’s 1992 *World Development Report*

Every year the World Bank publishes its *World Development Report*, dedicated to whatever topic the WB deems most important at the time. In 1992 the topic was "The Economy and the Environment". I was not on the team that wrote the Report, but was included in a panel of internal reviewers charged with commenting on successive drafts and suggesting improvements. I felt that this was my most important task at the time, and eagerly awaited the first draft.

The first draft arrived and I began reading. In the first chapter there was a diagram entitled *"The Relation of the Economy to the Environment".* The diagram consisted of a rectangle labeled "Economy", with an arrow entering from the left labeled "Inputs", and an arrow exiting to the right labeled "Outputs". That was it. Nothing in the diagram or accompanying text indicated what the inputs were, where they came from, what was going on inside the rectangle, what the outputs were, where they were going. And even if that were accepted as a bare-bones representation of the economy, where was the environment? It was simply not there! Undefined inputs came from nowhere and undefined outputs went nowhere, after passing through an empty box. Not a helpful diagram.

After recovering from my disappointment, I said to myself, OK this is only a first draft, and the title of the diagram is on target even if the diagram itself is vacuous. So here is my chance to make some helpful suggestions for how to improve the initial diagram, and give a better pre-analytic vision to guide the subsequent Report.

Here are my suggested revisions with a bit of supporting commentary and evidence from events after 1992.



Let's draw a big circle around the rectangle and label it ""Environment". The Earth-environment, let us say, has one input from space, solar energy, and one output back to space, waste heat. No significant material inputs from or outputs to space.[2] Materials circulate as energy flows through the environment. The inputs to the economy come from the containing finite environment and constitute depletion, a cost. The final outputs return to the environment as wastes and constitute pollution, also a cost.

For now, focus on the upper "empty world" part of the diagram. The economy (brown stuff, consisting of human bodies and manmade artifacts) is made from matter and energy taken from the environment (green stuff). Thanks to the first law of thermodynamics (no creation or destruction of matter-energy) more brown stuff necessarily means less green stuff. In physical dimensions the economy is an open subsystem of the environmental biosphere (i.e., it both receives matter and energy inputs and returns matter and energy outputs to the larger system).

[2] True, an occasional meteor hits the earth (a dangerous involuntary material import) and a few moon rocks were voluntarily imported and now decorate a stained-glass window in the National Cathedral. A few rockets and rovers have been exported to space. A lot of satellites, as well as material detritus, are circulating in earth orbit. Whether we consider material in earth orbit as part of the earth or outer space can be debated. Currently a few billionaires are fixated, along with NASA, on space colonization as necessitated they believe by our overconsumption, overpopulation, and continuing commitment to growth. The problem is real, but their solution is delusional, as is the expensive technological effort to migrate to where few intelligent people want to go, and to discover “if we are alone in the Universe”.

People die and artifacts wear out or are used up, so there is an inevitable outflow of degraded waste from the economy back to the environment. If the inflow of production and reproduction is equal to the outflow of depreciation and death then the economy (stocks of people and artifacts) remains constant in physical size, a steady state. If inflow is greater than outflow it grows; if less it declines.

In addition to the quantitative difference between inflow and outflow there is also a qualitative difference. The inflow consists of useful natural resources, the outflow of useless wastes. Usefulness is closely correlated with low entropy, and uselessness with high entropy.[3] An economy cannot directly reuse its own wastes any more than an animal can directly re-ingest its own excrement, or a car can run on its own exhaust fumes. This follows from the second law of thermodynamics, the entropy law.

It is true that waste matter is ultimately reused, but only after having been decomposed and restructured by biogeochemical cycles powered by the sun. Solar energy arrives in low entropy form and exits the earth in high entropy form. Accumulating carbon dioxide in the atmosphere from burning fossil fuels slows down the outflow of heat, forcing a rise in temperature and consequent climate change which has huge economic consequences. Energy is not recycled whether from the current solar flow, or from the stored sunlight of Paleolithic summers concentrated in the form of fossil fuels. As shown in the diagram only matter is recycled, often advantageously, but is far from completely recycled—about 35% for municipal solid waste in the US. Furthermore, it requires an increase in energy throughput, as well as the wearing out of material implements, to carry out the limited recycle. Money flows in a circle. Physical resources ultimately do not. The current enthusiasm in some quarters for a fully “circular economy” is quite misleading, as is the circular flow diagram in the first chapter of mainstream textbooks.

So far, our diagram is in physical terms only. The economy thus appears as a giant machine for converting useful resources into useless wastes---an idiotic process. To make sense of the economy we must recognize that the ultimate value product of the economic process is not a physical thing, but a psychic experience, the conscious enjoyment of life, represented by the word "Welfare", placed outside the circle of biophysical things. But we are not disembodied spirits. As physical earth-beings our enjoyment of life depends on our physical maintenance, and requires the services of both the natural ecosystem (green arrow to Welfare, e.g. clean air and water) and the services of artifacts that we have produced (brown arrow to Welfare, e.g. bicycles and cell phones).

Looking now at the lower "Full World" version of the diagram we might ask how much larger is the economy than previously. World population in my lifetime has quadrupled, from 2 to 8 billion. That has never happened before. Populations of cars, houses, cell phones, etc., have far more than quadrupled in my lifetime. Human biomass plus that of our cattle, now accounts for some 96% of all mammalian biomass (36% human, 60% cattle, soon to be converted to human biomass). Only 4% is left for wild mammals. As for birds, 70% are chickens and other poultry, with only 30% wild birds.[4] As noted above the atmosphere is now so full of greenhouse gasses that it is altering the climate in extremely costly ways. The world is clearly full in the stock dimension of populations of people and our produced goods and "bads". As a consequence of the larger stock dimension there is an increased flow dimension of the throughput necessary to maintain the larger stocks. More depletion and more pollution of the smaller remaining biosphere means a reduced flow of ecosystem services. This is obvious without monetary measurement.

[3] Nicholas Georgescu-Roegen, *The Entropy Law and the Economic Process*, Harvard University Press, 1971.

[4] https://www.ecowatch.com/biomass-humans-animals-2571413930.html

Continuing with the "full world" diagram, we see that the larger economy has increased the maintenance throughput (more depletion and pollution, larger throughput arrows). The larger economy also increases the flow of economic services, but the consequently smaller biosphere has diminished the flow of ecological services. If the physical growth of the economy results in an increase in the brown economic services arrow that is greater than the reduction in the green ecosystem services arrow then we have *economic growth*. Extra benefits greater than extra costs. If the reduction in the green ecosystem services arrow is greater than the increase in the brown economic services arrow then we have *uneconomic growth.* Extra costs greater than extra benefits. The optimal scale of the economy relative to the biosphere occurs when the sum of ecosystem services and economic services is a maximum.[5]

That completes my suggested revision of the original diagram of "the relation of the economy to the environment". I sent my suggested revisions off to the *World Development Report* authors with high hopes. When the second draft arrived, I saw that the original diagram was repeated, with no change in the text. However, a larger rectangle, unlabeled, now enclosed the original diagram, like a picture frame. With some annoyance I wrote back that my suggestion was not simply to put a picture frame around the diagram, but rather to specifically depict the most basic "relationships of the economy to the environment" and explain them.

Time passes and the third draft arrives. No more diagram. Completely omitted. No comment on my suggestions. They abandoned the whole idea of a visual representation of the relation of the economy to the environment. I was very surprised, but gradually began to understand why such a diagram simply could not be included, and why I was naive to have expected it.

Once you depict the economy as a subsystem of a larger system that is finite, non-growing, and materially closed (with a non-growing throughput of solar energy), then it is obvious that the growth of the economic subsystem is limited by the finitude of the containing ecosystem. It is also limited by the entropic nature of the metabolic throughput of matter-energy by which the economy is maintained. The goal of the World Bank and its member countries is growth. It serves this goal by making loans that must be paid back at interest made possible by the growth that the investment generates. To realize that not only is growth limited *physically* by finitude and entropy, but that it faces an earlier *economic* limit when the loss of ecosystem services begins to exceed the gains from extra economic services, is a large and bitter pill for the Bank to swallow. It is especially bitter in view of evidence that we have already reached the economic limit and that further growth has become uneconomic, at least in rich countries. So, you might suspect that the WB would advocate reduced resource throughput for rich countries to allow greater throughput in poor countries up to an acceptable standard of living. But no, the rich are urged to grow faster in order to provide markets for the poor to sell in, and to accumulate capital to invest in poor countries. The idea that growth in the global macro-economy could, even

[5] Rational humans could be expected, as growth continues, to satisfy our most important needs first, and to first sacrifice in exchange our least important ecosystem services, in so far as we are able. Therefore, marginal benefits of growth generally decline while marginal costs of growth increase, tending toward equality at the optimal scale. And on the subject of measurement, it must be noted that we have only incomplete measures of economic services, and extremely incomplete measures of ecosystem services. Nevertheless, real magnitudes do not cease to exist just because we can't accurately measure them numerically. We can see and feel their consequences. Also, in spite of Pareto, we know that a pin prick hurts Jones less than a leg amputation hurts Smith. Although analytic thought requires distinct definitions, dialectic thought can reason with partially overlapping categories. For now, we also leave this definition of optimum scale as purely anthropocentric, referring only to human welfare. But other sentient creatures both enjoy their lives and suffer—they have intrinsic as well as instrumental value. It is difficult to account for the welfare of all life beyond recognizing that steps toward counting welfare of non humans will require greater sharing of the earth with them, and consequently a lower optimum scale for humans.

theoretically, be *uneconomic* is very disturbing to economists. You will not (yet?) find the term "uneconomic growth" in the index of any textbook on macroeconomics.

But this is the basic message of Ecological Economics. The economy is a subsystem of the biosphere and has become too large to fit. We have overshot our ecological niche. Our major goal of growth has now become uneconomic, and growth must be replaced by shrinkage---or "degrowth" as some now say.[6] That is not as dismal as it might at first seem because Ecological Economics distinguishes between *growth* (quantitative increase in size by accretion or assimilation of matter), and *development*, (qualitative improvement in technology, design, and ethical priorities). Sustainable development in ecological economics is defined as development without growth (qualitative improvement without quantitative increase) ---still possible, but much slower and more difficult than the customary "development with growth" as measured by GDP.[7]

Part II: Analytical Parable: The Plimsoll Line

If we begin with the pre-analytic vision recommended above, rather than the vision of an empty rectangle receiving inputs from nowhere and sending outputs back to nowhere, then what analytic questions arise? Since the economy is now seen as a subsystem, the first question is, how large *is* the existing economic subsystem relative to the containing and sustaining ecosystem? Then, how large *can* it be without destroying the larger system with its entropic throughput of depletion and pollution? And, how big s*hould* it be to optimize total Welfare? This is the problem of Scale, completely ignored by mainstream economics, the so-called neoclassical-Keynesian synthesis. The next big question after Scale is what is the Distribution of ownership of natural resources among the population, and the Distribution of the income and wealth produced with those resources? The last big question is how is the resource throughput Allocated among the different goods produced? Does the menu of produced goods match the preferences of the people? In sum, what is the physical *scale* of the economy relative to the ecosphere, what is the *distribution* of income and wealth among the citizens, and what is the *allocation* of total output among different products. A good *scale* is at least sustainable, and hopefully optimal; a good *distribution* is fair or just; a good *allocation* is efficient.[8]

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[6] Timothee Parrique, *The Political Economy of Degrowth*,

https://www.researchgate.net/publication/339844751_The_Political_Economy_of_Degrowth/link/5e68d72a4585153fb3d61970/download

[7] A small like-minded group within the WB decided to provoke external debate with the message of the 1992 *World Development Report*, given that our internal efforts to influence it had failed. See Robert Goodland, Salah El Serafy, and Herman Daly, eds. Population, Technology, and Lifestyle : The Transition to Sustainability, Island Press, 1992, Washington, D.C. (Also published by UNESCO, 1991, Paris; under the title Environmentally Sustainable Economic Development : Building on Brundtland). This collection's authority was bolstered by the fact that it contained contributions by two Nobel laureate economists (Trygve Haavelmo and Jan Tinbergen), as well as a supporting introduction by the environmental ministers of two of the Bank's biggest borrowers (Emil Salim of Indonesia and Jose Lutzemberger of Brazil). But that was not enough to elicit any internal reconsideration of the World Bank's commitment to growth. A decade later in 2003 another *World Development Report* on the same topic was more willing to recognize some costs of growth, but was still firmly within the growthist paradigm. (See, "The illth of nations: comments on World Bank World Development Report, 2003", in H. Daly, Ecological Economics and Sustainable Development, Edward Elgar, Publishers, 2007.

[8] Herman Daly "Allocation, Distribution, and Scale: Towards an Economics that is Efficient, Just, and Sustainable," *Ecological Economics,* 1992 (December)

Mainstream economics has exhaustively analyzed the problem of efficient allocation, using the Pareto definition of efficiency, that is, an allocation such that any reallocation could not improve the welfare of one individual without reducing the welfare of some other individual. It follows that Pareto efficiency is defined only on the basis of a given distribution. Mainstream economists overwhelmingly focus on policies of efficiency of allocation, making some better off without making anyone worse off. Distribution is usually treated as given. Although questions of distributive justice are not ignored, and indeed have been increasingly studied by mainstream economists recently, they are correctly treated as matters of justice, not efficiency. Nevertheless, following Pareto, to objectively make some better off while making no one worse off is much easier with growth. More for some without less for others. That works as long as we allow scale to increase. But too large a scale means uneconomic growth. Ecological economics, by contrast, starts with the problem of sustainable scale, followed by that of just distribution. Only after social collective answers to these questions are given is the individualistic market allowed to seek an efficient allocation of goods, and even then, only of rival and excludable goods. Nevertheless, many necessary goods are both rival and excludable, so efficient allocation remains important.

To clarify, consider the analogy of loading a boat. Allocation involves apportioning the weight of cargo and passengers efficiently so as to maximize load carried without capsizing the boat. Distribution involves the apportionment of ownership of the cargo and cabin space among passengers, the rich and the poor, first class and steerage. Scale is the total load, the weight of cargo plus passengers, placed in the boat. Suppose we keep on loading the boat gradually, always allocating the weight efficiently and distributing it justly. Eventually the boat will sink, "efficiently and justly," to the bottom of the harbor.

Such overloading of ships is prevented by the maritime institution of the Plimsoll line. When the water mark hits the Plimsoll line the ship is fully loaded, it has reached its scale limit, even though the load is efficiently allocated and justly distributed. Samuel Plimsoll (1824-1898) fought in the English Parliament for many years to get a load limit law passed.[9] Ship owners preferred to overload ships, risking the lives of sailors while fully insuring the value of their ships, cargo and profits. This is an example of the "moral hazard" of insurance. Being insured against a hazard makes one less diligent in preventing it, and perversely increases the overall likelihood of the hazard. But sailors' lives lost were not counted as a cost to the merchants, nor insured for the benefit of the sailors' widows and orphans. Samuel Plimsoll was known as "the sailor's friend". The macro-economy has no analog to the Plimsoll line to prevent the growing scale of the economy from exceeding the carrying capacity of the ecosystem. Another parable coinciding with a historically true story.

So, the next question for analysis is what would such an economic analog to the Plimsoll line look like when combined with concern for distribution and allocation? We have a good clue from the cap-auction-trade systems that have already been applied to some resource flows, including petroleum and fish. A cap or quota is set on total extraction per year that is deemed within ecological carrying capacity-- in the case of oil the capacity of the atmosphere to safely absorb resulting CO2, in the case of fish at the estimated optimal sustainable yield. This is the scale limit. Second, is the distribution limit. Who owns the resource, and who owns the dollars that will buy access to the limited resource at auction? There are various possibilities for setting distributive limits. One is a minimum and maximum income---a limit to the range of inequality in incomes. Another is a wealth tax. Another is public ownership of the resource being auctioned. Third, the resource or the right to deplete it once purchased at auction can be resold to third parties in a free market. This permits efficient allocation in accord with differing individual preferences, differing technologies, and ability to pay. Market prices would allocate the

[9] https://blog.britishnewspaperarchive.co.uk/2013/02/10/samuel-plimsoll/

aggregate quota, they would not determine the size of the quota (scale), or the initial distribution of ownership and income, as they do now.

The logic of the cap-distribute-trade system was first described by Kenneth Boulding as an institution for limiting the scale of population while giving everyone the same right to reproduce, yet allowing these equally distributed rights to be reallocated by exchange or gift in the light of peoples' differing ability and desire to have and care for children.[10]

Although he knew it would have no political support as a population control measure, Boulding nevertheless saw it as a way of combining macro stability (limiting aggregate births to a replacement amount), while justly distributing ownership of the newly scarce right (everyone is given the same number of reproduction rights), while also respecting individual differences in ability and desire to reproduce (allowing market reallocation in conformity with preferences and ability to pay). The scheme respects and combines sustainable scale, just distribution, and efficient allocation. Although there has been no support for applying this imagined scheme to population control, it has been successfully applied to limiting pollution or depletion of some resources, as indicated above.

Many object to any connection between reproduction and markets as if any contact between money and births profaned the sacred. At the same time, however, we witness the *selling* of ova by young women in elite colleges, and of sperm by young men, to be combined *in vitro* by physicians *for a fee*, and then implanted in the *rented* womb of a surrogate gestational "mother". For some reason these very invasive ties between reproduction and markets elicit little opposition, often hailed as scientific progress, while Boulding's minimally invasive connection elicits vehement objection. Why is that? Perhaps because the aim of Boulding's plan is to limit aggregate births, as appropriate in a full world, while the aim of the medical market is to increase births, as might be appropriate if the world were still empty. As for the objection that it gives the rich an advantage in reproduction, remember that the rich always have an advantage in everything, and that the overall plan, as here modified, limits that advantage by restricting the range of income inequality between a maximum and a minimum income, as well as by equal initial distribution of the birth quotas. And, from the point of view of children, is it really so bad if as a result they are on average born richer rather than poorer? Also, Boulding's plan has no eugenic motivation, while the sperm and ova markets clearly do by advertising the qualities and accomplishments of the paid “donors”. A much more reasonable objection is that birth rates are currently declining without such an institution in response to increased education of women and availability of contraception, so for now just invest a lot more in education of women, which should be done anyway, independently of any consequences for the birth rate. Put the Boulding plan on the back burner regarding population, but don't forget it, and meanwhile expand its application to limiting the throughput of basic resources.

China's one-child policy was a much more drastic measure to lower population than the Boulding plan envisioned. A one-child family means no brothers, sisters, cousins, or aunts and uncles. When coupled with an unjust cultural preference for males, and the availability of selective abortion, it also greatly distorts the sex ratio, restricting future availability of marriage partners. Boulding's plan offers a less socially disruptive path to population reduction, should that ever become an accepted goal. I discuss the Boulding plan, not as a currently viable political alternative, but because it so clearly distinguishes the goals of sustainable scale, just distribution, and efficient allocation, and because its logic has already been applied to limiting scale of use of certain resources. Also, if it should ever be recognized as

[10] Kenneth Boulding, *The Meaning of the Twentieth Century*, Harper and Row, 1965. The broader application to pollution quotas was made in J. H Dales, *Pollution, Property, and Prices*, University of Toronto Press, 1968.

necessary to reduce the scale of population (as I expect it will be), it is hard for me to imagine a more just and efficient way of doing it. The reader os invited to do better.

Because of its partial reliance on the market for solving the allocation problem (in preference to central planning) the cap-auction-trade system has sometimes been labeled "free market environmentalism". This is totally misleading. It should rather be called "doubly constrained market environmentalism" because, contrary to the free market, there is a cap that limits scale, and a distributist institution that limits the range of inequality of ownership, or of income in general. The market is no longer free to determine scale or distribution, which it could never do acceptably in the first place.

Part III: Technological Parable: The Tragedy of Thomas Midgley, Jr.

A common reaction to the radical policy of limiting growth has been to emphasize the power of science and new technology to increase the productivity of a given throughput of resources. This is recognized and encouraged in ecological economics as qualitative development rather than quantitative growth. Without for a moment denying the benefits of technology, it is necessary to remember that new technology introduces novelty, something with which we have had no experience and consequently do not fully understand. It frequently has unintended consequences which can be very costly.[11]

Most people have never heard of Thomas Midgley, Jr., even though he likely had more impact on the atmosphere than any other human.[12] Midgley was a chemical engineer who worked for DuPont and General Motors.[13] He was given the task of eliminating engine knock, and came up with the solution of adding tetraethyl-lead to gasoline. It solved the problem by creating the bigger problem of spreading a neurotoxin all over the world in the exhaust of automobiles. Eventually, after 50 years and the spreading of 25 trillion liters of leaded gasoline, its use was banned. Next Midgley was given the job of finding a substitute refrigerant gas that was neither toxic nor flammable. He invented a good substitute, CFCs, (Freon) which worked well both as a refrigerant and as a propellant in spray cans. However, when it dispersed into the stratosphere it combined with ozone, reducing the capacity of the ozone shield to partially block ultraviolet radiation arriving to earth, thereby increasing the incidence of skin cancer. It too was eventually banned, but again it took nearly 50 years before Mario Molina and Frank Sherwood Rowland discovered the unexpected effect (for which they received the Nobel Prize in chemistry for 1995).

Midgley, an excellent chemist, found technical solutions to two fairly small economic problems that unintentionally created two very large ecological problems. As if that were not enough tragedy for one man, Midgley contracted polio late in life and was confined to a wheelchair. Being an inventor, he constructed a system of ropes and pulleys to hoist himself out of his wheelchair into bed. One night he got his neck tangled in the ropes and was strangled to death. This true story of unbearable irony serves

[11] Also increased productivity in using a resource lowers its price, which in turn increases quantity demanded, thus cancelling in part or in whole the reduction in use of the resource made possible by the technological improvement. In the 1866 words of William Stanley Jevons “It is wholly a confusion of ideas to suppose that the economical use of fuel is equivalent to a diminished consumption. The very contrary is the truth.” Jevons’ insight suggests an important advantage of quantitative controls over price controls—the blowback of greater consumption from the efficiency increase induced by the tax-augmented price is blocked by the quantitative cap.

[12] Frank A. Von Hippel, *The Chemical Age,* University of Chicago Press, 2020.

[13] For a fuller account of Midgley, see https://www.youtube.com/watch?v=IV3dnLzthDA

as another parable that warns against unintended consequences from technology-driven "economic" growth.

DuPont, General Motors, and Thomas Midgley, Jr. were trying to do good, but ended up doing harm because their vision of the economy was the same as that of the *World Development Report* discussed earlier---a system that converts undefined inputs into undefined outputs without recognizing the effect they have on the containing and sustaining biosphere. Chemists already knew that lead was a neurotoxin, and had they viewed the economy as a subsystem of the biosphere should have sought another cure for engine knock. Nobody yet knew about the effect of chloroflourocarbons on the ozone layer, but this parable of ecological ignorance provides further reason for the economy to expand slowly and carefully into the biosphere.

While much of pollution has traditionally been ordinary garbage and junk, much advertised “better living through chemistry” has given us novel pollutants with which the biosphere has had no evolutionary experience and to which it is consequently un-adapted. Non-degradable plastics, radioactive materials, agro-toxics, endocrine disruptors, etc. effectively fill the world in the sense of crowding out safe human and non-human habitation because some are deadly even in low concentrations of parts per billion or trillion.

Part IV: Ethical Parable: Darwin vs. Wallace and the 1924 Leopold-Loeb “Trial of the Century”

The pre-analytic vision and initial analysis of ecological economics given above are very simple, and the policy implications are very radical. The most radical policy implication is that growth, our major goal in the empty world, has become uneconomic in the full world. Growth now increases environmental and social costs faster than production benefits[14]. We should stop aggregate growth and begin to contract or "degrow", both in terms of per capita throughput and population. What happens to GDP as a consequence is of secondary importance. Climate change and loss of biodiversity are symptoms of the basic problem of overshoot, and overshoot means that the world is too full of us and our stuff[15] – too much *takeover* of areas capable of supporting current photosynthesis, and too rapid *drawdown* of the stored products of ancient photosynthesis.[16]

Growth has for two centuries been our *summum bonum*. Growth has been our attempt to solve poverty without sharing, our substitute for distributive justice, our cure for unemployment, and for inflation, our hoped-for cure for overpopulation via the automatic demographic transition, and our illusory means of imposing peace through military superiority. Growth has also meant human domination of the rest of nature (the anthroposcene), without a recognition of the consequent duty of humans to use our vastly superior capacities in service to the total creation of which we are a key part.

What ethical foundation can support such a radical about face? Does such a foundation exist?

Currently the ethical foundation of ecological economics is unsettled and eclectic. Many take the ancient materialist Epicurean and Lucretian view, most recently modernized in the neo-Darwinism preached by many biologists, that everything results from random mutations subject to natural selection by

[14] John Talberth, Clifford Cobb, Noah Slattery, *The Genuine Progress Indicator*, Redefining Progress, Oakland CA, 2006.

[15] William R. Catton, *Overshoot*, University of Illinois Press, 1980.

[16] Ecological Footprint, https://www.footprintnetwork.org/our-work/ecological-footprint/

differential reproductive success.[17] Objective value and ethics, beyond reproductive success, is considered meaningless. Humankind is considered ultimately no different from other creatures, a random consequence of blind evolution. Many ecologists have absorbed this worldview from their parent discipline of biology. Blind purposelessness, however, leaves no room for value. And without value the economy has no reason to be, other than to generate material waste, as we saw in Part I. So, the desired happy marriage between the disciplines of ecology and economics requires some serious marriage counseling.

Those ecological economists less enthralled by neo-Darwinism see humans as fundamentally different, as still part of the larger evolved creation to be sure, but a special creature who, like it or not, is effectively in charge of the larger creation, because far more than other creatures, humans reflect the image, albeit a broken image, of their Creator. Humans have conscious self-identity as persons, plus reason, language, law, literature, mathematics, history, science, music, art, etc. Ethics, in this view, derives from this special capacity and resulting responsibility to employ these unique gifts for the care and nurture of creation. Reducing humans to the level of other animals is false humility covering up irresponsibility. If we want to stop a bullfight we address our arguments to the matador, not to the bull.

Modern scientific materialism does not like the idea of Creator, even one who employs evolution as a means of creating. To speak of responsibility or blame is a further infraction of the rules of the naturalistic methodology---it is "unscientific." They believe that Chance and Necessity, natural selection, neo-Darwinism, is the correct and sufficient worldview. When confronted by other scientists with the extreme fine-tuning of the physical laws and numerous constants necessary for life, the materialists admit that the compound probability that life emerged in our universe by chance is infinitesimal. So, they postulate infinitely many (unobservable) universes in which the infinitesimal probability, multiplied by infinitely many trials, could, and evidently did, happen. We simply won the grand cosmic lottery---lucky us! Their pre-analytic paradigm of Materialism and Chance is very strong. It has, after all, led them to many powerful discoveries-- as well to a basic nihilism. Increasing power with diminishing purpose---what could possibly go wrong?

In popular discussion the Chance view is considered Scientific, the Purpose view Religious. In a deeper sense, however, each view is both scientific and religious.[18] For example, the independent co-discoverer of natural selection, Alfred Russell Wallace, concluded that the theory of natural selection, while certainly powerful, was nevertheless insufficient to explain the vastly superior capacities of humans over other creatures.[19] He invoked a spiritual dimension as a hypothesis supplementary to the insufficient hypothesis of materialist natural selection to explain the enormous human difference. The procedure is open-minded, but it lowered his prestige among the materialistic Darwinists.

And even Darwin, although remaining a materialist, nevertheless wrote to a correspondent:[20]

> Nevertheless, you have expressed my inward conviction, though far more vividly and clearly than I could have done, that the Universe is not the result of chance. But then with me the horrid doubt always arises whether the convictions of man's mind, which has been developed from the mind of the lower animals, are of any value or at all

[17] Richard Dawkins, *The Selfish Gene*, Oxford University Press, 1976.

[18] Neil Thomas, *Taking Leave of Darwin*, Discovery Institute Press, 2021

[19] Alfred Russell Wallace, *Darwinism*, (Chapter 15), 1889.

[20] Charles Darwin, *Life and Letters of Charles Darwin*, (1986), "Religion", in Francis Darwin (ed.), Vol. I, Ch VIII, New York: D. Appleton & Co. pp. 274–86.

> trustworthy. Would any one trust in the convictions of a monkey's mind, if there are any convictions in such a mind?

This is a curious statement. Darwin asserts an inward conviction that the Universe is not the result of chance. But he then disparages his own troublesome conviction as untrustworthy, having developed from a "monkey's mind." Yet he seems not to discount his own theory of materialist natural selection for that reason, although it must have come from the same "monkey's mind" as his other convictions. As others have asked, if my thoughts are reducible to matter in motion, then why believe any of them, including this one?

Ethics requires purpose, ordering of wants and actions relative to objective value, final causation, teleology, and a perception of ultimate value – all the things that the reigning naturalism and materialism deny. This vision leaves no room for objective value and a hierarchy of purposes in reference to which actions are chosen, as required by ethics. Ethics is doubly ruled out – if all is determined, then purpose is a non-causative illusion; if good and evil were non-existent then there would be no criterion by which to choose ethically, even if choice were possible. On what basis then could we argue for ecological economics and its policies rather than the current growth economy---or vice versa?

The idea of objective value scares us because we think, with some evidence, that it might lead to intolerance and persecution of those whose vision of objective value is different from ours. This is certainly a danger, but the larger danger is that in denying objective value we no longer have anything to appeal to in an effort to persuade. It is just my subjective preferences versus yours, and since there is by assumption no higher authority, we have nothing to point to in order to persuade, nor accede to in being persuaded. There is no alternative but to fight, either with force or deceit. A commitment to the reality of objective value, including our ability to reason together about it – however dimly it is perceived – is necessary to avoid arbitrary rule by force. This defense of objective value was cogently argued by C. S. Lewis.[21]

A frequent objection to the reality of objective value is the assertion that different religions and cultures have quite different values. If value were truly objective there should be agreement on basic values, not the disagreement that we allegedly observe. In an Appendix to the book just cited, Lewis counters this opinion by assembling over 100 very similar affirmations of objective values drawn from authoritative sources in very different cultures in very different times and places. He divides the statements into eight categories, the titles of which indicate the particular objective value illustrated: 1. the law of general beneficence (against murder, violence); 2. the law of special beneficence (to family, friends); 3. duties to parents, elders, ancestors: 4. duties to children and posterity; 5. the law of justice (sexual justice, honesty); 6. the law of good faith and veracity (truth telling, avoiding slander); 7. the law of mercy (for widows, orphans, the poor and sick), 8. the law of magnanimity (rejoice in the good fortune of others, without envy). Lewis considered this collection of diverse cultural affirmations of common values not as proof, but as supporting evidence for objective value. His main argument was logical rather than empirical, *reductio ad absurdum* or proof by contradiction ---assume the contrary (no objective value) and show that it leads to contradictions and absurdities, as done in the preceding paragraph, and the following one.

Some materialist philosophers and biologists teach that morality and free will, however commonly experienced across cultures, are illusions, but beneficial ones with survival value, they say, and therefore selected by their presumed contribution to reproductive success to fit our environment – our

[21] C. S. Lewis, *The Abolition of Man*, 1944, reprinted by HarperCollins e-Books.

randomly changing environment, to be clear. However, they do not go on to consider the consequences of our (their) seeing through the illusions. Can an illusion, even a "beneficial" one, be effective once it is exposed as an illusion? I doubt it. The consequences of drinking this poison were made strikingly evident in the 1924 Leopold–Loeb "trial of the century" of two academically brilliant young Nietzschean–Darwinist nihilists who decided to prove to themselves that they were free from the illusion of objective morality by murdering a young man.[22] The only defense that their attorney, the famous Clarence Darrow, could muster for saving the admittedly guilty pair from execution was that their actions were determined, that in the great chain of strict determinism '*something slipped*'. But why '*slipped*' if there is no objective norm to fall short of?

It is evident that the institutions and policies of an ecological economy in a full world, will require a much more solid ethical foundation than that prevailing today. Economics must rethink its reduction of objective value to subjective preference, and ecology must rethink its reduction of objective value to purposeless neo-Darwinist materialism.[23] To combat the force of growthism by appeal to subjective preference and/or materialist determinism will be futile. Political economy began as a part of Moral Philosophy. Ecological economics requires returning to that historical starting point and re-thinking economics in the light of ecology, philosophy, and religion.[24] It also requires the foundation of a pre-analytic vision of the economy as a subsystem of a finite sustaining biosphere subject to the laws of thermodynamics and ecology. In terms of policy, it means that qualitative improvement (development) must replace quantitative increase (growth) as the path of progress. All together that is a very big change!

What development policies are indicated by such a big change, assuming the ethical will to enact them? As discussed earlier the cap-distribute-trade system for basic resources provides a framework for capturing increasing scarcity rents from basic natural resources and redistributing them equitably, while at the same time allowing the higher resource prices to induce both greater efficiency and frugality. Resource caps to limit the throughput of basic resources, especially fossil fuels, are required to reduce the ecological overshoot and consequent climate and biodiversity disasters from which all countries suffer. In nearly all countries inequality in the distribution of income has become extreme, and aggregate GDP growth no longer offers the hope to reduce inequality in an era of uneconomic growth. Therefore, a limited range of inequality bounded by both a minimum and a maximum income seems a necessary sharing to elicit the cooperation of the vast majority of citizens in democratic countries.

Contraceptive education and devices should be made universally available so that every birth may be a wanted birth. The greater demographic problem for nations will be migration. Ecological disasters, wars, and failing states have greatly increased the number of migrants, many of whom are legitimate refugees. Any country that limits its own resource use, limits its births, and provides a minimum income to its citizens, as here advocated, unfortunately cannot long continue to welcome large numbers of immigrants. Instead of people migrating to countries whose policies respect objective value (if such countries exist), those good policies will have to migrate to all other countries. Development policy must stop persisting in further growth in an already full world. And to accomplish this Ecological Economics

[22] They were sentenced to life in prison where Loeb was killed by fellow inmates. Leopold was eventually paroled and in apparent repentance spent the remainder of his life as a hospital technician in Puerto Rico. Darrow later defended John Scopes from the charge of "teaching evolution" in the notorious "Monkey Trial" of 1925.

[23] See, for example, Thomas Nagel, *Mind and Cosmos: Why the Materialist Neo-Darwinian Conception of Nature Is Almost Certainly False*, Oxford University Press, 2012.

[24] Herman Daly, *From Uneconomic Growth to a Steady-State Economy*, Edward Elgar, Publishers, 2014.

needs to base its ethics on objective value, rather than subjectivist individualism or materialist neo-Darwinism.

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The Paradigm in the Iron Mask: Toward an Institutional Ecology of Ecological Economics

Gregory A. Daneke [Professor Emeritus, Arizona State University, USA]

The economy is a wholly owned subsidiary of the environment, not the reverse.
Herman Daly

Anyone who believes that exponential growth can go on forever in a finite world is either a madman or an economist.
Kenneth Boulding

*Many of the social and environmental failures of the global economy trace to the flawed and outdated maps of the **ego´**-nomics currently taught in our most prestigious universities as scientific truth and echoed daily in the media. Those failures are so significant that they pose an existential threat to the survival of the human species. Recognizing that ego´-nomics shields economic predators from moral responsibility, private financial interests use their financial power to relentlessly promote the maps of ego´-nomics through media, education, government, and even religion.*
David Korten

We will never create sustainability while immersed in the present financial system. There is no tax, or interest rate, or disclosure requirement that can overcome the many ways the current money system blocks sustainability.
Dennis Meadows

Abstract
Various heterodox economists envision some sort of Socio-ecological Economics (armed with complex adaptive systems tools and concepts) as the vanguard of their displacement of the crumbling cultural citadel of Mainstream Economics. This is especially relevant given rapidly converging environmental catastrophes on a planetary scale. Unfortunately, ecological reasoning remains institutionally imprisoned and policy impoverished. Its development has been disrupted by its own disarray and by its subservient adherence to rules and conventions that the mainstream itself regularly violates. In order to mount a serious paradigmatic challenge, scholars and practitioners need be able to dismantle the institutional barricades erected in their path over decades. They also need to build a stronger policy orientation, and focus their efforts on financialization as the prime source of much of the social and natural systems disintegration.

Given the numerous disasters exhibited of late involving Mainstream Economics, various heterodox economists have called for much greater consideration of ecological processes (both natural and social, see Fullbrook & Morgan, 2001). Such processes, in turn, have become increasingly illuminated through the burgeoning science of complex adaptive systems (e.g., Preiser, et al, 2018). What some of these earnest observers fail to fully appreciate, however, is that ecological reasoning demands perspectives

that economics as a policy enterprise is specifically designed to obliterate. Merely invoking alternative perspectives without first exploring the stranglehold that mainstream economists have over specific institutions and the culture at large is mostly a fool's errand. Economics and ecology stem from the same Greek root "oikos" or eco (meaning home) and referring to the art of life. Yet, they have become like the twins in the swashbuckling tale by Dumas, *The Man in the Iron Mask* (with one the vile usurper the other the innocent prisoner). Fairly early on economics abandoned concern for widespread human welfare and focused on what the Greeks called "chrematistics" (or "the art of acquisition", see Stahel, 2021). During the middle of the 20th century, Mainstream Economics became less of a science and more like a primitive cult (for a bit comic relief see Leijonhufvud, 1973). It is now primarily practiced to conceal the contradictions and extoll the virtues of yet another predatory epoch (much like the Guided Age, see Veblen 1899). Mainstream Economics is a pretty much a static system virtually out of touch with the dynamics of "living systems" (popularized by Capra, 1996). It is particularly hostile to anything systemic and symbiotic, especially those theories and methods associated with sustainable socio-ecological systems. Over the last few decades, the mainstream has morphed to ignore mounting incongruities, moving from Neoclassical to Neoliberal and now Neofeudal representations, further enshrining inequality and environmental devastation.

Given their appeal to pecuniary interests and proclaiming their status as the supreme social science, economists sought to sufficiently disguise their ideological predilections and their overwhelming allegiance to their generous plutocratic patrons. In the process, mainstream economists became increasing recalcitrant in defense or their fraudulent prestige (e.g., fake Nobel Prizes) and inordinate power (in business & government), not to mention their outsized personal remuneration and blatant conflicts of interest (recall the award-winning documentary, *Inside Job*).

Worse yet, by pretending to be apolitical, ahistorical, and value free, they have clandestinely expanded the vast set of cultural entanglements with a retrograde political economy and associated ecological destruction. Maintenance of their mythology requires increasingly intense societal dementia. The rapacious systems, they so vigorously defend, exacerbate inherent financial instability (see, Minsky, 1980) and accelerate upward redistribution, as well as ignoring the rapidly converging ecological catastrophe (i.e., global climatic chaos). Even under optimistic scenarios these processes will bring with them levels of political oppression and societal immiseration not seen since the Dark Ages.

All the while, the remediative observations of ecologists remain tangential, at best, to serious policy discussions. Catch phrases and sound bites have entered the lexicon, but mostly as "green washing" for corporate and governmental tokenism, and more recently to stimulate popular support for various neofeudal schemes such as the so-called "Great Reset" (see Roth, 2021). Things are indeed dire, but hopefully not so dire, that the public should trust the "Davos Men" (who created these crises) to completely privatize planet and rent it back to them in a less environmentally disruptive fashion. Before these schemes gain more momentum a new breed of scholars should seriously strive to identify and excise the anti-ecological as well as anti-democratic institutions hard-wired into the existing political economy (note Daneke, 2019).

Never Betwixt Will Meet

The forced partition of ecology and economics is obviously complex and convoluted, but for purposes of this discussion John Bellamy Foster (1999) provides a highly simplified, yet useful heuristic, "the four laws of ecology and the four anti-ecological laws of capitalism". ***The Laws of Ecology*** are vague, but, relatively straight forward,

1. Everything is connected to everything else;
2. Everything must go somewhere;
3. Nature knows best; and
4. Nothing comes from nothing.

To the extent that Mainstream Economics makes any sense at all, it is only in the context of early industrial capitalism. At its core, economics is an attempt to memorialize and concertize a brief instance in human history as some sort of enduring natural process. Hence it may be safe to say that Bellamy Foster's laws of capitalism are for the time being the ***Laws of Economics***,

1. The only lasting connection between things is the cash nexus;
2. It doesn't matter where something goes as long as it doesn't reenter the circuit of capital;
3. The self-regulating market knows best; and
4. Nature's bounty is a free gift to the property owner.

Separated at birth in the early 20th century economics thrived politically, but stagnated intellectually. Ecology, meanwhile, remained obscure, but blossomed into a rigorous science of evolution and adaptation. Beginning as a minor subfield in zoological studies, ecology (once referred to as the "economics of nature") has evolved to embrace the dramatically enhanced awareness of human and natural systems interactions. Moreover, they have recently adopted the tools and concepts emerging from computational advances and the science of nonlinear dynamical systems (see, Levin, et al, 2013; Anderies, 2014), as well as those of political ecology and cultural anthropology (note, Fabinyi, Evans, and Foale, 2014).

Unfortunately, while economists use (and abuse) 19th century physics (Mirowski, 1989) to formalize rosy fairy tales (e.g., efficient markets, general equilibrium, etc.), ecology uses 21st century physics to paint unpleasant pictures of pending resource peril. If ecologists were to be taken seriously as social scientists, then would have to address their own deterministic specters (Darwin as well as Spencer), and temper their darkening visions. The Original Institutional Economics (also called Evolutionary Economics) seems to have already laid the groundwork for less deterministic concepts (Hodgson. 2003). Moreover, complexity scientists (with their "far from equilibrium" worldview, see Jantsch, 2022), offered more novel, as well as explosive, recombinations. Together, Institutional Economics and complexity theories generate perspectives where evolving human desires and designs actually matter, and where long-term mutual cooperation prevails over brute competition. Some see in this institutional blending a more solid theoretical foundation for complexity applications (e.g., Gräbner, 2017). Brian Arthur, the godfather of Complexity Economics (2021), suggests that it is by its very nature is an evolutionary eco-system perspective with roots in folks like Thorstein Veblen. Mainstream Economics, with its static equilibrium models, has, of course, already swept most of evolution under the rug. The rare exceptions being when they try to account for the periodic appearance of their technological salvation cycles (note Nelson, 2020; also see Daneke, 1998).

Ecological Economics Blithers Ahead

Having partially escaped their imprisonment, ecological approaches were often blinded by a kaleidoscope of ideologies and methodologies (see, Sagoff, 2012; Lo, 2014; also note, Fragio, 2022). Given their own observations regarding ubiquitous human maladaptations, the ability of ecologists to demonstrate a politically palpable path became problematic. All the more so if they ignored the lessons regarding barriers to change provided by the early institutionalists (note, Smith, 2015). Mounting anthropological (Abel and Stepp, 2003) and "archaeoecology" (see. Crabtree and Dunne, 2022)

evidence regarding the regularity of societal devolution and/or "collapse" (e.g., Tainter, 1988; also note Rubiños and Anderies, 2020) tended to fuel more pessimistic prognostications. Meanwhile, the objective reality of large-scale ecological catastrophes in the near future (brought on by civilization's addiction to cheap and/or militarily manipulated fossil fuels amid global warming) should have at least raised the salient of their ideas. Instead, with the help well-funded propaganda (muddying the waters of sound environmental, geologic, and atmospheric science), a culture of denial emerged. More significantly perhaps, ecologists had very little experience "speaking truth to power".

Emerging ecological ideas also rushed headlong into the canonical growth imperative of the mainstream. Anyone who uttered ecology and economics in the same breath was bullied and harassed going as far back as the 19th century, but the battering became more intense in the late 1970s as Neoliberalism was fully asserting itself in the halls of power (Reagan, Thatcher, etc.). The unrelenting and scurrilous ad-hominem attacks on the scholars associated with *The Limits to Growth* (Meadows, et al., 1972) and/or other Club of Rome studies is a clear case in point. Unlimited growth is so essential to the mainstream's systems of power, it was cardinal sin to even broach the subject. One need not, apparently, concern themselves with distributional dysfunctions and the fraudulent nature of financial systems if the pie is always expanding.

Besides the magical device of yet undiscovered technological substitutions could be relied upon to replace all finite resources. Like the joke about the economist, physicist, and engineer stranded on a desert island confronting their only can of beans. "No problem" says the economist, "we'll just assume we have a can opener, and more cans will simply appear from the ether". In reality, the outputs of the US innovation system declined dramatically since the 1970s for various reasons (Arora, et al., 2020). One might expect, however, that the increase in financial tomfoolery (see Mazzucato, 2013) may have had something to do it, with all three of our castaways opting for jobs on Wall Street.

With the support of various groups like the United Nations, Ecological Economics forged their own subdiscipline and persisted in their attempts convince the mainstream that economic development was not the same at GDP growth, and that widespread economic well-being could made much more ecologically sustainable (see, Clark & Munn, 1986). But continued vagaries about nature of development, coupled with severe north/south inequities, made the popular notion of "Sustainable Development" pretty much an oxymoron (note Doyle, 1998). Furthermore, with the inordinate influence of the fossil fuels empire, the thermodynamic insanity of economics seemed the only thing being sustained (see Georgescu-Roegen, 1982). Nevertheless, sustainability, vaguely defined, remains the basic raison d'état of Ecological Economics.

Many ecologically oriented economists, however, after both trying to blend-in and/or beating their brains out against the mainstream fortress, seem to have decided to play "The Price is Right" game. Forgetting the old adage that "an economist is person who knows the price of everything and the value of nothing", they proceeded pell-mell. Initially some rediscovered the long lost "Lauderdale Paradox" (Maitland, 1804) which posits an inverse correlation between public wealth and "use values" on the one hand and private wealth and "exchange values" on the other. Neoclassicists, of course, decided early on to only recognize the relevance of the latter. Jumping into the deep end where welfare and standard environmental economists were already floundering trying to reproduce exchange mechanisms, many ecological economists held tight to the floaty of internalizing externalities and/or the infinite digress of pricing unpriced values. Myriad technical and epistemic, as well as institutional difficulties ensued (note, Vatn, 2007). When attempting to assert multi-attribute utility functions, "horse and rabbit stew problems" readily emerged (i.e., how many ecological rabbits does one need to temper the taste of financial horses?). Meanwhile, the political valiance of cost-benefit analysis was shifting, along with the rise of Neoliberalism. Cost-benefit was originally developed by the Army Corps of Engineers as a shopper's

guide for justifying otherwise questionable water projects (e.g., claiming flood control benefits for acreage that would be permanently flooded), but it had morphed into a powerful anti-regulatory weapon, capable generating claims that little of what government does is worth doing (except protecting private property). Plus, Cost-benefit has mostly ignored distributional problems (public costs, private benefits).

"Willingness-to-pay" surveys and other attempts to simulate market discovery mechanisms, were equally disheartening, unless one wished to privatize all of nature. Several self-identified "ecological economists", nonetheless, pressed on with their pricing campaign and ultimately came up with the figure for "natural systems services". The planet's "natural capital" was worth around 33 trillion according to Constanza and colleagues (1997). However, others contended it is quite a bit larger (maybe in the quadrillions) using devices like the "Ecosystems Bundling Index" and if one wants to recoup a portion of what has already been lost (see, Van der Biest, et al., 2014). Such indices are useful in identifying which companies and countries are getting the biggest free ride. But beyond finger pointing, actual policies for reducing the burden on natural systems are few and far between.

While pricing Natural Systems Services was a very dramatic gambit, this may have been a misstep on the part ecologically oriented economists. As capitalism is thoroughly predicated upon maximizing the free use of nature, turning the super tanker around in this narrow inlet is more than monumental task. At a basic level, billing or taxing (actually endless litigating) firms and nations over their use of natural systems may debase the notion of Natural Capital altogether, as well as further inflaming the political eco-system. Plus, one would expect past processes of commodification to proceed apace, not to mention the new incentivizing of hairbrained schemes like geoengineering the atmosphere. The entire process may prove a pyrrhic victory, if exchange values still predominate. Also, all the shadow pricers on the planet are no match for the "Shadow Bankers" (the unholy alliance of hedge or private (pirate) equity funds, mortgage brokers, ratings agencies, insurance companies, pay-day loan sharks, weapons dealers, and major investment banks).

Enter the Eco-warrior

While, the overall record or Ecological Economists in their battle with dismal science is pretty dismal. There were, however, a few minor victories, and one of their more prominent commanders was the late Herman Daly (e.g., 1968; 1986; 1998; and 1999, also note, Daly and Morgan, 2019). He made a dent in the prevailing paradigm by maintaining his Institutionalist moorings, as well as his commitment to the classical notions of a stable economies (which he called "Steady State") involving low throughput processes (Industrial Ecology). While perhaps just as doomed to third class citizenship among the mainstream, Daly presented a special threat. He was not afraid to resurrect long abandoned heretics such as James Maitland the 8th Earl of Lauderdale (1759-1839), Henry George (1828-1897), and Frederick Soddy (1877-1956) who along with Thorstein Veblen (1857-1929) remain increasingly relevant to the current economic conundrums. Daly was also an admirer of Karl Polanyi (1886-1964) and his detailed unnatural history of the "market society" and its explicit dangers (Polanyi, 1944). Furthermore, beyond his unique blending of institutional and ecological elements, Daly recognized that economics was primarily a policy enterprise.

As James Galbraith recently reconfirmed (2021), Mainstream Economics is far less a science than it is a "policy discipline", and a rather undisciplined one at that. Daly believed that it was on this ground that the crucial battles would be fought. Unlike many of the ecologically oriented, Daly was quick to engage it in many a policy skirmish. While respecting much of Neoclassicism, Daly was not afraid to point out its many defects, particularly when they entailed such obvious ethical as well as intellectual lapses. For him economics, especially at the macro level, had totally lost sight of human needs, with its perilous

pursuit of growth at any cost. Plus, he recognized that the micro's historic conversion of rents and financial manipulations into "earned income" was a key defect. More importantly perhaps, Daly stumbled upon the real "heart of darkness" in the systems of money and banking. Well before the recent financial meltdown, he exposed the inordinate stupidity at the core of financial institutions, and really struck a nerve by reiterating the call for "100% reserve banking" (Daly, 2016). But Neoliberal forces beat back these discussions and pushed forward into new realms of financial chicanery (e.g., exotic derivatives, mega-rehypothecations, and self-securitizations) claiming them to be vital to US financial leadership of the "New World Order". At the time, moreover, few Ecological Economists, rallied to their fearless leader.

Ecological Economics Without Economists

Eventually it may well be that reforming the mainstream is futile. A few heterodox economists (e.g., Rees, 2019; Norgaard, 2021; Spash and Guisan, 2021) imply that Socio-ecological Economics is far too important to be left to anyone with even a few toes remaining in the mainstream. Rees cogently points out that an effective program of "degrowth" is simply beyond economists' distorted concept of reality. Richard Norgaard labels the current epoch the "Econocene", placing the bulk of the responsibility with economic logic. Like Spash and Guisan, he contends that if economics were more about "social provisioning" then the logic would be dramatically different, starting with the many power and ethical variables that the mainstream completely excludes. Economics has for some time been a highly selective activity with its overly ardent lists of priors (preconditions) and the sleight-of-hand of ceteris paribus (all else equal). It is noteworthy that a "provisioning perspective" might also rejuvenate the institutional concerns of rent-seeking and debt mongering.

Spash and Guisan label their new improved ecological orientation, Socio-ecological Economics, emphasizing a richer admixture of biophysical and institutional dimensions. Mainstream Economics is pushed to the backseat (if not the curb) by redefining the nature of agency and responsibility. In other words, economics, as presently conceived, would play rather reduced role in the pantheon of recursive loops between diversely motivated agents (e.g., reciprocal, "other-regarding", as well as greedy), their institutions, and the environment. This perspective is what Daneke (1999) refers to as "systemic choices" (with patterns of interaction, not individuals, as the unit of analysis).

It is already clear that some of the much more compelling work is being done by social ecologists, with the barest minimum of conventional economics to impede them (note, Kish and Farley 2021). Some even imply that economic thinking, as a cultural variable, is the great fly in the ointment of adaptive human behavior (Schill, et al., 2019). A few directly apply the unique (e.g., "emergent properties") political economy of complex adaptive systems (note Van Heur, 2010) toward the development of novel policy perspectives (e.g., Anderies & Janssen, 2013). However, a few of these may still rely too much on Lin (Elinor) Ostrom and her students' regional and rare cases of temporarily reversed "tragedy of the commons" problems (see, Ostrom, et al., 1994). When one moves from her examples to her theory, they might detect a faint scent of libertarian fairy dust. Plus, her prime examples rely upon lists of priors that would choke a horse and functioning arrangements that require relationships nearly akin to kinship. Nonetheless, her famed "framework" (Ostrom, 2009) and her notion of "institutional grammars" have inspired some very interesting policy process studies (see Bazzan, et al., 2022; and Saddiki and Franz, 2022).

Other socio-ecological scholars, are building upon and enhancing the work of famed zoologist, Buzz (C.S.) Holling and his various colleagues and their notion of "Panarchy" (see Holling, 2001). Of particular import are their applications of "adaptive cycles" (note, Sundstrom & Allen, 2019) and "resiliency theory"

to instances of institutional change and resource sustainability (Gunderson, Holling, and Light, 1995; and, Boyd & Folke, 2011). The panoply of Panarchy scholars tend to focus on the co-evolution of similar mechanisms at differing scales as well as certain key policy traps emerging from the outdated "command and control" strategies of resource management. These reinventions of institutional analysis by ecologists, while a vast improvement upon the so-called "Neo-institutional" approach of business and legal scholars (e.g., "transaction costs", see, Williamson, 1981), still might profit from more ingredients from the originals (Veblen, Commons, Polanyi, Galbraith, etc.). Thorstein Veblen, for instance, still has highly relevant insights for the credit crisis (Davanzati and Pacella, 2014) as well as being regarded as the patron saint of Environmental Sociology (Mitchell, 2001).

Along original institutionalist lines, another group eco-modelers (Motesharrei, et al., 2014, and 2016) used their simplified *Human and Nature Dynamics Model* (HANDY) simulation to explore amplifying institutional relationships (e.g., "bi-directional coupling"). Moreover, by applying a predator/prey characterization using the famed Lotka-Volterra equation they illustrate the intense mutual causality of inequality and ecological disruptions. These inventive inquiries suggest that the quest for a more inclusive economy, might begin by unraveling various anti-ecological institutions. As impressive as these efforts are, effective policy chances still demand much better road maps from oligarchy to panarchy. And, a good starting point is the great oligarchic country club of money and banking.

Back to the Heart of the Darkness

While relatively few ecologists view their enterprise a matter of finance, a few brave or foolhardy souls like Frederick Soddy (1922; 1931, also note Zencey, 2009) and the already mentioned Herman Daly (2016) saw it as the head waters of many anti-ecological institutions. Nevertheless, serious research on the relationship between sustainability and financial systems was pretty much a black hole as late as 2015 (note, Aspinall, et el., 2018). Despite (or perhaps because of) the Lietaer et.al. (2013) report to the Club of Rome, "the missing link between money and sustainability", remained pretty much beyond the pale (note Dittmer, 2015; and, Larue, 2020). Nevertheless, "endogenous money" had at least begun to enter discussions by "macroeconomic ecologists" (see Svartzman, et al., 2019).

Recently, however, a masterful revisiting of the so-called "missing link" has emerged reviewing a range interesting new inquiries and policy skirmishes (Alves, Santos, and Penha-Lopes, 2022). They not only confirm the anti-ecological centrality of money and banking, they highlight their contradictions for various cherished notions of transparency and self-government, as well as their overwhelming impact upon inequality. Moreover, they include a number of policy development guidelines, such as Donella Meadows *Leverage Points* (1999). One might only fault their preoccupation with the "monetary monoculture" and hence the can of worms cure of competing currencies, especially in an era of cryptocurrencies.

It is worth re-establishing that Herman Daly (2016) focused on the custom of fractional reserves, as the fundamental fraud at the heart of the money machinery. It is also worth recalling that several hard-core laisse fare economists (e.g., Irving Fisher, 1935) supported 100% reserves to be part of New Deal Reforms (see, Phillips, 1995). What was once partially misbranded the *Chicago Plan* was revisited and praised by scholars at the International Monetary Fund (Benes and Kumoff, 2012). Yet, it is fair to say that bankers, generally speaking, lack interest in having their cash cow cashiered, especially if central banks (backed by tax-payers) continue to act like Pepto-Bismol in stopping the runs.

Other measures suggest having governments simply reclaim their right to print their own "interest free money" by executive order. Lincoln, not wanting to pay usurious amounts to New York banks to finance

the civil war, just had the treasury issue his famed "greenbacks" (and planned to use them as well in the Reconstruction). Likewise, John Kennedy simply commissioned "silver certificates" (but try to find one now) to help finance Viet Nam and the Space Program. Both debt free currencies died untimely deaths along with these presidents. The history of governments relishing the relinquishment of sovereignty over their own money has more cloak and daggers than a John Le Carre novel. How many people know about the 1951 Accord which allowed the Federal Reserve (a privately held banking cartel) and the US Treasury Department to effectively swap certain roles? Nonetheless, the pursuit of debt free (as well as diverse) money remains a linchpin among "degrowth" strategists (see Douthwaite, 2012; Jackson, 2016; Hornborg, 2017).

Public banking , might have a better shelf life, especially if used in conjunction with saving small communities' cherished post offices in the US. Global experiments have prompted mixed results, requiring a more dynamic theory (according to Marois, 2002). A more interesting inquiry might be directed at why there is only one public bank in the all of US (North Dakota). Or why the US Congress cannot get even a partial audit of the US Federal Reserve.

Herman Daly maintained "that it is easier to nationalize the money than to nationalize the banks". Obviously, there is nothing easy about taking on the most powerful entities on the face planet. The preposterous power plays of money and banking in the last century alone, from Jekyll Island and the "Nixon Shock" (e.g., fiat money) to the Financial Services Modernization Act and Quantitative Easing (QE1, 2, 3…infinity), boggle the mind. Maybe, Henry Ford was correct, that if the American public actually understood their systems of money and banking, then there would be a revolt by morning. For example, the average person has no concept that vast majority of all money comes into being as interest bearing debt to private banks. Actual insurrections, however, are highly problematic and a financial insurrection will take a much wider and more enduring "Occupy Wall Street" type movement, with actual policy proposals. Ecologists might want to get their financial act together before the take the field with the Neo-Austrians, gold bugs, and crypto-knights.

In their proposals for a multi-progged assault on the debt finance nexus, Alves, Santos, and Penha-Lopes (2022) admit that ecologists may have missed an ideal opportunity following the recent meltdown. The first lesson of the policy wonk, is "not to let a crisis go to waste". But, the overnight reinflation and redistribution of the real estate bubble and chronic quest for new emergency measures suggest that the financial crisis that first came to public attention in late 2007 is far from over, and ecologists may yet get another bite at the apple.

The Rotting Apple Revealed

Social discord over the character of financial systems goes back millennia, and probably explains much of the mainstream's maintenance of origination myths (i.e., barter, loanable funds, etc.) despite mounting anthropological evidence to the contrary (Graeber, 2001; 2011). The last few decades of hyper-financialization suggest that the predatory ecology of the money and banking metastasized to stage four institutional cancer, requiring ever-increasingly bizarre measures to merely keep the corpse on display. The meltdown in the FIRE (finance, insurance, and real estate) industries, not to mention the many military misadventures, pulled back curtain on the wayward wizards of wealth. And, it is high time to pour over the "technical read-out" for great financial "Death Star" (or Debt Star).

Many were expecting the Democrats to lower the boom on the bankers as FDR had during the Great Depression. But there was no restoration of Glass-Steagall (the fire wall between commercial and investment banking) no Pecora Commission (to reveal the web of corporate "money trusts", etc.), and

no one went to jail. Instead of helping the defrauded home owners, politicians from both parties bowed and scraped to the bankers. It is as if someone set off the Neutron Bomb, destroying most of the people while leaving the banks intact. Banker bailouts and Federal Reserve subsidies totaled in the trillions of dollars. Even the promised pittance for "mortgage relief" was a fiasco, and the papered-over "robo foreclosure scandals" further reconfirmed that financial services ruled the US and by extension, the world.

The on-going financial crisis engendered a level of dispossession not seen since genocidal colonization of Native Americans. Not only did 10 million Americans lose their homes, the government expedited their swift transfer to pirate equity funds who turned a huge share of America's housing into rentals and securitized the ever-increasing revenue streams for investors (note, Glantz, 2019). Likewise, the instant uber-lords (Bezos, Zuck, Gates, etc.) who earned their wealth the old fashion way by expropriating public infrastructure and investments (i.e., the internet) and violating anti-trust laws, are now gobbling-up 1000s of homes and 1,000,000 of acres of farms. Meanwhile, the corporate sector, hyper-leveraged with weak covenants and questionable collateral, has an armada of "zombie firms" sailing along on a sea of "junk bonds".

Essentially, American's have witnessed its own Shock Doctrinaires (Klein, 2007) coming home to roost, and following the "Economic Hitman" (Perkins, 2007) playbook, chapter and verse (financialize, indenture, destabilize, privatize, impoverish, extract, and authoritarianise). It should be no surprise that the lion's share of pandemic relief for middle America actually went to Wall Street and multi-national corporations (many on the brink of receivership well before Covid). Congress and regulators also greenlighted (as if they needed their permission) more "emergency" shenanigans for the Federal Reserve (see, Brenner, 2020). In essence, the Fed now guarantees that no matter how reckless a certain class of speculators might be, they would never lose a dime. The Fed effectively negates key market mechanisms (from replacing the Repo and Corporate Bond Markets to extending bail-outs to non-financial entities as well as Shadow Bankers), nullifying the risk/reward mythology, and raising moral hazard into the stratosphere. The Fed's fake money balance sheet began pushing 10 trillion. Meanwhile the public largesse flowing to the Military Industrial, Petroleum, Surveillance Complex remains at full blast. Without ever-increasingly frenetic levels of financial witchcraft and unimaginable levels of new debt the great Ponzi scheme will implode once again.

At present, the planet is drowning in debt. The world's debts for all corporations, governments, and households are more than 305 trillion in US dollars, or exceeding output by 300%. Plus, that number does not include the nominal value (500 trillion of more) of derivatives betting that the debts will default. Worse yet, the raising of interest rates in the hope of slowing stagflation only makes debt service more tenuous. As a biologist and a banker (May & Haldane 2011), pointed out this deformed debt engine produces vast networks of cumulative counterparty risk, unleashing nonlinear dynamics and triggering cascading criticalities.

Credit, of course, makes productive investment (new products, factories, and employment, infrastructure, etc.) possible. Unfortunately, in the last few decades, corporatization and financialization were exemplified by previously illegal stock buybacks and the Fed serving as a perennial stock put. Finance in general became like the dog eating its own vomit, with speculation in speculation itself, all playing off hyperbolic asset inflation and agglomeration, rather than innovation (Daneke and Sager, 2015). The final insult to this injury is a sort of societal level "protection racket", with elites promising the public a detour from another economic as well as ecological collapse, if they merely support their neofeudal ambitions.

Final Thoughts

Returning for a moment to the original analogy of the *Man in the Iron Mask* the tale concludes with the imprisoned twin (and rightful king) turning the tables on his evil bother. But first he must quickly learn to behave as a king to actually displace one. To remove their mask, Socio-ecological Economists need to polish their policy acumen, and in fairly short order. External indifference and internal scabbles have undermined a clear, coherent, and manageable policy agenda. Perhaps being imprisoned for so long made many willing to settle for scraps from the king table. Still other elements acted as if a platform for fair and full-throated debate, let alone that the topic of political economy, still existed in policy circles. Beyond name calling and character assassinations, the mainstream monarch rarely engages. Moreover, through fake science, propaganda, and political skullduggery, the mainstream has conditioned the public to believe that "there is no alternative". Perhaps the old adage of "one can't kill a theory with facts, it takes a theory to kill theory" may no longer apply. The rapidly ascending era of Neofeudal Economics involves an entrenched and corrupt policy cartel, and it might well take a cartel to kill a cartel.

Socio-ecological scholars may not have the time nor plutocratic support to become a policy contenders, they have to jump in the ring, nonetheless. The mainstream's meticulous undermining of scientific as well social institutions exhibited a well-orchestrated and patient long game. It is probably a good thing that this strategy is both logistically impossible as well as repugnant, at this point. Socio-ecological economists, beyond having a huge social welfare advantage, have much better tools and concepts as well as battle tested theories (e.g., evolution, entropy, living systems, etc.) to draw upon. They could be ever more well-armed by embracing a full-blown "institutional ecology" (see Daneke, 1999; also note Vatn, 2020), one which aids in the emergence of more adaptive political economy.

It is worth reiterating, however, that better social and ethical science was rarely what the Mainstream was about, and better policy science is certainly another matter. Recall that pre-complexity polymath, Herbert Simon (1975) suggested that much of policy is actually a matter of "design science", and that Veblen favored engineering over business as a model of economics. It is clear that ecological scholars now have epistemic advantage. They can test policy proposals with simulated interactions between heterogeneous agent, evolving institutions, and changing natural systems on a computers (decades of evolution in an afternoon). Yet, they still need to realize that systemic choices are rarely fully manifest in stultified processes of public choices. Convincing the citizenry, furthermore, is made much more difficult amid the current cacophony of internet armchair experts and industry paid professional deniers. Socio-ecological economists would certainly benefit from a couple of crash courses in state-of-art policy process research, as well as media studies. But they will mostly have to master the smoke and mirrors of policymaking on the fly, as it were.

Given the huge power asymmetries, they must choose their battles very carefully and be acutely aware of attempts to steal their thunder, via various Trojan Horses (e.g., unenforceable and cosmetic corporate environmental & social governance guidelines, (Mi)stakeholder Capitalism, and "green" this or that), as well as continuing attempts to curtail purposive public action altogether. Finally, they must recognize one old adage still pertains---"if one wants to attack the king, they had better kill him". If not, Neofeudal Economics will merely absorb the blows, and come roaring back.

Merely attacking around the edges will not do the trick. Socio-ecological economists must stab the mainstream squarely in its barely beating heart. Amid all the atherosclerosis is where economists hide their most desperate and dangerous derangements and disasters, disguised as financial innovations. The mere fact that mainstream economists have been so disingenuous about the monetary systems, not to mention their distributional dysfunctions (laughable Laffer curves, "trickle down", and the virtual

demise of progressive taxation) the next time someone calls them out, others might listen. Economics, as the art of dispossession, may at last be vulnerable to substantive change. Without significant alterations to global financial systems, an ecologically sound economic transformation has little to no chance. It is well past time to go eco or go home.

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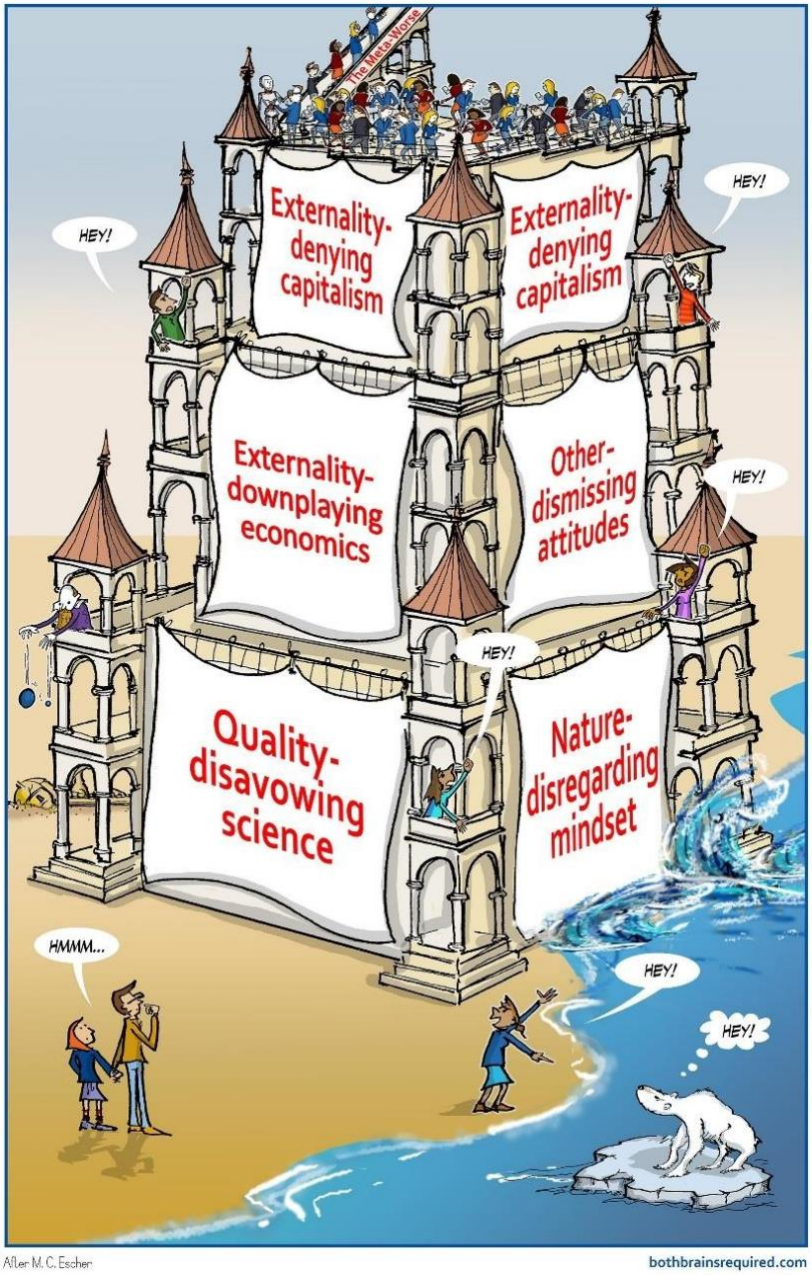
The Towering Problem of Externality-Denying Capitalism

Duncan Austin
Illustrations by Matt Tweed



1. Stepping Back

A major first response to our sustainability challenges has been to try and turn profit to more sustainable ends. Alas, even 'purposeful profit' seems unable to overcome the deeper momentum of what might be termed 'externality-denying capitalism' – 'externality-denying' in that billions of daily investment and consumption decisions ignore certain of their social and environmental consequences.

As just one example, the World Bank reports that less than 4 percent of global carbon emissions are currently priced at levels consistent with the Paris Agreement's temperature goals, endorsed by 194 nations.[25] Hence, hardly any of today's market transactions are *fully costed*, in terms of reflecting their contribution to climate change. The same neglect repeats to varying degrees for certain other environmental and social problems.

We don't call our predominant socio-economic system 'externality-denying capitalism', but possibly we should, to constantly remind ourselves of what we are doing.

Figure 1

Caught in this embracing dynamic, first-response market-led sustainability strategies – such as socially responsible investing (SRI), corporate social responsibility (CSR), and an environmental, social and governance (ESG) movement – are showing signs of exhaustion. While these strategies have helpfully accelerated awareness of sustainability challenges and have catalysed fresh innovation paths and business models, they are being overpowered by the externality-denying capitalism that remains the larger force shaping our social and natural worlds. Hence, there is a pressing need to step out of the day-to-day frame to appraise this bigger system (Figure 1).

[25] World Bank, *State and Trends of Carbon Pricing 2022* (Washington, DC: World Bank, 24 May 2022). https://doi.org/10.1596/978-1-4648-1895-0>, page 9

In part, we have arrived at externality-denying capitalism – read, consequence-denying capitalism – because it has been rationalized by an externality-downplaying economics discipline (Figure 2). Economics has had a theory of externalities for over a century, but a concept that should have been central to the subject was fatefully marginalized – and not for particularly good reasons.

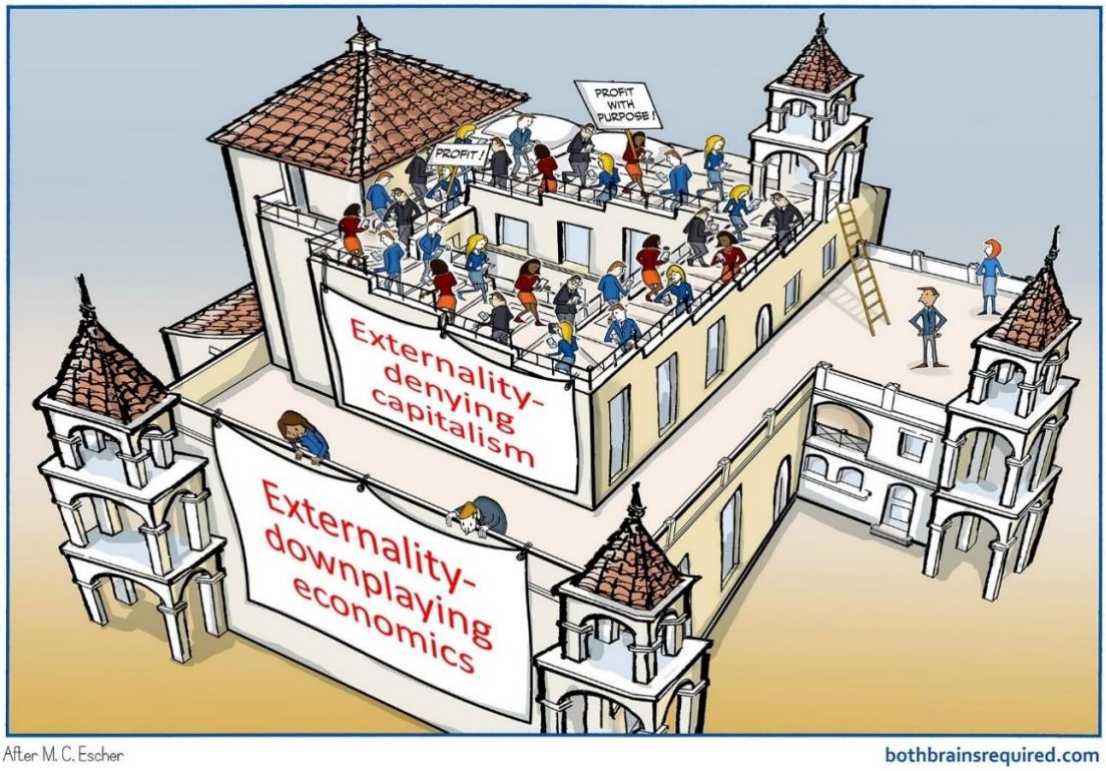


Figure 2

There has been a general attitude that external costs might be small, or that positive and negative externalities might roughly cancel out to leave market signals as a still reliable guide for economic decisions. (Unfortunately, there is an important asymmetry: positive externalities are 'free good things', of which you can never have too much, while negative externalities may accumulate to have system-breaking consequences).

Above all, 20th Century economists' craving for elegant mathematical models, for which externalities were a complication too far, encouraged a view of externalities as the negligible residuals of an all-encompassing efficient market system. (See Postscript for more details).
However, externalities can no longer be dismissed as negligible market failures when they are becoming *the main event!* Economics' – and now society's – markets-first, world-second perspective is no longer credible – no longer *sustainable*.

Externality-downplaying economics promotes various ideas – 'trickle-down', 'rising tide lifts all boats', 'win-win', 'green growth' etc. – that are all variants of the same basic attitude: whatever the problem, more growth is surely the answer (Figure 3).

But if the measurement of growth is externality-denying, then the growth that is meant to solve problems may simply create more of those problems along the way. Externality-denying growth may *rebound* or *backfire* to become not the solution but the driver of various social and environmental harms.

Figure 3

2. Technical intermission

(a) Kuznets Curves

Economics' story – a hypothesis not a law – that 'growth is always the solution' is expressed in the (social) Kuznets Curve and a related Environmental Kuznets Curve (EKC, shown in Figure 4). The inverted U-shaped curves hypothesize that while economic growth may initially increase social inequalities or environmental damages, more growth 'bends the curve' to solve the problems. The moral of the hypothesis: 'stay the course, growth will save the day'.

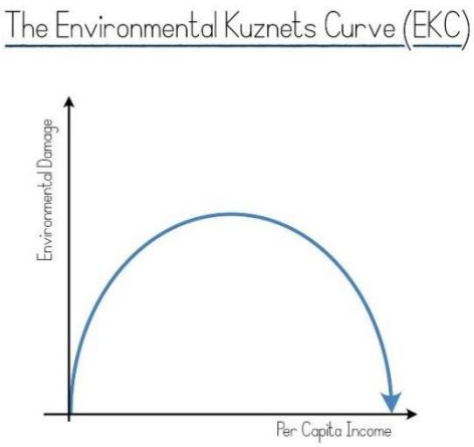


Figure 4

Certain anecdotes and intuitions support the idea – it takes a wealthy country to invent solar panels, say – but the key question is whether the curve for the relevant system can bend back down far enough and fast enough.

Critically, the EKC does not envisage biophysical 'tipping points' – thresholds which, if crossed, may set in motion natural dynamics that become impossible to slow or reverse even if the triggering human activities are subsequently halted. The possibility of tipping points or thresholds requires adding a horizontal line to a Kuznets Curve diagram, which has profound implications.

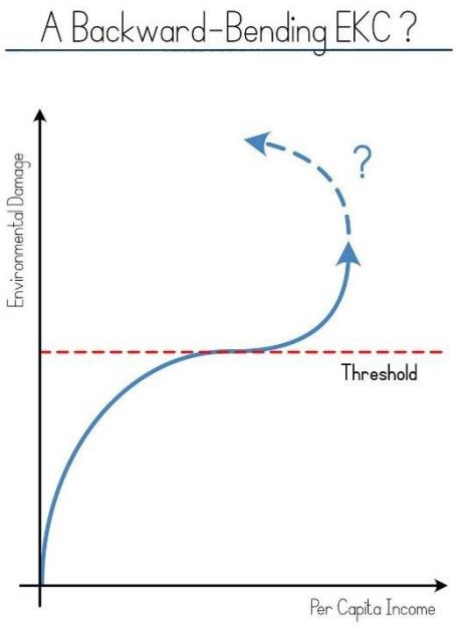


Figure 5

If the natural world contains irreversible biophysical tipping points to which our measures of 'economic growth' are blind, our pursuit of that growth may lead us to breach thresholds that trigger ecological breakdown beyond any ability to remedy or reverse subsequently. How wealthy we were all going to be becomes a moot point. Indeed, it is quite possible that ecological damage beyond irreversible thresholds not only slows economic growth but reverses it if the environmental damage erodes economic foundations. In such a case, the EKC becomes backward-bending (Figure 5).

(While the tipping points for ecological issues are strictly matters of biophysics, for social issues they can be thought of as fuzzier lines of how much inequality and injustice can be tolerated before a society 'snaps' or breaks down. Social lines are defined not just by measures of relative income, say, but also by our ever-evolving sense of what is fair and how far 'society' extends).

Why does the horizontal red line matter? Today, climate scientists and ecologists are increasingly pointing out – and the public is only slowly recognizing – that the critical feature of climate change and biodiversity problems is that they are characterized by tipping points.

The significance of tipping points has been surfacing with a lag through the deliberative IPCC process, but the growing recognition that tipping points pose greater risks at lower temperatures than first thought is one of the major conclusions of the last twenty years of climate science research:

> "[Two decades ago,] 'large-scale discontinuities' in the climate system were considered likely only if global warming exceeded 5°C above pre-industrial levels. Information summarized in the two most recent IPCC Special Reports (published in 2018 and 2019) suggests that tipping points could be exceeded even between 1°C and 2°C of warming."[26]

[26] Timothy Lenton and others, 'Climate tipping points – too risky to bet against', Nature, Vol. 575, Issue 7784, pp. 592-595, https://doi.org/10.1038/d41586-019-03595-0

Even with the IPCC now identifying 15 significant tipping elements in the 2021 Sixth Assessment Report, an August 2022 review in the Proceedings of the National Academy of Sciences (PNAS) argued the consequences of tipping points still remain "dangerously unexplored":

> "There are feedbacks in the carbon cycle and potential tipping points that could generate high GHG concentrations that are **often missing from models**. Examples include Arctic permafrost thawing that releases methane and CO_2, carbon loss due to intense droughts and fires in the Amazon, and the apparent slowing of dampening feedbacks such as natural carbon sink capacity. These are likely to not be proportional to warming, as is sometimes assumed. **Instead, abrupt and/or irreversible changes may be triggered at a temperature threshold.** Such changes are evident in Earth's geological record, and their impacts cascaded across the coupled climate–ecological–social system."[27] (emphasis added)

Summarizing the latest information, a September 2022 *Science* article identified that with global temperatures now ~1.1°C above pre-industrial levels we are already in range of five globally significant tipping points, including the collapse of the Greenland and West Antarctic ice sheets, expected to be triggered at 1.5°C of warming.[28]

The PNAS review also highlighted:

> "Particularly worrying is a 'tipping cascade' in which multiple tipping elements interact in such a way that tipping one threshold increases the likelihood of tipping another."[29]

In a tipping cascade, as each threshold is breached the EKC is deflected upwards to become progressively steeper (Figure 6). (The EKC does not have a time axis, but a cascade would likely exhibit a temporal acceleration of damage, too).

[27] Luke Kemp and others, 'Climate Endgame: Exploring Catastrophic Climate Change Scenarios', *Proceedings of the National Academy of Sciences*, 119.34 (2022), e2108146119 https://doi.org/10.1073/pnas.2108146119

[28] David I. Armstrong McKay and others, 'Exceeding 1.5°C Global Warming Could Trigger Multiple Climate Tipping Points', *Science*, 377.6611 (2022), eabn7950 https://doi.org/10.1126/science.abn7950

[29] Kemp and others.

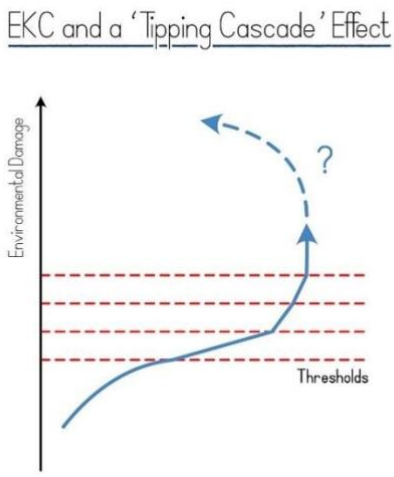


Figure 6

Figure 7 illustrates the two fundamentally contrasting perspectives – threshold-denying and threshold-aware – that represent the core difference between 'economic' and 'ecological' perceptions of the world. 'Which of the two worlds do you see?' is becoming the Rorschach test of our times. The reader may want to reflect on not just *which* perspective accords more strongly with their intuition but also *why* they may intuit one graph as truer than another. What educational, professional, and cultural experiences have shaped their views on the matter? And what influences were those influences drawing on?

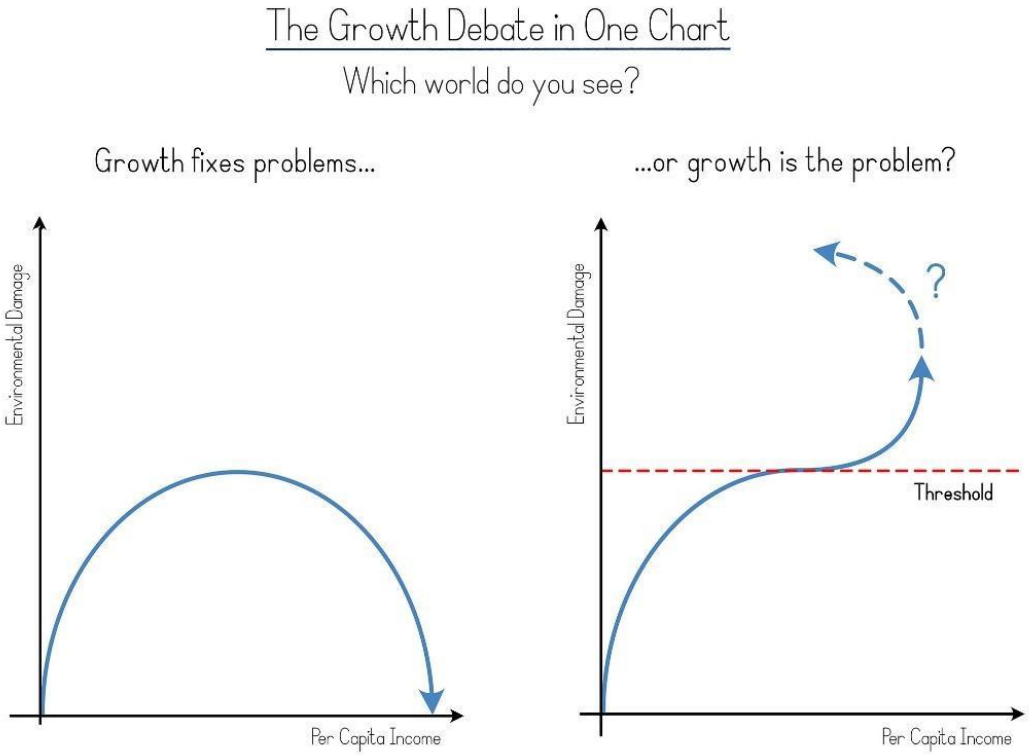


Figure 7

The Kuznets Curves are hypotheses and the time-honoured way to test hypotheses is via experiment. It is an empirical matter whether various social and environmental Kuznets Curves have been or will continue to be true. The data to inspect are measures of social inequality and global environmental health.

Of interest, Simon Kuznets had reservations about the validity of the (social) curve he hypothesized (the environmental version was formulated after his death). Kuznets suggested the US patterns of the 1950s and 1960s, which inspired the idea, might just prove to be an exceptional period of falling inequality. Indeed, were he alive to review the last 50 years of US data, he would probably hypothesize the exact opposite relationship to the one he did.[30]

Unfortunately, for climate change we are the experiment, and the experiment is global and ongoing. There is nowhere to stand that is not part of the experiment.

Figure 8 shows the latest global EKC for climate change, plotting per capita income against global average temperature that is the proximate driver for tipping points scientists are most focused on. The dotted lines represent central estimates of the temperature levels at which key global tipping points are thought to lie, though at ~1.1°C, we are already in the forecast range of some tipping points (e.g., the estimated temperature at which the Greenland ice sheet will collapse is between 0.8°C and 3.0°C above pre-industrial levels).[31]

[30] See, e.g., page 229 of the World Inequality Report, 2022; Lucas Chancel and others, *World Inequality Report 2022* (World Inequality Lab, 2021) <https://wir2022.wid.world/download/>.

[31] Global per capita income from World Bank Open Data website measured in constant 2015$. Global average temperature data from NOAA National Centers for Environmental Information, expressed as degrees Celsius above 1881-1900 average. Tipping point lines are median estimates for selected tipping points from Armstrong McKay and others, Science 2022 (see above).

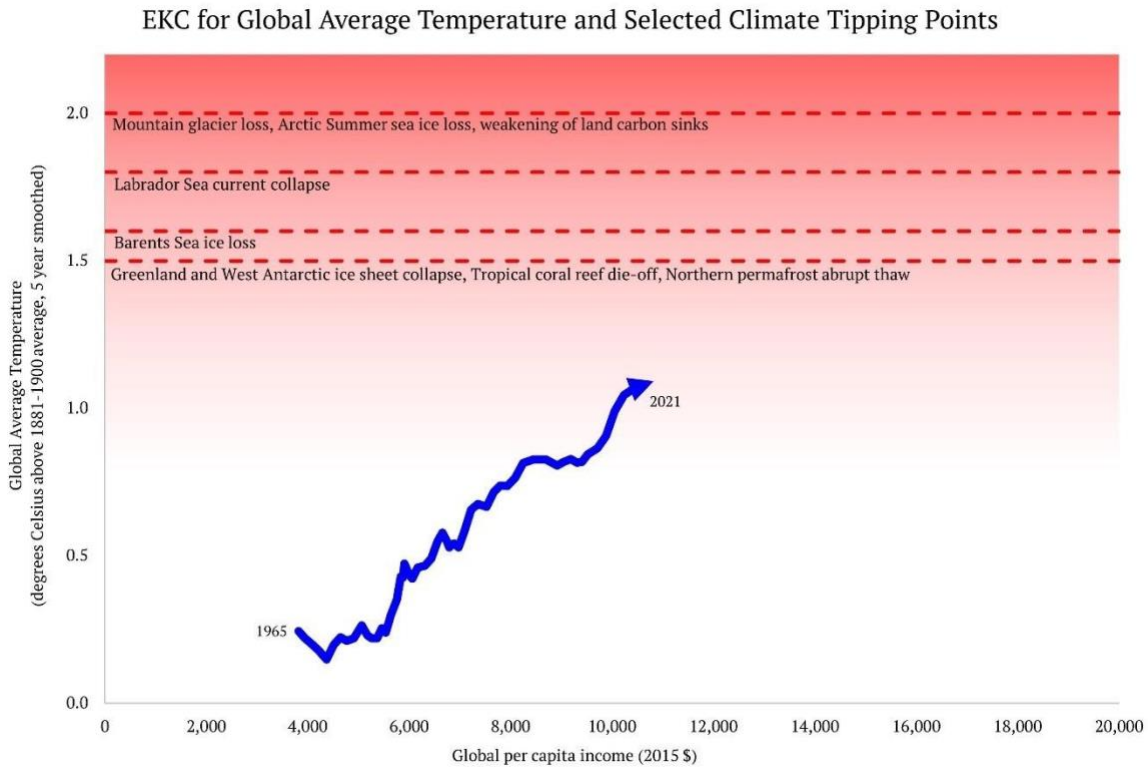


Figure 8

It is critical to remember that the proximate driver of climate damages is *global temperature* not *national GHG emissions*. There has been some recent enthusiasm that several high-income countries have been able to *begin* to bend down their EKC curves of *national emissions* from high initial per capita levels – also known as 'decoupling' of emissions. Of course, reduction of absolute emissions is exactly what is needed, but there is a clear danger that a 'decoupling of emissions' narrative, based on moderate reductions in atypical countries, invites complacency that global economic growth is imminently about to bend down the *global temperature* curve. It is the need to bend the *global temperature* curve quickly down that lies behind the urgent call for much stiffer 'net zero'- and 'zero' type emissions reductions strategies, for which several countries reporting decoupling of *emissions* is only the first small step in what is a race against time. Too much enthusiasm for moderate and piecemeal decoupling risks defusing the sense of urgency.

(b) Kuznets Curves and Externalities

How do the Kuznets curves link to externalities?

What determines how fast a Kuznets curve can bend down, if at all, is the degree to which the 'downward' force – the solutions of market-led growth – can overpower the 'upward' force – the damaging consequences of the growth. In other words, externality-denying capitalism is a dynamic system consisting of positive and negative forces in tension – a pattern systems thinkers recognize as a 'fix that fails' dynamic (Figure 9).

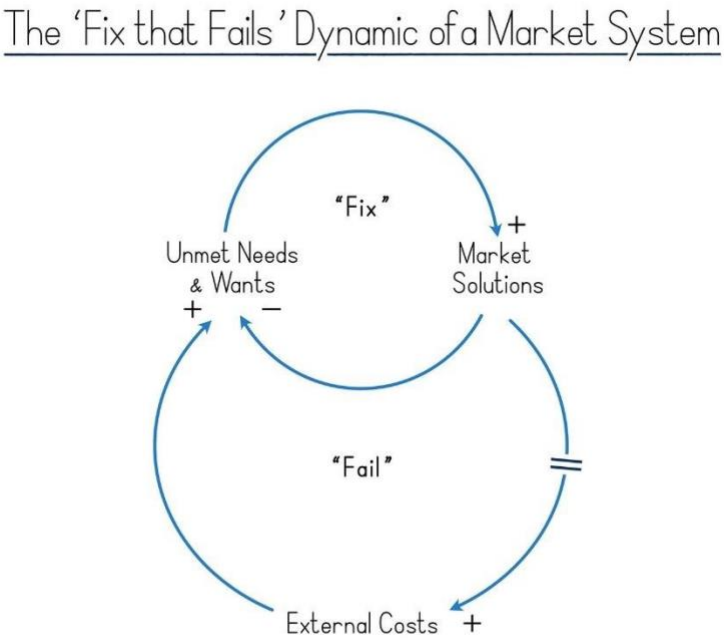


Figure 9

The 'fix that fails' systems archetype is usually drawn as a 'fat 8'. In this case, the top loop illustrates that market solutions are often a good 'fix' for 'unmet needs and wants'. However, the bottom loop reflects that the 'fixing' of market activities may also trigger adverse consequences – the 'fails' of externalities – that prompt new needs and wants (e.g., less polluted air, restored landscapes, a stable climate etc.). Importantly, the lower 'fail' loop often arises or is recognized with a lag (the '=' sign indicates delay).

Hence, a market system is a dynamic system in which a 'fixing' market is in a continual contest against the 'failures' of external costs spun off by the market. As such, two contrasting scenarios are possible (Figure 10). If the 'fixing' is a stronger force than the 'failing', then the Kuznets curve will beneficially bend down because growth fixes problems fast enough. On the other hand, if the 'fixing' is a weaker force than the 'failing', the Kuznets curve will continue upwards, potentially breaching irreversible thresholds.

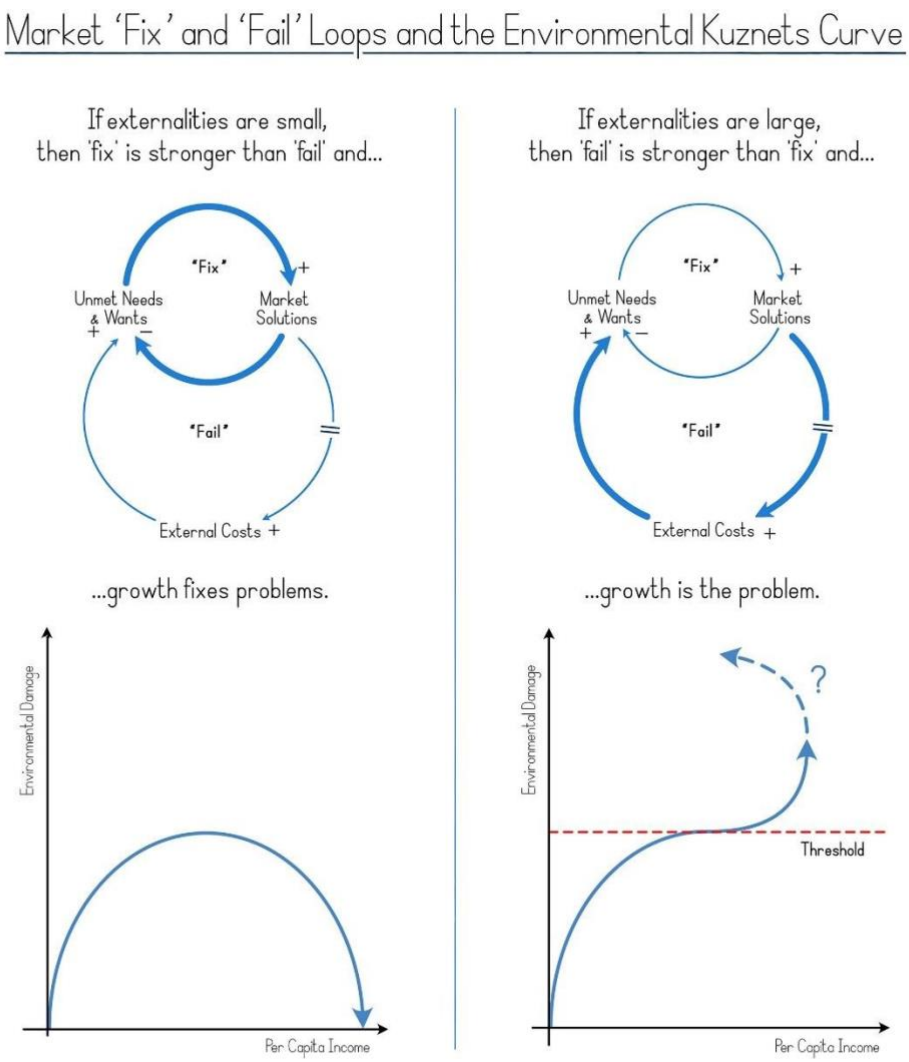


Figure 10

Thus, whether a market system can avoid potentially catastrophic runaway or overshoot behaviour depends on the degree to which human market participants are conscious of – and have accepted – the harms associated with market growth and taken adequate steps to prevent them. The more that markets fail to recognize external costs, the more likely it is that a market system will lead its human participants to breach important thresholds and trigger irreversible consequences.

For any living system, from a small organism to complex human society, to avoid runaway or overshoot ecological events, it must be able to regulate its behaviour to the surrounding environment. Yet, as systems thinker Stafford Beer emphasized:

> "We cannot regulate our interaction with any aspect of reality that our model of reality does not include."

A market system is essentially a large, shared 'model' that coordinates human behaviour by organizing information about parts of the world and attaching differential 'values' to possible choices, which then

guide our actions. In turn, a market-led culture is one that self-organizes predominantly to follow the signals of the market model over alternative models of behaviour upheld by other cultural systems and traditions. The stewards of a market-led culture may frequently opine that 'the market is always right.'

But, if markets have large externalities, *the market system is not a good model of reality* and granting it too much authority in its externality-denying state invites social and environmental dysregulation and runaway. If we submit too much to the signals of externality-denying markets, we cannot regulate our behaviour to important aspects of reality that may be existential in nature.

To avert that outcome, externalities can be recognized, either by explicit pricing (e.g. taxes, fees, etc.) or by various regulatory or policy actions that place an implicit 'price' on harmful behaviours. A legal or cultural prohibition, for example, is the equivalent of placing an infinite price on a certain activity. In both cases, the market calculus must now work around an identified 'scarcity' rather than assume certain inputs or waste sinks are 'free to use', as is the default otherwise. A 'pricing' action, in its various forms, is the process by which markets become 'aware' of a scarcity.

Personally, I find a metaphor helpful to grasp all this. Essentially, a fixing Invisible Hand is connected to a failing Unmentionable Foot (Figure 11).

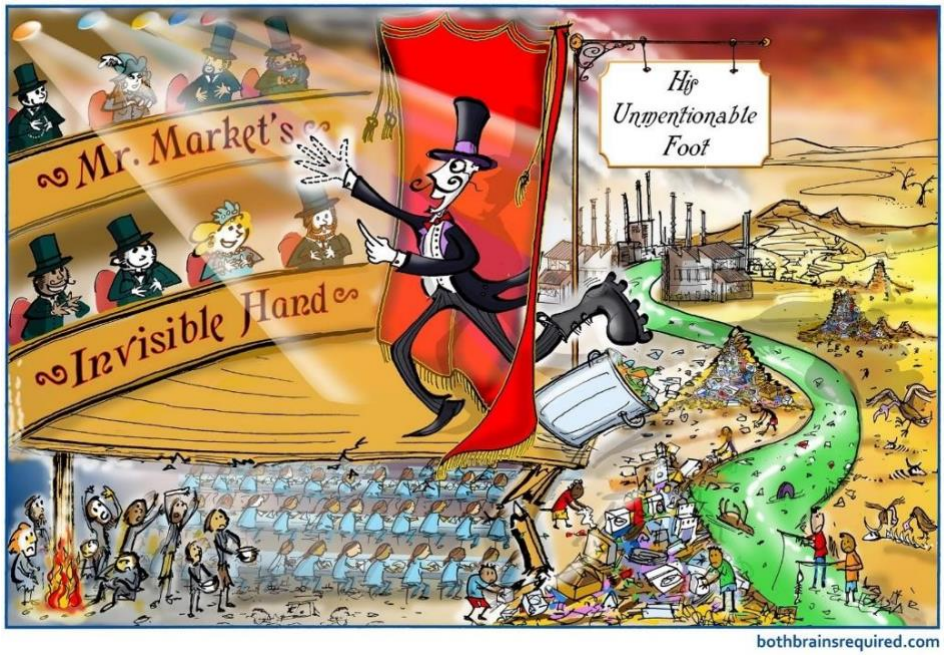


Figure 11

The correspondence to the earlier discussion is indicated by the arrows in Figure 12. (Ecological and social fail loops have been split for artistic purposes, but there exist many interactions between them).

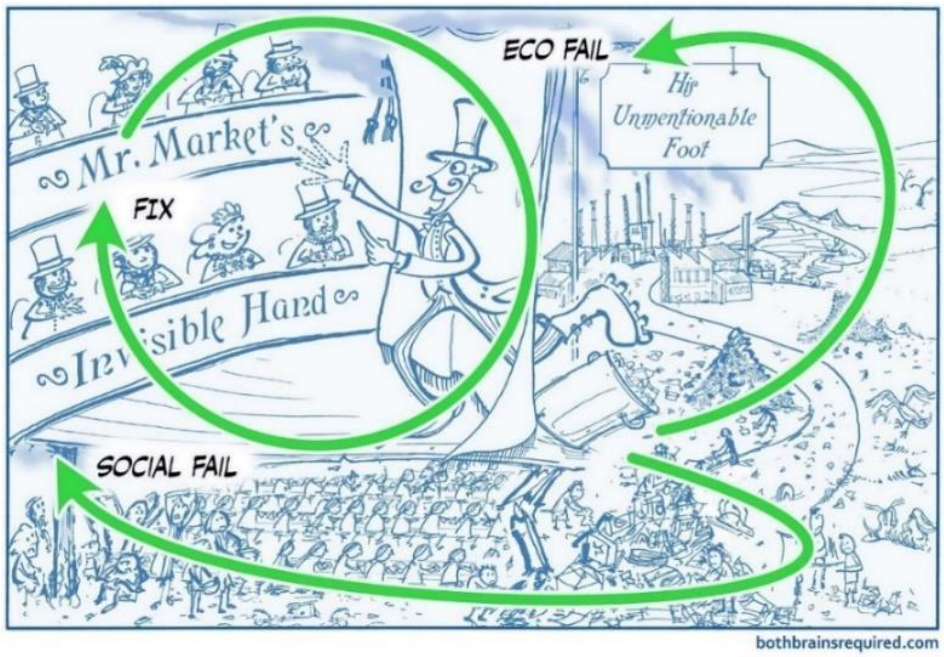


Figure 12

Again, it is an empirical matter whether the Hand is stronger than the Foot, or vice-versa. Unfortunately, various environmental and social trajectories indicate that the Foot is now overpowering the Hand in important ways. Note that the situation is not that markets are outright 'good' or 'bad' – as polarizing capitalism-versus-socialism debates so often quickly descend to – but rather how helpful or harmful current markets are based on how well they reflect known reality.

A critical factor in evaluating the relative strength of the Hand and the Foot is how broadly one chooses to look. If the world becomes 'smaller' because population grows and communications technologies connect everyone so that we become more aware of inequalities, and if the world becomes 'smarter' so that we identify hard-to-discern trends of climate change and biodiversity decline, the damages of the Foot become more visible than they were, *and ever harder to unsee*.

Alas, a market-led culture exhibits blinkered vision in that its decision-making is directed overwhelmingly by what markets 'see', i.e., what is priced. This vision may be 'sticky' or slow to perceive and integrate new realities. Effectively, Mr. Market suffers from *hemianopsia* – a loss of vision in half of the visual field. In Mr. Market's case, he can see what is priced *but nothing else exists* (Figure 13).

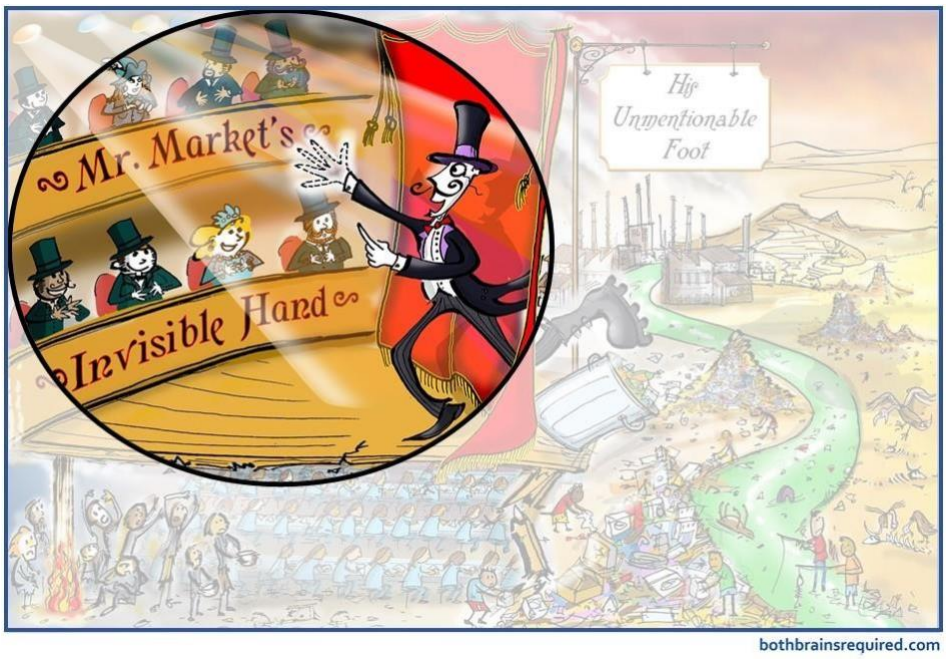


Figure 13

To try and overcome this problem, one of the 'first response' strategies of the sustainability movement has been to push for measurement and disclosure of what Mr. Market cannot see – to spotlight what markets miss (Figure 14).

Figure 14

However, this strategy is flagging, because it has not (yet) led to the 'pricing' or regulating of the spotlighted externalities, and so this new information remains largely outside the market realm of 'real' prices and costs which continue to be privileged. While some companies and investors attend seriously to the new social and environmental information, *at the level of the whole system* this information has not achieved decision-making equivalence with financial information, so those that choose to ignore the

new information can avail themselves of opportunities left behind by those who deem it important. Moreover, in the crucible of making difficult career- or business-protecting decisions, new social and environmental information may not even have full equivalence in the companies and portfolios that profess to take it seriously.

'What gets measured gets managed' was the idea, but that is not a law of the universe, only a management consulting slogan of dubious validity. Instead, we often measure things to disclose them in supplementary tables to not really have to manage them. Unfortunately, 'measuring and disclosing to avoid really managing' seems to have caught on. We are still a long way from having an integrated decision-making vision which weighs the damages of the Foot and benefits of the Hand on truly equal terms, and which would constitute an expansion of our integrated consciousness (Figure 15).

Figure 15

The Kuznets Curve hypotheses, then, are how economics strives to maintain self-coherence on the issue of growth on a finite planet. The appealing 'bend' of the curves sanctions the ongoing use of externality-denying economic and financial metrics, because even if relying on those flawed metrics creates harms along the way, the growth they facilitate can supposedly clean it all up before it is too late.

However, to assume Kuznets curves will always bend down away from tipping points is to take a leap of faith that reveals economics is just as much a faith-*based* system of thought as other systems that declare themselves so. To live in modern society is to be a member of the church of externality-denying growth, though you may never have been formally asked or told. Faith-based systems generally announce themselves with a portal – a church door, say – or a ritual message of welcome that alerts people to the fact they are entering a faith-based frame but, to paraphrase Ursula K Le Guin, we live *in* externality-denying capitalism, so there is no warning for the unsuspecting or unreflecting.

3. The Tower of Externality-Denying Capitalism

It gets (meta) worse. One might hope that rising awareness of the innately physical problems of climate change and biodiversity would prompt a re-grounding impulse, but exactly the opposite dynamic seems to be playing out in the continued momentum behind virtualization.

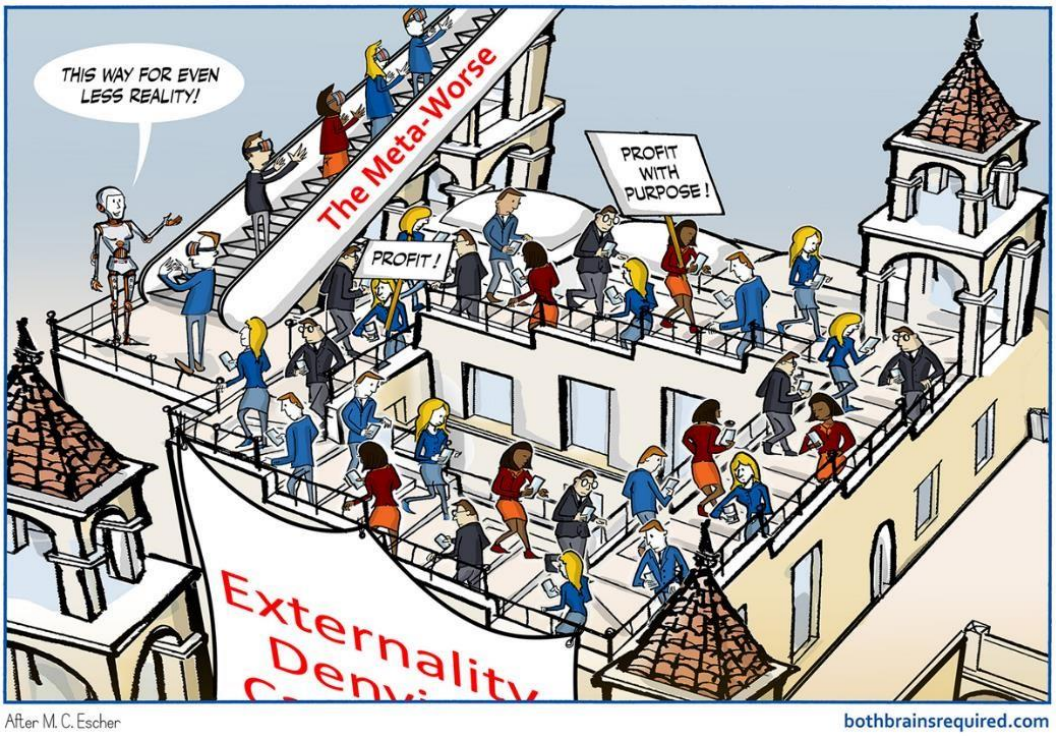


Figure 16

Externality-denying capitalism is fundamentally a phenomenon of *abstraction* (from Latin: 'drawing away' or 'detaching'). We lift selected parts of the world via 'commodification' so that we can combine and allocate those parts into new configurations that, by our estimation, are more 'valuable' than how the parts were distributed before. We value a car more than the initially widely-dispersed molecules that were consumed or assembled to produce it.

However, of necessity, these acts of 'value creation' are also acts of 'value destruction' as potentially critical social and natural patterns are compromised. In only keeping proper tabs on the 'creation' side of the ledger, we inexorably disembed economic and financial 'value' from a richer social and biophysical reality. This impulse to keep on abstracting and virtualizing – to keep *drawing away* from reality – continues apace, from derivatives markets to Bitcoin to virtual worlds. We are constructing a virtual exchangeable part-world in which critical connecting relationships – social and natural – are severed and left behind to wither.

Perhaps it is logically consistent that externality-denying capitalism should spawn reality-denying business models, but it feels like we are approaching the terminal stages of what the 'logic' can support. Indeed, we seem to have reached the reality-denying stage of capitalism. It is, of course, a delusion because even the latest and greatest virtualizations must have a tether back to the material and energy foundations upon which they entirely depend. Virtual reality goggles – the epitomising product of externality-denying capitalism – need plastic and electricity to conjure their illusions.

In a sense, we find ourselves atop a high tower. Certain cognitive and behavioural developments of different vintages have proved mutually reinforcing in erecting the perch we are upon. A 'Western' mindset has paired with extractive behaviours of Western countries and empires that promoted and exported externality-denying capitalism. The cognitive and behavioural are two faces of the same tower (Figure 17).

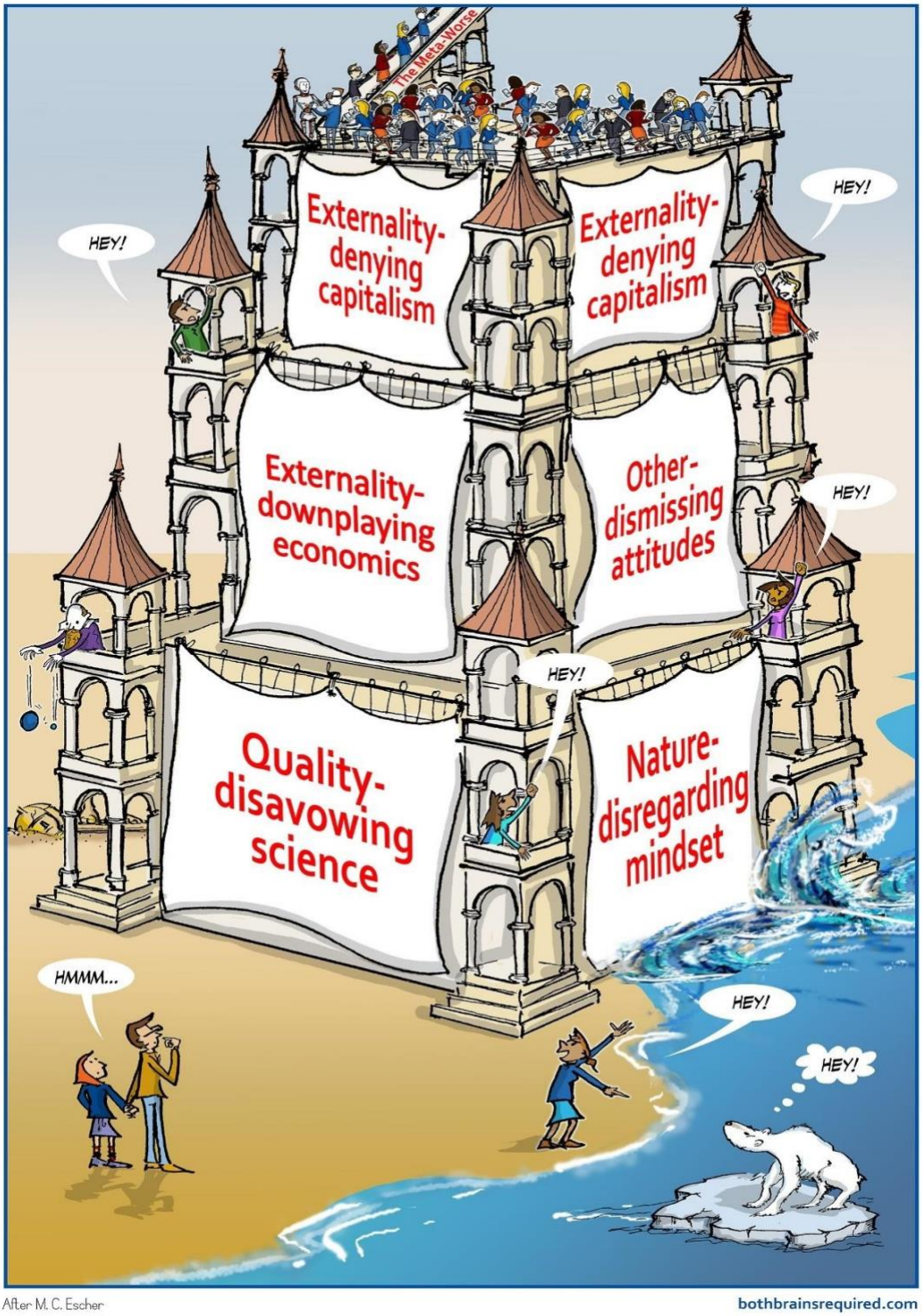


Figure 17

Cognitively, the abstraction that is modern economics is a continuation of the peculiar, biased perspective that took hold at the dawn of the Scientific Revolution in which quantitative ways of knowing the world were granted fateful primacy over qualitative ways of knowing – an intellectual development that has culminated in economics' eagerness to mathematize social and natural relationships. (See Postscript for more on this long-term and critical cognitive development).

Behaviourally, while 'externality-denial' is not unique to capitalism, capitalism happens to be the widely embraced vehicle by which externality-denial has achieved today's global scale and threatening pace. (Other externality-denying systems had flaws that prevented them from reaching global scale). For many countries in the Global South, disproportionately on the receiving end of this global cost-shunting system, the experience is that of 'neocolonialism' – a continuation of extractive colonial patterns by new, market-led, means. Similarly, from an environmental perspective, capitalism is proving not to be the efficient ideal of economic theory, so much as the most efficient way we have yet discovered to mine, harvest and pollute Nature beyond its capacity to absorb and regenerate.

An excessively abstract approach to the world has licensed large-scale extractive behaviour, which has generated material spoils that reward the abstract thinking and encourage more of it… creating a runaway feedback loop. The mutual reinforcement of how we behave and how we have chosen to know (epistemology) is central:

> "Epistemological error is all right, it's fine, up to the point at which you create around yourself a universe in which that error becomes immanent in monstrous changes of the universe that you have created and now try to live in." (Gregory Bateson)

4. If Market 'Fixes' are Failing, We Must Fix Markets

Alas, sustainability appears to be a much bigger project of 'unlearning' than many are yet reconciled to. Urgent re-grounding would seem to be the order of the day. It is not enough to aim for a 'sustainable economy', but rather we need a sustainable culture that has an economy, rooted in a more sustainable shared cognition of the world.

One critical intervention point is now 'cultural' – or *extra*-market – decisions *about* the markets we have rather than continuing to hope that markets as currently constituted can deliver enough change, fast enough. If market fixes are failing, among other measures we need to fix markets.
This is not straightforward. A curious but critical aspect of our current predicament is that the practice of externality-denying capitalism for several decades has produced a surrounding culture whose norms, institutions and power relationships prevent the internalization of externalities that is capitalism's own proposed remedy for externalities!

The notion, for example, that we might follow the prescriptions of economics textbooks and levy meaningful taxes on carbon emissions is widely held to be 'impractical'. Perversely, 'capitalism', the idea, has become 'externality-denying capitalism' in practice, has begotten an 'externality-denying culture' that cannot repair itself, because the remedies proposed by its own rationalizing science – 'economics' – are deemed 'not practical'! Ideologies that beget cultures that cannot implement their very own theories of self-repair are not self-coherent *in practice* and risk dysregulating and even collapsing as complete systems (Figure 18).

For want of alternative, 'growth' becomes the only 'practical' solution, uniting almost all political parties, but only exacerbating problems if the growth is externality-denying. Hence, the degrowth agenda is

radical in the true sense of the term – it dares challenge the *root* problem that superficially opposed parties are all agreed upon (even if the implied 'degrowth forever' does not seem quite right).

We have reached the bizarre point where societies built around a professed enthusiasm for markets find they cannot implement the policy and regulatory changes required for markets to address our largest problems. It is critical to remember that the theoretical superiority of markets as allocative mechanisms rests on *all costs being recognized*, implying all financial statements are *fully costed*. According to market logic, if a project's – or business's or investment's – revenues exceed costs, it is profitable and so 'good' to do. But if a project is not fully costed, we can have no assurance of the equivalence of 'profit' and 'good', which is the cornerstone premise of a market-led culture. If financial statements are not fully costed, some portion of economic growth and profit just comes from running down valuable resources not recognized by markets because earlier generations did not comprehend the value of those resources. In such circumstances, it is not clear whether we want more or less of what we are measuring as 'growth' and 'profit'.

In essence, we are not only not stewarding the planet well, but we are also not stewarding the market system well. A basic stewarding duty of market-favouring societies must to be internalize externalities that become known on their watch. It is the fate of current generations that large and global externalities have been identified on our watch.

As such, a society that enjoys the freedoms and genuine innovative and allocative possibilities of markets must periodically 'true up' its market model to realities that become known to its human participants but have not yet been communicated to Mr. Market. With less than 4 percent of global carbon adequately priced, Mr. Market has no real inkling of the climate crisis because it has not been communicated to him in the language he understands. It might help to tell him – by 'pricing' carbon so he comes to know of the problem. Certainly, he is likely to respond badly on hearing the news – and might angrily ask why he was not told earlier! – but immediately thereafter, he will prove to be of almost incomparable assistance.

Of course, it's the telling him that is difficult. While markets can easily and autonomously sniff out new revenue streams, the crystallization of new costs to true up a market system to reality can only be achieved via extra-market regulatory or policy interventions. The latter are difficult to implement because they can be portrayed and resisted as arbitrary interventions in otherwise 'efficient' and 'free' markets. But this misses that the seeming precision of today's market values is entirely founded on the no less arbitrary patterns of existing property rights and regulations established by prior generations based on their earlier understanding of reality and scarcity. It is to mistake an incumbent model for an accurate model, in the context of ever-changing human comprehension of reality.

However, the difficulty of introducing new costs is very real, so induces the widespread sense that 'it's not practical' – a refrain that becomes a self-reinforcing belief the more it is voiced. Yet, it is probably behind the door marked 'not practical' that genuine sustainability solutions now lie. The sooner we self-organize to open that door, the better.

Ah, but now we are finally getting towards the heart of it, for the stubborn force holding the door in place is nothing other than greed – from individual to species-wide. The real barrier to 'truing up' markets is that it requires reconciling ourselves to real costs, past and present, that may be painful to accept and share. In many respects it has been the function of externality-denying capitalism to shield us from this difficult reality.


The Meta-Worse
MORE ENERGY! MORE MINERALS!
OOOH!
Externality-denying capitalism
Externality-denying capitalism
Externality-downplaying economics
Other-dismissing attitudes
Quality-disavowing science
Nature-disregarding mindset
THEY RODE ABSTRACTION ALL THE WAY HOME...
THEY RODE EXTRACTION ALL THE WAY HOME...
After M. C. Escher
bothbrainsrequired.com

Figure 18

The exonerating story economics offered was that the pursuit of greed was socially acceptable because the Invisible Hand could grasp the expressions of self-interest made in the marketplace and transmute them into the best possible outcome for humankind. This was the counter-intuitive possibility that de Mandeville and Smith glimpsed in the 18th Century, but from qualified beginnings the Hand has acquired mythical status, gradually being elevated from a beneficial Invisible Hand to an Infallible Hand – able to turn *all* greed into good. This was the transformation of the Hand facilitated by mathematical economics through the 20th Century, for in eliminating externalities from their models because the maths was too complex, the Hand was recast as all powerful. The Foot was unmodelable, the market 'fail' loop could not be represented, and so an unblemished Hand emerged. Economists at their blackboards may have understood the limitations of what they were doing, but their models were seized upon by certain political opportunists and brought to real life.

Yet, if markets are incomplete – if externalities exist – then markets do *not* capture and neutralize all the effects of greed, with the consequence that plenty of greed slips through the Hand's grasp and behaves like, well, plain old greed with excesses that dysregulate social relations and undermine ecological systems.

Morally, the elevation of the Invisible Hand to status of near Infallible Hand has been nothing less than the culture-scale sanctioning of selfishness and deshaming of greed in the belief-cum-hope that the Hand can soak it all up and smooth things out. This has been deeply systemized and normalized, inducing the runaway dynamics we now face. But if a culture has venerated the Hand too much for too long, its counterbalancing institutions and traditions will have diminished. It may even feel uncomfortable to express the view that greed is the root problem for there will be a 'common sense' that we have outgrown such old-fashioned ideas. Greed had been discovered to be good, no?

The words of Gus Speth crystallize the innately moral dimension of the moment:

> "I used to think the top environmental problems were biodiversity loss, ecosystem collapse and climate change. I thought that with 30 years of good science we could address those problems. But I was wrong. The top environmental problems are selfishness, greed and apathy…and to deal with those we need a spiritual and cultural transformation."

Sustainability is a profoundly cultural issue – a moral challenge before it is a market opportunity. Moreover, the continued insistence that sustainability *be* a market opportunity looks increasingly like the effort to fend off acceptance of the moral obligation. The sustainability problem is not 'out there', it is 'in us' and in our systems, made by humans and alterable by humans.

Postscript: Western Science's Neglect of Quality and Meaning

Quality-disavowing science (see Figures 17 and 18)? A bit cryptic, but a rough overview for those interested:

A major impetus behind the emergence of externality-denying capitalism was the yearning of 20th Century economists to be taken seriously as 'scientists' of equal prestige and forecasting-power as physicists. Economics' craving for its own 'Nobel Prize' was a marker of the aspiration.
To achieve scientific credibility, economists felt compelled to communicate in maths, but the mathematical techniques of the time were too limited to do justice to the complex reality of societies dependent on natural systems, even as maths was sufficiently well advanced to handle physics' less

complex problems. (Yes, physics is complicated but is helped enormously by studying only 'dead' things).

Nonetheless, the compulsion of economists to craft elegant mathematical models led to the fateful development of growth theories in which growth was delinked from natural foundations and of 'complete market' theories that denied the possibility of markets causing external damages. While at some level economists understood these were just theories, the models nonetheless took hold – and were opportunistically seized upon - as 'good enough' depictions of reality with which to run nations.

In turn, the belief that mathematics was the route to credibility reflects the yet earlier development in which 'science' was profoundly shaped by Galileo and others to include only what could be measured – so-called primary properties (weight, length etc.) not secondary properties (taste, smell, appearance etc.). Science became a quantitative method to understand the world, in which there was no room for qualities. That was a fine assumption to get classical physics up and running, but a very restrictive assumption for living systems. Unfortunately, the early breakthroughs in the 'hard sciences' of physics and chemistry etc., were so stunning and beneficial, the inadvertent meta-conclusion of the Western Enlightenment was that all investigations of the world should proceed in a similarly quantitative fashion. Of all the disciplines that then strove to be social 'sciences', economics drank the quantitative Kool-Aid most deeply.

Unfortunately, living systems also derive 'meaning' from the world by recognizing and responding to patterns (qualities). We humans know that we navigate the world by responding to what is beautiful or ugly, delicious or disgusting, painful or soothing. These are all qualities based on pattern recognition. Critically, all living things are engaged in pattern recognition even if dimmer and less sophisticated than what we do – or, in many cases, more advanced. Hence, to eliminate pattern recognition from explanations of the living world is a massively limiting step. Not only does it 'deaden' and diminish the human view of Nature – in contrast to pre-Scientific Enlightenment traditions which intuit Nature as living and deeply connected – but a quantitative view of the world eventually loops back to dehumanize us in the conception of a *Homo Economicus* ideal around which we fashion a socio-economic system, and which we then must try to live up to simply to get along. In following quantitative reductionism to its logical conclusion, we have unwittingly ended up 'reducing' ourselves.

The eclipse of quality in favour of quantity shows up in many ways. One major consequence is the term 'capitalism' (from *capita* or 'head' of cattle, sheep etc. = 'counting-ism') whose *sine qua non* technology is the ac*counting* statement and which propels the urge to quantify everything ('human capital', 'social capital', 'knowledge capital', 'natural capital' etc., little of which is convincingly quantifiable).

Another repercussion is the ascendancy of quantitative disciplines, i.e., STEM, over disciplines that transmit knowledge through patterns, such as literature, humanities, and the arts – the latter, of course, further penalized for enriching their students in ways that are less quantifiable…! We have inserted a quantitative filter between ourselves and the world, leading us to count our way back from the world and each other. We are in a quantitative doom loop.

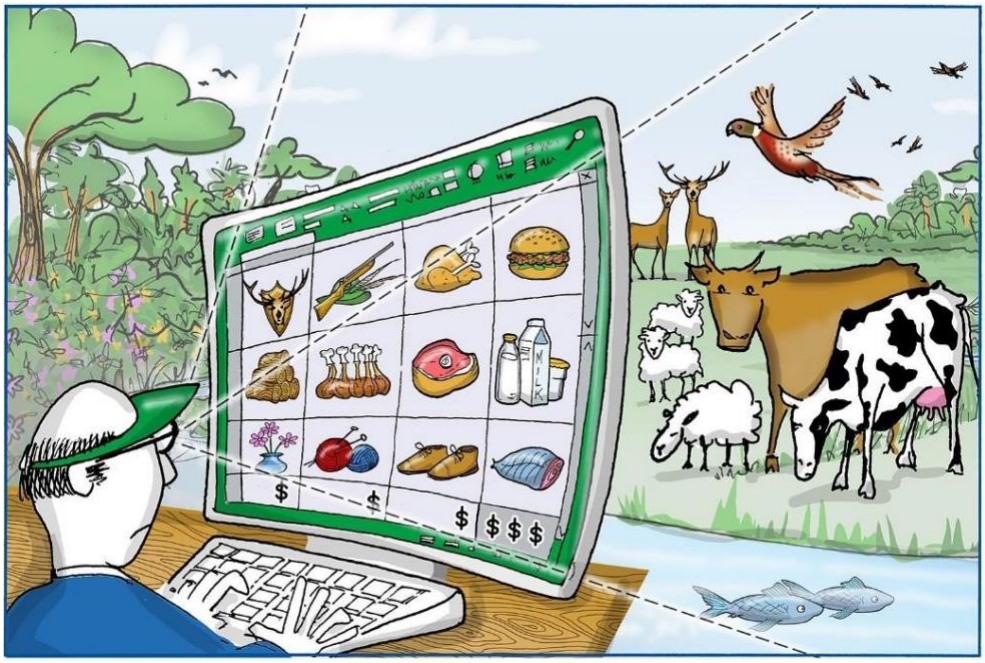


Figure 19

That's why biologists like Brian Goodwin argued that we need to develop a 'science of qualities' to complement the 'science of quantities' we have had (which raises questions about what then to do with the word 'science' given its deeply quantitative heritage). Ultimately, the question is not 'how enlightened are we?' but 'how are we enlightened?' - and how not? Fittingly, the latter are qualitative questions, not quantitative ones.

Ironically, as economists were racing down a mathematical dead end, physicists had already reversed course. Classical physics' initial productive dependency on quantification did not survive the discovery of quantum physics. Quantum physics is baffling but one of its central problems is 'The Measurement Problem' (!), which forces a systemic, non-quantitative interpretation of how small particles behave.

Similarly, other social 'sciences' dabbled in quantification only to turn back. Sociology, for example, rushed to embrace 'social capital', out of the same credibility-from-quantification impulse that had earlier gripped economics, but there are now decidedly mixed views on the value of the concept.

Fortunately, and genuinely encouraging, the uptake of systemic thinking in many disciplines amounts to a collective '*re*-cognizing' of the need to temper the quantitative, reductionist mindset that has dominated Western science. This is how the Western mind, at least, is coming back to its senses, but the true repository of wisdom in these areas lies in many indigenous cultures and traditions that never excised quality from their understanding of the world in the first place, and so never dulled their appreciation of the living world we all depend upon.

Acknowledgments

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Have We Passed Peak Capitalism?

Blair Fix [York University, Toronto, Canada]

Abstract

This paper uses word frequency to track the rise and potential peak of capitalist ideology. Using a sample of mainstream economics textbooks as my corpus of capitalist thinking, I isolate the jargon of these books and then track its frequency over time in the Google English corpus. I also measure the popularity of feudal ideology by applying the same method to a sample of christian bibles. I find that over the last four centuries, biblical language fell out of favor and was replaced by the language of economics. Surprisingly, however, I find that since the 1980s, the trend has reversed. Today, the language of economics is waning, while biblical language is on the rise. Is this evidence that we've passed the peak of capitalist ideology?

The end is (not) near

Among leftists, predicting the end of capitalism is a favorite parlor game. For example, as a graduate student in the 2010s, I remember discovering the 1976 edition of Marx's *Capital* and being struck by the introduction. Written by the Belgian Marxist Ernest Mandel, the foreword concluded that it was 'most unlikely' that capitalism would survive another half-century (Mandel, 1976).

This prediction (and many like it) did not age well. What capitalism's critics often misunderstand is that social orders rarely 'die'. More often, they fade into irrelevance. Just as no one can point to the end-date of feudalism, it seems unlikely that capitalism will have a decisive 'finish'. But what it may have is a *peak*.

The goal of this post is to chart the rise (and potential peak) of 'capitalism' … as I understand it. This caveat is key. To study a social system, we must first define it. To many people, capitalism is a 'mode of production' (a definition inherited from Marx). The view that I take here, however, is that capitalism is primarily an ideology — or what Jonathan Nitzan and Shimshon Bichler call a 'mode of power' (2009). Capitalism is a set of ideas that justify the modern social order.

Although there are many ways to chart the rise of capitalism, what interests me here is that it was the first major ideology to have spread during the era of mass publication. That means capitalism's rise (and potential peak) should be visible in the word frequency of written language.

For example, as capitalism spread, we'd expect that capitalist jargon — words like 'market' and 'price' — should become more common. And feudal jargon — words like 'fief' and 'vassal' — should become less common. Now, I've chosen these specific words as an illustration. But for my actual analysis, I do not 'choose' the jargon words. Instead, I choose a corpus of text that I believe encapsulates the ideology in question (capitalism or feudalism). And from there, I let the jargon of the text speak for itself. The

basic idea is that jargon words are those that are both frequently used in a text corpus and *overused* relative to mainstream English.

The first step of the analysis, then, is to select a corpus of ideological texts. To capture feudal ideology, I use a sample of 22 modern English bibles. I use modern translations because I don't want text that contains archaic words (like 'thou'). And I use the Bible because christian theology formed the backbone of European feudalism.[32] To capture capitalist ideology, I use a sample of 43 introductory economics textbooks. My claim is that these textbooks deal mostly in capitalist metaphysics; they describe a fantasy world of self-equilibrating markets in which each person earns what they produce.[33]

With my samples of biblical and economics text, I first isolate the jargon words of each corpus. Then I use the Google English corpus to measure how the frequency of this jargon has changed over time. (As a consistency check, I also analyze the text in paper titles on the Sci-Hub database and book titles in Library Genesis.)

I find that over the last several centuries, biblical jargon became less popular and was slowly replaced by economics jargon. I also find evidence that the popularity of economics language peaked during the 1980s, and has since declined. Ominously, this peak coincides with an uptick in the popularity of biblical language. In simple terms, it seems that we (anglophones) are in the midst of an ideological transition.

Why ideology matters

In a moment, I'm going to dive into my methods for analyzing ideology. But before doing that, it's worth emphasizing why I think the study of ideology is important.

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[32] One could argue that since the various books of the Bible were written over many centuries, the text advocates a hodgepodge of different 'isms'. (For example, the Old Testament is remarkably 'tribal'.) That said, I don't want to worry too much about the specific 'ism' that the Bible decrees. The point is that christian ideology formed the foundation of class relations in medieval Europe. For example, here is an oath of fealty used by the Emperor Charlemagne in 802:

> By this oath I promise to be faithful to the lord Charles, the most pious emperor, son of King Pepin and Bertha, as a vassal should rightfully be to his lord, for the preservation of his kingdom and of his rights. And I will keep and hope to keep this oath which I have sworn as I know it and understand it, from this day henceforward, with the help of God, the creator of heaven and earth, and of these sacred relics.' (quoted in Ganshof, 1952)

Notice the use of biblical language, both in the explicit reference to God, but also in use of the word 'lord' — a biblical synonym for God. The hallmark of christian ideology is its use of a heavenly hierarchy to legitimize earthly ones.

[33] The ideology of economics evolved with capitalism. It started life as 'political economy', a project that was explicit about the values it advocated. With the neoclassical revolution of the late 19th century, however, these values were purged and what was left was called 'economics' — a supposedly scientific description of a market economy. It is this neoclassical theory that fills modern economics textbooks. The problem is that there is very little 'science' in neoclassical economics. Generations of critics have shown that its foundations are either untenable or untestable. (For example, see Keen (2001), Mirowski (1991), and Bichler & Nitzan (2021).)

Like the Bible, neoclassical economics deals almost completely with metaphysics. Thus, it seems fitting to call economics an 'ideology'. Its central claim is that when left alone, competitive markets lead to an optimal society. However, like the God of the Bible, these competitive markets are nowhere to be found in the real world. Instead, we find a world filled with massive corporations who wield power in the name of the 'free market'.

Karl Marx was likely the first political economist to exhaustively study the transition from feudalism to capitalism. In Marx's eyes, this transition was to be understood in material terms. Ideology was not an explanation … it was something to be explained:

> Just as our opinion of an individual is not based on what he thinks of himself, so we cannot judge … a period of transformation by its own consciousness. … [O]n the contrary, this consciousness must be explained from the contradictions of material life. (Marx, 1980)

This is Marx's doctrine of historical materialism, which I think is boldly wrong. Ideas matter, and they have a life of their own within our collective consciousness. In a sense, Marx proved so himself by writing an ideological tome about capitalism that went on to inspire many anti-capitalist revolutions.

In broader terms, humans are a cultural species, which means that our behavior is driven in large part by our collective ideas. How and why these ideas evolve is poorly understood. But what seems clear is that the evolution of our ideological milieu is an important topic of inquiry. To turn Marx on his head, we can and should judge a period of transformation by its own consciousness.

Dissecting an ideology

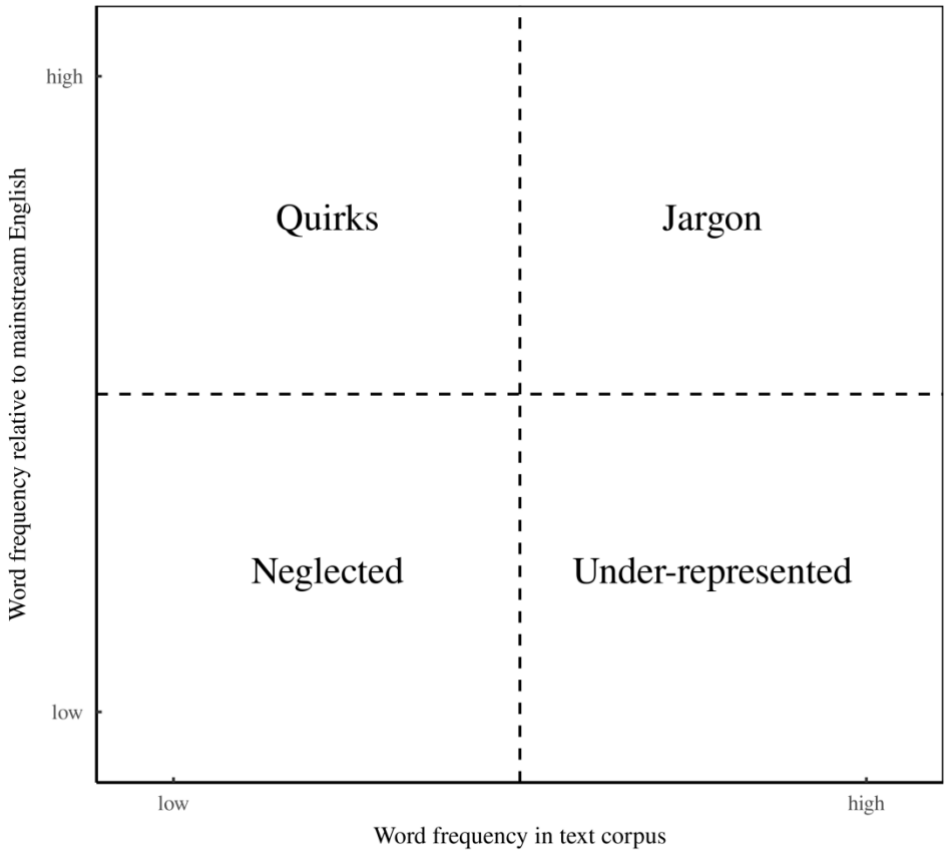
Given that we're interested in the transformation of ideology, how should we study it? One option is what I will call the 'philosophical approach'. To understand ideological change, we analyze the meaning of a belief-system. Then, we try to map this meaning onto the changing social zeitgeist.

Another option is what I will call the 'statistical approach'. Rather than engage with an ideology's broader meaning, we break the belief system into its smallest components — namely, words. The idea is that the features of an ideology can be discerned through the frequency of its vocabulary. Words that are frequent tell us what the ideology emphasizes. And words that are infrequent tell us what the ideology ignores. The main advantage of this statistical approach is that it allows us to parse massive quantities of text, and so gauge the written zeitgeist in a way that no philosopher ever could.[34]

To analyze the rise of capitalist ideology, I will use the statistical approach. The core of my method is illustrated in Figure 1, which demonstrates how I use word frequency to classify the vocabulary of a text.

[34] To give you a sense of the analytic scale we can achieve with the statistical approach, consider the size of the Google English database. It reports the frequency of about 800 billion words (written over more than four centuries) and can be parsed by a modern computer in a few minutes. (Compiling this database took far longer.) If a person attempted to read the same volume of text, they would die long before they finished. For example, supposing you read 300 words per minute for 8 hours a day, 365 days a year, you would need about 15,000 years to parse 800 billion words.

Figure 1: Categorizing the vocabulary of a corpus of text.



This figure illustrates my method for classifying words within a sample of text. On the horizontal axis I measure word frequency within the text itself. On the vertical axis, I compare this frequency to that found in 'mainstream English'. Based on these two measurements, I categorize words into four quadrants: 'jargon', 'quirks', 'neglected' or 'under-represented'.

On the horizontal axis in Figure 1, I plot word frequency within the text itself. As an example, in economics textbooks we expect that the word 'price' will be ubiquitous, while the word 'acetophenone' (an organic compound) will be rare.

Although it is tempting to judge a text by its word frequency alone, we need to account for a more general feature of language, which is that some words get used more than others. For example, in the broader English language, 'price' is a common word. And except for a small corner of organic chemistry, 'acetophenone' is extremely uncommon. So to judge economists' use of these words, we should also compare their frequency to what is found in 'mainstream English'. I will call this comparison 'relative frequency':

$$\text{relative frequency} = \frac{\text{text frequency}}{\text{frequency in mainstream English}}$$

In Figure 1, I plot this 'relative frequency' on the vertical axis. Based on these two dimensions of frequency, we can classify the vocabulary of a text into four quadrants:

1. *Jargon*: words that are common in the text corpus and overused relative to mainstream English.
2. *Quirks*: words that are rare in the text corpus, yet overused relative to mainstream English.
3. *Under-represented*: words that are common in the text corpus but underused relative to mainstream English.
4. *Neglected*: words that are rare in the text corpus and underused relative to mainstream English.

Of these four quadrants, 'jargon' words and 'neglected' words are the most interesting. Jargon words tell us about the concepts that define a text. And neglected words tell us about the omissions that define a text.

I will use this classification scheme to measure the changing ideological landscape of the English language. In what follows, I assemble a corpus of economics textbooks and a corpus of bibles. Then I determine their 'jargon' using the quadrant system shown in Figure 1. The advantage of this approach is that we do not need to choose the jargon words ourselves. Instead, we let the text speak for itself.

That said, my classification scheme still requires some subjective decisions. Most importantly, to construct our quadrants, we need to compare word frequency in the text to the frequency found in 'mainstream English'. And that means we need to decide on a representative sample of mainstream writing. However, given that there are many forms of writing (books, newspapers, websites, email, text messages), it is not clear what a 'representative sample' of English writing would/should be. To simplify things, I will focus only on the language found in books.

As my measure of 'mainstream English', I use data from the Google English corpus. This massive dataset, which is derived from Google's trove of digitized books, contains a sample of roughly 800 billion words covering text written over the last four centuries. While I will call this sample 'mainstream' English, note that I do not mean 'colloquial' English. The Google corpus includes both popular books as well as technical monographs. So it does not tell us about the language heard in a typical English conversation. Instead, the Google corpus quantifies the average linguistic patterns found across the whole spectrum of anglophone books.[35]

The other major decision that goes into my word classification system is the choice of threshold that separates the left and right quadrants (in Figure 1). There is no linguistic feature that tells us exactly where this threshold should lie. However, when we plot word frequency on a logarithmic scale (see the horizontal axes in Figures 2 and 5), I find that the value of 50 words per million lies roughly in the middle of the frequency range. So I use this number as my dividing line between left and right quadrants.

[35] Some scientists are skeptical of using the Google English corpus to gauge the social zeitgeist (for example, Pechenick, Danforth, & Dodds, 2015). One problem is that the corpus contains one of each book, so it does not account for a book's popularity. I personally don't think this is an issue, so long as we are clear that we are measuring what authors *write*, not what people read. Another criticism is that the Google books corpus contains a huge number of scientific books, so it is not a sample of 'colloquial' English. Again, I don't see this fact as a problem, since I am concerned here with the state of ideas expressed in English, not the state of the 'common' tongue.

Analyzing the language of economics

Having described my word classification scheme, let's now apply it to the language found in economics textbooks. As a reminder, these books serve as my corpus of 'capitalist ideology'.

To analyze the language of economics, I have collected a sample of 43 undergraduate economics textbooks, shown in Table 1. Although not exhaustive, this sample contains most of the standard texts used in undergraduate economics courses (taught in English). When possible, I tried to get the 'micro', 'macro' and 'general' versions of each book. To isolate the textbook content, I trimmed each textbook of front matter, and then fed the resulting text into a word-counting algorithm. (For details about the text processing, see Sources and methods.) The resulting language sample contains about 10.7 million words, with a vocabulary of roughly 35,000 unique words.

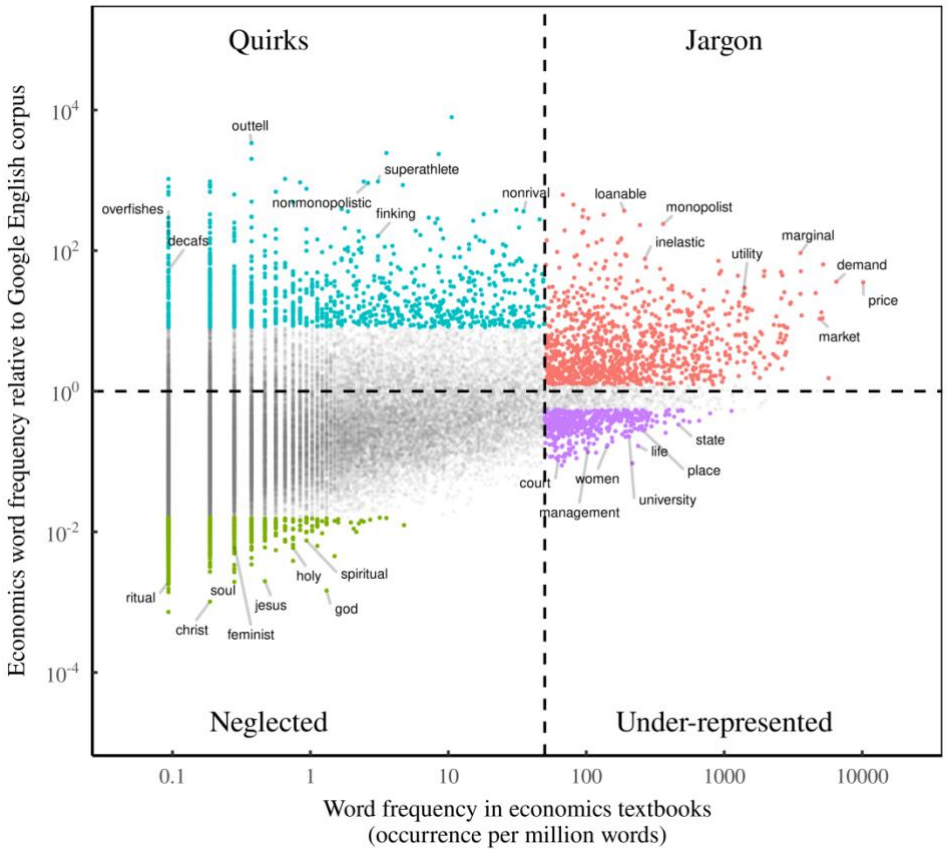
Table 1: A corpus of capitalist ideology from 43 economics textbooks

Author	Title	Year
Arnold	Economics	2008
Arnold	Macroeconomics	2008
Arnold	Microeconomics	2011
Blanchard & Johnson	Macroeconomics	2012
Case, Fair & Oster	Principles of Economics	2012
Case, Fair & Oster	Principles of Macroeconomics	2011
Case, Fair & Oster	Principles of Microeconomics	2008
Cowen & Tabarrok	Modern Principles of Economics	2011
Frank & Bernanke	Principles of Economics	2008
Frank & Bernanke	Principles of Macroeconomics	2008
Frank & Bernanke	Principles of Microeconomics	2008
Hubbard & O'Brien	Economics	2009
Hubbard & O'Brien	Macroeconomics	2011
Hubbard & O'Brien	Microeconomics	2013
Krugman & Wells	Economics	2009
Krugman & Wells	Macroeconomics	2005
Krugman & Wells	Microeconomics	2012
LeRoy Miller	Economics Today	2011
LeRoy Miller	Economics Today: The Macro View	2011
LeRoy Miller	Economics Today: The Micro View	2011
Mankiw	Principles of Economics	2008
Mankiw	Principles of Macroeconomics	2011
Mankiw	Principles of Microeconomics	2011
McConnell, Brue & Flynn	Economics	2008
McConnell, Brue & Flynn	Macroeconomics	2006
McConnell, Brue & Flynn	Microeconomics	2011
Nicholson & Snyder	Microeconomic Theory	2004
Nicholson & Snyder	Microeconomic Theory	2007
Nicholson & Snyder	Microeconomic Theory	2011
Parkin	Macroeconomics	2011
Parkin	Microeconomics	2011
Parkin, Powell & Matthews	Economics	2005
Perloff	Microeconomics	2011
Perloff	Microeconomics	2014

Author	Title	Year
Pindyck & Rubinfeld	Microeconomics	2012
Pindyck & Rubinfeld	Microeconomics	2014
Rittenberg & Tregarthen	Principles of Economics	2009
Rittenberg & Tregarthen	Principles of Macroeconomics	2009
Rittenberg & Tregarthen	Principles of Microeconomics	2009
Samuelson & Nordhaus	Economics	2009
Varian	Intermediate Microeconomics	2005
Varian	Intermediate Microeconomics	2010
Varian	Intermediate Microeconomics	2014

In Figure 2, I take the vocabulary in these economics textbooks and plot it on my quadrant system. In this chart, each point represents a word. The horizontal axis shows the word's frequency in economic textbooks. On the vertical axis, I plot relative frequency — the ratio of textbook frequency to the frequency in the Google English corpus. In each quadrant, the colored points represent the 1000 words that are most overused (for quirks and jargon) or most underused (for neglected and under-represented). Looking ahead, it is the red-colored 'jargon' words whose frequency I will track over time.

Figure 2: Dissecting the language found in economics textbooks.



This figure analyzes word frequency in a sample of 43 economics textbooks. Each point represents a word, with its frequency in economics textbooks plotted on the horizontal axis. On the vertical axis, I compare this textbook frequency to word frequency in the Google English corpus (averaged over the years 2000–2019). In each quadrant, the colored points represent the 1000 words that are most overused (for quirks and jargon) or most underused (for neglected and under-represented). For more details about the data, see Sources and methods.

Some things to note about Figure 2. If the language in economics textbooks was identical to the Google English corpus (something we do not expect), then all the points would cluster around the horizontal axis. But that is not what happens. Instead, we find a large vertical spread in relative frequency. This spread indicates that economics textbooks overuse some words (those which appear above the horizontal axis) and underuse others (those which appear below the horizontal axis).

When interpreting the data in Figure 2, note that both axes use logarithmic scales. These scales allow us to visualize the entire vocabulary of our text corpus on one chart; however, they have the effect of compressing frequency variation, which is actually enormous. For example, in my sample of economics textbooks, the most common word ('price') outnumbers the least common words (such as 'ritual') by a factor of 100,000. (Note that preposition words would be even more frequent. But since they are uninteresting for ideological analysis, I have removed them. For more details about the text processing, see Sources and methods.)

Just as word frequency varies immensely, so does relative frequency. For instance, economics textbooks use the word 'loanable' about 370 times more frequently than the Google English corpus. And they use the word 'christ' about 1000 times less frequently than the Google English corpus.

Because there are about 35,000 words plotted in Figure 2, it's not possible to label all of them. However, the word cloud in Figure 3 gives you a sense of the words that define economics writing. Here I show several hundred words from the 'jargon' quadrant. When you read an economics textbook, these are the words that stand out.

Figure 3: Economics jargon.

This cloud shows the most overused words from the economics jargon quadrant in Figure 2. These are words that are frequent in economics textbooks and overused relative to mainstream English.

Figure 4: Words that economics neglects.

This cloud shows the most underused words from the neglected quadrant in Figure 2 — words that are infrequent in economics textbooks and underused relative to mainstream English.

In addition to its jargon, economics is also defined by the words it neglects. Figure 4 shows several hundred of these neglected words. Interestingly, many of them relate to christian ideology. (For example, ‘lord’, ‘chapel’, ‘christ’, ‘monk’, ‘prayer’, and ‘jesus’.)

In a sense, this exclusion of religious words is banal, since economics presents itself as a ‘science’, and all science is secular. My claim, however, is that this scientific appearance is largely a veneer. Under the hood, economics textbooks care little for the scientific method. (For example, I challenge the reader to find a mainstream economics textbook that subjects its ideas to an empirical test. I doubt you will find one, for the simple reason that neoclassical doctrines amount to untestable metaphysics.)

Accepting that economics textbooks promulgate an ideology, then their secular language becomes significant. Why? Because in the past, most successful ideologies were tied to religion. The reason for this connection is easy to understand. The crux of an ideology is that it presents a myth about the social order, a myth that is then used to ‘creorder’ (Nitzan and Bichler’s term) human behavior. As social creatures, the myths we find most compelling are the ones that tell stories about human-like characters. Give these characters divine authority (which conveniently cannot be challenged or contradicted) and you have a recipe for a successful ideology.[36]

[36] If anything, history shows how difficult it is to create a secular ideology. For example, in the 19th century, the French philosopher Auguste Comte tried to create a secular ‘religion of humanity’ that would foster ‘altruism’ (a word he coined) among the masses (Wernick, 2001). The movement went nowhere. It was not until the 20th century that secular ideologies began to dominate human societies. The trick seems to have been to wrap ideology in the

Viewed in this light, economics ideology is remarkable for being the first widely accepted social myth that did away with gods. Commenting on this new secular belief system, Jonathan Nitzan and Shimshon Bichler observe that economics took the "hierarchical rule of God" and replaced it with a "flat law of nature, a secular–universal mechanism that regulated and equilibrated both heaven and earth" (2009).

Analyzing the language of the Bible

Having analyzed the language of economics textbooks (my corpus of capitalist ideology), let's do the same for the christian Bible, which will serve as my corpus of feudal ideology.

To analyze biblical language, I've selected a sample of 22 modern translations of the Bible, shown in Table 2. I use modern translations because I want to put these bibles on the same footing as economics textbooks. In other words, I don't want a biblical text that is littered with archaic words ('thou') and tenses ('sayeth') — language that we already know has become uncommon. To isolate the content, I have trimmed each Bible of front matter. The resulting language sample contains about 13 million words, with a vocabulary of roughly 32,000 unique words.

Table 2: A corpus of feudal ideology from 22 modern translations of the Bible

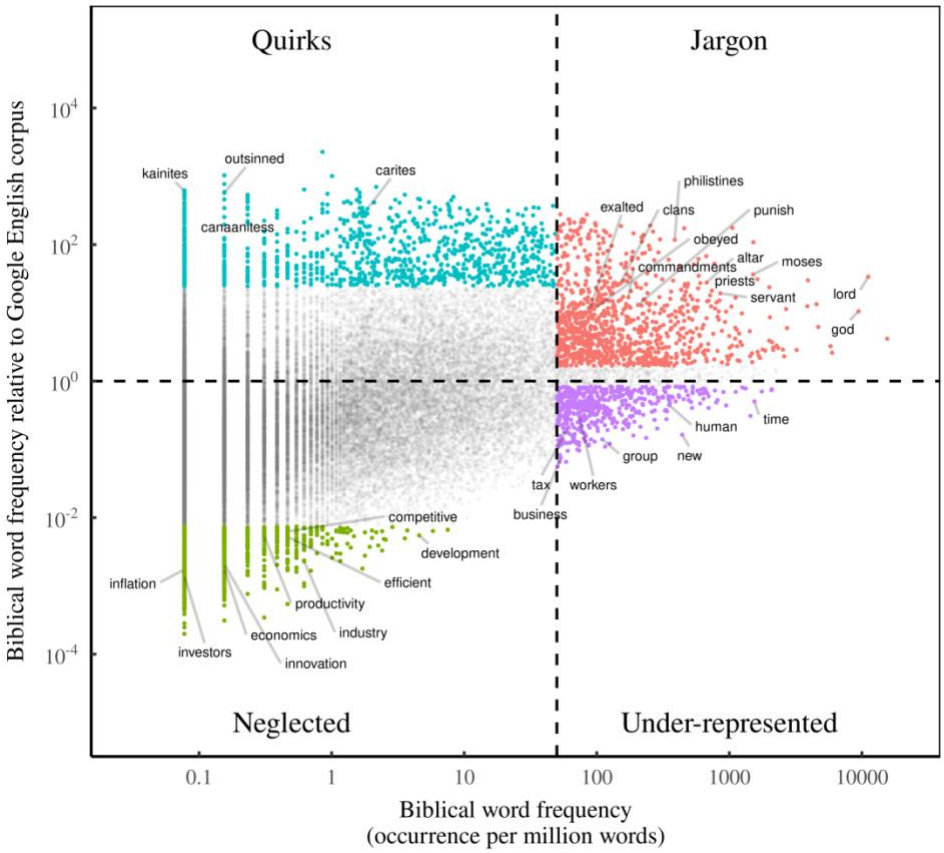
Version	Translation Date
American Standard Version	1901
Bible in Living English	1943
Borean Reader's Bible	2016
Catholic Public Domain Version	2009
Christian Standard Bible	2016
Common English Bible	2010
Easy English Bible	2001
English Standard Version	2001
Good News Bible	1966
JPS Tanakh	1917
NET Bible	2001
New American Bible	1970
New American Standard	1971
New Century Version	1983
New International Version	1973
New Life Version	1986
New Living Translation	1996
New Revised Standard Version	1993
Open English Version	2010
Revised New Jerusalem Bible	2019
The Message	1993
World English Bible	2000

In Figure 5, I analyze the vocabulary of this biblical corpus using my quadrant system. Each point represents a word. The horizontal axis shows word frequency in my sample of bibles. The vertical axis

authority of science. That's how we got economics. It's also how we got Marxist ideology, as well as the fascist ideology of eugenics.

compares this biblical frequency to the word frequency found in the Google English corpus. In each quadrant, the colored points represent the 1000 words that are most overused (for quirks and jargon) or most underused (for neglected and under-represented). In the analysis that follows, I will track the frequency over time of the red jargon words.

Figure 5: Dissecting biblical language.



This figure analyzes word frequency in a sample of 22 modern translations of the Bible. Each point represents a word, with its biblical frequency plotted on the horizontal axis. On the vertical axis, I compare this biblical frequency to word frequency in the Google English corpus (averaged over the years 2000–2019). To characterize the language, I divide it into four quadrants. In each quadrant, the colored points represent the 1000 words that are most overused (for quirks and jargon) or most underused (for neglected and under-represented). For more details about the data, see Sources and methods.

As with economics, we find that biblical language is different than mainstream English. Diving into these differences, Figure 6 shows several hundred words from the jargon quadrant — words that the Bible most overuses. Here we find the names of many biblical characters and the places in which they lived. We also find a large helping of familiar christian terms — words like ‘tabernacle’, ‘sinners’, and ‘crucified’.

Figure 6: Biblical jargon.

This cloud shows the most overused words from the biblical jargon quadrant in Figure 5 — words that are frequent in the Bible and overused relative to mainstream English.

Figure 7: Words that the Bible neglects.

This cloud shows the most underused words from the biblical neglected quadrant in Figure 5 — words used infrequently in the Bible and underused relative to modern, mainstream English.

When we turn to the words that the Bible neglects, shown in Figure 7, we find a collection of modern terminology. (For example 'television', 'newspaper', 'nuclear' and 'matrix'.) Given that the Bible is an iron-age document, it is unsurprising that it should neglect these words — even when it is translated into modern English.

We also find among the neglected words a significant amount of economics jargon — words like 'output', 'industry', and 'investors'. As we will see shortly, it turns out that the Bible systematically neglects the jargon of economics (and vice versa). This fact suggests that we are dealing with two mutually exclusive ideologies.

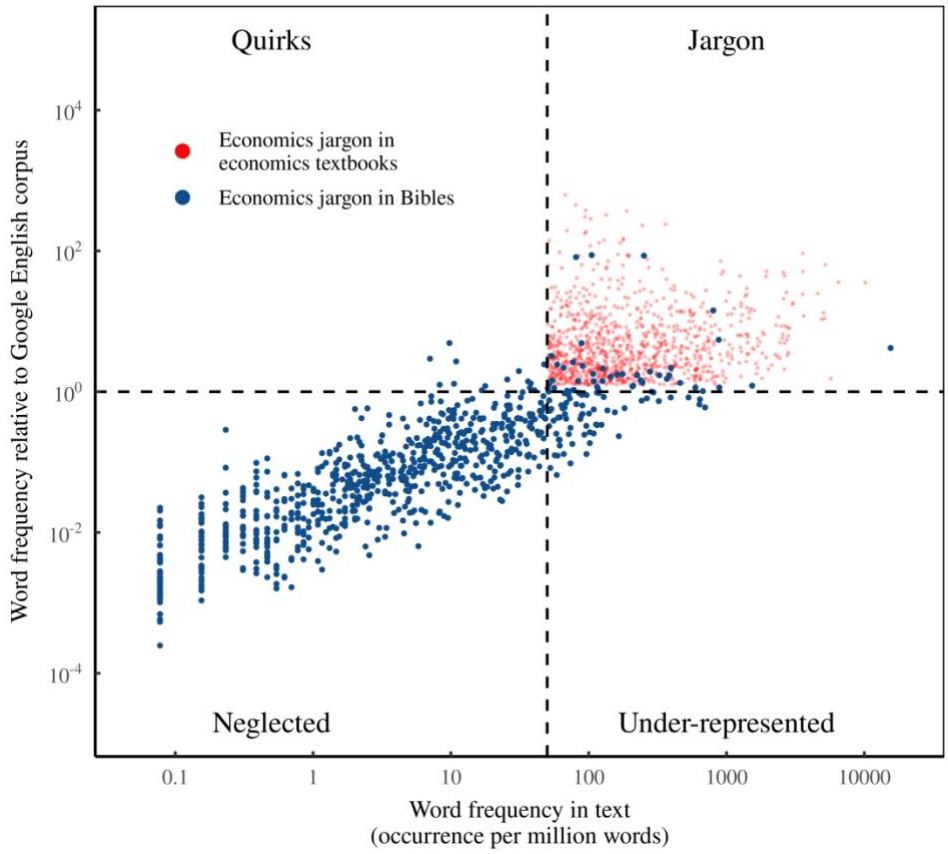
Ideological poles

Looking ahead, I'm going to take the jargon words from my corpus of bibles and economics textbooks and measure how their (respective) frequency has changed with time. Before we get to this analysis, though, it is worth making some predictions.

Looking only at our samples of economics textbooks and bibles, we can predict that the jargon of these two corpora will move in opposite directions. In other words, if economics jargon becomes more popular, biblical jargon will become less popular (and vice versa). The reason we can make this prediction is because these two corpora systematically neglect each other's jargon.

We can see this fact by taking the jargon of each corpus and looking at its 'position' (on my quadrant system) within the other corpus. Figure 8 conducts this experiment using the jargon of economics. Here, each point represents an economics jargon word. The red points show the 'position' of these words within economics textbooks. (By definition, economics jargon is found in the 'jargon' quadrant.) The blue points show the 'position' of the same words as they are represented in my sample of bibles. Looking at the top 1000 economics jargon words, I find that 88% of them are either 'neglected' by my sample of bibles, or absent from biblical vocabulary entirely.

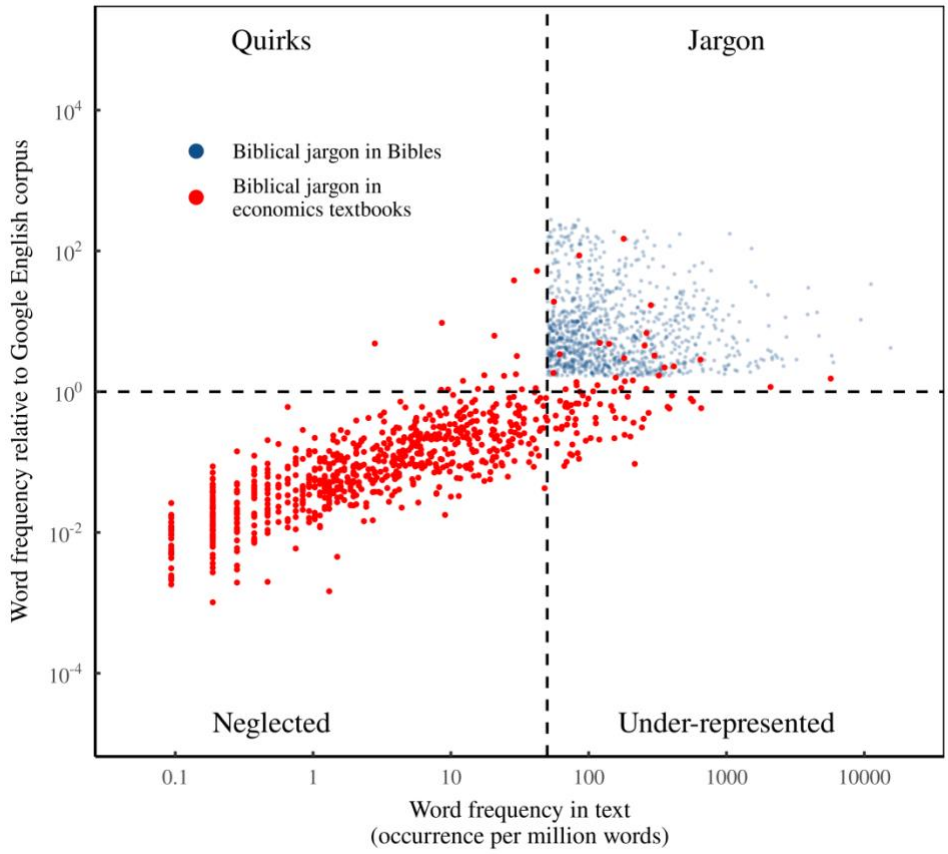
Figure 8: The location of economics jargon in economics textbooks and in the Bible.



This figure shows the top 1000 jargon words selected from my sample of economics textbooks. The red points show the 'position' of these words in economics textbooks (by definition, in the 'jargon' quadrant'). The blue points indicate the 'position' of the same words in my sample of bibles. The vast majority of these words are found in the 'neglected' quadrant, indicating that the Bible ignores the jargon of economics. For more details about the data, see Sources and methods.

Figure 9 conducts the reverse experiment. Here I take the jargon of the Bible and look at its 'position' within economics textbooks. The blue points show the 'position' of biblical jargon within bibles. The red points show the 'position' of the same words within economics textbooks. Again, we find that the two corpora are polar opposites. Biblical jargon is systematically neglected by economics textbooks. Of the top 1000 jargon words found in my sample of bibles, 90% of these words are either 'neglected' by economics textbooks, or entirely absent from economics vocabulary.

Figure 9: The location of biblical jargon in the Bible and in economics textbooks.



This figure shows the top 1000 jargon words selected from my sample of bibles. The blue points show the 'position' of these words in my sample of bibles (by definition, in the 'jargon' quadrant'). The red points indicate the 'position' of the same words in my sample of economics textbooks. The vast majority of these words are found in the 'neglected' quadrant, indicating that economic textbooks ignore biblical jargon. For more details about the data, see Sources and methods.

Because our bibles and economics textbooks neglect each other's jargon, it follows that the two ideologies are mutually distinct. Moreover, if the two ideologies remain distinct, their jargon must move in opposite directions. Therefore, with no understanding of history, we can make a simple prediction: if economics jargon becomes more popular, biblical jargon will become less popular (and vice versa). As we will see in a moment, this is exactly what happened historically.

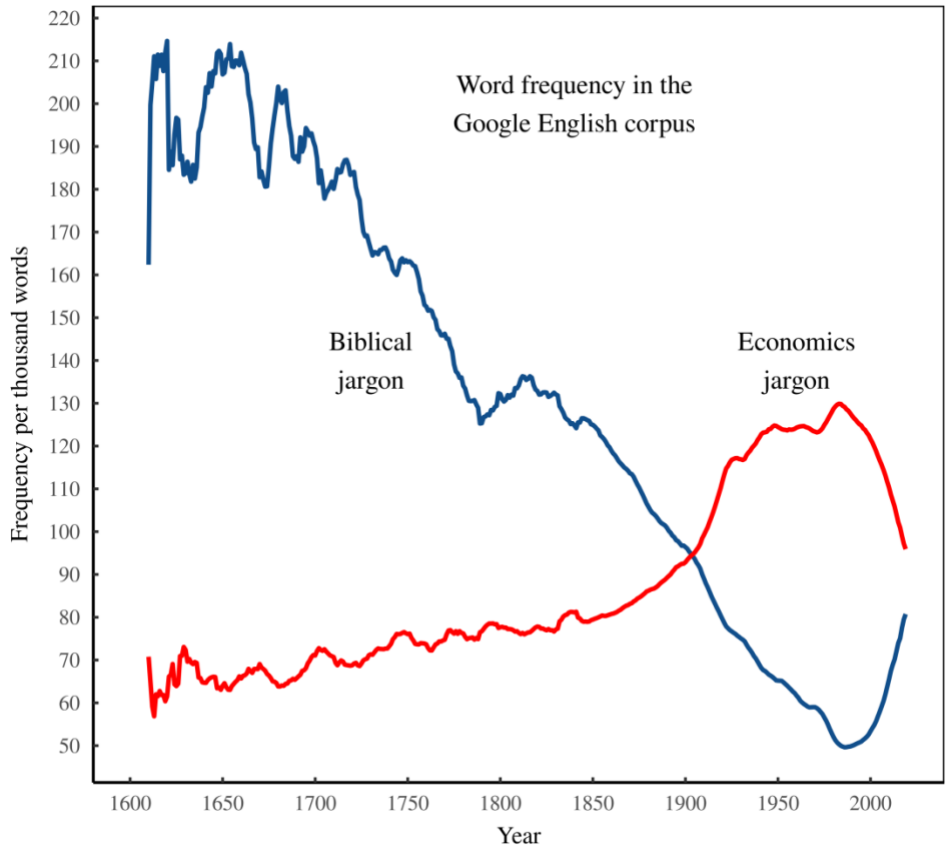
Pausing for reflection, I suspect that the mutual exclusion shown in Figures 8 and 9 is a general feature of all opposing ideologies. In short, if two ideologies conflict, we expect that they will not share each other's jargon.

The changing frequency of biblical and economics jargon in the Google English corpus

We're now in a position to look at the changing ideological landscape that is written in the English language. To quantify ideological change, I measure how the frequency of biblical/economics jargon has changed with time in the Google English corpus.

Figure 10 shows my results. Here the blue line shows the annual frequency of biblical jargon. The red line shows the annual frequency of economics jargon. Note that the frequency is expressed per thousand words, so you can interpret it like a batting average. For example, during the 1950s, for every 1000 words contained within the Google corpus, about 130 of them were economics jargon. (If our economics jargon 'batted' 1000, it would mean that English writing consisted entirely of economics jargon.)

Figure 10: The changing frequency of biblical and economics jargon in the Google English corpus.



Each line shows the frequency of biblical/economics jargon within the Google English corpus. I define 'economics jargon' as the 1000 most overused words from the jargon quadrant of Figure 2. And I define 'biblical jargon' as the 1000 most overused words from the jargon quadrant of Figure 6. In each year, I sum the frequency of these words in the Google corpus, and plot the pattern over time. To smooth the trends, each line shows the 10-year trailing average of jargon frequency. For more details about the data, see Sources and methods.

Looking at Figure 10, let's start with what is unsurprising. Over the last four centuries, biblical jargon fell out of favor while economics jargon became more popular. This is exactly what we expect for the transition from feudalism to capitalism.

To give you a sense of the scale of this linguistic transformation, note that in the 17th century, English writing was overwhelmingly religious. For every 1000 words written during that period (and captured by the Google English corpus), on average about 200 of them were biblical jargon. That may not sound significant, until you realize that my sample of bibles themselves only 'bat' 300. In other words, for every 1000 words in these bibles, 300 of them are 'jargon'. So it's not an exaggeration to say that the English literature of the 17th century was dominated by theology.

From the 18th century onward, however, this christian hegemony steadily waned. At the same time, the jargon of economics grew more popular, becoming the dominant ideology around the turn of the 20th century.

While we should be cautious about interpreting these trends (because they depend in part on my analytic assumptions), they seem consistent with what we know both about the history of capitalism and about the history of economic thought. We know, for example, that the transition to capitalism has deep roots, but that the change accelerated during the late 19th century, as Western countries began to industrialize. We also know that the origin of modern-day economics dates back centuries, but that these ideas were not mainstream until after the marginal revolution of the late 19th century. So over all, the long-term pattern in Figure 10 meets our expectations.

That said, something conspicuous happened after 1980: the popularity of economics jargon began to wane, and the popularity of biblical jargon began to rise. What should we make of this reversal? Does it indicate that we (anglophones) have passed the peak of capitalist ideology? I think the answer is yes.

Reinforcing evidence

There is a saying in science that extraordinary claims require extraordinary evidence. I admit that I cannot muster 'extraordinary' evidence to back my claim that we've passed the peak of capitalist ideology. However, I can muster several independent lines of linguistic evidence that point to the same conclusion. In what follows, I look at different ways of tracking the popularity of biblical and economics language. Most of these measurements suggest that capitalist ideology (as measured by the language of economics) peaked in the 1980s.

The language similarity index

In Figure 10, I tracked the frequency of biblical and economic 'jargon' words. The advantage of this method is that it is (in my opinion) simple to understand. The disadvantage of the jargon approach is that it tracks only a small portion (about 3%) of the vocabulary of each corpus. To address this shortcoming, I look now at a measure that I call the 'language similarity index'. This index quantifies the similarity between two language samples using *all* of the words common to both vocabularies.

The idea behind the similarity index is that we can quantify language similarity by comparing the frequency of words in two samples of text. For example, if the word 'market' occurred at the same frequency in two text samples, this would indicate that the writing is similar. Of course, 'market' is just one word. So what we should do is compare the frequency of *every* word that is contained within both samples of text. The closer the frequency of each word, the more similar the texts.

In more technical terms, the similarity index is defined as follows. Let f_a^i be the frequency of word i in language sample a. And let f_b^i be the frequency of the same word in language sample b. For the intersection of all words found in both samples, the similarity index is defined as:

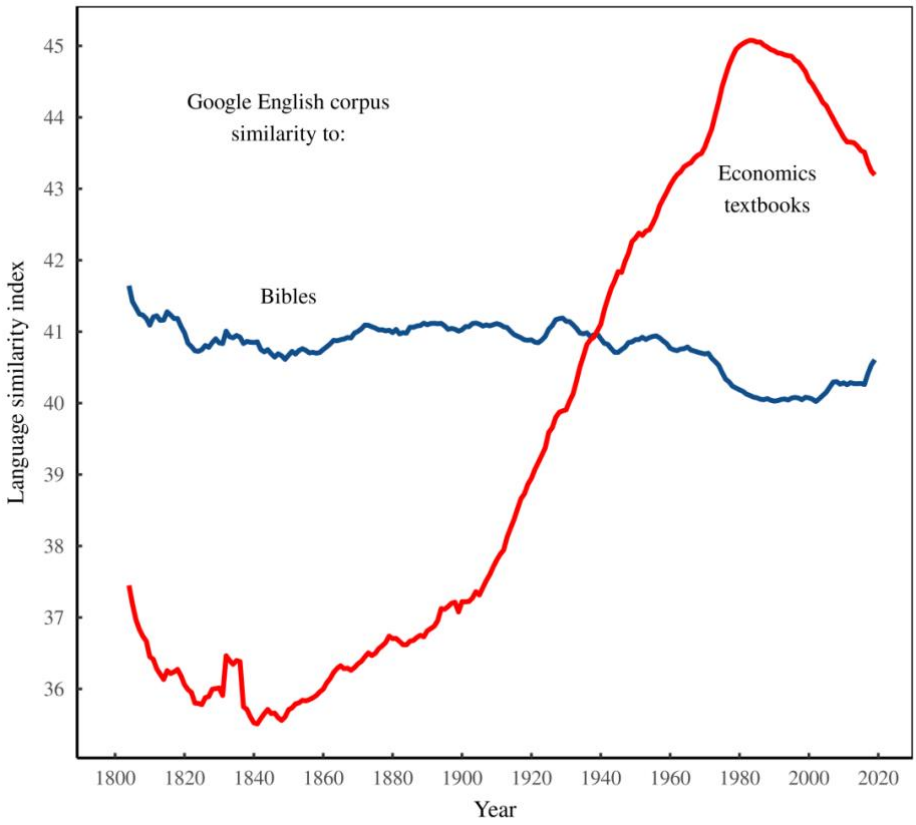
$$\text{similarity index} = \frac{100}{\text{mean}\left(\lfloor \left| \ln(f_a^i) - \ln(f_b^i) \right| + 1 \rfloor\right)}$$

Here, the vertical lines '| |' indicate taking the absolute value, and '⌊ ⌋' indicates rounding down to the nearest integer. The resulting similarity index varies from 0 (no similarity between language samples)

to 100 (the language samples have identical word frequency). The advantage of the similarity index is that it measures all words in a text. The disadvantage is that it requires a large text sample to give accurate results. (See Sources and methods for a discussion.)

In Figure 11, I apply the similarity index to measure the similarity between the Google English corpus and: (a) my sample of bibles (blue line); and (b) my sample of economics textbooks (red line). Because the similarity index requires a large text sample to be accurate, I restrict the analysis to the last two centuries.

Figure 11: The similarity index between the Google English corpus and my sample of bibles and economics textbooks.



The 'language similarity index' measures the extent to which the words in two samples of text have the same frequency. An index of 0 indicates no similarity. An index of 100 indicates that the word frequency is identical. The blue curve compares the similarity of the Google English corpus to my sample of bibles. The red curve compares the similarity of the Google English corpus to my sample of economics textbooks. To smooth the trends, each line shows the 5-year trailing average of the similarity index. For more details about the data, see Sources and methods.

Looking at Figure 11, we see that the trends are not identical to those found using jargon (in Figure 10). Using the similarity index, we find that the decline of biblical language is less pronounced, while the increase of economics language is more rapid. That said, the overall pattern is similar. Over the last two centuries, mainstream English became less similar to modern bibles and more similar to economics textbooks. And around 1980, this pattern reversed.

The frequency of biblical and economics jargon in other samples of English writing

Although the Google English corpus is the largest sample (by far) of historical English writing, it is wise to check that our results hold across multiple sets of data. With that in mind, I turn now to the word frequency found in two other sources of historical text:

1. The titles of academic articles on Sci-Hub
2. The titles of books on Library Genesis

For some context, Sci-Hub and Library Genesis are two databases that make copyrighted material available for free. (Publishers call this act 'piracy'. The database maintainers see it as 'liberation'.) Sci-Hub has amassed a collection of some 90 million scientific papers. And Library Genesis holds a collection of over 20 million books.

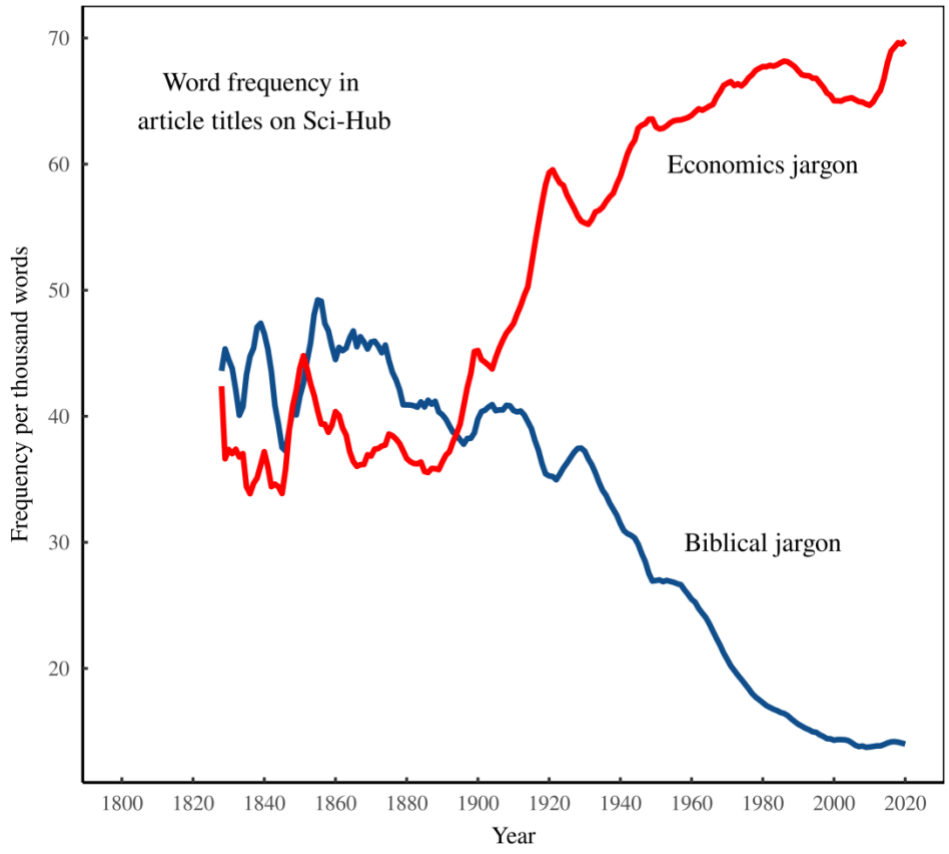
Since these articles and books are available in full text, we could in principle analyze their word frequency as Google has done with its corpus of books. However, the scale of the task is enormous; it would involve downloading and processing many terabytes of data.[37] While certainly possible, I leave this intensive task as a possibility for the future. Here, I look only at the *titles* within these two databases.

At first glance, studying titles alone seems like a poor source of English text. Keep in mind, however, that Sci-Hub and Library Genesis host many millions of entries. So even when we look only at titles, we are still dealing with a substantial body of writing. (For details about the sample size, see Figure 17 in Sources and methods.) The caveat is that the Sci-Hub and Library Genesis datasets are not large enough to apply the language similarity index. So I look only at the frequency of jargon.

Figure 12 shows the frequency of biblical and economics jargon within article titles on Sci-Hub. Consistent with the trends found in the Google corpus (Figure 10), it seems that over the last two centuries, biblical jargon fell out of favor, while economics jargon grew more popular. We also see a plateau in this pattern circa 1980. However, it's not clear from the Sci-Hub data that the popularity of economics jargon has actually peaked, since after 2010, we see an uptick in the trend.

[37] For example, public domain advocate Carl Malamud recently released an ngram database which analyzes the full text of some 107 million academic articles, many of which are suspected to have come from Sci-Hub (Public Resource, 2021). The problem is that this dataset is an unwieldy 38 Terabytes. Crunching data of this scale is beyond the scope of the current analysis.

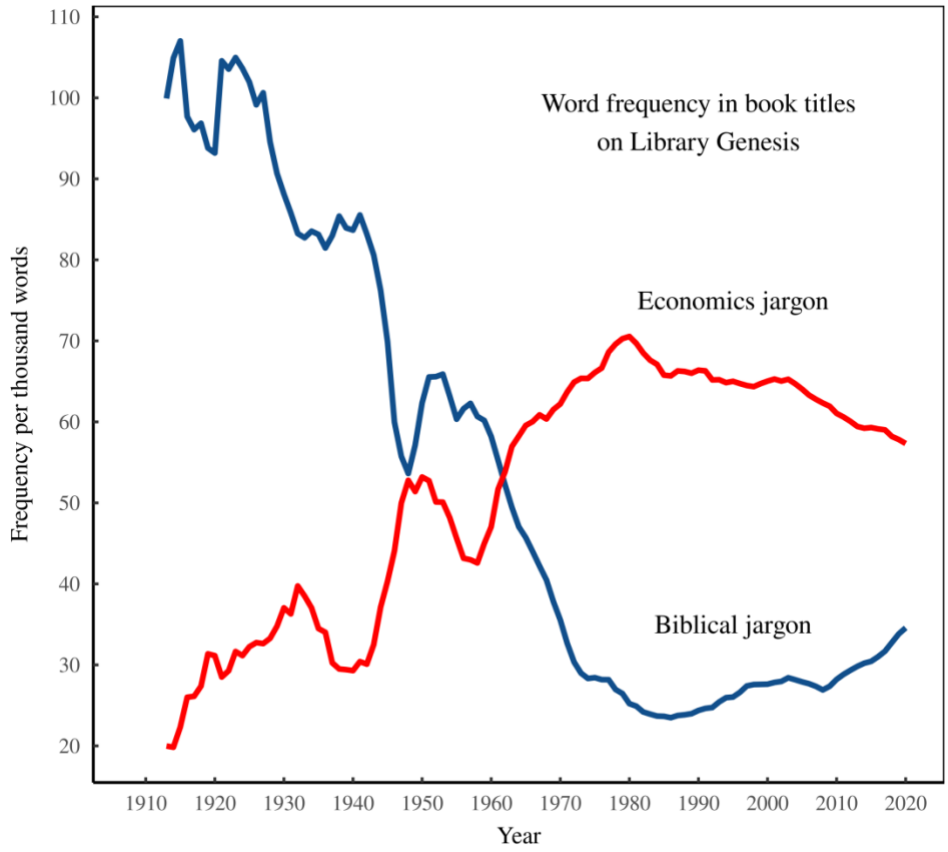
Figure 12: The frequency of economics jargon and biblical jargon in article titles on Sci-Hub.



The red curve shows the frequency of economics jargon in the titles of articles in the Sci-Hub database. The blue curve shows the frequency of biblical jargon. The 'jargon' of each corpus is defined as the 1000 most overused words from the respective jargon quadrants in Figures 2 and 5. I show data over the period during which the Sci-Hub dataset contains more than 10,000 words per year. To smooth the trends, each line shows the 5-year trailing average of jargon frequency. For more details about the data, see Sources and methods.

Turning to the book titles in Library Genesis, Figure 13 shows the frequency of economics and biblical jargon over the last century. Again, we see that until 1980, biblical jargon waned in popularity, while economic jargon grew more popular. After 1980, the pattern reversed.

Figure 13: The frequency of economics jargon and biblical jargon in book titles on Library Genesis.



The red curve shows the frequency of economics jargon in the titles of books in the Library Genesis database. The blue curve shows the frequency of biblical jargon. The 'jargon' of each corpus is defined as the 1000 most overused words from the respective jargon quadrants in Figures 2 and 5. I show data over the period during which the Library Genesis dataset contains more than 10,000 words per year. To smooth the trends, each line shows the 5-year trailing average of jargon frequency. For more details about the data, see Sources and methods.

Looking at the results in Figures 10–13, the trends from the various measurements/datasets appear consistent with one another. Until about 1980, biblical language became less popular and economics language grew more popular. After 1980, these trends reversed. (For in-depth consistency checks, see Figures 19 and 20 in Sources and methods.)

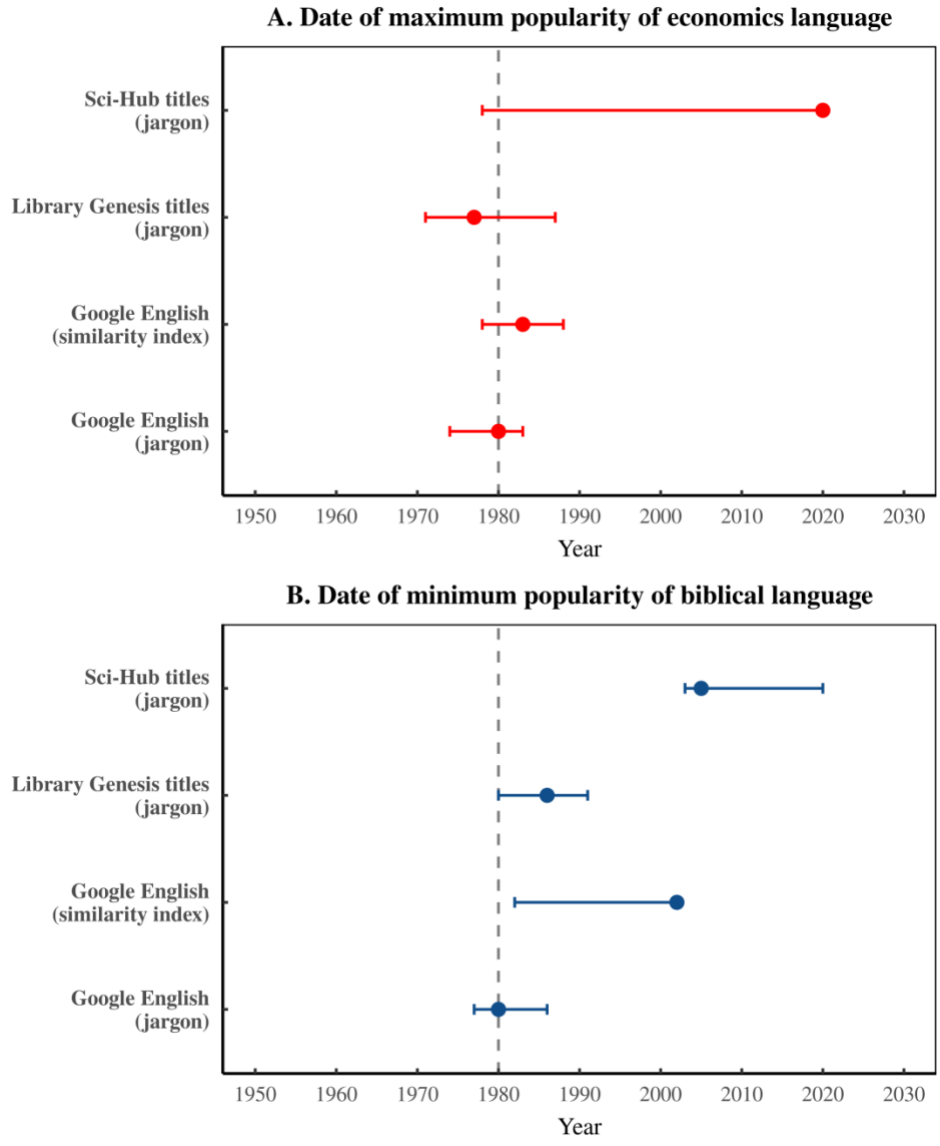
The peak of capitalist ideology

Having collected several independent measures of English word frequency, we're now in a position to judge if and when capitalist ideology peaked (as measured by the frequency of economics language).

Figure 14 analyzes the timing of this peak. In panel A, points indicate the date when economics language peaked in popularity, as judged by the corresponding metric on the vertical axis. The error bars show the range for the top ten years. Using the same convention, panel B shows the date when

biblical language reached its minimum popularity. The evidence suggests that economics ideology peaked around 1980, with biblical ideology reaching a minimum around the same time (or shortly thereafter).

Figure 14: The timing of peak economics.



Panel A analyzes the date at which economics language peaked in popularity in my samples of English writing. Panel B analyzes the date when the popularity of biblical language reached a minimum. Points indicate the date of maximum (for economics) or minimum (for biblical language) popularity. Error bars show the range for the 10 years with maximal/minimal popularity. For more details about the data, see Sources and methods.

Before discussing the significance of this peak, a note of caution. Technically, the evidence demonstrates that there has been *a* peak in the popularity of economics language. Because the future is unwritten, we cannot be certain that we have observed *the* peak.[38] However, assuming there is no

[38] US oil production provides a good example of *a* peak that was not *the* peak. In 1970, US oil production peaked, and then proceeded to decline for many decades. Many analysts thought they had witnessed *the* peak of oil

reversal of current trends, we are left with a fascinating conclusion: capitalist ideology (as I measure it) seems to have peaked around 1980.

The date of this peak is interesting, because it coincides with the so-called 'neoliberal' turn in anglophone politics. In 1980, Ronald Reagan became US President, running on a platform that heralded the benefits of free-market capitalism. In Britain, Margaret Thatcher ran on a similar platform, and was elected Prime Minister in 1979.

The term 'neoliberal' refers to the fact that this free-market movement (which extended far beyond Reagan and Thatcher) hearkened back to the laissez faire policies of the 19th century. The linguistic evidence, however, suggests that this way of characterizing the neoliberal turn is not entirely accurate. Yes, free-market ideas existed in the 19th century and were promoted by neoclassical economists. But they were not the dominant ideology. Instead, it was during the 'neoliberal' era that the ideology of economics achieved its maximum appeal. And so perhaps a more appropriate way of thinking about neoliberalism is that it was not a return to the past; it was a statement of ideological *supremacy* — the moment when there really was no alternative to the doctrines of economics.

The neoliberal euphoria didn't last long. From the 1990s onward, the popularity of economics ideology waned. I can think of many reasons for this decline, all of which relate to the fact that economics promises a free-market road to utopia. The longer this myth fails to pan out in reality, the less convincing it becomes.

As an example, take the problem of inequality. Beginning in the 1980s, anglophone countries experienced an explosion of income inequality, likely caused by neoliberal policies (Piketty, 2014). Apart from being socially corrosive, the problem with inequality is that it tends to undermine the economic doctrine that income stems from productivity. For example, if a CEO earns 5 times more than the average worker, many people can be convinced that this added income stems from the CEO's greater productivity. But if the CEO earns 500 times more than the average worker, attributing this windfall to 'productivity' seems laughable.

The 1980s also marked the period when climate change became a growing concern. People discovered that mainstream economists paid virtually no attention to the environment, other than to say that the market would solve our problems. But the market did not solve our ecological problems, which are today more severe than ever.

Broadly speaking, I suspect that since the 1980s, there has been a wave of hostility to neoclassical economics. Part of this hostility has come from the left, and from social scientists seeking to construct a more realistic theory of human interaction. How impactful this left-leaning movement has been, I do not know. (An interesting research project would be to use the linguistic methods developed here to study the extent of progressive ideology.)

What we do know is that a major source of hostility towards economics seems to have come from christian reactionaries. Indeed, this is the most plausible explanation for why biblical language is on the rise. And yet here we have a puzzle. Many evangelical christians proclaim a faith in both God and free markets (Rae & Hill, 2010). So you would think that if evangelical ideology became more prominent, biblical and economics language might *both* become more popular. And yet there is little evidence for such a trend.

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production. However, during the 2010s, there was an explosion of shale oil extraction that reversed the decline, and eventually pushed oil production to new heights. The lesson: we can never be certain that a peak is permanent.

Without researching the language of evangelical christianity in more detail, it's difficult to resolve this puzzle. But I suspect that given its appeal to biblical literalism, the evangelical movement has less in common with the secular doctrines offered in economics textbooks, and more in common with the religious doctrines of the Bible.

An age of ideological discord

The linguistic evidence suggests that anglophones are in the middle of an ideological transition — a period when economics ideology is losing its dominance but has not yet been replaced by another hegemonic belief system. Assuming this inference is true, then there should be many signs of this ongoing ideological struggle.

In his book *Ages of Discord*, biologist-turned-historian Peter Turchin provides a rich set of evidence that over the past few centuries, the United States has experienced several 'cycles of discord' (Turchin, 2016). What Turchin means is that the US seems to oscillate between periods of social harmony and periods of conflict. Unsurprisingly, Turchin argues that the United States is now in an 'age of discord'.

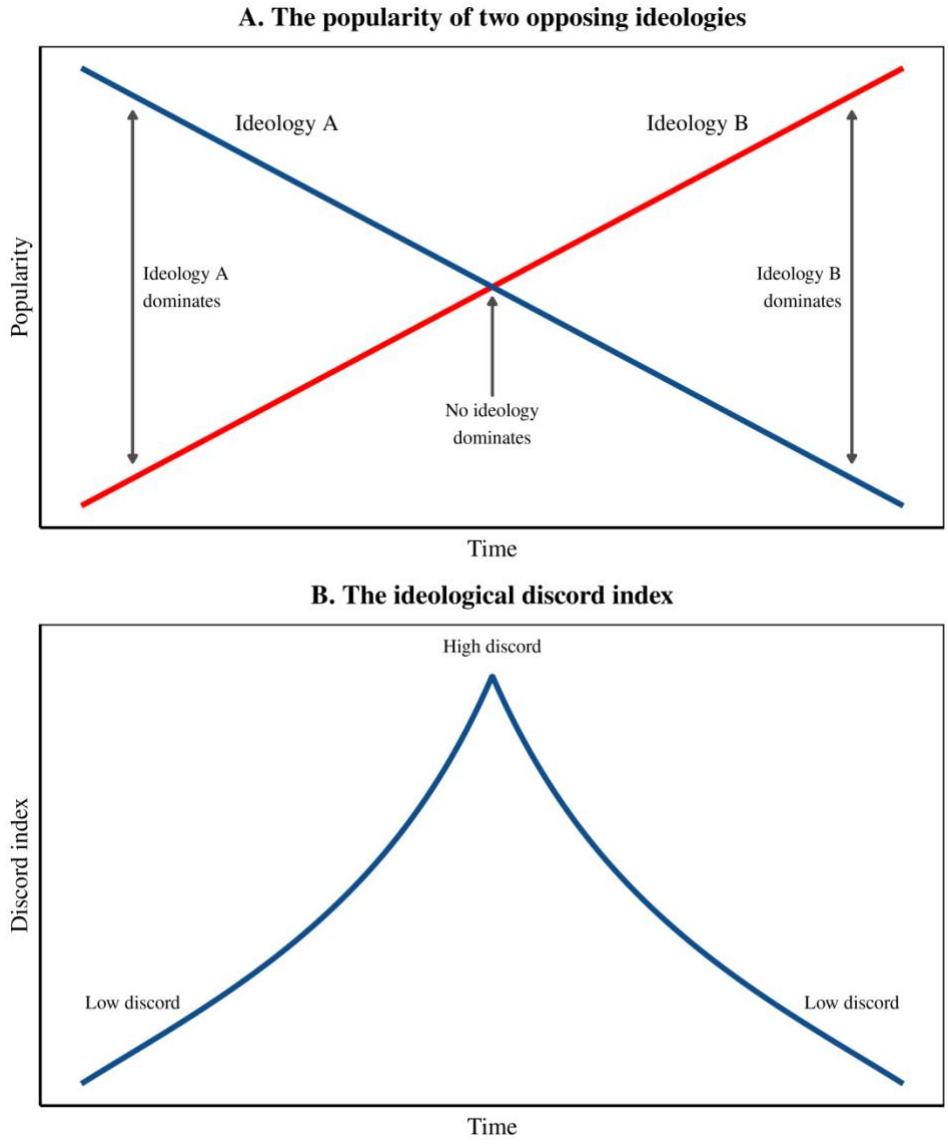
Might this discord relate to the ideological transition that is written in the linguistic data? To test this possibility, I propose something called the 'ideological discord index'. To frame this index, let's highlight an interesting (almost paradoxical) feature of ideology. Humans discern ideology in much the same way as we smell things. For example, when you walk into a bakery, you immediately smell the aroma. Yet the baker, who has been in the bakery all day, smells nothing. That's because humans mostly smell *new* scents. When an aroma becomes ubiquitous, it quickly loses its odor.

The same is true of ideology. As a rule, a dominant ideology is an 'odorless' one. In other words, when an ideology is ubiquitous, people cannot sense its presence. Instead, they see a 'natural order'. However, when ideologies are put in conflict, they suddenly have a 'smell'. 'Those people' have the wrong ideology and it 'stinks'.

The 'ideological discord index' builds on this analogy. It proposes that the world appears 'discordant' to the degree that no ideology dominates. Conversely, as one ideology becomes hegemonic, the world appears 'concordant'.

Figure 15 illustrates this thinking. In the top panel, the red and blue lines plot the popularity of two opposing ideologies. Over time, ideology A falls out of favor and is replaced by ideology B. The bottom panel shows the corresponding ideological discord index. When ideology A is dominant, there is little discord. But as the two ideologies approach equal popularity, discord rises. Then, as ideology B becomes dominant, discord falls.

Figure 15: The ideological discord index.



This figure illustrates the principle behind the 'ideological discord index', a measure which quantifies the degree of conflict between two opposing ideologies. Panel A shows a hypothetical ideological transition during which ideology A falls out of favor and is replaced by ideology B. The red and blue lines illustrate the popularity of each ideology. Panel B shows the corresponding ideological discord index. In visual terms, the discord index is inversely proportional to the popularity difference (in panel A) between the two ideologies. Thus, when ideology A dominates (left side) or when ideology B dominates (right side), the discord index is low. However, when no ideology dominates (center), ideological discord is high. For more details about the data, see Sources and methods.

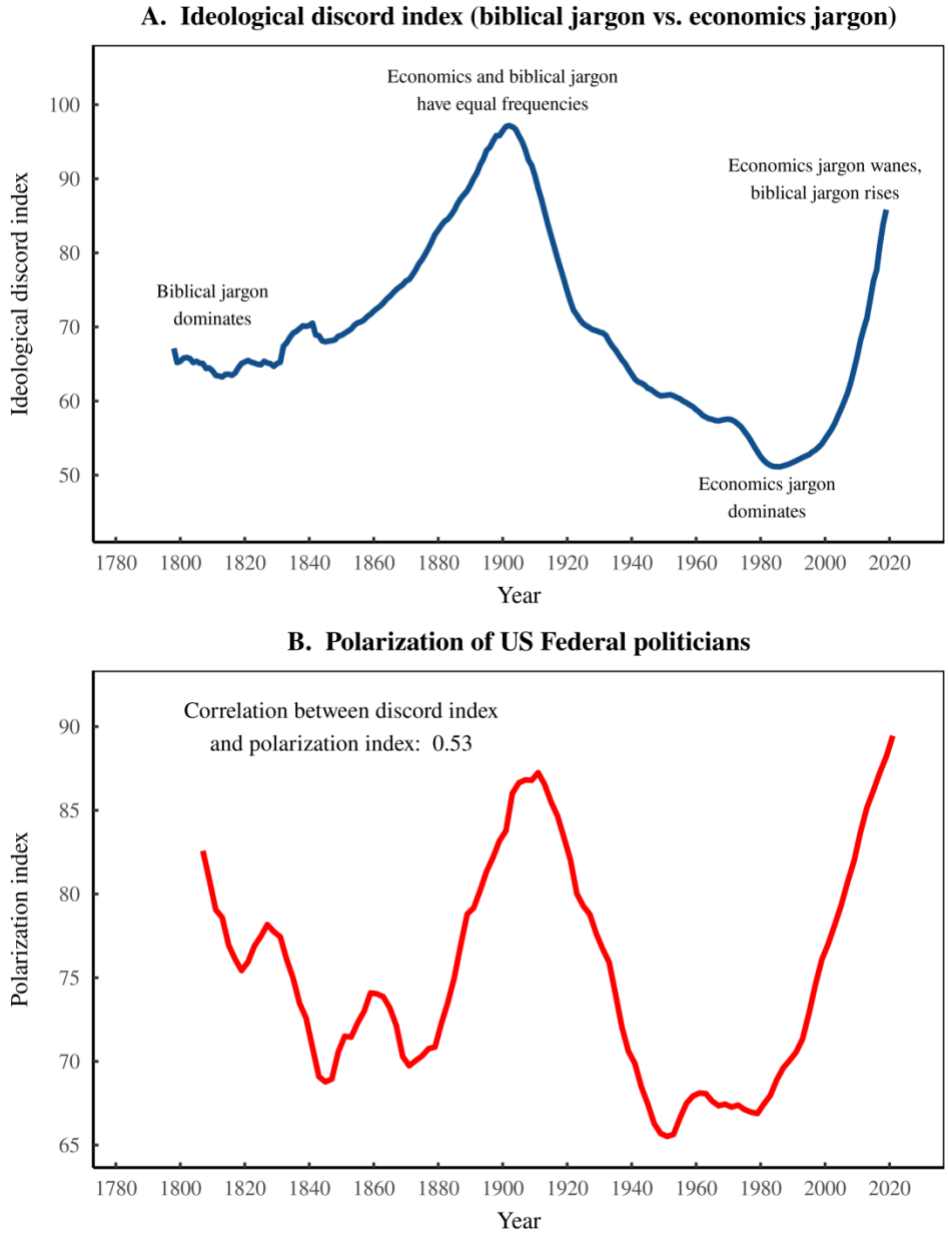
In more technical terms, I define the ideological discord index as follows. Let p_a and p_b measure the popularity of two ideologies, a and b. The ideological discord index is:

$$\text{discord index} = \frac{100}{|\ln(p_a) - \ln(p_b)| + 1}$$

The logic here is that when one ideology becomes dominant ($p_a \gg p_b$ or $p_a \ll p_b$), the discord index approaches 0. In contrast, when the two ideologies have equal popularity ($p_a = p_b$), the discord index is 100.

In Figure 16A, I apply the discord index to the struggle between biblical and economics ideology. I measure the popularity of each ideology using the frequency of its jargon in the Google English corpus (the data shown in Figure 10). Over the last two centuries, it seems there have been two cycles of discord. The first cycle peaked at the turn of the 20th century — the moment when economics ideology first surpassed the popularity of biblical ideology. The second discord cycle began around 1980 — corresponding to the peak of economics popularity. The current rise of discord is due to the declining popularity of economics ideology and the rising popularity of biblical ideology.

Figure 16: Ideological discord and the polarization of US Federal politicians.



Panel A shows my 'ideological discord index', constructed from the frequency of biblical jargon and economics jargon in the Google English corpus. (See the data in Figure 10.) The discord index measures the lack of dominance between ideologies on a 100-point scale. Discord is at maximum (100) when biblical and economics jargon have

the same frequency. Discord it is at a minimum (0) when one type of jargon completely dominates the other. Panel B shows my measure of the polarization of US federal politicians. Constructed using data from voteview.com, the index measures the polarization among all members of the House and Senate, plus the US President. A larger value indicates more extreme polarization. Note that both the discord index and the polarization index have been smoothed with a 10-year trailing average. For more details about these two metrics see Sources and Methods.

Assuming the discord index captures a real ideological struggle, the tension should be visible elsewhere — for example, among politicians. If you follow US politics, you know that today there is a bitter (almost pathological) divide between Democrats and Republicans. However, if you are older, you might remember a time when bipartisanship was the norm.

In *Ages of Discord*, Peter Turchin shows that over the last two centuries, the US federal government has gone through several cycles of polarization, and is currently in an era of extreme partisanship. Figure 16B shows these cycles. Here I've used data from voteview.com which reports, for every session of congress, the 'economic/redistributive' stance of federal politicians on a 0–1 scale. (The dataset tracks all members of the House, the Senate as well as the President.)

For each congress, c, I calculate polarization by taking the standard deviation of the set of ideological stances, I_c, of the constituent politicians:

$$\text{polarization index} = 200 \cdot SD(I_c)$$

The polarization index varies from 0 (no polarization, meaning everyone holds the same ideology)) to 100 (maximum polarization, meaning there are two equally sized groups that hold opposing ideologies.)

As Figure 16 demonstrates, the cycles of political polarization seem to match the oscillations of the ideological discord index. In other words, during periods of ideological conflict, US politicians become more polarized. Of course, that connection makes sense in abstract terms. After all, the US is supposed to be a democracy, so divisions amongst the population ought to induce polarization among politicians. However, it is not obvious (to me) that this political polarization relates to the specific conflict between biblical ideology and economics ideology. And yet the evidence suggests that it does.

For many Americans, the growing struggle between secular liberalism and reactionary christianity has been highlighted by recent Supreme Court decisions, especially the overturning of Roe v. Wade. Importantly, the linguistic evidence suggests that this secular-religious divide runs far deeper than the Supreme Court. On that front, journalist Amy Littlefield may not be exaggerating when she describes the rise of a 'christian legal army' that is fighting to install theocratic law (Littlefield, 2021).

Ideological futures

As a critic of neoclassical economics, I am happy that its doctrines are becoming less popular, and that in this sense, we have passed 'peak capitalism'. But like many leftists, I had hoped that when capitalist ideology faded, it would be replaced by something better.

True, this 'something better' may still happen. Today, there are many vibrant movements seeking to build a world that is more equitable and more sustainable. What remains unknown is the extent to which these alternatives are challenging the ideology of economics … or for that matter, the reactionary politics of the christian right.

On that front, Marx (1844) called religion the 'opium of the people', and he was right. Religion is a powerful ideological drug. But it is perhaps not the *most* powerful one. Give people a choice between living as a devout christian who is poor or as a secular liberal who is rich, my guess is that most people will choose the latter option. (This is one way to read 20th-century history.)
If you take away the opiate of wealth, however, people will quickly return to their religious drug of choice. It happened after the Soviet Union collapsed (Pankhurst, 2012). And it seems to be happening within anglophone countries today. The growth engine has slowed and the gains that remain are going almost exclusively to the rich. If these trends continue (and the linguistic patterns that go with them), the future may look less like a post-capitalist utopia and more like Margaret Atwood's *The Handmaid's Tale*.

Acknowledgements

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Sources and methods

Data and code for the analysis are available at the Open Science Framework: https://osf.io/ynp3t/

English word list

To ensure that all samples of writing are restricted to the same base of words, I keep only the words that are within a common English 'dictionary'. To construct this dictionary, I combine the following word lists:

- The Grady Augmented word list from the R lexicon package
- The Project Gutenberg word list from Moby Word II
- An English word list from Leah Alpert

From the resulting list, I remove words that are uninteresting for ideological analysis:

- remove words with 2 or fewer characters
- remove prepositions (using R lexicon function pos_preposition)
- remove English numerals from 1 to 100 (i.e. one, two, three …)
- remove acronyms (words containing '.')

- remove contractions (words containing apostrophes)
- remove hyphenated words
- remove words containing numbers
-

To adjust for different spellings, I also replace all British spellings with American versions (i.e. change 'labour' to 'labor'). The resulting dictionary contains about 500,000 words.

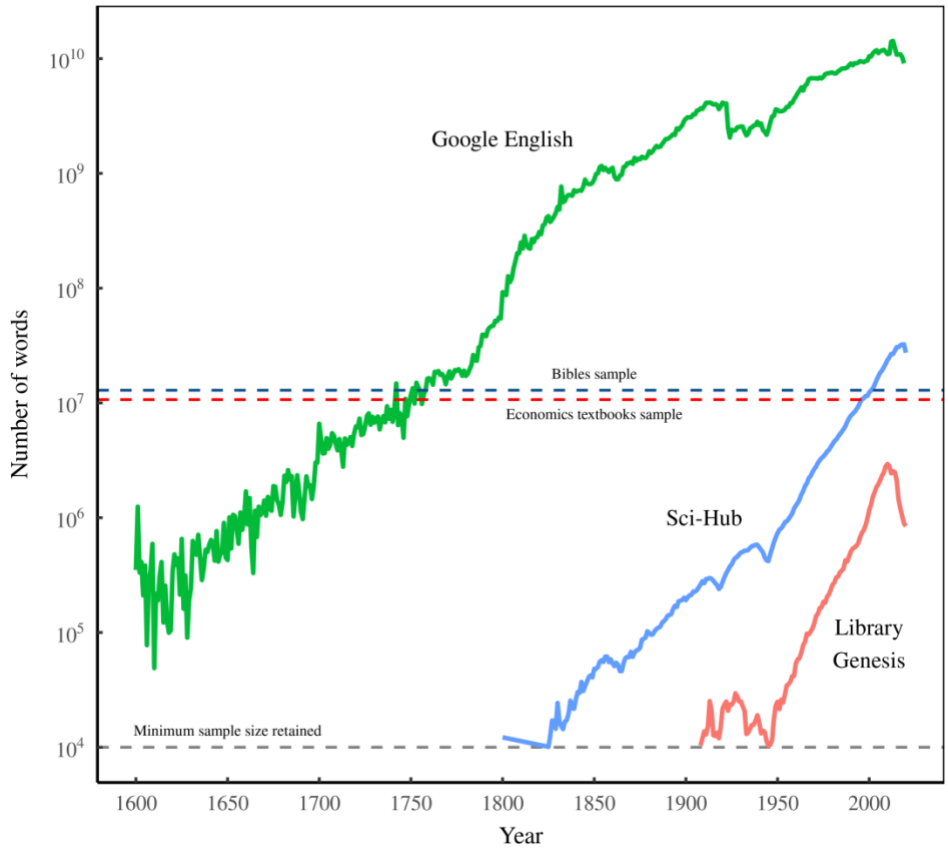
Samples of historical written English

I use three samples of historical written English:

1. Google English corpus (2019)
2. Titles of articles in the Sci-Hub database (dumped in August 2021, and downloaded from Library Genesis
3. Titles of books in the Library Genesis nonfiction database (dumped in June 2022)

After cleaning the data (keeping only the words that are in my English dictionary), I discard years in which the database has fewer than 10,000 words. Figure 17 shows the resulting sample size of each database over time. Google English is by far the largest sample, exceeding the others by several orders of magnitude.

Figure 17: Number of words in the Google English, Sci-Hub and Library Genesis databases.



Each line shows the number of words as a function of year in the given language database. Note the logarithmic scale on the vertical axis. I keep only the years in which each database includes more than 10,000 words. The blue and red dashed lines show the size of my sample of bibles and economics textbooks.

The language similarity index

The idea behind the language similarity index is that it measures the average difference in word frequency between two samples of text. Let f_a^i and f_b^i be the frequency of word i in two samples of text, a and b. A simple definition of the similarity index would be:

$$\text{similarity index}=\frac{100}{\text{mean}\left(\left|f_a^i-f_b^i\right|+1\right)}$$

However, since word frequency varies over an enormous range, a better approach is to take the logarithm of frequency:

$$\text{similarity index}=\frac{100}{\text{mean}\left(\left|\ \ln(f_a^i)-\ln\left(f_b^i\right)\ \right|+1\right)}$$

A problem with this definition, though, is that it requires an enormous sample to give accurate results. This is because as a rule, word frequency is distributed according to a power law, meaning the vast majority of words are quite rate. To capture the 'true' frequency of these rare words, we need an enormous sample. For example, if a word has a frequency of 1 per 10 million, we need to sample billions of words to recover this frequency reliably. The consequence is that in practice, the above definition of the similarity index is unworkable.

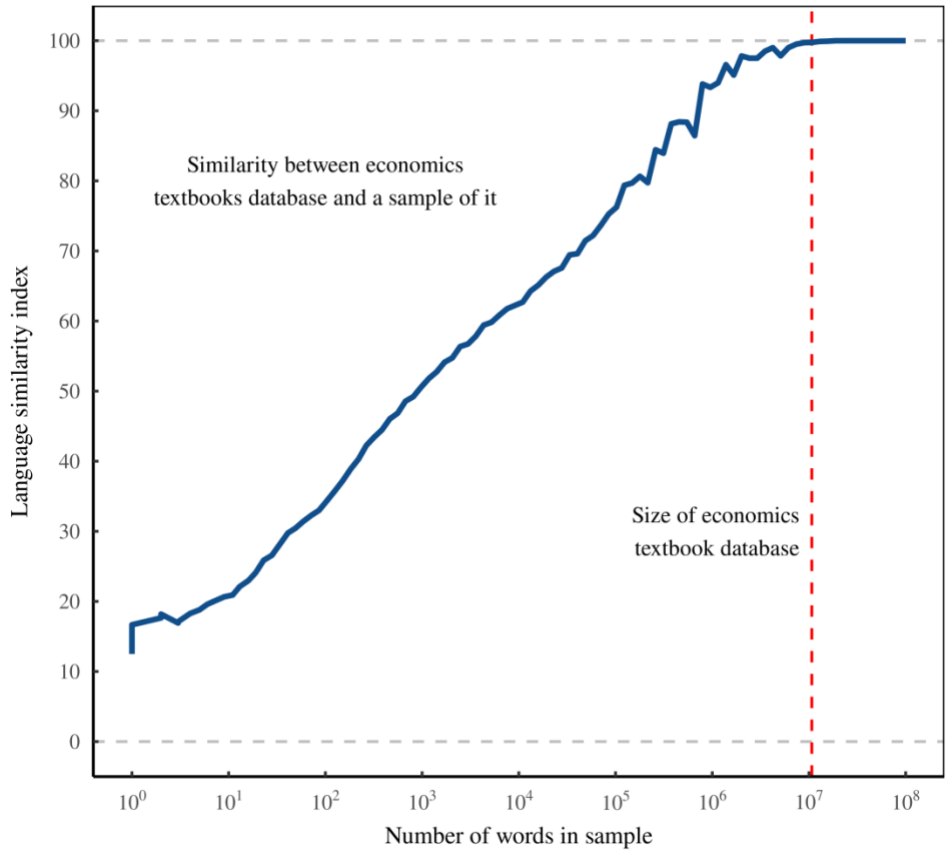
I fix the sample-size problem by taking the floor of the log differences, as follows:

$$\text{similarity index}=\frac{100}{\text{mean}\left(\lfloor\ \left|\ \ln(f_a^i)-\ln\left(f_b^i\right)\ \right|+1\ \rfloor\right)}$$

Taking the floor of the log frequency difference speeds up convergence of the similarity index to its correct value. Still, we need a fairly large sample for this metric to be accurate.

Figure 18 illustrates. Here I show what happens when we take a word sample from my economics textbook corpus and calculate the similarity between this sample and the full corpus. The resulting similarity index (vertical axis) depends on the size of the sample (horizontal axis). We recover the true similarity (100) as the sample size approaches the size of the economics corpus (about 10 million words). For smaller samples, the similarity index under-estimates the degree of language similarity.

Figure 18: How the language similarity index is affected by sample size.



This figure shows the result of an experiment where I sample words from the economics textbooks corpus and then calculate the similarity index between this sample and the full corpus. The horizontal axis shows the sample size. The vertical axis shows the corresponding similarity index. We reach the true similarity (100) only when the sample size is comparable to the database itself.

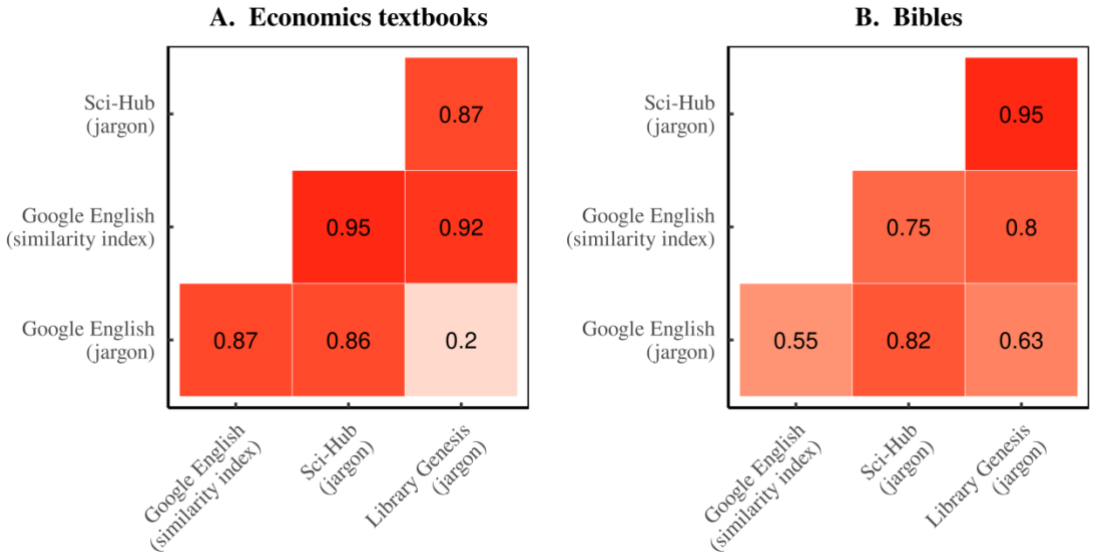
Testing the consistency of the various measures of economics/biblical language

I have assembled four measures of the popularity of economics/biblical language:

1. Jargon frequency in the Google English corpus (Figure 10)
2. Language similarity index between bibles/economics textbooks and the Google English corpus (Figure 11)
3. Jargon frequency in Sci-Hub article titles (Figure 12)
4. Jargon frequency in Library Genesis book titles (Figure 13)

To verify the consistency of these different measurements, Figure 19 shows their 'correlation matrix'. Each box shows the correlation between the corresponding time series labeled on vertical and horizontal axis. (Darker red indicates a stronger correlation.) Panel A correlates the various measure of economics language. Panel B correlates the measure of biblical language. The correlations are generally high, indicating that the measurements are consistent with each other.

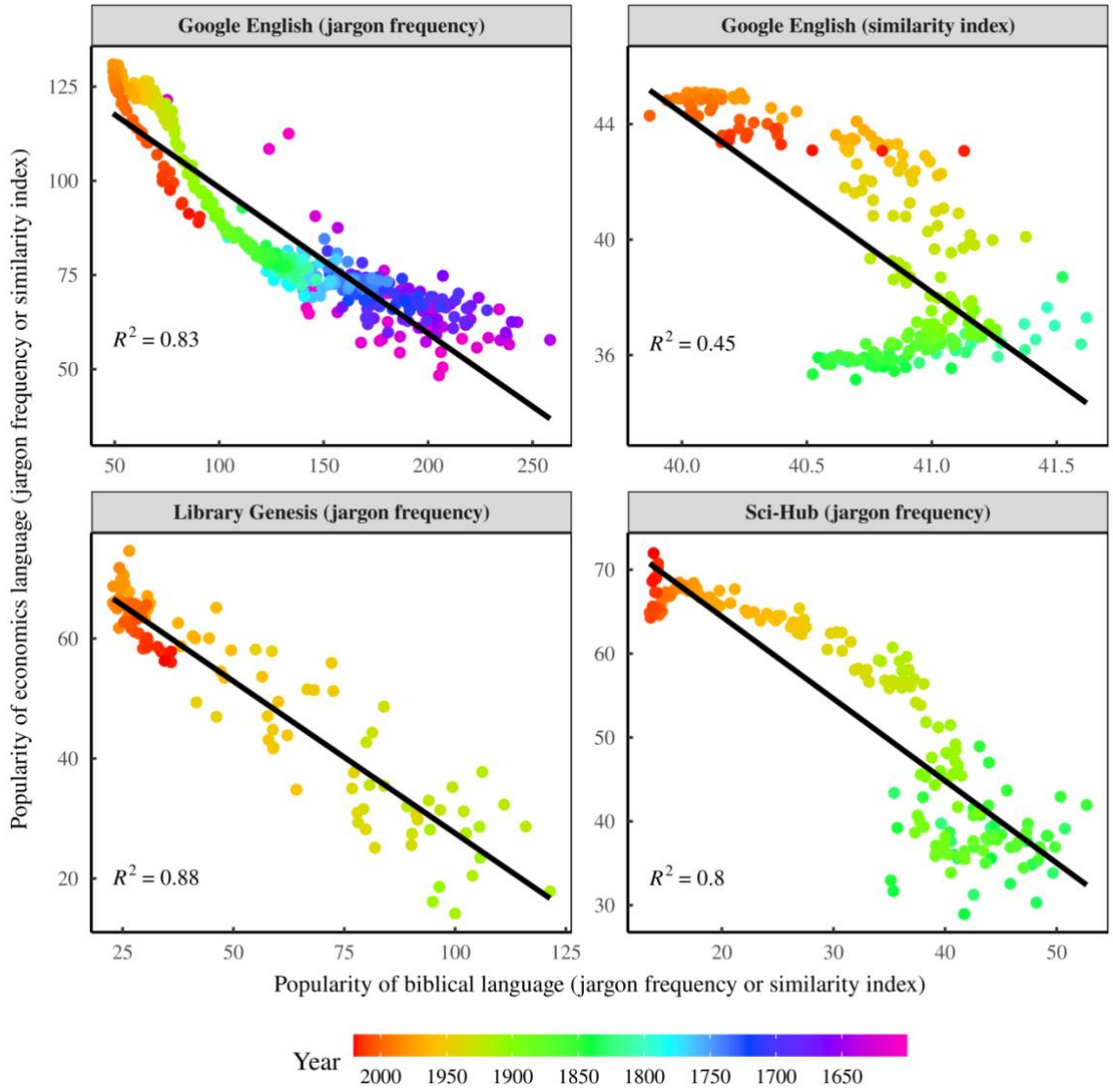
Figure 19: Cross correlating the four metrics of economics/biblical language.



Each box in the 'correlation matrix' indicates the time-series correlation between the corresponding metrics on the horizontal and vertical axes. For example, in panel A, the top right box shows the time-series correlation between economics jargon in Library Genesis and in Sci-Hub. The top right box in panel B shows the equivalent correlation for biblical jargon. A deeper shade of red indicates greater correlation.

Figure 20 illustrates that for each of these measurements, the popularity of biblical language correlates negatively with the popularity of economics language.

Figure 20: The popularity of economics language correlates negatively with the popularity of biblical language.



Each panels shows a different measurement of word frequency in English, with the popularity of biblical language plotted on the horizontal axis and the popularity of economics language plotted on the vertical axis. Color indicates the year of the data. The correlations are strong and negative. When biblical language becomes less popular, economics language becomes more popular, and vice versa.

Polarization of US Federal Government

Data for the ideological stance of Federal politicians comes from voteview.com, series nokken_poole_dim1. It quantifies the ideological stance of each US president, senator and member of congress on an 'economic/redistributive' scale ranging from 0 (extremely conservative) to 1 (extremely liberal). For details about this data, see Boche, Lewis, Rudkin, & Sonnet (2018).

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A Probabilistic Theory of Supply and Demand

John Komlos [Professor Emeritus, University of Munich]

Abstract
We propose a model of supply and demand that replaces the conventional deterministic model with one based on a normal probability distribution. This suggests that prices and quantity realizations fluctuate without any fundamental changes in the underlying variables. Thus, variability becomes an inherent feature of the system in place of static equilibrium.

Keywords: Law of supply and demand, probabilistic demand, probabilistic supply, endogenous fluctuations of prices and quantities, fuzzy logic, normal distribution

JEL: A10; A20; B41; B50; D01

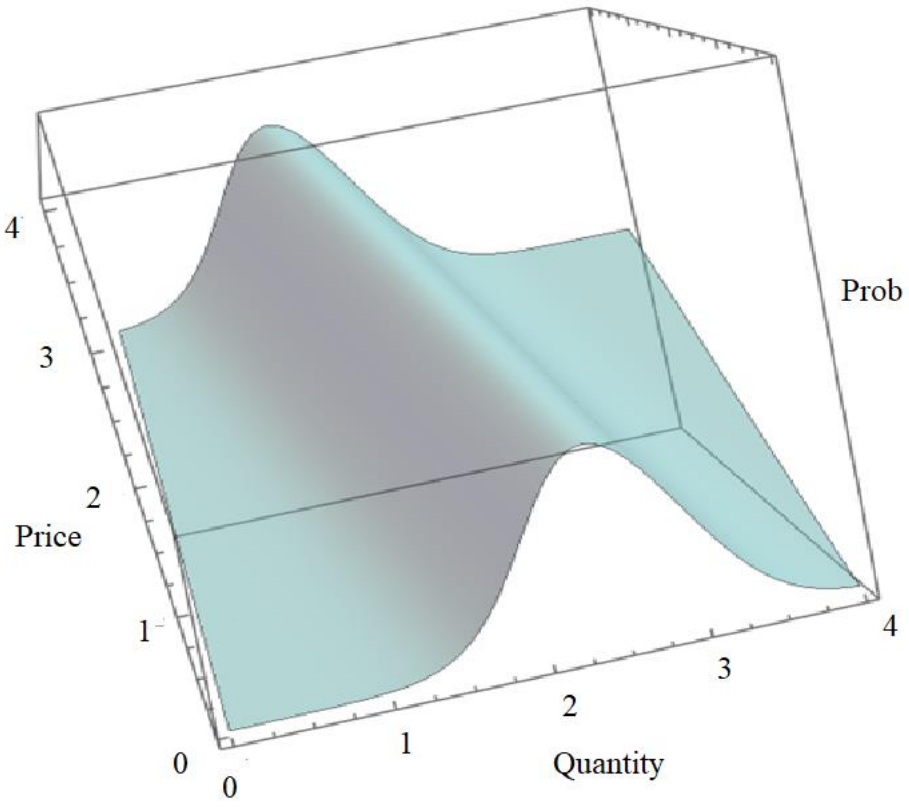
The concepts of supply and demand are one of the fundamental building blocks of economics. They describe the interaction of a downward sloping demand function and an upward sloping supply function. The assumption underlying their interaction is deterministic: at every price there is a unique quantity of a good demanded [$Q_d=f(p)$] by an individual consumer and supplied [$Q_s=f(p)$] by a firm, ceteris paribus. When these values are aggregated the deterministic market equivalent is obtained.

We now relax this deterministic view and frame the supply and demand problem in terms of the kind of radical uncertainty reflected in the quantum-theoretical view of reality (Farjoun and Machover 1983). In contrast to the classical conception of the world, physicists realized at the turn of the twentieth century that elementary particles do not have the same physical properties as objects on a human scale. Based on empirical evidence, giants like Albert Einstein, Max Planck, Niels Bohr, and many others discovered that physical laws that describe macroscopic objects cease to be valid at the subatomic level where particles do not have deterministic attributes. Rather, they have ambiguous characteristics, are probabilistic in nature, and there are real limits to how accurately their properties can be predicted prior to measurement. In general, one cannot predict with certainty what will happen at the subatomic level, but only provide probabilities.

Regrettably, this revolution in epistemology still eludes mainstream economics which continues to conceive of the behavior of its fundamental units, human economic agents, as being deterministic. In the current context, the rejection of the deterministic view of human behavior implies that one cannot know with certainty the quantity that will be purchased of a good by an individual at the current price (per unit of time) let alone at any future price before its actual realization (Mantegna and Stanley, 2000). This indeterministic view of demand is not a question of measurement error; rather, like Heisenberg's uncertainty principle, it is rooted in the intrinsic limitations of human knowledge, a basic feature of which is the uncertainty associated with human action: the quantity that will be demanded at any price is

vague, uncertain, and depends on a probability distribution (Kahneman, Sibony, and Sunstein 2021).[1] The justification is that consumers do not know themselves with any degree of certitude how many apples or oranges, or any other product for that matter, they will consume at its current price (per unit time) until the moment the purchase takes place, let alone in the future if that price (or other prices) were to change. Wants are "fuzzy" since consumers are unsure, hesitate, are subject to imperfect information, must decide within a time constraint using judgement, or err (Zadeh, 1975; Faber, Manstetten, and Proops, 1992). Similarly to quantum mechanics, the price-quantity pair is not knowable ex-ante, in principle, until observed.

Figure 1: Probabilistic Demand Function Given by a Normal Distribution.



For the sake of simplicity, we assume that at every price the consumer's cumulative probability of choosing a product can be described by a normal distribution with a standard deviation σ and mean μ:

$$Q_d = N(\mu,\sigma) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{1}{2}[\frac{q-\mu}{\sigma}]^2} \qquad \text{(Figure 1).}$$

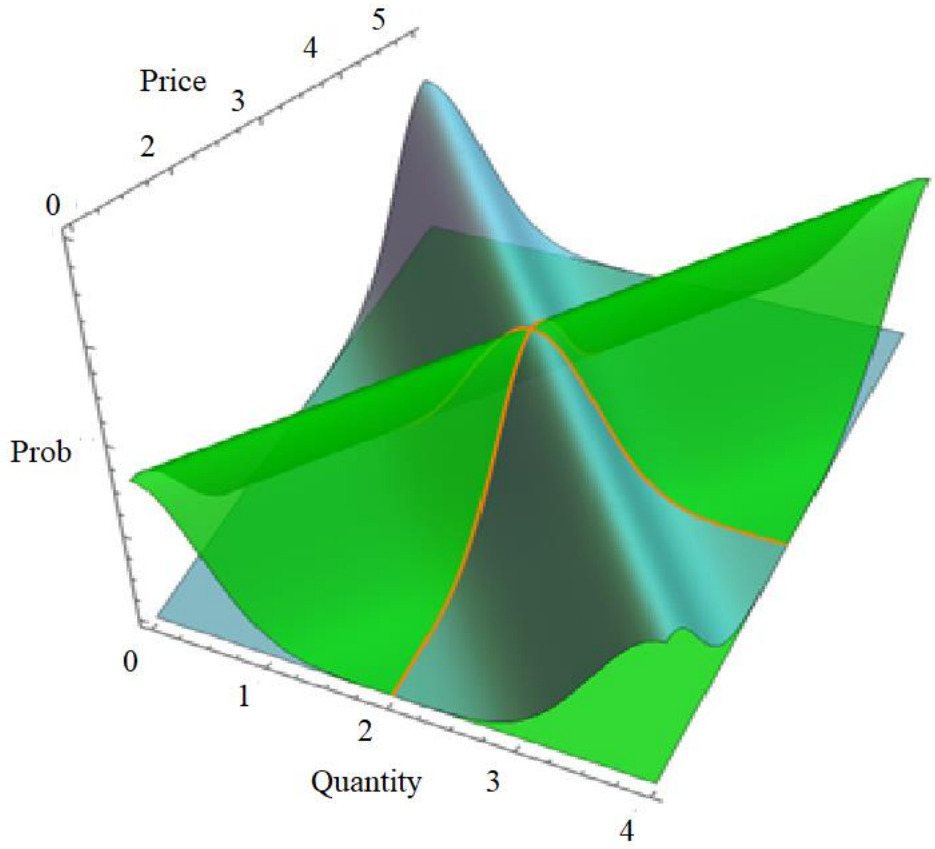
This bears some similarity to the probabilistic framework proposed by McFadden in the case of choice between two products.[2] He assumed that "utility is a random function," (1980, p. S14). The sources of

[1] This is similar to econophysics whose "approaches to traditional economic problems are essentially probabilistic (Cockshott et al., 2009). For another stochastic approach that does not impose the normal distribution see Cerreia-Vioglio et al., (2022).

[2] For a probabilistic framework modeling bid and ask stock market prices see (Biais, Hillion, Spatt. 1995).

randomness in his view "are unobserved variations in tastes and in the attributes of alternatives, and errors of perception and optimization by the consumer" (1980, p. S15). Deaton suggests similarly that "the absence of complete price information causes mistakes to be made" by consumers (Deaton 1977, p. 900). This can also be thought of as "semi-rational" behavior in a random utility model with preferences subject to unknowable "probability mechanisms" which might be considered stochastic (Luce and Suppes, 1965, p. 256). For the sake of simplicity, we impose the normal distribution on this randomness, and further assume that σ does not vary with price $D(p)=N(\mu,\sigma)$. The envelope of μ traces the conventional demand function (for instance: $\mu=a-bp$) (Figure 1). Clearly, these simplifying assumptions can all be relaxed in subsequent analysis.

Figure 2: Probabilistic Demand and Supply Functions, Both Given by a Normal Distribution.



The supply is specified similarly since producers also face multidimensional uncertainty regarding how much to produce at various prices. This is not conceptualized as the conventional shocks in macroeconomics (Blanchard, 1989). Instead, the fluctuations are inherent in the Knightian uncertainty characteristics of production (Knight, 1921). Much depends on the evolution of inventory levels over time, how long production takes to replenish inventories, the extent to which the product is perishable or can go out of fashion, actions of competitors, expectations regarding the macroeconomic environment, demand for the product the last period, and a number of unknowable factors such as supply chain interruptions.

The intersection of the stochastic supply and demand functions yields the set of price-quantity realization pairs (Figure 2). The realizations in this model become the "intersection" of the product of two normal bivariate distributions (expressed as a product):

$$z = -(\exp(-(x-y)^2 * \exp(-(x-y)^2))).$$

Figure 3 displays this set or realizations with 1,000 random price-quantity pairs drawn from the intersection of two normal probability distributions each with mean (μ) = 2 and standard deviation (σ) = 0.5.[3] The height of the cone (on the z-axis) represents the probability of obtaining a particular pair.

Figure 3: The Probability of a Price-Quantity Pair Is Given by the Intersection of Supply and Demand with $\mu = 2$ and $\sigma = 0.5$.

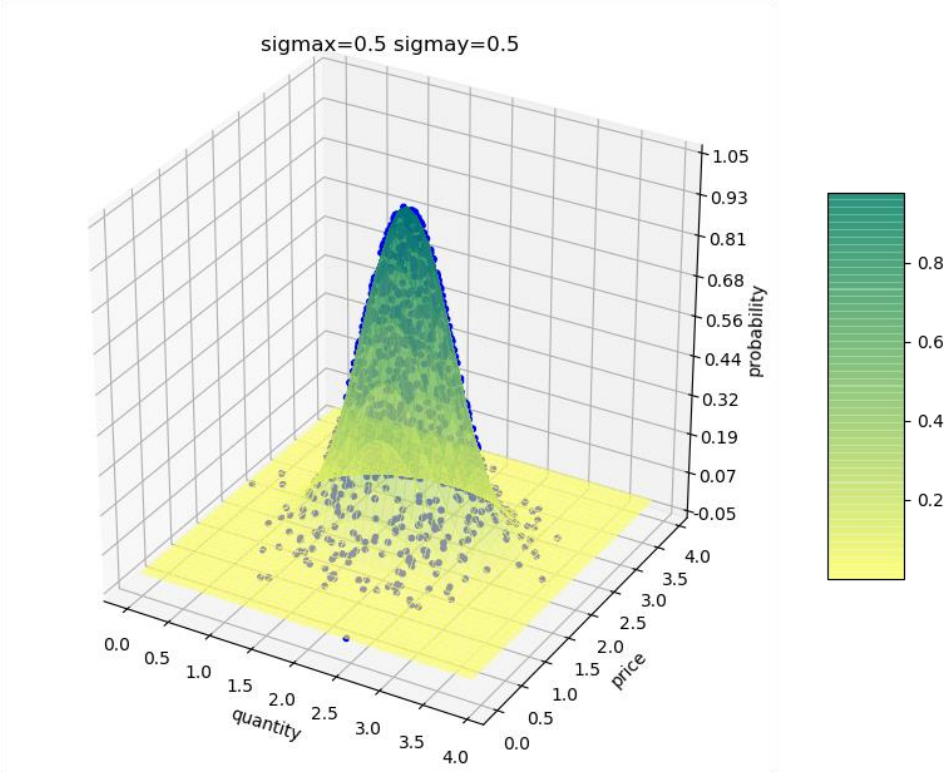
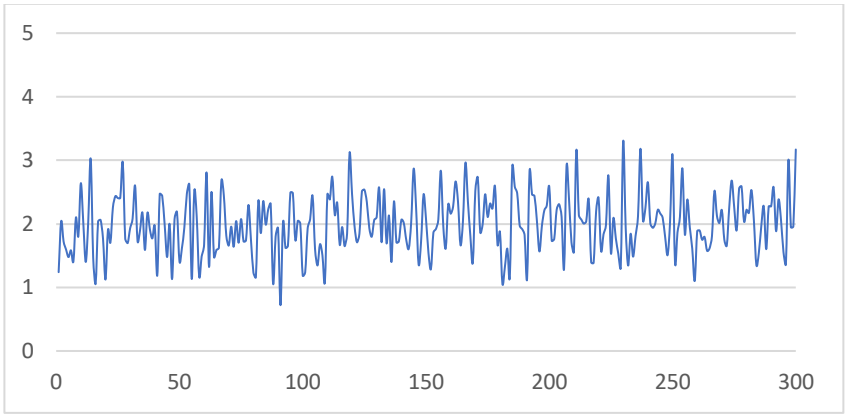


Figure 4 depicts the view of this set seen from the top down, i.e., projected on the x,y plane, showing that the values are bounded within a fuzzy circle that concentrate around the mean values.

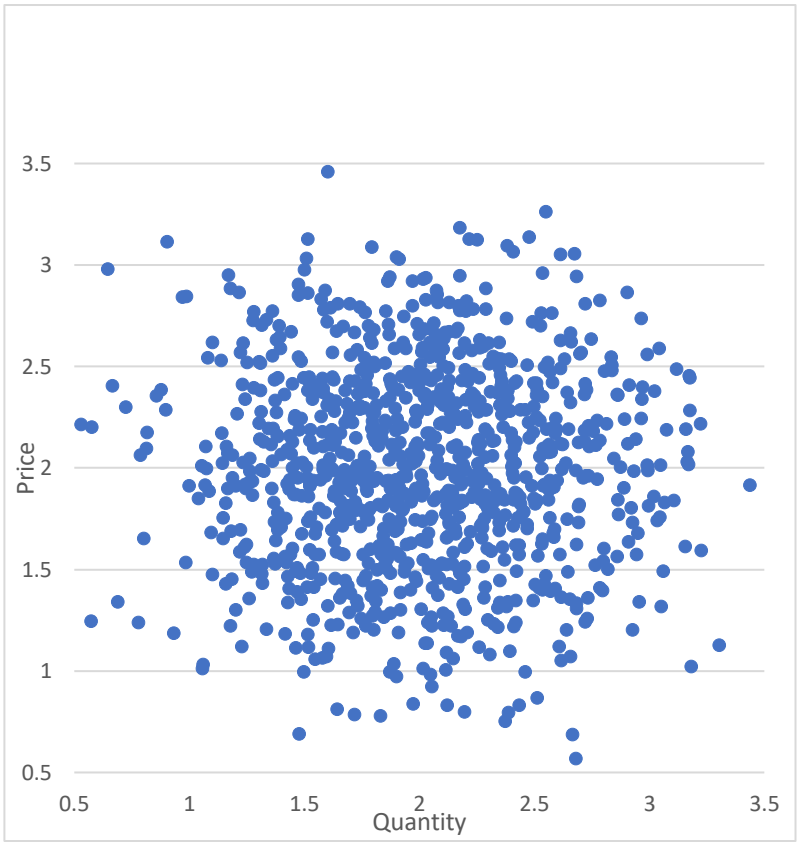
Figure 4: Random Price Fluctuations $\mu = 2$, $\sigma = 0.5$

[3] Since the sum of N independent normal distributions has a mean of $N\mu_i$ and a variance of $N\sigma_i^2$ for 1000 consumers the market demand would have a mean of 2000 and its σ would become 15.8 and the coefficient of variation would decline from 0.25 to 0.0079.



Price fluctuates randomly, although the fundamentals of demand and supply remain unchanged, i.e., neither income, tastes, production costs, or anything else change (Figure 5).

Figure 5: View of the Probabilities from Top Down, with $\mu = 2$, $\sigma = 0.5$ for both functions.



In Figure 6 the supply curve's σ is decreased to 0.25, indicating how the bound of a set of probable equilibrium values becomes an elliptic cone and its projection on the x,y plane becomes an ellipse (Figure 7).

Figure 6: The Probability of a Price-Quantity Pair Is Given by the Intersection of Supply and Demand with μ =2; σ(price)=0.5 and σ(quantity)=0.2.5.

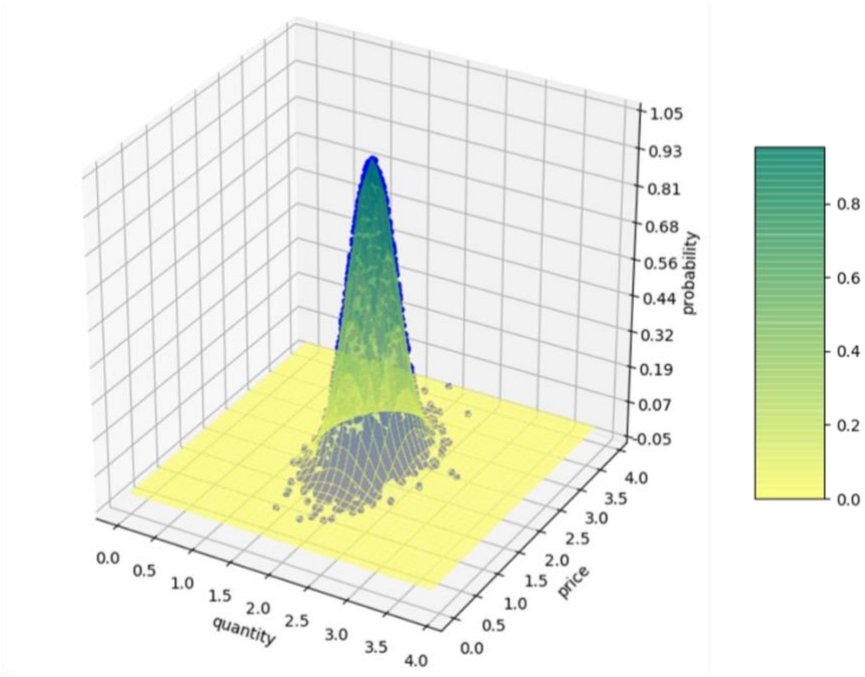
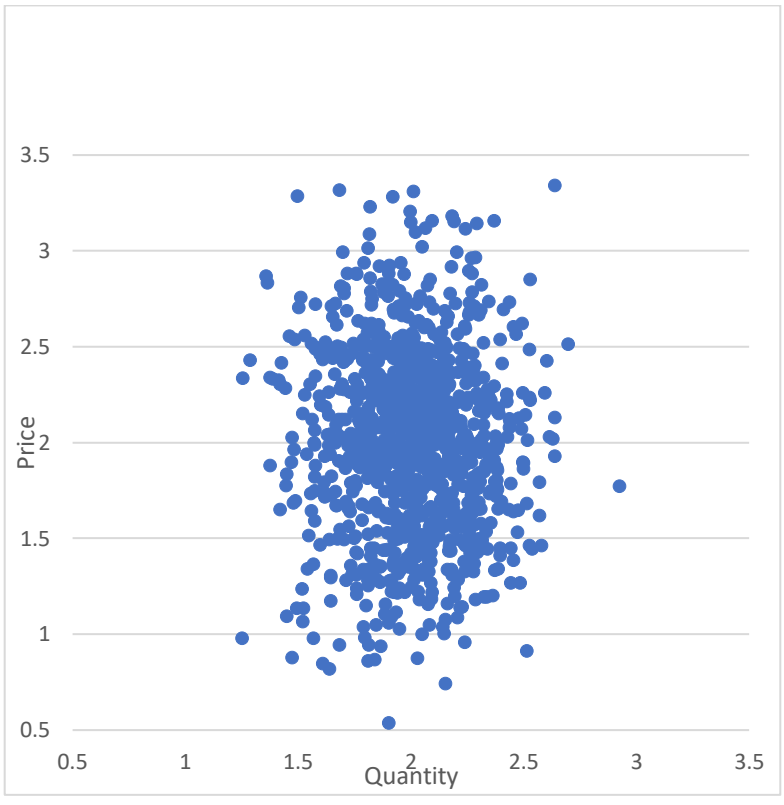


Figure 7: Realizations in Two Dimensions, with μ =2; σ(price)=0.5 and σ(quantity)=0.2.5.



In the conventional deterministic framework, the supply and demand curves intersect in a point and produce an equilibrium value. There is no randomness in that model. The consumers know exactly how much they demand, and the market demand is the just the sum of individual demands, so it is also a point. Randomness might emerge in measurement, but the theoretical model is itself deterministic. In contrast, in the present probabilistic framework there is no such equilibrium at the individual level and

market outcomes are also probabilistic, i.e. depend on a probability distributioin. Instead, there is a fuzzy set of realized price-quantity pairs. Hence, price-quantity pairs fluctuate within a range, determined by the standard deviations of the respective functions' probability distribution, but this randomness emerges without any external changes in the supply and demand functions, i.e., without changes in costs, or incomes, or utility functions. Thus, in this model price variations are endogenous to the system.

This model is a falsifiable hypothesis requiring further research. Obviously, individuals could be surveyed to see how much of some items they will demand under certain conditions and then see how accurate the realizations were compared to their expectations. Moreover, the above model points to a general way of thinking about other economic phenomena in order to overcome the tendency to conceptualize the economy using deterministic theories. An extreme example of the misplaced use of deterministic models is the compulsive insistence on relying on microfoundations in order to understand aggregate macroeconomic phenomena (Stiglitz, 2018). This is precisely the kind of fundamental error that quantum physicists began to remedy well over a century ago. Such a paradigm shift would be advantageous in economics as well.

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Unicorn, Yeti, Nessie, and Neoclassical Market – Legends and Empirical Evidence

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Abstract
The neoclassical market model continues to have a major influence on important economic policy decisions. In this model, the formation of equilibrium prices at the intersection of the aggregated supply and aggregated demand functions plays a central role. We examine whether the formation of equilibrium prices actually occurs. To do so, we analyze 2,217 prices for homogeneous products recorded by students in stores and online between October 2020 and May 2022. In 143 out of 146 cases, no equilibrium price emerges. The percentage price range regularly exceeds 100%. The presumed steering function of an equilibrium price does not materialize. The establishment of market mechanisms for the efficient solution of economic problems must therefore be questioned.

Keywords: Equilibrium price, Price dispersion, Price comparison, Market equilibrium, Information asymmetry, Neoclassical economics.
JEL Codes: B13, D01, D11, D12, D40, D50, E13, L13, P12

1. Introduction

Some people believe that cheerful unicorns trot through the few remaining remote primeval forests, that an intermediate form of animal and human, namely the Yeti, is at home in the heights of the Himalayas, and that an underwater monster meanders through the waters of Loch Ness in Scotland. There are eyewitness accounts for all these phenomena. To make a long story short: When critically examining all of these indications, one cannot speak of clear empirical evidence. While very few adults believe in the existence of unicorns, snow giants, and sea monsters, the idea of the neoclassical market is widespread in science and practice and finds many supporters and advocates.

Adam Smith (1776) was the first to emphasize the central importance of markets for all processes at the level of the individual economy as well as at the level of the national economy. The Austrian School propagated the market as the central element of liberal economic activity and free society, and as the decisive counter-concept to planned economy and socialism. Ludwig von Mises, Friedrich August von Hayek, Gottfried Harberler, and Oskar Morgenstern can be considered the most ardent advocates of market orientation. The influential textbook by Paul A. Samuelson (1948) contributed quite significantly to the spread of the notion of the neoclassical market. In current textbooks, such as Mankiw and Taylor (2020), it is presented unchanged: As prices rise, the willingness of (actual or potential) suppliers to provide products increases. With rising prices, however, the willingness of (actual or potential) demanders to purchase the corresponding products decreases. This results in an aggregate supply

function with a positive slope and an aggregate demand function with a negative slope. The intersection of the supply and demand functions determines the equilibrium price. This equilibrium price leads to market clearing. We refer to this form of market mechanism as the neoclassical market. The neoclassical market mechanism has the merit of automatically leading to efficient outcomes (Mises, 1929 and 1940). Goods necessarily flow to the demanders who most desire or need them. Goods are necessarily provided by the suppliers who can most easily spare or produce them.

The neoclassical market model is based on a variety of assumptions (Pindyck & Rubinfeld, 2017; Varian, 2014; Samuelson & Nordhaus, 2009): 1. The traded goods are homogeneous, 2. There are many suppliers and many demanders, 3. No supplier and no demander exercises market power, 4. Any supplier and any demander can enter or leave the market at any time without costs, 5. All suppliers and all demanders are independent of each other and consider only their own situation when making decisions, i.e., there is no herd behavior and no strategic behavior, 6. There is complete information and thus no asymmetric information distribution, 7. All suppliers and all demanders are rational agents interested solely in maximizing their utility, 8. Property rights are always evident and undisputed, 9. There are no transaction costs, 10. There are no externalities.

However, it is considered a weakness of the neoclassical market model that the assumptions can often not be considered fulfilled in reality. In practical economic life, there is not a single market in which all ten model assumptions can be regarded as fulfilled (see, e.g., Ötsch, 2019; Bridel, 1997; Walker, 1993). In some markets, not even one of the assumptions is fulfilled. However, this alone cannot shake the neoclassical market model because the core statements of the model fit the everyday experience that when supply declines, prices often rise and when demand declines, prices often fall. Even a model whose assumptions do not correspond to reality can lead to useful descriptions of the real world.

However, this does not relieve economics of the duty to empirically verify whether the neoclassical market really exists or whether it is exclusively the product of a fantasy world - similar to the case, presumably, of unicorns, Yeti, or Nessie. This leads us to the core of the problem. The neoclassical market model largely eludes empirical observation. It is plausible to assume that the aggregate supply function shows an increasing and the aggregate demand function a decreasing trend. Empirically, however, neither the one nor the other function can be represented. This will be illustrated by an example:

An innkeeper who runs the only pub in a village wants to find out how his guests would react to any price changes. So, he tries to get a picture of the aggregate demand function of his guests. For this reason, he distributes questionnaires to the guests. There they are to enter how much beer they would drink at which price level. However, his guests smell a rat and behave strategically. If the price level were higher than the current one, the guests say they would no longer come to the pub at all and would rather drink their beer at home. If the price level were lower than the current one, they make exaggerated statements about their planned consumption behavior. The pub owner who relies on this information is in for a surprise. If he actually lowers the price, the additional consumption estimated by the survey will probably largely fail to materialize. A demand function thus eludes empirical observation.

The same applies to aggregated supply functions. For example, the water protection authority may ask the farmers in a region how much targeted floodplain area they would make available in the event of a flood, depending on how high the authority sets the compensation payments. The farmers will promise large amounts of land as compensation increases, but they do so only to drive up compensation for existing floodplains as much as possible. The strategic behavior of the providers makes it impossible to observe the actual supply function empirically.

Since neither the supply function nor the demand function can be observed, the empirical examination of the neoclassical market model has to focus on the equilibrium price. The market model assumes that all transactions of a given good at a given point in time (at least) are settled at one and the same price, namely the equilibrium price. Numerous studies have therefore collected prices for homogeneous goods from different suppliers within a market that is clearly defined in terms of space and time. This has shown again and again that prices for one and the same good can vary greatly (see Table 1).

Table 1: Synoptic literature review

Research paper	Markets covered	Methods	Conclusion
Stigler (1961)	Cars, anthracite coal	Absolute price range, standard deviation	No price equilibrium
Maynes (1976)	Life insurance, drugstore items, consumer electronics, petrol, etc.	Absolute price range	No price equilibrium
Pratt, Wise & Zeckhauser (1979)	39 different product categories, e.g., bicycles, aquariums, air conditioners	Minimum, maximum, mean, standard deviation	No price equilibrium
Dahlby & West (1986)	Car insurance premiums	Percentage price range, variance, coefficient of variation	No price equilibrium
Van Hoomissen (1988)	Refrigerators, light bulbs, books for children, various groceries	Interstore relative price variability (measure of spread based on standard deviation)	No price equilibrium
Borenstein & Rose (1994)	Flight tickets	Gini coefficient, coefficient of variation	No price equilibrium
Brynjolfsson & Smith (2000)	Books, CDs	Absolute price range, percentage price range, standard deviation	No price equilibrium
Kessner & Polborn (2000)	Life insurances	Coefficient of variation	No price equilibrium
Sorensen (2000)	Prescription drugs	Absolute price range, standard deviation, coefficient of variation, estimated margin	No price equilibrium
Brown & Goolsbee (2002)	Life insurances	Standard deviation of residuals from a regression of life insurance prices paid and various explanatory variables	No price equilibrium
Lach (2002)	Refrigerators, chicken, coffee, flour	Mean, coefficient of variation, F-test, standard deviation, time effects	No price equilibrium
Scholten & Smith (2002)	20 different retail products, e.g., groceries, toiletries, batteries, cleaning products, thermometers	Coefficient of variation	No price equilibrium
Aalto-Setälä (2003)	120 different food items	Standard deviation, mean, regression analysis	No price equilibrium
Baye, Morgan & Scholten (2004)	Consumer electronics	Minimum, absolute price range, percentage price range, coefficient of variation	No price equilibrium
Baye, Morgan & Scholten (2006)	Consumer electronics	Absolute price range, percentage price range, coefficient of variation	No price equilibrium
Hong & Shum (2006)	Books	Absolute price range	No price equilibrium
Lewis (2008)	Petrol	Standard deviation, regression analysis	No price equilibrium
Wildenbeest (2009)	14,000 products from supermarkets	Regression analysis	No price equilibrium
Vukina & Zheng (2010)	Live hogs	Minimum, maximum, mean, standard deviation, absolute price range	No price equilibrium
Moen, Wulfsberg & Aas (2020)	766 homogeneous products in 4,297 retail stores	Coefficient of variation	No price equilibrium

Empirical research on the equilibrium price begins in the second half of the 20th century, when several authors start collecting prices for homogeneous goods in shops or in magazines. Stigler (1961) discovers price dispersion in the automobile and anthracite coal markets. Maynes (1976) compares

prices for identical life insurances, medicines, and nine other products and finds that different providers charge very different prices for homogeneous goods. In their influential study, Pratt, Wise & Zeckhauser (1979) extend the research to 39 different products. They show that the formation of equilibrium prices suggested by the neo-classical theory is by no means observable in practice. Burdett & Judd (1983) counter that the empirical study of prices is not suitable for deriving convincing statements about the validity of the neoclassical market model. If the observed price dispersion can be explained by search costs, one can still speak of market equilibrium even with different prices for homogeneous goods. However, search costs cannot be quantified easily in practice, which creates a similar dilemma as with the supply and demand functions mentioned at the beginning.

From the 1980s onward, the background to the observed price deviations is increasingly investigated. In particular, factors influencing the extent of price dispersion have come into focus. It has been shown that price dispersion tends to increase when the number of suppliers is low (Baye, Morgan & Scholten, 2004; Dahlby & West, 1986) and in times of strong inflation (Van Hoomissen, 1988). Other studies find that price dispersion tends to be lower for consumer goods that are regularly repurchased (Sorensen, 2000) and for goods in mature markets (Baye, Morgan & Scholten, 2006). Moreover, deviations from the equilibrium price model are also observed within one supplier. Even for the same supplier, there can be strong price deviations for different customer groups (Borenstein & Rose, 1994) or at different times of the day (Vukina & Zheng, 2010), which also does not fit the neoclassical theory.

Technological and political events also influence the scientific debate about the equilibrium price. In the 1990s, increasing globalization and the spread of the Internet are changing the way commerce works. The transportation of raw materials and finished goods is constantly becoming faster and cheaper. New forms of communication make it possible to work efficiently with supra-regional customers and suppliers at different points in the value chain, which creates more competition. Due to all these influencing factors, the number of potential suppliers and buyers within a market increases massively. The increasing spread of the Internet also ensures more transparency for customers, who can now compare prices from different providers much more easily.

These changes lead to a revival of empirical research on equilibrium pricing in the early 2000s. However, the studies always come to the same conclusion. Globalization and the introduction of the Internet have slightly shifted the extent of price dispersion in individual market segments, but an equilibrium price in the sense of neoclassical theory is still nowhere to be observed (Brown & Goolsbee, 2002; Scholten & Smith, 2002; Brynjolfsson & Smith, 2000).

Since the 2010s, fewer and fewer price comparisons have been published to test the neoclassical market model. The new studies partly argue on the basis of data that are several decades old (e.g., Moen, Wulfsberg & Aas, 2020). With the beginning of the 2020s, however, massive political and societal cuts have again had an impact on markets. In the course of the Covid19 pandemic, international supply chains collapsed en masse. Important products for daily use became scarce within a short period of time. Many consumers also faced changing financial conditions due to layoffs and short-time work. All of this can lead to changes in behavior on the part of both suppliers and consumers.

We see it as an important task of research to continuously test the validity of established models from theory in practice. The neoclassical market model is undoubtedly one of them. This study therefore raises the research question of whether an equilibrium price has been established for different product categories and products in the year of the Covid19 pandemic outbreak (2020) and the two subsequent years.

2. Data basis

To shed more light on our research question, we evaluate actual prices for homogeneous goods announced by retailers between October 2020 and May 2022. The prices were collected and documented by students of the Ostfalia University of Applied Sciences Wolfsburg in brick-and-mortar stores or online. In-store price collections were conducted in northern Germany in twelve cities (Braunschweig, Einbeck, Gifhorn, Goslar, Hannover, Helmstedt, Hildesheim, Lüneburg, Peine, Salzgitter, Wolfenbüttel, and Wolfsburg). Online price collections were conducted on price comparison portals or directly on the retailers' websites. All prices were quoted in €. All price observations were documented by photos or screenshots with location and time information. The observations have been published in the series "Wolfsburg Invisible Hand Studies" (WIHSt).

The eleven studies in the WIHSt series (see Table 2) cover 146 price comparisons for 77 different products, consisting of a total of 2,217 individual price observations (see Table 3). Each price comparison thus comprises an average of 15.185 prices from different retailers for one and the same product.

Table 2: Overview of studies from the "Wolfsburg Invisible Hand Studies" series

Study	Year	Authors
WIHSt 1	2021	Kornhardt, C.
WIHSt 2	2021	Yavuz, D.
WIHSt 3	2021	Clar, F., Petrunina, J., Qitaku, A. & Zubke, L.
WIHSt 4	2021	Chmielewski, L. & Kunzmann, O.
WIHSt 5	2021	Möbius, D., Schmidt, M. & Waldhelm, S.
WIHSt 6	2021	Flemming, J., Boztepe, C. & Tawbe, S.
WIHSt 7	2022	Wenzlaff, L. & Leohold, S.
WIHSt 8	2022	Beck, O. & Ülker, S.-L.
WIHSt 9	2022	Wahlers, J. & Schulenburg, S. von der
WIHSt 10	2022	Younis, R. & Sokolowski, P.
WIHSt 11	2022	Ziegner, K. & Mützel, P.

Table 3: Number of price observations per product category

Product category	Price comparisons	Prices
Drugstore	47	634
Food	59	776
Other	40	807
Total	146	2,217

Note: For a detailed overview per product, see Table A-1 in the appendix.

The database is divided into 47 price comparisons for drugstore products (634 price observations), 59 price comparisons for food (776 price observations), and 40 price comparisons for other products (807 price observations). The "Other" category includes products from the areas of consumer electronics, toys, kitchen appliances, clothing, printer supplies, medicines, car accessories, and sports & outdoor. The original product designations are used below. An overview of the respective English product descriptions can be found in Table A-2 in the appendix.

Eight products are examined in more than one Wolfsburg Invisible Hand Studies (WIHSt). These are Red Bull Classic 250ml (3x), as well as Funny-frisch “Ungarisch” 175g, Nutella Nuss-Nugat-Creme 450g, Pringles “Original” 200g, Duschdas Duschgel Sport 2-in-1 250ml, Milka Alpenmilch 100g, WMF Kult X Mix & Go 0.6l, and Dr. Oetker Ristorante Pizza Salame 320g (2 each). For the remaining 69 products, prices are only examined in one WIHSt each.

The price comparisons in the studies from the WIHSt series are from 2020 (10x), 2021 (84x), and 2022 (52x). 45 price comparisons were conducted exclusively in brick-and-mortar stores, 52 price comparisons were conducted exclusively online, and 49 price comparisons were conducted both in brick-and-mortar stores and online. In the 101 price comparisons that were conducted completely or partially online, prices including shipping costs were documented in 35 cases.

3. Methods

The prices are examined with regard to the setting of an equilibrium price. An equilibrium price exists when all transactions are carried out at the same price. To this end, the lowest observed price (minimum) is compared with the highest observed price (maximum). The difference between minimum and maximum is the absolute price range. If it is different from 0, there is no equilibrium price.

In order to determine the extent of price dispersion, relative measures of dispersion are used in the form of the percentage price range and the coefficient of variation. The percentage price range is obtained by dividing the absolute price range by the minimum:

$$Percentage\ Price\ Range\ (X) = \frac{Absolute\ Price\ Range\ (X)}{Minimum\ (X)}\ \text{X}\ 100\% = \frac{[Max\ (X) - Min\ (X)]}{Min\ (X)}\ \text{X}\ 100\%$$

A percentage price range > 100% indicates that the absolute price range is larger than the minimum. In other words, in this case the maximum is more than twice as large as the minimum, which indicates a strong deviation from an equilibrium price.

The coefficient of variation is obtained by dividing the standard deviation by the arithmetic mean of the observations:

$$Coefficient\ of\ Variation\ X = \frac{Standard\ Deviation\ (X)}{Arithmetic\ Mean\ (X)} = \frac{\sigma(X)}{\mu(X)}$$

A coefficient of variation > 0.1 indicates that the standard deviation is greater than 10% of the arithmetic mean, which also indicates a strong deviation from an equilibrium price.

The percentage price range and the coefficient of variation are more meaningful in that they relate the absolute price range and the standard deviation, respectively, to the price of the product. An absolute price range or a standard deviation of €1 represents a significantly more serious deviation from an equilibrium price if the observed product is priced in the order of €10 than if it is priced in the order of €1,000.

4. Results

A total of 146 price comparisons are analyzed. In 143 cases, the absolute price range, percentage price range, standard deviation, and coefficient of variation are not equal to zero. That is, in 143 of 146 cases, different prices were observed for a homogeneous good at a given time within a narrowly defined geographic area. The average percentage price range is 126.37%. The one-sample t-test supports that there is no equilibrium price (p-value = 0.000).

First, the price comparisons collected purely in brick-and-mortar retail stores are considered (Table 4). Here, 45 price comparisons with 398 individual price observations are carried out. The products for which a price comparison is carried out are displayed sorted according to the coefficient of variation (last column). That is, from products that show a large deviation from an equilibrium price to products that show a less large deviation from an equilibrium price.

Table 4: Comparison of prices collected in stores

Product	#	Min	Max	$\bar{x}$	σ	Absolute price range	Percentage price range	CV
Coca-Cola Original Taste 0,33l	17	€0.59	€2.29	€0.95	€0.47	€1.70	288.14%	0.495
Nivea Deoroller Fresh pure 0%	11	€1.65	€1.95	€1.92	€0.90	€0.30	18.18%	0.469
Milka Alpenmilch 100g	10	€0.59	€1.99	€1.03	€0.43	€1.40	237.29%	0.418
Pringles Chips Sour Cream & Onion 200g	13	€1.29	€3.89	€2.14	€0.78	€2.60	201.55%	0.364
Funny-frisch “Ungarisch” 175g	12	€1.49	€3.29	€1.71	€0.50	€1.80	120.81%	0.294
Snickers 50g (07.08.21)	8	€0.69	€1.39	€0.86	€0.25	€0.70	101.45%	0.291
Snickers 50g (30.08.21)	8	€0.69	€1.39	€0.86	€0.25	€0.70	101.45%	0.291
Pflaster Hansaplast "Classic"	20	€2.95	€5.55	€3.75	€1.06	€2.60	88.14%	0.282
Konfitüre Schwartau Extra Erdbeere 340g	7	€1.39	€3.49	€2.32	€0.62	€2.10	151.08%	0.266
Red Bull Classic 250ml	16	€1.05	€2.55	€1.55	€0.40	€1.50	142.86%	0.258
Honig Langnese "Flotte Biene" 250g	5	€2.99	€4.49	€3.29	€0.67	€1.50	50.17%	0.204
Jägermeister 0,7l	9	€10.49	€18.99	€12.77	€2.43	€8.50	81.03%	0.190
UHU Kleber 21g (09.08.21)	7	€1.89	€2.99	€2.15	€0.39	€1.10	58.20%	0.181
UHU Kleber 21g (30.08.21)	6	€1.89	€2.99	€2.18	€0.39	€1.10	58.20%	0.179
Dr. Oetker Ristorante Pizza Salame 320g	8	€1.59	€2.49	€2.28	€0.39	€0.90	56.60%	0.171
Red Bull Sugarfree 250ml	19	€0.87	€1.59	€1.18	€0.20	€0.72	82.76%	0.170
Nutella Nuss-Nugat-Creme 450g	7	€2.99	€4.29	€3.18	€0.49	€1.30	43.48%	0.154
Zahnpasta Elmex "Kariesschutz"	24	€2.55	€4.20	€3.19	€0.47	€1.65	64.71%	0.146
Pril Kraftgel Ultra Plus	19	€0.99	€1.45	€1.33	€0.19	€0.46	46.46%	0.143
Pringles “Original” 200g	9	€2.59	€3.69	€2.71	€0.37	€1.10	42.47%	0.137
Duschgel Kneipp "Lebensfreude"	12	€2.95	€4.45	€3.11	€0.42	€1.50	50.85%	0.136
Niemand Dry Gin 0,5l (30.08.21)	3	€28.99	€36.99	€34.31	€4.61	€8.00	27.60%	0.134
UNO Standard	9	€6.99	€9.99	€8.77	€1.11	€3.00	42.92%	0.127
Converse Chuck Taylor All Star High	7	€49.99	€75.00	€71.41	€8.75	€25.01	50.03%	0.123
Géramont “Classic 200g	6	€1.66	€2.44	€2.29	€0.28	€0.78	46.99%	0.122
Niemand Dry Gin 0,5l (06.08.21)	4	€28.99	€36.99	€34.98	€3.99	€8.00	27.60%	0.114
Maggi Würze 250g	20	€1.25	€2.39	€1.80	€0.19	€1.14	91.20%	0.103
Nivea Soft 200ml	13	€2.85	€3.49	€2.96	€0.22	€0.64	22.46%	0.074
WMF Kult X Mix & Go 0,6l	3	€29.99	€34.99	€33.31	€2.35	€5.00	16.67%	0.071
Xiaomi Scooter 1S	3	€395.99	€449.00	€413.66	€24.99	€53.01	13.39%	0.060
Leibniz Keks'N Crem Choco 228g	9	€1.69	€1.99	€1.85	€0.11	€0.30	17.75%	0.058
AirPods 2. Gen. / MV7N2ZM/A (30.08.21)	4	€132.99	€149.00	€134.32	€7.58	€16.01	12.04%	0.056

TomTom "Go Discover 7"	3	€269.00	€299.00	€281.33	€12.82	€30.00	11.15%	0.046
AirPods 2. Gen. / MV7N2ZM/A (18.08.21)	4	€126.95	€136.99	€129.97	€4.78	€10.04	7.91%	0.037
Schauma 7 Kräuter Shampoo	17	€1.65	€1.99	€1.94	€0.07	€0.34	20.61%	0.036
HP 302 Cyan/Magenta/Gelb Druckerpatrone	5	€22.90	€24.99	€23.37	€0.81	€2.09	9.13%	0.035
Hipp "Ultra Sensitiv" Feuchttücher 4er Pack	4	€3.45	€3.79	€3.62	€0.12	€0.34	9.86%	0.034
Hipp "Zart Pflegend" Feuchttücher 4er Pack	4	€3.45	€3.65	€3.54	€0.09	€0.20	5.80%	0.025
Barilla Penne Rigate 500g	6	€1.65	€1.69	€1.68	€0.02	€0.04	2.42%	0.012
I Love Extreme Mascara "Volume"	3	€2.75	€2.79	€2.76	€0.02	€0.04	1.45%	0.007
Pampers "Premium Protection" 26 Stück	6	€3.95	€3.99	€3.96	€0.02	€0.04	1.01%	0.005
Aptamil "Pronatura PRE" 800g	5	€15.95	€15.99	€15.97	€0.02	€0.04	0.25%	0.001
Duschdas Duschgel Sport 2-in-1 250ml	6	€1.25	€1.25	€1.25	€0.00	€0.00	0.00%	0.000
Pampers "Baby Dry" 21 Stück	3	€2.95	€2.95	€2.95	€0.00	€0.00	0.00%	0.000
Bebe "Creme Intensivpflege" 50ml	4	€3.45	€3.45	€3.45	€0.00	€0.00	0.00%	0.000
	398							**0.145**

Number of observations;
Min Minimum;
Max Maximum;
x̄ Arithmetic mean;
σ Standard deviation;
CV Coefficient of variation.

For the product "Coca-Cola Original Taste 0.33l", 17 individual price observations are collected from 17 different retailers. While the observed minimum sales price is €0.59, the observed maximum price for this product is €2.29. The mean of the price observations is €0.95, and the standard deviation is €0.47. The absolute price range of €1.70 is obtained by subtracting the minimum from the maximum. The percentage price range is 288.14%, showing that the absolute price range is almost three times as high as the minimum price. The coefficient of variation of 0.495 also shows that there is a strong deviation from an equilibrium price.

It is remarkable that for the three goods in the last three rows of Table 4, for which all observed prices are identical (coefficient of variation = 0.000), only very few prices are recorded (n = 3; n = 4; n = 6). One of these products is "Duschdas Duschgel Sport 2-in-1, 250ml" in WIHSt 5. The same product is also observed in WIHSt 3, but there at 29 different retailers. WIHSt 3 determines an absolute price range of €0.50 for this product and therefore no equilibrium price.

Overall, the prices collected in brick-and-mortar stores yield an average coefficient of variation of 0.145. The majority of price comparisons in brick-and-mortar stores show that an equilibrium price cannot be observed.

Table 5 lists the price comparisons carried out purely in online retailing. Shipping costs are not taken into account at first. Here, 28 price comparisons with 497 individual price observations are carried out. For the product "Bebe Creme Intensivpflege 50ml", the mean of €4.67 and the standard deviation of €2.26 result in the highest coefficient of variation of 0.485 and thus the greatest deviation from an equilibrium price.

The largest percentage price range is observed for the product "UHU Kleber 21g" at 602.78%. That is, the most expensive retailer offers the product at a selling price more than six times higher than the least expensive retailer. Overall, the high percentage price ranges in online retailing show that there are large price differences among suppliers on the Internet. This is also reflected in the higher average coefficient of variation of 0.219 in online retailing compared with stationary retailing. In the price comparisons

carried out among online retailers without taking shipping costs into account, an equilibrium price cannot be observed.

Table 5: Comparison of prices collected online excluding shipping costs

Product	#	Min	Max	x̄	σ	Absolute price range	Percentage price range	CV
Bebe "Creme Intensivpflege" 50ml	6	€3.44	€9.70	€4.67	€2.26	€6.26	181.98%	0.485
Nivea Soft 200ml	8	€2.66	€8.02	€3.82	€1.81	€5.36	201.50%	0.474
UHU Kleber 21g (09.08.21)	43	€1.08	€7.59	€2.35	€1.11	€6.51	602.78%	0.472
UHU Kleber 21g (30.08.21)	51	€1.08	€7.59	€2.34	€1.07	€6.51	602.78%	0.457
Zahnpasta Elmex "Kariesschutz"	9	€2.89	€7.70	€3.82	€1.58	€4.81	166.44%	0.414
WMF Kult X Mix & Go 0,6l	6	€29.99	€64.99	€40.16	€13.86	€35.00	116.71%	0.345
Duschgel Kneipp "Lebensfreude"	10	€2.39	€5.99	€3.31	€1.06	€3.60	150.63%	0.321
Nivea Deoroller Fresh pure 0%	7	€1.65	€3.73	€2.32	€0.74	€2.08	126.06%	0.319
Red Bull Classic 250ml	4	€1.20	€2.44	€1.70	€0.46	€1.24	103.33%	0.271
Pampers "Premium Protection" 26 Stück	9	€3.82	€8.18	€5.45	€1.45	€4.36	114.14%	0.267
WMF Kult X Mix & Go 0,6l	16	€29.99	€59.99	€37.04	€9.35	€30.00	100.03%	0.252
Honig Langnese "Flotte Biene" 250g	7	€2.72	€5.10	€3.76	€0.85	€2.38	87.50%	0.226
AirPods 2. Gen. / MV7N2ZM/A (18.08.21)	76	€123.80	€345.69	€150.94	€30.97	€221.89	179.23%	0.205
Pflaster Hansaplast "Classic"	12	€2.80	€4.79	€3.58	€0.60	€1.99	71.07%	0.169
UNO Standard	11	€6.52	€10.71	€8.21	€1.37	€4.19	64.26%	0.167
Konfitüre Schwartau Extra Erdbeere 340g	7	€2.09	€3.29	€2.63	€0.44	€1.20	57.42%	0.166
AirPods 2. Gen. / MV7N2ZM/A (30.08.21)	89	€119.95	€236.29	€150.63	€23.29	€116.34	96.99%	0.155
Nutella Nuss-Nugat-Creme 450g	7	€2.84	€4.15	€3.39	€0.50	€1.31	46.13%	0.148
HP 302 Cyan/Magenta/Gelb Druckerpatrone	15	€17.64	€27.99	€22.48	€3.06	€10.35	58.67%	0.136
Niemand Dry Gin 0,5l (30.08.21)	24	€26.01	€39.90	€32.33	€3.57	€13.89	53.40%	0.110
Niemand Dry Gin 0,5l (06.08.21)	23	€26.01	€39.90	€32.54	€3.59	€13.89	53.40%	0.110
Converse Chuck Taylor All Star High	11	€55.95	€79.00	€72.10	€6.06	€23.05	41.20%	0.084
TomTom "Go Discover 7"	11	€214.46	€299.99	€271.66	€22.29	€85.53	39.88%	0.082
Algemarina Trockenshampoo 200ml	5	€2.95	€3.49	€3.27	€0.26	€0.54	18.31%	0.081
Head&Shoulders Apple Fresh 300ml	13	€3.29	€3.99	€3.90	€0.26	€0.70	21.28%	0.067
Sony Playstation 5 Disc Version	5	€795.99	€944.00	€887.72	€48.94	€148.01	18.59%	0.055
Xiaomi Scooter 1S	6	€395.00	€499.00	€395.00	€18.56	€104.00	26.33%	0.045
I Love Extreme Mascara "Volume"	6	€2.75	€3.09	€2.83	€0.12	€0.34	12.36%	0.042
Total	**497**							**0.219**

Number of observations;
Min Minimum;
Max Maximum;
x̄ Arithmetic mean;
σ Standard deviation;
CV Coefficient of variation.

A similar picture emerges when looking at price comparisons for online retailing including shipping costs (Table 6). Here 24 price comparisons with 459 individual price observations are considered. If shipping costs are incurred, the inclusion of the shipping costs in the sales prices may increase the maximum price by the amount of the shipping costs. If no shipping costs are incurred or if these are included in the product price, the sales price does not increase, and the minimum price may remain constant. This

can affect the average price, the standard deviation, the absolute and percentage price range, and the coefficient of variation.

Both the highest coefficient of variation (0.515) and the highest percentage price range (685.83%) are found for the product "Red Bull Classic 250ml". Overall, across the 24 price comparisons, the average coefficient of variation for online retailing including shipping costs is 0.200. This is slightly lower than the coefficient of variation for online retailing excluding shipping costs. Likewise, an equilibrium price cannot be observed for online retailers including shipping costs in any price comparison.

Table 6: Comparison of prices collected online including shipping costs

Product	#	Min	Max	$\bar{x}$	σ	Absolute price range	Percentage price range	CV
Red Bull Classic 250ml	4	€1.20	€9.43	€5.92	€3.05	€8.23	685.83%	0.515
Nivea Deoroller Fresh pure 0%	7	€1.65	€9.14	€5.51	€2.18	€7.49	453.94%	0.396
WMF Kult X Mix & Go 0,6l	6	€29.99	€68.94	€42.96	€15.08	€38.95	129.88%	0.351
Duschgel Kneipp "Lebensfreude"	10	€2.39	€11.98	€7.08	€2.37	€9.59	401.26%	0.335
Konfitüre Schwartau Extra Erdbeere 340g	7	€2.09	€9.28	€7.18	€2.39	€7.19	344.02%	0.333
WMF Kult X Mix & Go 0,6l	16	€29.99	€63.94	€40.81	€9.60	€33.95	113.20%	0.235
Nivea Soft 200ml	8	€6.16	€10.92	€8.13	€1.73	€4.76	77.27%	0.213
Honig Langnese "Flotte Biene" 250g	7	€6.96	€12.09	€8.79	€1.81	€5.13	73.71%	0.206
AirPods 2. Gen. / MV7N2ZM/A (18.08.21)	76	€124.55	€345.69	€153.67	€30.53	€221.14	177.55%	0.199
Pflaster Hansaplast "Classic"	12	€2.95	€7.94	€6.92	€1.36	€4.99	169.15%	0.196
Nutella Nuss-Nugat-Creme 450g	7	€5.98	€9.95	€8.27	€1.40	€3.97	66.39%	0.170
Pampers "Premium Protection" 26 Stück	9	€6.81	€12.96	€9.94	€1.65	€6.15	90.31%	0.166
UHU Kleber 21g (09.08.21)	43	€3.39	€9.86	€7.56	€1.21	€6.47	190.86%	0.160
UHU Kleber 21g (30.08.21)	51	€3.39	€10.45	€7.61	€1.17	€7.06	208.26%	0.154
AirPods 2. Gen. / MV7N2ZM/A (30.08.21)	89	€119.95	€236.29	€153.42	€22.95	€116.34	96.99%	0.150
Zahnpasta Elmex "Kariesschutz"	9	€5.88	€8.70	€7.09	€1.01	€2.82	47.96%	0.143
UNO Standard	11	€6.99	€13.68	€11.00	€1.54	€6.69	95.71%	0.140
I Love Extreme Mascara "Volume"	6	€6.25	€8.69	€7.04	€0.90	€2.44	39.04%	0.129
Bebe "Creme Intensivpflege" 50ml	4	€7.13	€9.70	€8.04	€1.00	€2.57	36.04%	0.124
HP 302 Cyan/Magenta/Gelb Druckerpatrone	15	€20.63	€30.87	€25.67	€2.99	€10.24	49.64%	0.117
Niemand Dry Gin 0,5l (30.08.21)	24	€31.24	€45.80	€37.79	€3.98	€14.56	46.61%	0.105
Niemand Dry Gin 0,5l (06.08.21)	23	€31.05	€43.98	€38.01	€3.67	€12.93	41.64%	0.097
Converse Chuck Taylor All Star High	11	€58.85	€82.94	€73.89	€6.36	€24.09	40.93%	0.086
Algemarina Trockenshampoo 200ml	4	€6.48	€7.99	€7.20	€0.57	€1.51	23.30%	0.079
Total	**459**							**0.200**

Number of observations;
Min Minimum;
Max Maximum;
$\bar{x}$ Arithmetic mean;
σ Standard deviation;
CV Coefficient of variation.

The ability to ship products enables an online retailer to operate in the same geographical area as a brick-and-mortar retailer. In this way, the number of retailers offering a product in a narrowly defined geographic area can increase significantly. Therefore, it is also necessary to consider online retail and brick-and-mortar retail together. In Table 7, the aggregated results of stationary and online trade are

presented excluding shipping costs. Here, 38 price comparisons with 692 individual price observations are considered.

The highest coefficient of variation is 0.478, observed for the product “Milka Haselnussschokolade 100g“. The cheapest retailer offers the product for €0.57 and the most expensive retailer for €1.89. This results in an absolute price range of €1.32, which is more than double the price of the cheapest vendor. This is also shown by the percentage price range of 231.58%.

For the joint consideration of stationary trade and online trade across all 38 price comparisons, the average coefficient of variation is 0.203. The inclusion of online retailers in addition to stationary retailers thus leads to an overall increase in the coefficient of variation. The extent of price dispersion is similar to that of pure online retailing. An equilibrium price cannot be determined here either.

Table 7: Comparison of prices collected in stores and online excluding shipping costs

Product	#	Min	Max	$\bar{x}$	σ	Absolute price range	Percentage price range	CV
Milka „Haselnussschokolade“ 100g	6	€0.57	€1.89	€1.11	€0.53	€1.32	231.58%	0.478
Red Bull Classic 250ml	14	€0.85	€2.79	€1.52	€0.68	€1.94	228.24%	0.447
Funny-frisch „Ungarisch" 175g	12	€1.34	€3.59	€1.68	€0.66	€2.25	167.91%	0.393
Red Bull Classic 250ml[1]	15	€0.88	€2.75	€1.40	€0.54	€1.87	212.50%	0.384
Extra Professional White Kaugummi 50 Stück	12	€2.25	€4.50	€3.02	€1.03	€2.25	100.00%	0.341
Nivea Dry Impact Deo 150ml	7	€1.75	€3.53	€2.07	€0.65	€1.78	101.71%	0.314
Pringles „Original" 200g	12	€1.15	€4.00	€2.51	€0.74	€2.85	247.83%	0.295
Haribo Happy Cola 200g	10	€0.69	€1.79	€1.19	€0.35	€1.10	159.42%	0.291
Odol-med3 Zahnpasta Extra White 125ml	20	€0.99	€2.99	€1.54	€0.43	€2.00	202.02%	0.279
Heineken Pils 6 x 0,33l	10	€4.85	€10.26	€6.00	€1.67	€5.41	111.55%	0.278
Toffifee 125g	29	€1.35	€2.89	€1.60	€0.45	€1.54	114.07%	0.278
Aspirin 500mg (20 Tabletten)	9	€3.80	€7.49	€5.71	€1.50	€3.69	97.11%	0.263
Airwaves Kaugummis Cool Cassis 12 Stück	22	€0.69	€1.59	€1.02	€0.26	€0.90	130.43%	0.255
Baby Einstein Magic Touch Piano	32	€23.99	€69.99	€33.39	€8.39	€46.00	191.75%	0.251
WMF Toaster Stelio Edelstahl	15	€36.85	€69.99	€46.88	€10.95	€33.14	89.93%	0.234
Pom-Bär Original 75g	32	€0.79	€2.59	€1.22	€0.28	€1.80	227.85%	0.226
Milka Alpenmilch 100g	20	€0.55	€1.70	€1.11	€0.22	€1.15	209.09%	0.198
Haribo Goldbären 200g	20	€0.65	€1.18	€0.87	€0.17	€0.53	81.54%	0.195
Tempo Taschentücher 30 x 10 Stück	22	€2.85	€4.51	€3.17	€0.57	€1.66	58.25%	0.180
Uncle Ben’s Express Langkornreis 250g	18	€1.29	€2.49	€1.76	€0.31	€1.20	93.02%	0.178
JBL Flip 5	30	€84.90	€156.25	€103.43	€17.73	€71.35	84.04%	0.171
Ritter Sport Voll-Nuss 100g	28	€1.36	€2.69	€1.46	€0.25	€1.33	97.79%	0.168
Ritter Sport Alpenmilch 100g	20	€0.69	€1.39	€1.19	€0.18	€0.70	101.45%	0.151
Milka Luflée Schokolade 100g	9	€0.69	€1.29	€1.13	€0.17	€0.60	86.96%	0.148
Airwaves Strong Kaugummi 12 Stück	9	€0.75	€1.10	€0.92	€0.13	€0.35	46.67%	0.145
Pantene PRO-V Repair & Care 300ml	10	€1.99	€2.99	€2.67	€0.36	€1.00	50.25%	0.136
Dr. Oetker Ristorante Pizza Salame 320g	17	€1.79	€2.99	€2.75	€0.36	€1.20	67.04%	0.133
Big Bobby Car Classic Sansibar	9	€45.85	€64.90	€55.12	€6.87	€19.05	41.55%	0.125
Lindt Lindor Kugel Milch 100g	11	€2.04	€2.99	€2.75	€0.31	€0.95	46.57%	0.113
FIFA 21 (Playstation 4)	39	€49.95	€80.20	€61.58	€6.85	€30.25	60.56%	0.111

[1] Here, the special offer price also documented in the study is noted.

Maggi Ravioli in Tomatensauce 800g	15	€1.39	€2.49	€2.00	€0.22	€1.10	79.14%	0.108
PS4 Wireless Dualshock Controller, V2	43	€48.98	€76.31	€58.72	€5.21	€27.33	55.80%	0.089
FIFA 22 (Playstation 5)	11	€59.55	€79.99	€71.90	€6.28	€20.44	34.32%	0.087
Duschdas Duschgel Sport 2-in-1 250ml	29	€1.25	€1.75	€1.29	€0.11	€0.50	40.00%	0.084
Nintendo Switch	37	€306.87	€421.28	€335.88	€26.25	€114.41	37.28%	0.078
Head&Shoulders Classic Clean 300ml	20	€3.50	€4.29	€3.91	€0.17	€0.79	22.57%	0.044
KTM Radical Kids Training Bike	7	€116.00	€129.99	€118.07	€4.92	€13.99	12.06%	0.042
Nutella Nuss-Nugat-Creme 450g	11	€2.99	€3.29	€3.06	€0.11	€0.30	10.03%	0.036
Total	**692**							**0.203**

Number of observations;
Min Minimum;
Max Maximum;
x̄ Arithmetic mean;
σ Standard deviation;
CV Coefficient of variation.

Finally, the brick-and-mortar retailers and the online retailers are also analyzed jointly, taking into account the shipping costs incurred to transport the goods to the corresponding place (Table 8). Here, 11 price comparisons are documented with 171 individual price observations. At brick-and-mortar retailers, a good can be purchased directly at the called retail price. Online retailers may charge additional shipping costs to transport the goods to the end customer. As a result, the maximum selling price at online retailers increases due to the inclusion of shipping costs, while the selling price at brick-and-mortar retailers remains constant.

This is particularly noticeable when determining the coefficient of variation for the product "Milka Alpenmilch 100g". Here, the standard deviation of €2.68 is greater than the arithmetic mean of €2.53, resulting in a coefficient of variation of 1.059. The maximum price here is more than 18 times higher than the selling price of the cheapest supplier. The percentage price range of 1,721.82% also impressively shows that there is a particularly strong deviation from an equilibrium price in this price comparison.

Overall, the joint analysis of brick-and-mortar retailers and online retailers including shipping costs shows a significantly higher average coefficient of variation of 0.416. An equilibrium price cannot be observed in the aggregated analysis of brick-and-mortar retailers and online retailers including shipping costs either.

Table 8: Comparison of prices collected in stores and online including shipping costs

Product	#	Min	Max	x̄	σ	Absolute price range	Percentage price range	CV
Milka Alpenmilch 100g	20	€0.55	€10.02	€2.53	€2.68	€9.47	1,721.82%	1.059
Ritter Sport Alpenmilch 100g	20	€0.69	€6.19	€1.88	€1.63	€5.50	797.10%	0.866
Haribo Goldbären 200g	20	€0.65	€8.13	€3.50	€2.90	€7.48	1,150.77%	0.829
Uncle Ben's Express Langkornreis 250g	18	€1.29	€9.48	€2.92	€2.34	€8.19	634.88%	0.800
Head&Shoulders Classic Clean 300ml	20	€3.50	€10.49	€5.20	€2.23	€6.99	199.71%	0.429
Baby Einstein Magic Touch Piano	32	€26.98	€69.99	€37.31	€8.04	€43.01	159.41%	0.216
Big Bobby Car Classic Sansibar	9	€49.75	€64.90	€56.22	€5.96	€15.15	30.45%	0.106
Aspirin 500mg (20 Tabletten)	9	€6.45	€8.74	€7.73	€0.70	€2.29	35.50%	0.091

Vilsa Classic 12 x 0,7l Kasten[2]	6	€4.92	€5.99	€5.30	€0.38	€1.07	21.75%	0.072
KTM Radical Kids Training Bike	6	€116.08	€135.94	€120.24	€7.43	€19.86	17.11%	0.062
Toniebox Starterset inkl. Kreativtonie	11	€71.76	€83.43	€78.01	€3.29	€11.67	16.26%	0.042
Total	**171**							**0.416**

Number of observations;
Min Minimum;
Max Maximum;
x̄ Arithmetic mean;
σ Standard deviation;
CV Coefficient of variation.

Looking at the results as a whole, it becomes clear that the price comparisons in brick-and-mortar retailing with a mean coefficient of variation of 0.145 are clearly far from an equilibrium price. However, the setting of equilibrium prices is not observed at all, with the exception of three price comparisons with a low number of price observations in each case.

Looking at online retail, the average coefficient of variation is 0.219 (without taking shipping costs into account) and 0.200 (with taking shipping costs into account). Here it is already clear that the prices are more widely spread and that there is a greater deviation from an equilibrium price online than in stationary retail.

The joint analysis of brick-and-mortar retailers and online retailers shows an average coefficient of variation of 0.203 (without taking shipping costs into account) and 0.416 (with taking shipping costs into account). The mean coefficient of variation with shipping costs taken into account shows a significant deviation from an equilibrium price. This may be due to the fact that the shipping costs charged by an online retailer result in a higher maximum price, while the sales price remains constant for stationary retailers. This results in a higher overall price spread between brick-and-mortar retailers and online retailers, which leads to a greater deviation from an equilibrium price.

5. Discussion

Empirical results of the past 60 years clearly show that equilibrium prices do not occur, even for absolutely homogeneous goods. This is true even if one sets narrow geographic boundaries (a city) and considers only short time periods (< 1 day).

The neoclassical market model can be decomposed into three main components: 1. Aggregate supply function, 2. Aggregate demand function, 3. Equilibrium price. As already stated in the introduction, the first two main components escape empirical observation. This is because both suppliers and demanders have clearly discernible motives for never giving honest, but always strategically distorted information about their willingness to supply or demand at different price levels.

Therefore, the focus of empirical research on the neoclassical market model must be on observing price differences. The research results presented here support the findings of numerous previous studies. With very few exceptions, no equilibrium price emerges.

[2] The minimum order value is higher than the observed price for one retailer.

One might have expected that the increased importance of the Internet would contribute to a reduction in search costs and information costs, so that the empirically observable price deviations would decrease significantly. However, the price observations presented here do not indicate this at all.
Contrary to what the neoclassical market model suggests, we are dealing with a highly fragmented market. Even at one place and at one time, transactions of a homogeneous good are carried out at quite different prices. Aggregation of demand and aggregation of supply do not occur in reality. The demanders do not act as a group. Instead, with their respective demands they are fragmented into small groups or even completely isolated from the other demanders. The situation is no different for suppliers. They, too, do not act as a group. Their offerings are also fragmented or even isolated. No retailer has an overview of the entire demand. No customer has an overview of all the suppliers. Thus, some suppliers always meet some demanders without knowing or paying attention to the overall situation of aggregated supply and aggregated demand. Individual demands meet individual offers in a completely unconnected and uncoordinated way. This leads to transactions that show entirely different price levels - even for completely homogeneous goods, even at one and the same place and at one and the same time.

The reasons for this structural market fragmentation lie primarily in the non-fulfillment of the model assumptions of the neoclassical market model. In economic reality, there are herd behavior, strategic behavior, asymmetric information distributions, externalities, search costs, information costs, negotiation costs, decision costs, monitoring costs, and enforcement costs. Real economic agents are, as a rule, far from rationally seeking their pecuniary utility maximum. On the contrary, many people tend to behave irrationally at least occasionally. They accept higher prices because a store offers nice parking spaces, because they like the shopkeeper or because they are happy to chat with the nice staff from time to time.

The neoclassical market model is unquestionably the best-known and most influential model that economic science has ever produced. Even economic laymen know the representation of the aggregate demand function, the aggregate supply function, and the formation of an equilibrium price. But what is left of this model if two main components are not empirically observable and empirical observations of the third main component regularly point to the conclusion that market activity is inaccurately described by the neoclassical market model? A sober assessment must lead to the conclusion that the neoclassical market model consists to one half of wishful thinking and to the other half of (more or less esoteric) beliefs. The neoclassical market model thus appears to belong to the same category as the unicorn, the Yeti, and the Loch Ness monster.

This sobering finding makes two consequences inevitable:

1. Economic theory must produce a new market model that adequately reflects the fragmentation of markets. So far, economic research has been too comfortable. It is often conceded that the neoclassical market model does not (quite) accurately describe reality. But in the same breath, the view is often expressed that, on the whole, things will probably work out more or less as in this model. This attitude, however, is unworthy of a science. The equilibrium price is said to have a steering function. This steering function is connected with an efficiency expectation. If, however, no equilibrium price is achieved, the assumed steering function of the price does not occur, and the efficiency promise remains unfulfilled. Real markets thus deviate fundamentally from the neoclassical market model. For this reason, it is wrong to consider market orientation as the solution to almost all economic problems, as the protagonists of the Austrian School have done in the past 100 years.

2. Economic policy must no longer follow the efficiency promise of market orientation. Generations of economic policymakers believed that the establishment of market mechanisms would automatically lead to efficient outcomes. Public health policy in Germany can be seen as an example of the failure of this approach. For about 40 years, every Minister of Health has been given the task of ensuring more competition in the healthcare system and thus contributing to cost containment. In the course of this market orientation, many hospitals were privatized and competition between hospitals was stimulated. It was hoped that this would uncover hidden reserves of personnel and materials and lead to more efficient and cost-effective healthcare. The result, however, was that highly remunerated healthcare services in particular were performed more frequently and that costs in the hospital system continued to rise unchecked. In 2019, 315 artificial hip joints were implanted per 100,000 inhabitants in Germany. That is almost twice as many interventions as the average for OECD countries, where only 174 corresponding operations per 100,000 inhabitants occurred in 2019 (OECD, 2021). In a sector as strongly characterized by asymmetric information distributions as the healthcare sector, competition cannot lead to efficient market outcomes. A patient cannot independently judge whether an artificial hip joint is the appropriate treatment. A patient must rely on the judgment of a physician. If, however, the latter is encouraged to perform as many hip operations as possible by means of correspondingly high remuneration, competition between hospitals will not lead to greater efficiency, but rather to increasing misuse in public healthcare.

In view of the empirical results presented in this study, we should address these challenges in economic theory and economic policy with great commitment.

6. Summary

The neoclassical market model enjoys great popularity and continuous dissemination in academic teaching. In the neoclassical market model, rising prices mean that suppliers are more willing to provide goods. At the same time, however, rising prices reduce the willingness of demanders to purchase these goods. The resulting aggregate supply and demand function form an intersection which characterizes the equilibrium price and, according to the theory, leads to market clearing. The neoclassical market model, however, has a weakness in its model assumptions, which often cannot be regarded as fulfilled in reality.

This study aims to empirically test the validity of the neoclassical market model and to determine whether a neoclassical market can be observed in reality. For this purpose, price observations of homogeneous goods within a narrow geographical area at a specific point in time are conducted and analyzed. According to the neoclassical market model, a homogeneous good should have an equilibrium price and be traded at the same price by different sellers within a spatially and temporally delimited market. In academic discourse, similar price observations have repeatedly revealed widely varying prices for homogeneous goods (see, for example, Vukina & Zheng, 2010; Brynjolfsson & Smith, 2000; Borenstein & Rose, 1994; Dahlby & West, 1986; Pratt, Wise & Zeckhauser, 1979). Not only the massive political and societal influences on markets with the beginning of the 2020s (Covid19 pandemic, collapse of international supply chains, war in Ukraine, etc.), but also the progressive development of online trade mean that the validity of empirical findings has to be permanently verified by science.

Between October 2020 and May 2022, students at Ostfalia University of Applied Sciences in Wolfsburg conduct 146 price comparisons for 77 different goods with a total of 2,217 individual price observations. They record 59 price comparisons for food items, 47 price comparisons for drugstore items, and 40

price comparisons for other products. The price comparisons take place both in brick-and-mortar retail and in online retail. We analyze the recorded prices both separately for each type of retail and aggregated, and also consider the impact of any shipping costs that may apply. We consider the percentage price range of the observed goods and determine the coefficients of variation to analyze the extent of deviation from an equilibrium price.

It turns out that in 143 out of 146 price comparisons, the percentage price range, the standard deviation, and the coefficient of variation are non-zero. The other three price comparisons are based on very few observations. In another study analyzed, a second price comparison was carried out for one of these three goods with a significantly higher number of individual price observations, and it was found that an equilibrium price cannot be observed. According to our data, the setting of an equilibrium price for a homogeneous good cannot be observed in a spatially and temporally delimited market (p-value of one-sample t-test = 0.000).

The strongest deviation from an equilibrium price is found in the aggregated analysis of brick-and-mortar and online retail including shipping costs with a coefficient of variation of 0.416. In brick-and-mortar retailing only, we find the smallest deviation from an equilibrium price with a coefficient of variation of 0.145. The fact that online retailers can operate in the same geographic area as brick-and-mortar retailers seems to result in a stronger deviation from an equilibrium price overall.

Our results are consistent with previous academic findings in the literature. Despite recent massive political and social influences on markets, our results support previous empirical findings that do not observe an equilibrium price according to the neoclassical market model in reality. Transactions of homogeneous goods are carried out at different prices. In contrast to the neoclassical market model, market activity in reality is highly fragmented. There is no aggregation of supply and demand. Suppliers do not act as one group, within suppliers there are many groups that act separately. Consumers do not act as one group either, within consumers there are also many groups that act separately from each other. The entirety of supply and demand cannot be processed by individual actors. As a result, transactions occur at different price levels, even though the goods in question are homogeneous.

Economic theory must take the fragmentation of markets adequately into account and produce a new market model. Economic policy should immediately abandon the naïve notion that the establishment of market mechanisms alone will produce efficient results.

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Appendix

Table A-1: Summary of price comparisons

Product	Number of price comparisons	Number of prices	WIHSt No.
Category "Drugstore"	**47**	**634**	**-**
Algemarina Trockenshampoo 200ml	2	9	6
Aptamil "Pronatura PRE" 800g	1	5	6
Bebe "Creme Intensivpflege" 50ml	3	14	6
Duschdas Duschgel Sport 2-in-1 250ml	2	35	3, 5
Duschgel Kneipp "Lebensfreude"	3	32	4
Head&Shoulders Apple Fresh 300ml	1	13	10
Head&Shoulders Classic Clean 300ml	2	40	8
Hipp "Ultra Sensitiv" Feuchttücher 4er Pack	1	4	6
Hipp "Zart Pflegend" Feuchttücher 4er Pack	1	4	6
I Love Extreme Mascara "Volume"	3	15	6
Nivea Deoroller Fresh pure 0%	3	25	11
Nivea Dry Impact Deo 150ml	1	7	5
Nivea Soft 200ml	3	29	10
Odol-med3 Zahnpasta Extra White 125ml	1	20	10
Pampers "Baby Dry" 21 Stück	1	3	6
Pampers "Premium Protection" 26 Stück	3	24	6
Pantene PRO-V Repair & Care 300ml	1	10	7
Pflaster Hansaplast "Classic"	3	44	4
Pril Kraftgel Ultra Plus	1	19	9
Schauma 7 Kräuter Shampoo	1	17	9
Tempo Taschentücher 30 x 10 Stück	1	22	10
UHU Kleber 21g	6	201	2
Zahnpasta Elmex "Kariesschutz"	3	42	4
Category "Food"	**59**	**776**	**-**
Airwaves Kaugummis Cool Cassis 12 Stück	1	22	10
Airwaves Strong Kaugummi 12 Stück	1	9	3
Barilla Penne Rigate 500g	1	6	5
Coca-Cola Original Taste 0,33l	1	17	10
Dr. Oetker Ristorante Pizza Salame 320g	2	25	5, 9
Extra Professional White Kaugummi 50 Stück	1	12	3
Funny-frisch "Ungarisch" 175g	2	24	1, 3
Géramont "Classic" 200g	1	6	1
Haribo Goldbären 200g	2	40	8
Haribo Happy Cola 200g	1	10	3
Heineken Pils 6 x 0,33l	1	10	1
Honig Langnese "Flotte Biene" 250g	3	19	4
Jägermeister 0,7l	1	9	5
Konfitüre Schwartau Extra Erdbeere 340g	3	21	4
Leibniz Keks'N Crem Choco 228g	1	9	3
Lindt Lindor Kugel Milch 100g	1	11	3
Maggi Ravioli in Tomatensauce 800g	1	15	9

Maggi Würze 250g	1	20	8
Milka „Haselnussschokolade“ 100g	1	6	1
Milka Alpenmilch 100g	3	50	5, 8
Milka Luflée Schokolade 100g	1	9	7
Niemand Dry Gin 0,5l	6	101	2
Nutella Nuss-Nugat-Creme 450g	4	32	3, 4
Pom-Bär Original 75g	1	32	3
Pringles “Original” 200g	2	21	1, 5
Pringles Chips Sour Cream & Onion 200g	1	13	3
Red Bull Classic 250ml	5	53	1, 3, 11
Red Bull Sugarfree 250ml	1	19	9
Ritter Sport Alpenmilch 100g	2	40	8
Ritter Sport Voll-Nuss 100g	1	28	3
Snickers 50g	2	16	2
Toffifee 125g	1	29	3
Uncle Ben’s Express Langkornreis 250g	2	36	8
Vilsa Classic 12 x 0,7l Kasten	1	6	5
Category “Other”	**40**	**807**	**-**
AirPods 2. Gen. / MV7N2ZM/A	6	338	2
Aspirin 500mg (20 Tabletten)	2	18	5
Baby Einstein Magic Touch Piano	2	64	7
Big Bobby Car Classic Sansibar	2	18	7
Converse Chuck Taylor All Star High	3	29	11
FIFA 21 (Playstation 4)	1	39	1
FIFA 22 (Playstation 5)	1	11	5
HP 302 Cyan/Magenta/Gelb Druckerpatrone	3	35	11
JBL Flip 5	1	30	1
KTM Radical Kids Training Bike	2	13	7
Nintendo Switch	1	37	1
PS4 Wireless Dualshock Controller, V2	1	43	1
Sony Playstation 5 Disc Version	1	5	6
TomTom "Go Discover 7"	2	14	6
Toniebox Starterset inkl. Kreativtonie	1	11	7
UNO Standard	3	31	11
WMF Kult X Mix & Go 0,6l	5	47	5, 11
WMF Toaster Stelio Edelstahl	1	15	9
Xiaomi Scooter 1S	2	9	6
Total	**146**	**2,217**	**-**

Table A-2: Product descriptions in English

Product	English description
Category "Drugstore"	
Algemarina Trockenshampoo 200ml	Dry shampoo
Aptamil "Pronatura PRE" 800g	Baby food
Bebe "Creme Intensivpflege" 50ml	Moisturizer
Duschdas Duschgel Sport 2-in-1 250ml	Shower gel
Duschgel Kneipp "Lebensfreude"	Shower gel
Head&Shoulders Apple Fresh 300ml	Shampoo
Head&Shoulders Classic Clean 300ml	Shampoo
Hipp "Ultra Sensitiv" Feuchttücher 4er Pack	Wet wipes
Hipp "Zart Pflegend" Feuchttücher 4er Pack	Wet wipes
I Love Extreme Mascara "Volume"	Mascara
Nivea Deoroller Fresh pure 0%	Deodorant stick
Nivea Dry Impact Deo 150ml	Deodorant spray
Nivea Soft 200ml	Moisturizer
Odol-med3 Zahnpasta Extra White 125ml	Toothpaste
Pampers "Baby Dry" 21 Stück	Diapers
Pampers "Premium Protection" 26 Stück	Diapers
Pantene PRO-V Repair & Care 300ml	Hair care product
Pflaster Hansaplast "Classic"	Plaster
Pril Kraftgel Ultra Plus	Dishwashing detergent
Schauma 7 Kräuter Shampoo	Shampoo
Tempo Taschentücher 30 x 10 Stück	Tissues
UHU Kleber 21g	Glue
Zahnpasta Elmex "Kariesschutz"	Toothpaste
Category "Food"	
Airwaves Kaugummis Cool Cassis 12 Stück	Chewing gum
Airwaves Strong Kaugummi 12 Stück	Chewing gum
Barilla Penne Rigate 500g	Pasta
Coca-Cola Original Taste 0,33l	Soft drink
Dr. Oetker Ristorante Pizza Salame 320g	Pizza
Extra Professional White Kaugummi 50 Stück	Chewing gum
Funny-frisch "Ungarisch" 175g	Potato chips
Géramont "Classic" 200g	Cheese
Haribo Goldbären 200g	Jelly sweets
Haribo Happy Cola 200g	Jelly sweets
Heineken Pils 6 x 0,33l	Beer
Honig Langnese "Flotte Biene" 250g	Honey
Jägermeister 0,7l	Liquor
Konfitüre Schwartau Extra Erdbeere 340g	Jam
Leibniz Keks'N Crem Choco 228g	Cookies
Lindt Lindor Kugel Milch 100g	Chocolate
Maggi Ravioli in Tomatensauce 800g	Pasta
Maggi Würze 250g	Sauce

Milka “Haselnussschokolade” 100g	Chocolate
Milka Alpenmilch 100g	Chocolate
Milka Luflée Schokolade 100g	Chocolate
Niemand Dry Gin 0,5l	Liquor
Nutella Nuss-Nugat-Creme 450g	Hazelnut spread
Pom-Bär Original 75g	Potato chips
Pringles “Original” 200g	Potato chips
Pringles Chips Sour Cream & Onion 200g	Potato chips
Red Bull Classic 250ml	Energy drink
Red Bull Sugarfree 250ml	Energy drink
Ritter Sport Alpenmilch 100g	Chocolate
Ritter Sport Voll-Nuss 100g	Chocolate
Snickers 50g	Chocolate bar
Toffifee 125g	Caramel candy
Uncle Ben’s Express Langkornreis 250g	Rice
Vilsa Classic 12 x 0,7l Kasten	Mineral water
Category “Other”	
AirPods 2. Gen. / MV7N2ZM/A	Earphones
Aspirin 500mg (20 Tabletten)	Medicine
Baby Einstein Magic Touch Piano	Piano
Big Bobby Car Classic Sansibar	Toy car
Converse Chuck Taylor All Star High	Shoes
FIFA 21 (Playstation 4)	Video game
FIFA 22 (Playstation 5)	Video game
HP 302 Cyan/Magenta/Gelb Druckerpatrone	Printer cartridge
JBL Flip 5	Portable speaker
KTM Radical Kids Training Bike	Bike
Nintendo Switch	Game console
PS4 Wireless Dualshock Controller, V2	Game controller
Sony Playstation 5 Disc Version	Game console
TomTom "Go Discover 7"	Navigation device
Toniebox Starterset inkl. Kreativtonie	Toy
UNO Standard	Card game
WMF Kult X Mix & Go 0,6l	Blender
WMF Toaster Stelio Edelstahl	Toaster
Xiaomi Scooter 1S	Electric scooter

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On the Efficacy of Saving

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Abstract
It is demonstrated that Keynes' definition of income and treatment of expectations make a logically consistent, causal analysis of dynamic behavior possible in Keynes' general theory and that Keynes' analysis definitively refutes the arguments of those who cling to the misguided classical belief that an increase in propensity to save will lower the rate of interest and thereby increase the rate of capital accumulation and economic well-being in the future.

Keywords: methodology, causality, monetary theory, theory of interest, Keynes.
JEL Codes: B41, E12, E13, E40

1. Introduction

Over the thirty-five years leading up to the Crash of 2008 the United States managed to a) encourage individual and municipal retirement accounts and funds, b) convert Social Security from a pay-as-you-go to a partial-prepayment system, c) neglect the minimum wage while suppressing labor unions, d) cut corporate taxes and taxes on the wealthy while increasing taxes on the not so wealthy, e) weaken usury laws while enacting draconian bankruptcy laws, f) refuse to enforce antitrust laws, g) reduce investment in physical infrastructure and human capital, and h) dismantle our domestic and international financial regulatory systems. These are policies that enhance the aggregate propensity to save by increasing the concentration of income and facilitating trade deficits—*policies that only make sense in macroeconomic models that ignore the relationship between consumption and effective demand and assume that saving enhances economic growth and employment*. These are also the policies that led to the Savings and Loan debacle of the 1980s, the Dotcom and Telecom bubbles in the 1990s, and the Housing bubble and Mortgage crisis in the 2000s that culminated in the Crash of 2008 and the economic stagnation that followed. (Blackford 2018; 2020a; 2021)

In examining the arguments put forth by those who reject Keynes and cling to the misguided belief that an increase in the propensity to save will lower the rate of interest and thereby increase the rate of capital accumulation and economic well-being in the future—a belief that underlies the policies that led to the Crash of 2008 and to where we find ourselves today—we begin by examining Dennis H. Robertson's confused criticism of Keynes with regard to what Robertson dubbed "the long-period problem of saving" which, as we shall see, is a misnomer. This argument stands at the very core of the belief in the efficacy of saving and has been explicitly defended by such eminent economists as George Horwich, Sho-Chieh Tsiang, and Meir Kohn and has been more or less accepted by innumerable others such as Alvin Hansen, Ben Bernanke, Harry Johnson, Milton Friedman, Lawrence Klein, and Axel Leijonhufvud, Gregory Mankiw, Paul Samuelson and William Nordhaus to name but a few.

2. Robertson's Confused Criticism of Keynes

In his November 1936 review of *The General Theory* Robertson took Keynes to task for his analysis of what Robertson called "the long-period problem of saving." Since Robertson's criticism is the foundation on which those who cling to the classical believe rest their case (Horwich, Tsiang, Kohn) it is quoted here at length:

> According to Mrs. Robinson,[2] Mr. Keynes' theory "has been developed mainly in terms of short period analysis;" but…it may be convenient to conclude by examining briefly the bearing of his "liquidity preference" formula on the long-period problem of saving. This problem can be put in various forms, of which I choose what is, I hope, alike the simplest and the best adapted to bring out Mr. Keynes' points. Will an increased rate of saving which is not itself hoarding (e.g. which takes the form of an increased demand for securities), but which involves an actual diminution in the rate of expenditure on consumable goods, lead to a progressive shrinkage in total money income?
>
> In one of his extremer passages (pp. 211-213) Mr. Keynes appears to invoke his formula in support of the view that such an event has *no* tendency to bring down the rate of interest nor therefore to stimulate the formation of capital equipment. For why, he asks, the quantity of money being unchanged, should a fresh[3] act of saving diminish the sum which it is required to keep in liquid form at the existing rate of interest? The answer surely emerges from the composite nature of "liquidity preference." If the event in question deprives the producers of consumption goods of income, it reduces by the same act their ability to hold money for "transaction" and "precautionary" purposes. It is only if they resist the switch in public demand by continuing to indulge in expenditure, to offer employment, and hence to hold (or cause to be held) money balances on the old scale, that "liquidity preference" as defined will remain unchanged. Mr. Keynes' argument in this passage seems to be a repetition in disguise of his old argument that increased saving which is not itself hoarding is necessarily balanced by the sale of securities on the part of entrepreneurs who are making losses but are determined not to restrict the amount or change the character of their output…. So long as such a situation exists and is expected to continue, the rate of interest will, it is true, not fall nor the formation of capital equipment be stimulated.… If such a situation does *not* exist, there is nothing in the doctrine of liquidity preference to invalidate the common-sense view that the increased demand for securities will tend to raise their price.
>
> There remains, however, a further point…. [I]f there exists for the community as a whole a negatively inclined curve of "liquidity preference proper" … some part of the additional savings devoted by individuals to the purchase of securities will come to rest in the banking accounts of those who, at the higher price of securities, desire to hold an increased quantity of money.[6] Thus the fall in the rate of interest and the stimulus to the formation of capital will be less than if [the liquidity-preference curve] were a vertical straight line, and the stream of money income will tend to contract.…

> It would, I think, be agreed by "orthodox" writers[7] that this is a situation calling for a progressive increase in the supply of money. (1936, pp. 187-8)

In this passage, Robertson clearly stated his belief that the only obstacle to maintaining income in the face of an "increased rate of saving" is "the additional savings … come to rest in … banking accounts" that results from the fall in the rate of interest ("higher price of securities"). In Robertson's view of this problem, this is "a situation calling for a progressive increase in the supply of money," hence, a problem that can be easily solved by increasing the supply of money. At the same time, Robertson's explanation of "Mr. Keynes' points" is at odds with what Keynes actually said with regard to these points.

To begin with, Robertson misstated the question asked by Keynes in "one of his extremer passages (pp. 211-213)." Keynes did not ask "why… the quantity of money being unchanged, should a fresh[3] act of saving diminish the sum which it is *required* [*emphasis* added] to keep in liquid form at the existing rate of interest" as Robertson asserted. What Keynes actually asked was "why, the quantity of money being unchanged, a fresh act of saving should diminish the sum which it is *desired* [*emphasis* added] to keep in liquid form at the existing rate of interest" (Keynes 1936, p. 213). These are entirely different questions.

Keynes' question as to what "is desired to keep in liquid form at the existing rate of interest" has to do with the *demand* for liquidity, that is, the quantity of liquidity *demanded* (i.e., desired or willingly held) at the existing rate of interest. Robertson's misstatement as to what "is *required* to be kept in liquid form" and his answer to his own question that if "the event in question deprives the producers of consumption goods of income, it reduces by the same act their ability to hold money for 'transaction' and 'precautionary' purposes" indicates that Robertson is talking about how a change in income will reduce the transactions and precautionary demands for money and, thereby, free those balances to increase the quantity of liquidity *supplied* as the system adjust to a new point of equilibrium. Robertson's irrelevant analysis of the effects of an increase in *supply* in response to Keynes' question with regard to the effects of an increase in *demand* clearly indicates the extent to which Robertson failed to address the point of Keynes' analysis of this problem.

Keynes' question appears at the end of section I in Chapter 16 of *The General Theory*, and throughout that section Keynes discusses the effects of the "absurd, though almost universal, idea that an act of individual saving is just as good for effective demand as an act of individual consumption ... so that current investment is promoted by individual saving to the same extent as present consumption is diminished." According to Robertson, Keynes' argument in this section "seems to be a repetition … of his old argument" from his *Treatise on Money*. Since this old argument also stands at the very center of the controversy between Robertson and Keynes it is also quoted here at length:

> Before leaving this section it may be well to illustrate further the conclusion stated above, that a fall in the price of consumption-goods due to an excess of saving over investment does not in itself—if it is unaccompanied by any change in the bearishness or bullishness of the public or in the volume of savings-deposits, or if there are compensating changes in these two factors—require any opposite change in the price of new investment-goods. For I believe that this conclusion may be accepted by some readers with difficulty.

> It follows from the fact that, on the above assumptions, the total value of the investment-goods (new and old) coming on to the market for purchase out of current savings is always exactly equal to the amount of such savings and is irrespective of the current output of investment-goods. For if the value of the new investment goods is less than the volume of current savings, entrepreneurs as a whole must be making losses exactly equal to the difference. These losses, which represent a failure to receive cash up to expectations from sales of current output, must be financed, and the non-receipt of the expected cash receipts must be somehow made good. The entrepreneurs can only make them good either by reducing their own bank deposits or selling some of their other capital assets. The bank-deposits thus released and the securities thus sold are available for, and are exactly equal to, the excess of current savings over the value of new investment.
>
> In the more general case where the public sentiment towards securities or the volume of savings-deposits is changing, then if the extent to which the entrepreneurs have recourse to the expedient of releasing bank-deposits plus the increase in savings-deposits allowed by the banking system just balances the increase in the desire of the public to employ their resources in bank-deposits, there is no reason for any change in the price of securities. If the former is in excess of the latter, the price of securities will tend to rise and if the latter is in excess of the former, the price of securities will tend to fall. (1930, pp. 130-1)

Both Robertson and Hayek criticized this argument in 1931, arguing that output must change in this situation. In his 1931 reply to this criticism Keynes restated the argument, and this time he emphasized the words "*in itself*" in the first sentence of the above passage, and toward the end of the discussion he added the following footnote:

> [1]I did not deal in detail in my book, and I am not dealing here, with the train of events which ensues when, as a consequence of making losses, entrepreneurs reduce their output. This is a long story … which I intend to treat in detail in due course. Its only bearing on the present argument is that a change in output affects the demand for active deposits, and may therefore (according to how the banking system behaves) affect the supply of hoards. (1931, p. 418)

In addition, in the preface to *The General Theory*, Keynes explained the nature of the theoretical arguments put forth in his *Treatise on Money* as an "instantaneous picture taken on the assumption of a given output." (pp. vi-vii)

From a) Keynes' old argument itself, b) Keynes' emphasis on the words "*in itself*" in his response to Robertson's and Hayek's criticisms, c) Keynes' footnote stating that his argument does not, in fact, deal with the situation in which output changes, and d) Keynes' explanation in the preface to *The General Theory* that his argument in *A Treatise on Money* assumes "a given output," it should be clear that in spite of the fact that Robertson presented his objections to Keynes' old argument within the context of "the long-period problem of saving," Keynes' old argument does not deal with the long-period effects of an increased rate of saving on income or the rate of interest. Specifically, it has to do with a *ceteris paribus* situation in which *output is assumed to be constant*. This is, of course, *precisely the kind of ceteris paribus situation that*

is the essence of Marshall's *ceteris paribus, partial equilibrium methodology*. (Blackford 2019a)

What Robertson described in the above passage is *not* Keynes' long-period problem of savings—that is, the problem of maintaining full employment in the long run in the face of a declining prospective yield at the margin due to the increasing stock of capital that results from saving/investment (Blackford 2019b; 2021). What Robertson described in the above passage is what may be referred to as *the short-period problem of saving*, that is, the problem of maintaining or achieving full employment *in the short run* in the face of an increase in the propensity to save. Robertson's conflation of these two problems and attributing this conflation to Keynes is obviously a straw-man since at no time did Keynes argue that an increased rate of saving can have no effect on income or the rate of interest *over the course of some indefinite period of time* as Robertson's arguments insinuated in the passage quoted above. Nor did Keynes argue that this is the reason why an increased rate of saving cannot stimulate the formation of capital. Keynes' (1938) argued that an increase in the propensity to save will, indeed, lead to a fall in employment, output, income, and the rate of interest *over time* in the situation posited by Robertson, but, as we shall see, Keynes' explanation as to *how* and *why* this will occur is, in fact, "radically opposed" (Keynes 1937, p. 241) to Robertson's explanation as to *how* and *why* this will occur.

It is demonstrated below that Robertson's supposition that Keynes based his analysis of the short-period problem of saving on the assumption that an increase in the propensity to save will not lead to a fall in income and the rate of interest was a red herring in that it conflated two separate issues raised by Keynes: 1) whether or not an increase in the propensity to save can, *in itself*, cause a fall in the rate of interest and 2) whether or not an increase in the propensity to save will stimulate the formation of capital, that is, increase the flow of investment. The source of Robertson's confusion in this regard, along with that of those who cling to the misguided belief in the efficacy of saving, can be seen by examining the differences between Robertson's and Keynes' definitions of income and treatment of expectations in their respective analyses of this problem.

3. Income and Expectations

Robertson used the terms "income" and "income received" interchangeably, and by these terms he meant quite literally money received from the sale of output. Thus, Robertson defined income as *the value of output sold*. (Robertson 1933; 1940; 1959; Horwich; Tsiang; Kohn; Hawtrey; Modigliani)

Keynes took great care in constructing his definition of income as being equal to sales less user cost, where user cost "is the measure of what has been sacrificed (one way or another) to produce [sales]." The fact that this "sacrifice" is, by definition, inversely related to changes in inventories and "maintenance and improvement" means that Keynes defined income as being equal to *the value of output produced*. (Keynes 1936, pp. 52-5, 63; Hayes) The significance of this difference between Robertson's and Keynes' definitions of income can be seen by examining Keynes' explanation of the way in which employment and output produced are determined in his general theory.

Keynes argued that whenever production takes time, at each and every point in time at which a decision must be made concerning employment and output that decision must be made with

reference to existing capital equipment on the basis of currently held *expectations* with regard to the costs to be paid and the proceeds to be received in the *future* while the output is being produced and when it is to be sold.[1] The actual costs and proceeds that result from employment and output decisions cannot have a direct effect on these decisions, only an indirect effect, and, even then, only to the extent they have an effect on stocks of capital assets and *subsequent* expectations, that is, on the capital stocks that exist and expectations formed *after* the expected costs and proceeds are (or are not) actually realized.[2] This argument has a clear implication with regard to income.

Since Keynes constructed his definition of income in such a way that income is equal to the value of output *produced,* whenever production takes time, income, so defined, is earned (accrues) *before* the output produced in generating income is sold. This makes income a psychological phenomenon, determined in the minds of decision-making units, and *this value cannot be separated from the expectations of these units*. The implication is that whenever production takes time, at each and every point in time at which a decision must be made

[1] Keynes:

> All production is for the purpose of ultimately satisfying a consumer. Time usually elapses … between the incurring of costs by the producer … and the purchase of the output by the ultimate consumer. Meanwhile the entrepreneur...has to form the best expectations[1] he can as to what the consumers will be prepared to pay when he is ready to supply them … after the elapse of what may be a lengthy period; and he has no choice but to be guided by these expectations, if he is to produce at all by processes which occupy time.
>
> These expectations, upon which business decisions depend, fall into two groups.... The first type is concerned with the price which a manufacturer can expect to get for his "finished" output at the time when he commits himself to starting the process which will produce it.... The second type is concerned with what the entrepreneur can hope to earn in the shape of future returns if he purchases (or, perhaps, manufactures) "finished" output as an addition to his capital equipment. We may call the former *short-term expectation* and the latter *long-term expectation*.
>
> Thus the behaviour of each individual firm in deciding its daily[1] output will be determined by its *short-term expectations*—expectations as to the cost of output on various possible scales and expectations as to the sale-proceeds of this output.... It is upon these various expectations that the amount of employment which the firms offer will depend. The *actually realised* results of the production and sale of output will only be relevant to employment in so far as they cause a modification of subsequent expectations. Nor, on the other hand, are the original expectations relevant, which led the firm to acquire the capital equipment and the stock of intermediate products and half-finished materials with which it finds itself at the time when it has to decide the next day's output. Thus, on each and every occasion of such a decision, the decision will be made, with reference indeed to this equipment and stock, but in the light of the current expectations of prospective costs and sale-proceeds. (1936, pp.46-7)

[2] Keynes:

> It is evident from the above that the level of employment at any time depends, in a sense, not merely on the existing state of expectation but on the states of expectation which have existed over a certain past period. Nevertheless past expectations, which have not yet worked themselves out, are embodied in the to-day's capital equipment with reference to which the entrepreneur has to make to-day's decisions, and only influence his decisions in so far as they are so embodied. It follows, therefore, that, in spite of the above, to-day's employment can be correctly described as being governed by to-day's expectations taken in conjunction with to-day's capital equipment.(1936, p. 50).

concerning income, that decision must be made on the basis of currently held *expectations* just as the corresponding decisions concerning the employment and output that generates that income must be made on the basis of currently held expectations. (Keynes 1936, chaps. 5-6)

The relationship between employment, output, income, and the entrepreneurs' *expectations* is also stated explicitly by Keynes in his definition of effective demand where he defined effective demand in terms of the *proceeds* producers *expect* to receive as they maximize their expectation of profits through the employment of resources.[3] It is the *expectation* of profits that is assumed to be the *direct* determinant of employment, output, and, hence, *income* in Keynes' general theory.

The psychological dependence of decisions concerning employment, output, and income on expectations is of the utmost importance in Keynes' general theory for it is this dependence that provides the distinction between the way in which expected and realized results affect decision-making behavior: Expectations affect *current* decisions directly whether they are realized in the future or not while realized results only affect decisions made *after* the results are (or are not) actually realized. This distinction lies at the very core of Keynes' general theory for it determines *the temporal order in which events must occur* which makes it possible to separate cause and effect. The ability to separate cause and effect is the *sine qua non* of causality, (Hume) and it is the psychological dependence of decisions concerning employment, output, and income on expectations that makes *a causal analysis of dynamic behavior possible in Keynes' general theory*. (Keynes 1936, ch. 5; Blackford 2019a; 2019b; 2020a)

When income is defined as Keynes defined it the causally significant variable becomes the value of output produced *as perceived by decision-making units in light of their current expectations*. This value is equal to Robertson's definition of income as the value of output sold changes randomly over time only if expectations are unit-elastic and the value of output produced adjusts *instantaneously* to changes in sales. (Modigliani) But whether expectations and the value of output produced are determined in this way or not the value of output produced *as perceived by decision-making units* depends on their current expectations in Keynes' general theory, and, *given the level of employment and output, income cannot change except through a change in expectations.*

When income is defined as Robertson defined it such that it is equal to the value of output sold, income becomes an *ex-post* magnitude the value of which is determined *after* output is sold. Thus, *Robertson's definition of income does not allow for the distinction that is central to causality in Keynes' general theory*—namely, the distinction between the way in which expected and realized results affect decision-making behavior with regard to employment, output, and income—since income is a realized result in Robertson's methodology and is not dependent

[3] Keynes:

> Furthermore, the effective demand is simply the aggregate income (or proceeds) which the entrepreneurs expect to receive, inclusive of the incomes which they will hand on to the other factors of production, from the amount of current employment which they decide to give. The aggregate demand function relates various hypothetical quantities of employment to the proceeds which their outputs are expected to yield; and the effective demand is the point on the aggregate demand function which becomes effective because, taken in conjunction with the conditions of supply, it corresponds to the level of employment which maximises the entrepreneur's expectation of profit. (1936, p. 55)

on expectations.[4] As we shall see, it is the absence of this distinction that limits Robertson's methodology to that of comparative statics.[5]

That herein lies the fundament difference between Robertson's and Keynes' understanding of the short-period problem of saving can be seen by contrasting Robertson's and Keynes' analysis of the way in which the effects of an increase in saving, that is, *an increase in the propensity to save*, work their way through the economic system *through time*, given Robertson's and Keynes' respective definitions of income and treatment of expectations.

4. Robertson on the Short-Period Problem of Saving

Robertson's understanding of the way in which the effects of an increase in saving work their way through the system through time which has been eulogized by Horwich, Tsiang, Kohn, and others along with Robertson's understanding of Keynes' analysis of this process can be found in Robertson's 1936 review of *The General Theory* quoted above, also in his attempt to explain the relationship between his and Keynes' theories of interest in Robertson's 1940 *Essays* (pp. 18-9), and again in his 1959 *Lectures* (pp. 67-70). The following passage is from his 1940 *Essays*:

> Let me state in my own language what I believe the Keynesian is trying to convey. Suppose that I decide to spend £100 of my income on securities, instead of as hitherto on fine clothes. My action destroys £100 of the income of my tailor and his employees and depletes their money balances by £100. It also raises the price of securities, i.e. lowers the rate of interest.[3] This fall in the rate of interest tempts some people to sell securities and to hold increased money balances instead. Thus the fall in the rate of interest is checked, and not all of my £100 succeeds therefore in finding its way through the markets for old securities and new issues, on to the markets for labor and commodities. Thus owing to the existence of this siding or trap, my act of thrift does not succeed, as "classical" theory asserts that it will, in creating incomes and money balances for builders and engineers equal to those which it has

[4] In December 1933 Hawtrey (pp. 702-4) attempted to explain the importance of the psychological dependence of income on expectations in establishing causality to Robertson. Robertson responded that he found his own formulation to be "easier than Mr. Hawtrey's conception of consumers' outlay, which is defined as expenditure 'out of income' though the income which it is 'out of' may apparently not yet have been received." (1933, p. 711) Robertson was simply unable to grasp the essential nature and validity of the point Hawtrey was attempting to make, namely, that, in the real world, expenditures are determined by *expectations*, not simply by realized income as defined by sales.

[5] It is worth noting that expectations play a central role in separating cause and effect throughout Marshall's *Principles*, a fact that Hicks (1946, p. 117) identifies with Marshall's dynamic methodology. It should also be noted that this distinction marks a fundamental difference between Keynes' *Treatise on Money* and *The General Theory*. In Chapter 7 of *The General Theory* Keynes observed that in his "*Treatise on Money* the concept of changes in the excess of investment over saving, as there defined, was a way of handling changes in profit, though I did not in that book distinguish clearly between expected and realised results1." (p. 77) In the accompanying footnote he noted that his "method [in the *Treatise*] was to regard the current realised profit as determining the current expectation of profit." Thus, while Keynes did not distinguish between expected and realized results in the *Treatise*, he decidedly made this distinction in *The General Theory* where he explicitly renounced the implicit assumption of unit-elastic expectations of the *Treatise*.

> destroyed for tailors. The net result of the whole proceeding is a fall in the rate of interest and an increase, perhaps, in capital outlay[1] but a net decrease in the total of money incomes and (probably) of employment.
>
> The argument is formally perfectly valid; and the practical inference that, if existing money is going to ground in this way, it is *prima facie* the duty of the banking system to create more money.... Here I will only say that it seems to me a most misleading way of expressing the causal train of events to say, as is sometimes done, that the act of thrift lowers the rate of interest through lowering total incomes. I should say that it lowers the rate of interest quite directly through swelling the money stream of demand for securities; that this fall in the rate of interest increases the proportion of resources over which people wish to keep command in monetary form; and that this increase in turn is a cause of there being a net decline in total money income, i.e., of money incomes not expanding in one sector to the extent that they are contracting in the other.[1] (1940, pp. 18-9)

In this passage Robertson clearly argued that an increase in the propensity to save accompanied by an increase in the purchase of securities ("spend … on securities, instead of … on fine clothes") will have a direct effect on the rate of interest by "swelling the money stream of demand for securities" and that the induced hoarding ("resources … people wish to keep … in monetary form") brought about by the subsequent fall in the rate of interest is "a cause of there being a net decline in total money income." It should be noted that this explanation is dynamic and is explicitly stated in causal terms. At the same time, Robertson's explanation of what Keynes was trying to convey clearly indicates the extent to which Robertson failed to address what Keynes actually said.

Keynes did not argue that an increase in saving "destroys … income" or that such an event "also raises the price of securities." In the passage quoted above from the *Treatise* (1930, pp. 130-1) Keynes argued that in the absence of a change in income in this *ceteris paribus* situation the "swelling money stream of demand for securities" that results from the increase in saving must be met by an equal swelling stream of supply of securities caused by the concomitant fall in sales that forces producers of consumption goods to borrow *money* or sell assets in order to obtain the *money* needed to maintain their transactions and precautionary balances as these balances are expended over time. If the increase in saving persists it will, of course, set in motion a *causal chain of events* that must eventually lead to a change in expectations, income, and the rate of interest *over time* (Blackford 2020a, pp. 1-95; 2019a; 2019b), but as should be clear from the way in which Keynes defined income the increase in saving cannot have an effect on income until *after* a change in expectations is brought about.[6]

[6] Since firms have a choice between borrowing money or selling non-debt assets to obtain the needed funds in the face of an increase in thriftiness, and households have a choice between lending money and buying non-debt assets in order to dispose of their excess balances, to the extent the choices of households and firms are not compatible at the existing rate of interest and price of non-debt assets the rate of interest and the price of non-debt assets can be expected to change to make them compatible. It is important to note, however, that these are portfolio-balance effects that result from changes in the supplies and demands for money and assets, not effects that result from changes in saving or investment as such. See Keynes (1930, pp. 130-1; 1936, pp. 173-4, 166) and Blackford (2019b; 2020a). In saying that "the increase in saving cannot have an effect on income until *after* a change in expectations is brought

5. Where Robertson and Keynes Disagreed

Throughout his controversy with Keynes and beyond, Robertson insisted that his and Keynes' methods of approach were "two different ways of saying the same thing." (1940, p. 9) Robertson maintained this position in spite of the fact that his and Keynes' methods of approach were so "radically opposed" that there was virtually nothing on which the two men could agree. Comparing Robertson's explanation of the way in which an increase in saving affects income and the rate of interest with Keynes' explanation clearly indicates the extent to which Keynes and Robertson did not say the same thing: Why is it "a most misleading way of expressing the causal chain of events to say … the act of thriftiness lowers the rate of interest through lowering total incomes" if Keynes is right, and *the only way in which the rate of interest can fall in this situation is, in fact, after there is a change in expectations that leads to a subsequent fall in employment, output, and, hence, income?* What does it mean to say that an increase in saving "lowers the rate of interest quite directly through swelling the money stream of demand for securities" if Keynes is right, and, *given expectations, income, and the supply and demand for money this swelling stream of demand must be met by an equal swelling stream of supply?* (Bibow; Blackford 2020a, pp. 1-94; 2019a; Hayes) When we look at what Robertson and Keynes actually said it becomes obvious that they did not say the same thing, and their differences are far from trivial within the analytical framework of Keynes' general theory. Robertson argued that the increase in the supply of loanable funds accompanying an increase in thriftiness can be considered the *direct cause* of the resulting fall in the rate of interest. Keynes argued that only a change in expectations can *cause* a fall in income in this *ceteris paribus* situation, and when income falls it will *cause* a fall in the transactions demand for money which, in turn, will increase the supply of speculative balances, and it is the increase in speculative balances that is the *direct cause* of the resulting fall in the rate of interest and increase in hoarding that occurs *after* income has fallen. (Bibow; Hayes; Blackford 2019a; 2020a, pp. 37-77) These two views of causality are simply irreconcilable within Keynes' general theory, and to reject Keynes' view of causality is to reject Keynes' general theory itself. There is no middle ground on this issue, and not only is it obvious that Robertson and Keynes did not say the same thing concerning this issue, it is also obvious that *if Keynes is right, Robertson is wrong*.

What is not obvious is why anyone would suppose that Keynes is not right. After all, decision-making units do, in fact, live in a world of uncertainty in which production takes time and in which sales fluctuate randomly from day to day, week to week, and month to month. Decision-making units cannot *know* that a fall in sales on any given day or during any given week or month is permanent and will not be compensated for by an increase on the following day or during the following week or month. They are in fact forced to form expectations with various degrees of confidence as to what the future will bring, and their decisions with regard to employment, output, and income must be based on these expectations. Where did Keynes go wrong in assuming that *until expectations change and employment, output, and income fall* decision-making units must sell assets or turn to the credit market to obtain the *money* required to finance their income payments and other contractual obligations to the extent these payments cannot be finance otherwise?

about" in this *ceteris paribus* situation we are excluding portfolio-balance effects which can go either way. These effects are examined in detail in Blackford (2019a, p. 18n).

Keynes is right, and the point at which Robertson went wrong can be seen by examining footnote 3 at the end of the fourth sentence of Robertson's explanation quoted above:

> [3] Debate on this matter has sometimes been hampered by the ghost of an old argument, dating from the days of the *Treatise on Money*. According to this argument the loss-making tailor, in order to avoid restricting either his personal consumption or the scale of his business, will sell securities to the same amount as I buy them. Obviously, so long as such a situation continues, the rate of interest will not fall nor the formation of capital equipment be stimulated, but neither, so far as the mere maintenance of total income (other than the tailor's) and employment goes, is it necessary that they should. Evidently, however, this can only be a transitional situation and it is not instructive to stop short at it. (1940, p. 18n)

In this footnote Robertson admitted that Keynes' "old argument" provides a correct analysis of the "transitional situation" under discussion. He then continued his *dynamic* explanation of the way in which the rate of interest is determined in the text and *completely ignored this transitional situation*. But this "transitional situation" has to do with the way in which the system moves *through time*. The only way this transitional situation can be ignored is if it is assumed that expectations are unit-elastic and along with the value of output produced adjust *instantaneously* to changes in sales. (Blackford 2019a; 2019c; 2020a, pp. 37-77; Modigliani) If this is not the case *there is no way to explain why firms would be willing to sell at a loss today or reduce their current scale of operations if their expectations are unchanged to the effect that they can accumulate inventories and otherwise maintain their current scale of operations today and expect to sell at a profit tomorrow*.

6. Robertson's Static Methodology

There is no way to make sense out of Robertson's 'dynamic' explanation of the way an increase in saving affects the economic system *through time* other than by way of the assumption of unit-elastic expectations with an *instantaneous* adjustment of the value of output produced, for *in the absence of this assumption the value of output produced as perceived by decision-making units cannot be equal to the value of output sold as sales change randomly over time*.[7] As a result, this assumption limits Robertson's method of analysis to that of comparative statics in that Robertson's methodology implicitly assumes that expectations adjust *instantaneously* in such a way as to achieve a state of static equilibrium *each period* with regard to the determination of both income and the rate of interest. He then *describes* how he believes these

[7] Those who have criticized Keynes' theory of interest (e.g., Tsiang, Horwich, Kohn, and Leijonhufvud) are also hobbled by Robertson's implicit unit-elastic, instantaneous adjustment assumption. At no point do those who have criticized Keynes explain why they believe producers are willing to sell at a loss today if their *expectations* are unchanged to the effect that they can accumulate inventories and otherwise maintain their scale of operations today and *expect* to sell at a profit tomorrow. Nor have they explained how producers are able to avoid turning to the credit or non-debt asset markets in order to obtain the *money* needed to finance their operations in this situation. Cf., Keynes (1930, pp. 130-1) and Blackford (2019a; 2019c; 2020a).

states of static equilibrium change from one period to the next.[8] Since Robertson explicitly denied the relevance of Keynes' "transitional situation" to his analysis of the way in which his intraperiod equilibriums are achieved, his dynamic explanation of the way in which an increase in thriftiness affects income and the rate of interest *within each period* is purely *ad hoc* and is irrelevant to the fundamental issue of causality raised by Keynes.[9]

That Robertson's dynamic explanation ignores the fundamental issue of *causality* raised by Keynes is clear in Robertson's footnote quoted above. In this footnote Robertson admitted that if "the loss-making tailor … will sell securities to the same amount as I buy them … the rate of interest will not fall." What Robertson admitted here is the obvious fact that income and the demand for money must fall in this situation *before* the rate of interest can fall. Robertson admitted this simple fact on at least four separate occasions (1936, p. 178; 1937, p. 435n; 1940, p. 18; 1959, p. 68-9) without any indication that he understood what this simple fact means with regard to his assertion that his act of saving "lowers the rate of interest quite directly." What this simple fact means is that *it is impossible for an increase in thriftiness to affect the rate of interest directly*; there must be a change in expectations that leads to a fall in income that is accompanied by a fall in the demand for money that increase the supply of speculative balances *before* the rate of interest can fall in response to an increase in the propensity to save. (Blackford 2019a)

Once Robertson's analysis is seen to be that of comparative statics it is clear that Robertson's arguments are irrelevant to the issues of *direct causality* raised by Keynes in *The General Theory*.[10] It is important to understand, however, that Keynes' fundamental objection to Robertson's analysis of the short-period problem of savings goes beyond Robertson's confused static analysis of the direct effects of an increase in saving.

[8] Cf., Tsiang, Kohn, Horwich, Modigliani, and Blackford (2019a; 2019c; 2020a; 2021).

[9] This same criticism applies to Hicks' (1937) IS/LM approach to this problem. Hicks, as with Robertson, assumed that the rate of interest and the values of other variables are determined simultaneously within a "week" by a system of equations rather than by the state of supply and demand in the individual markets for debt instruments at any given point in time during the week. It is also worth noting that Hicks explicitly acknowledged the existence of this problem:

> Even when we have mastered the 'working' of the temporary equilibrium system, we are even yet not in a position to give an account of the process of price-change, nor to examine the ulterior consequences of changes in data. These are the ultimate things we want to know about, though we may have to face the disappointing conclusion that there is not much which can be said about them in general. Still, nothing can be done about these further problems until after we have investigated the working of the economy during a particular week. (1946, p. 246)

The essence of Keynes' general theory is that it provides a *logically consistent* theoretical framework in which it is possible to investigate "the working of the economy during a particular week." See Blackford (2019a; 2019b).

[10] I find it rather surprising that the issue of direct causality raised by Keynes in *The General Theory* is virtually ignored in the controversy surrounding the publication of this work especially in view of the fact that words that refer to causality (cause, causes, causal, caused, causally, causing, causative, causation, causality) appear over 150 times in *The General Theory*.

7. Keynes on Saving and Capital Formation

Keynes argued throughout *The General Theory* that his fundamental objection to the classical theory of interest is the way in which this theory is used to justify the belief that an increase in the propensity to save will lower the rate of interest and, thereby, increase the rate of capital accumulation and economic well-being in the future. It was this belief that Robertson was attempting to justify in his 1936 review of *The General Theory* quoted above. Keynes was adamantly opposed to the reasoning on which this belief is based.

As we have seen, Keynes argued that whenever the process of production takes time, at each and every point in time at which a decision must be made concerning employment, output, and income that decision must be made on the basis of currently held *expectations* with regard to the future. This means that there must be a change in the *expectations* of the producers in the consumption goods industries with regard to the *profitability* of continuing to produce at current levels of employment, output, and income *before* employment, output, and income in the consumption-goods industries can change in response to an increase in the propensity to save. What happens to investment *after* this change in expectations and the resulting fall in income depends not only on the subsequent behavior of the rate of interest; *it also depends on how the diminished expectations of profits in the consumption-goods industries affect the subsequent expectations of investors with regard to the prospective yields of further investment in the consumption-goods industries.* Since there is every reason to believe the concomitant fall in the demands for consumption goods will have a *negative* effect on the expectations that determine prospective yields on investments in the consumption-goods industries, *there is no a priori reason to believe an increase in the propensity to save will increase the rate of capital accumulation*. As a result, Keynes saw no reason to believe an increase in the propensity to save will lead to an increase in output and economic well-being in the future.

Keynes explained his understanding of the nature of this problem in Chapter 8 of *The General Theory*:

> New capital-investment can only take place in excess of current capital-disinvestment if *future* expenditure on consumption is expected to increase…. A diminished propensity to consume to-day can only be accommodated to the public advantage if an increased propensity to consume is expected to exist some day….
>
> The obstacle to a clear understanding is … an inadequate appreciation of the fact that capital is not a self-subsistent entity existing apart from consumption. On the contrary, every weakening in the propensity to consume regarded as a permanent habit must weaken the demand for capital as well as the demand for consumption. (p. 105-06)

Keynes further expanded on this theme in Chapter 16:

> An act of individual saving means—so to speak—a decision not to have dinner to-day. But it does not necessitate a decision to have dinner or to buy a pair of boots a week hence or a year hence or to consume any specified thing at any specified date. Thus it depresses the business of preparing to-day's dinner without stimulating the business of making ready for some future act of consumption…. Moreover, the expectation of future consumption is so largely

> based on current experience of present consumption that a reduction in the latter is likely to depress the former, with the result that the act of saving will not merely depress the price of consumption-goods and leave the marginal efficiency of existing capital unaffected, but may actually tend to depress the latter also. In this event it may reduce present investment-demand as well as present consumption-demand.
>
> If saving consisted not merely in abstaining from present consumption but in placing simultaneously a specific order for future consumption, the effect might indeed be different.... however, an individual decision to save does not, in actual fact, involve the placing of any specific forward order for consumption, but merely the cancellation of a present order. Thus, since the expectation of consumption is the only *raison d'être* of employment, there should be nothing paradoxical in the conclusion that a diminished propensity to consume has cet. par. a depressing effect on employment. (1936, p. 210-11)

Put as simply as possible, Keynes believed that since the ultimate reason for investing in capital goods in the present is to facilitate the production and sale of consumption goods in the future, a fall in the demand for consumption goods in the present that is "regarded as a permanent habit" must reduce the expectations with regard to the demand for consumption goods in the future. This, in turn, can be expected to have a depressing effect on the demand for capital goods in the present, hence, "*cet. par.* a depressing effect on employment," output, and income.

Thus, if you believe, as Keynes believed, that producers must be guided by their *expectations* with regard to the *profitability* of producing at current levels of employment, output, and income there is no *a priori* reason to believe that employment, output, and income will begin to fall in the consumption-goods industries in response to a *ceteris paribus* increase in saving and subsequently lead to a fall in the rate of interest until *after* there is a change in expectations with regard to the profitability of continuing to produce in the consumption-goods industries at the current levels of employment, output and income.

If you also believe, as Keynes also believed, that this change in expectations will most likely have an adverse effect on expectations with regard to the *profitability* of further investing in the consumption-goods industries there is no *a priori* reason to believe the stimulus to investment that is assumed to arise from the subsequent fall in the rate of interest will not be accompanied by *diminished expectations with regard to the prospective yields that can be expected from increased investment in these industries*.

What happens to the rate of investment in this situation depends on the interaction between these two forces. Since there is no *a priori* reason to believe the positive effect on investment from the resulting fall in the rate of interest will more than offset the negative effect of the change in expectations on prospective yields there is no reason to believe investment will increase *as this dynamic sequence of events plays itself out through time.* This is especially so if the concomitant fall in the propensity to consume turns out to be permanent as *expectations adjust to this reality over time*.[11]

[11] Milton Friedman clearly failed to grasp the nature of Keynes' argument in the passages quoted above as indicated by Friedman's response to the critics of his "Theoretical Framework for Monetary Analysis." In his response Friedman argued that "a tax increase which is not matched by higher government spending will [not] necessarily have a strong braking effect on the economy," the reason being that:

What we are talking about here is one of those "complicated partial differentials 'at the back' of several pages of algebra which assume that they all vanish" Keynes warned about in *The General Theory* (pp. 297-8), and there can be no doubt where Keynes stood on this issue:

> Thus after giving full weight to the importance of the influence of short-period changes in the state of long-term expectation as distinct from changes in the rate of interest, we are still entitled to return to the latter as exercising, at any rate, in normal circumstances, *a great, though not a decisive*, [*emphasis* added] influence on the rate of investment. (Keynes 1936, p. 164)

That the rate of interest exercises a great, *though not decisive*, influence on the rate of investment is a central theme of *The General Theory*.[12] Robertson's *ad hoc* analysis of the short-period problem of saving by which he supposed the effects of an increase in saving systematically work their way through the system to increase the rate of capital accumulation and economic well-being in the future ignores the essential and mercurial role of expectations in determining the behavior of decision-making units emphasized by Keynes' throughout *The General Theory*. (Blackford 2019a; 2020a)

> higher taxes would leave taxpayers less to spend. But this is only part of the story. If government spending were unchanged, more of it would now be financed by the higher taxes, and the government would have to borrow less. *The individuals, banks, corporations or other lenders from whom the government would have borrowed now have more left to spend or to lend—and this extra amount is precisely equal to the reduction in the amount available to them and others as taxpayers.* If they spend it themselves, this directly offsets any reduction in spending by taxpayers…. If they lend it to business enterprises or private individuals—as they can by accepting a lower interest rate for the loans—the resulting increase on residential building and so on indirectly offsets any reduction in spending by taxpayers. (1972, pp. 914-5)

This argument ignores the fact that until expectations change and output falls *there will be no reason for lenders to accept a lower interest rate* (or lower prices of assets) since a) taxpayers will not only have less to spend *they will also have less to lend*, and b) producers must be willing to borrow (or sell assets) in an amount that is exactly equal to the amount "*individuals, banks* [etc.] *… have … left to spend or to lend*" to the extent these funds are not spent. Friedman's argument also ignores the possibility of *a negative effect on investment* as a result of a fall in prospective yields on investments in the consumption goods industries. See Blackford (2019a; 2019b; 2020a).

[12] Keynes:

> Even apart from the instability due to speculation, there is the instability due to the characteristic of human nature that a large proportion of our positive activities depend on spontaneous optimism rather than on a mathematical expectation…. Most, probably, of our decisions to do something positive, the full consequences of which will be drawn out over many days to come, can only be taken as a result of animal spirits—of a spontaneous urge to action rather than inaction, and not as the outcome of a weighted average of quantitative benefits multiplied by quantitative probabilities. Enterprise only pretends to itself to be mainly actuated by the statements in its own prospectus, however candid and sincere…. Thus if the animal spirits are dimmed and the spontaneous optimism falters, leaving us to depend on nothing but a mathematical expectation, enterprise will fade and die;—though fears of loss may have a basis no more reasonable than hopes of profit had before. (1936, pp. 161-62)

8. Conclusion

In the passage quoted above from Robertson's 1940 *Essays* he asserted that the net result of his decision to save rather than spend money on new clothes will be "an increase, *perhaps* [*emphasis* added], in capital outlay.[1]" And in the accompanying footnote he states: "Even this is not certain, since the demand of the tailor, weaver, etc., for machines will decline." This is, of course, precisely the issue raised by Keynes, and by 1940 it appeared that this had finally registered to some extent with Robertson. In retelling this tale in his 1959 *Lectures* (pp. 67-70), however, it had apparently unregistered as Robertson reverted to his original 1936 position in which the potential effects of an increase in the propensity to save on expectations, prospective yields, and the demand for investment goods were again ignored by Robertson. These effects were also ignored by Robertson's defenders and, as a result, by their followers who cling to the belief in the efficacy of saving. These effects were also ignored by policy makers in the debates leading up to the Crash of 2008 and the economic stagnation that followed. (Blackford 2018; 2021)

The extent of the confusion in this regard is indicated by Ben Bernanke, former head of the most powerful central bank in the world, when he proclaimed a "global savings glut" to be the reason for falling interest rates and that "textbook analysis suggests that, with desired saving outstripping desired investment, the real rate of interest should fall to equilibrate the market for global saving." As a solution to this problem Bernanke suggested that "increasing U.S. national saving from its current low level would support productivity and wealth creation and help our society make better provision for the future."

Keynes (1936) explained why, given the supply and demand for money, only a fall in income can equilibrate desired saving and investment; the rate of interest, real or otherwise, cannot achieve this end. At the very least, the supply of money must increase in this situation, and while "a progressive increase in the supply of money" may or may not be able to sustain employment, output, and income in the short run there is no reason to believe it can do so in the long run as was also explained by Keynes in 1936 and as was witnessed following the Crash of 2008. (Blackford 2021)

From Keynes' perspective, Bernanke's suggested solution to the problems created by the policies leading up to the Crash of 2008 and the economic stagnation that followed—namely, to continue to increase the propensity to save—is prologue to disaster. It amounts to more of the same with the expectation of a different result. (Blackford 2018; 2019a; 2019b; 2020a; 2021)

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Occupation Freedoms:
Comparing Workers and Slaves

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Abstract
Neoclassical economics assumes that workers in free labor markets are free to make occupational choices, while labor in pre-capitalist economies lack/lacked this freedom. This is a pivotal argument made in favor of capitalism, but it is also flawed. This essay revisits the comparison between workers and slaves by placing both in a 'primordial' capitalist economy, whose labor markets are free from government intervention and untainted by racism. Our comparisons show that the advantages claimed for workers over slaves are either exaggerated, do not exist, or the advantage belongs to slaves. At the same time, we wish to make it clear that slavery entails the near-complete loss of control over a slave's person, while a wage-worker surrenders this control generally over the *use* of her laboring capacities for some part of the day. Hence, a person will likely choose to be a wage-worker rather than slave.

Keywords: occupational freedom, workers, slaves, serfs, self-employment, peasants, freedom, coercion, capitalism, free labor, unfree labor

"…*the **veiled** slavery of the wage-laborers in Europe needed the unqualified slavery of the New World as its pedestal*."
Marx (1867, 925).

1. Introduction

In an essay that critiques the capitalist framing of the occupational freedoms of wage-workers—comparing them to serfs and slaves—it is necessary to state at the outset that occupational freedoms do not exhaust the ends that are desirable for a fulfilling life. When examined in a comprehensive moral framework that includes dignity, justice, and conceptions of freedom that are not limited to occupational choices, there may exist situations in which a wage-worker might prefer to be a slave or serf.[1]

Slavery entails the nearly total loss of control over a slave's *person*, not only for the duration of her life, but this condition is likely to persist over several generations. In addition, since the slave is a chattel, that is, the property of her master, the slave-master may beat and abuse her

[1] In some situations—such as loss of employment—a wage-worker facing death through starvation may choose to sell herself into slavery to avoid certain death.

and her family without any recourse to the law. On the other hand, a wage-worker surrenders control over the *use* of her laboring capacities for some part of the day. She is the owner of her own person outside the workplace, and her employer exercises no control over her family, not to speak of the generations that issue from her. While her condition as a wage-worker—without ownership of the means of production—forces her to accept the employer's dominion over her working capacities, this dominion is partial, and she is free, within limits, to choose another employer. Also, if she manages to save some of her earnings, she may escape the dominion of employers over her by becoming self-employed. Further, since a wage-worker is a free person, she has the same rights—at least in theory—as her employer. She may, therefore, in principle turn to the courts for restitution of wrongs done to her by other workers or by her employer. Finally, barring a legal system or culture that is discriminatory against minorities, a wage-worker may also enjoy the civil and political rights available to citizens in a political democracy. Given this contextualization, we may proceed to the question this essay seeks to answer without any suspicion of legitimizing slavery. On the contrary, we hope to strengthen the case for establishing economic systems that incorporate democracy in the workplace.

Are wage-workers in a capitalist economy freer or better off than slaves in *all* the diverse features that define their working lives?[2]

Some two centuries into the era of global capitalism, this question will strike some as quaint if not scurrilous.[3] The capitalist ideology of free labor often claims that *all* pre-capitalist economies were dominated by two classes of unfree labor relations, slavery and serfdom.[4] A worker in capitalist economies, on the contrary, is legally free to dispose of his time and working capacities. If the capitalist is free to hire workers under terms that best suit her interests, the worker too is free to choose the terms under which she offers her services to the capitalist. In other words, a worker enjoys occupational freedoms: she is free to choose her job, employer, job location, and conditions of her work. Thus, capitalism appears as a dual emancipatory project. It frees the bourgeoisie from the restraints of feudalism, at the same time it frees the slaves and serfs from the coercion of their masters. In a capitalist economy, the capitalist and worker meet as equals on free labor markets, each, free to dispose of her capacities in her best interests. There are two errors in this capitalist account of free workers.

First, the claim that coercion-free production began with the rise of capitalism is a convenient fiction; and discarding this has important consequences for capitalist accounts of freedom. Nearly all of human history contradicts this fiction. For more than 95 percent of their history, humans lived as free members of small groups of egalitarian foragers, their freedom

[2] Neither workers nor slaves own any means of production. A worker, however, is legally free and (putatively) faces no extra-market coercion in disposing of her time and working capacities. A slave is legally unfree; she is the property of her master who may and does coerce her into working. Workers possess 'negative freedom' while the slaves do not (Berlin, 2006).

[3] Comparisons between workers and slaves are by no means novel. From Aristotle and Cicero down to the end of the nineteenth century, "it was widely believed that anyone who was obliged to sell their labor in exchange for a wage was not far removed from that precarious and degraded social condition [that is, slavery] (MacGilvray, 2011: 159)."

[4] In her *Lectures on Jurisprudence*, Adam Smith states: "Slavery… has been universal in the beginnings of society, and the love of dominion and authority over others will probably make it perpetual (Smith, 1773: 187)." In Marx and Engels' (1848: 9) theory of successive modes of production also, capitalism was preceded by slavery and feudalism.

underpinned by access to abundant food-producing lands.[5] The first peasants, who practiced shifting cultivation, lived in acephalous societies, and did not have to pay rent or taxes to an overlord or government.[6] After they transitioned to fixed agricultural settlements, peasants began paying rent, taxes or both, but retained ownership of, or access to, lands for their own use; even serfs and, in some cases, slaves retained control over production of their means of subsistence.[7] In only two types of economies, slavery and capitalism, are primary producers stripped of ownership of, or access to, the means of production. However, historians have identified only two major ancient societies, Roman Italy and some Greek states, whose economies depended primarily on slave labor. We encounter slave societies again in parts of the Americas, between the sixteenth and the last decades of the nineteenth century.

In other words, self-employment in all its varied forms was the common lot of a great majority of primary producers, before capitalism became the dominant mode of production in north-western Europe, USA and Canada, starting in the nineteenth century. Outside of these areas, the dominance of self-employment continued throughout the nineteenth century; in much of Africa, and many parts of South Asia, Southeast Asia and Central America, self-employment persists as a major mode of production in agriculture and services. Why then have so many mostly Western writes chosen to demonstrate the superiority of capitalism by comparing 'free' workers to slaves, *not* to foragers, nomadic populations, peasants, artisans, and other self-employed persons? Thus stated, the question answers itself. Comparing workers to self-employed persons would not deliver the desired results. Self-employed persons enjoy far greater control over their working lives than the vast majority of wage workers.

Why do these writers fixate on freedom as the single criterion for demonstrating the superiority of capitalist over pre-capitalist modes of deploying labor? Many, if not most, observers might agree that, in addition to occupational freedoms, most humans also value non-occupational freedoms, security of livelihood, justice, fairness, human dignity and leisure; and that tradeoffs exist between occupational freedom and each of these other values. Measured against any of these alternative ends, it is doubtful that workers would come out ahead of self-employed persons. That might explain why protagonists of capitalism chose to compare wage-work against slavery, *not* self-employment. With slavery as the alternative to wage-work, freedom had the best chance of privileging wage-workers.

Capitalist fixation on freedom aligns with the fundamental interests of the capitalists. Except when it faces competition from imports or foreign capital, capital benefits from economic freedoms – such as freedom of movement for capital, labor and goods, freedom to hire and fire, to buy and sell goods, to despoil nature, and to inflict costs of production on third parties. This was already clear in early modern Europe when the local monopolies created by feudal lords were the chief obstacles to the expansion of a fledgling bourgeoisie. Freedom of

[5] See Sahlins (1998: 5-42).

[6] Following Wolff (1966: 13), a peasant household organizes production, mostly or entirely, for its own consumption.

[7] Braudel (1993: 317) writes that starting in the eleventh century—and as long as economic growth continued—"the lot of the peasants [serfs] rapidly improved." Braudel quotes Henri Pirenne as saying, that peasants in Western Europe "were free by the twelfth century." "In practice, " he writes, feudalism had reached an "equilibrium" that was widespread and "left the land with the peasants, who were *lords* and *masters* in their own domains, and who could pass on or sell their holdings (italics added)."

movement of labor alone would suffice to erode the very basis of feudalism; and free movement of goods would eliminate local tolls and tariffs, important sources of revenues for feudal lords.

While capital would selectively support intervention in markets for goods and services if this augmented their profits, all capitalists are united on the necessity of 'free' labor markets. Capital works assiduously to oppose interventions in labor markets if they raised the cost of labor. Free labor markets, in this sense, have always been an integral part of capitalist freedoms: and this freedom is directed squarely against the interests of workers. Both capitalism and slavery operate by stripping primary producers of the means of production. In addition, slavery also strips them of self-ownership. In part, because of this difference, capitalists are more likely to face, individually and as a class, growing demands to improve worker's lot. Individual slave-owners faced low-level opposition—generally expressed covertly—from their slaves, but as a class they rarely faced a general uprising of slaves. Organized efforts by workers gained strength from three circumstances. Industrial capitalism concentrated workers in a few urban centers, whereas agricultural slaves mostly remained dispersed over large areas of plantations and farms; in addition, slaves working in agriculture and mines could not move freely during their free time. Hence, workers could socialize, exchange ideas and organize because of their concentration in a few large urban areas. Finally, workers daily faced the risk of being forced into starvation, even death; slaves were assured of their livelihood. As a result, factory workers were generally in the vanguard of movements to get recognition for unions and the right to strike. Capitalists fought these workers' demands by painting them as attacks on free labor markets. In addition, mainstream economists made the case for free labor markets by arguing that since workers were free to make occupational choices, competitive pressures would neutralize the asymmetries between individual workers and individual capitalists.

The second error in the capitalist account of the superior occupational freedom of workers is the presumption that legal freedom is sufficient to produce occupational freedoms. We examine this error at some length in section three. It will be our chief concern in this essay to examine how the fundamental asymmetry in the employment relationship – examined in section two – together with a host of other factors, may limit a proletarian's ability to make occupational choices, and how the choices actually available to them compare with those available to slaves. We conclude that the putative superiority of workers over slaves in making occupational choices are either exaggerated, do not exist, or the workers may be at a disadvantage compared to slaves.

In no way, however, should our comparisons be read as exonerating the fundamental inhumanity of slavery. Slavery not only strips humans of the means of production: it also strips them to a greater degree than capitalism of their agency and their dignity. Slavery uses brutal force to capture free persons, tears them from their families, their villages, and their surroundings; transports them – often over great distances – to be sold on slave markets; and strips them of their language, culture, religion, their very identity. Generally, capitalists did not have to employ the brutal practices of slavery; they were better able to monitor workers who were concentrated in factories; they also used the threat of firings to discipline their workers.

We deny none of these differences. Our primary purpose is to show that that the capitalist ideology of 'free' workers – a pivotal defense of capitalism – mostly falls apart under careful examination. If slavery falls back on whipping to discipline slaves, capitalism controls its workers with the ever-present threat of firings, which may – in the primordial capitalist economy – easily lead to starvation, homelessness, disease, and death. How much of their dignity do workers retain when, in order to delay these threats, they have to put up with the orders, slights,

insults, bullying, and abuse of their overseers? Is this the best that humanity can do when it has been long in possession of energy resources and technology that could have banished poverty even on the most generous definition of human needs? Capitalism could not be the final destination of humanity. At some point in the future, we may be able to look back and say that it was at best a temporary aberration in man's journey towards self-sustaining enhancements of dignity, justice, freedom, self-expression and self-awareness.

2. Context of Comparisons

"*Comparisons are odorous...*"
Shakespeare, *Much Ado About Nothing* (3:5)

We compare proletarians and slaves within primordial capitalist economies that are free from government interventions and various ideologies of exclusion.

We have close approximations to our primordial economy in countries such as Britain, France, and the United States, roughly from the mid-eighteenth to the end of the nineteenth century. Over this period, self-employed persons were being forced into wage employment, even as the support afforded to them by village, local government, church, family, and access to commons were also slowly disappearing. On an average, the proletarians in primordial economies worked six days a week, 12 -14 hours a day, earned subsistence wages, were allowed few breaks during work, faced high rates of injuries, were subjected to corporal punishment, received no paid sick leave, faced high rates of mortality, and, when unemployed, often turned to begging, stealing or prostitution.[8] Children, as young as six, kept the same working hours as adults, and were often beaten at work; those working in mines and potteries suffered stunted growth and physical deformities. Most proletarians had no job security or protections against the hazards of unemployment.[9] The labor markets in our primordial economy approximate the conditions of labor markets in several of the industrializing countries during this period.

The labor markets in our primordial capitalist economy also describe – to various degrees of approximation – the conditions of as much as one-half or more of the global population of

[8] Karl Marx (1867: 521) provides evidence -- culled from official reports – of the very high rates of infant mortality in English industrial towns. For every 100,000 infants less than a year old, the number who died annually varied from a high of 26,125 in Manchester to 20,000 in 22 other districts. These deaths were "principally due to the employment of mothers away from their homes, and to the neglect and maltreatment arising from their absence, which consists in such things as insufficient nourishment, unsuitable food and dosing with opiates…" Drawing on a variety of sources, John Tang (2017: 147) describes a mortality Kuznets curve for industrialization, where the conditions of work in manufacturing activities worsened health outcomes for several decades before they begin to improve as a result of rising living standards, investments in public health measures, and medical treatment. Szreter (2004: 81) suggests that industrialization, in its early phase, exerts "intrinsically negative population health effects" on industrial workers. From 1776-1841, urban mortality in Britain was consistently higher than in rural areas (Williamson, 1990: 54). Multiple regressions on data from New England, from 1905 to 1912, show that age-adjusted mortality rates for workers in textile production were higher for mill workers compared to non-mill workers and this increased with years spent in mill work (Aldrich, 1982: 847).

[9] Most of the poor countries at the periphery of the global economy may also be classified as primordial capitalist economies. The millions of legal migrant workers in the oil-rich economies of the Middle East as well as the millions of undocumented workers in the developed countries also belong in this category.

proletarians since the twentieth century, mostly but not exclusively in the poorer countries of Africa, Asia and Latin America. Growing numbers of workers in several advanced countries too have faced, over the past four decades of neoliberal globalization, increasing job uncertainty, immiseration, and loss of rights and benefits that were available to their parents and grand-parents. Several of the rich countries also employ increasing numbers of temporary migrant workers with none of the protections, benefits and even basic rights available to the native proletarians. Millions of cheap migrant workers in the oil-rich Gulf countries become captives of their employers – who seize their passports – preventing them from changing employers or even returning to their home countries.

There exists another compelling reason for choosing primordial economies for our comparisons. Since protagonists of capitalism laud free markets for promoting the freedom of workers, our comparisons of workers and slaves too must occur in the context of free labor markets. In our primordial capitalist economy, therefore, there exists no regulation of wages, hours of work, or safety at work; likewise, there exist no unemployment benefits, welfare programs, mandated vacations, employer or tax-funded health care, and pensions. In equal measure, we also exclude trade unions, and the support that charities, families and friends offer to unemployed, sick or injured employees. Governments in this economy exist only in the capacity of Adam Smith's night watchman.

In addition, we assume that all free persons and slaves belong to the same race or ethnicity.[10] A racially and ethnically homogenous population will allow us to exclude those restrictions on slaves – especially in the United States – which were the result of an entrenched white racism against peoples of color. In addition, by assuming that all free persons and slaves belong to the same race or ethnicity, we may be excused – *only for the purpose of the present exercise* – if we abstract from the sensitivities arising from the historical association of blacks with slavery. We have no doubt about the immorality of slavery per se; the subordination of one person to the will of another is an unacceptable violation of human dignity, of the fundamental right of each sane and adult person to make decisions about her work and her life.

3. Occupational Freedoms

"As liberals, we take freedom of the individual, or perhaps the family, as our ultimate goal in judging social arrangements."
Milton Friedman (1962:13)

The ideology of free labor maintains that a legally free person who owns her own person, her time and working capacities can freely choose the uses of her time and capacities. On the other hand, since a slave lacks self-ownership, her master makes these choices for her. These inferences are simplistic: we need to take account of the fundamental asymmetry in the employment relationship, which together with a plethora of other factors may affect the proletarian's ability to make occupational choices.

[10] Slavery in the USA especially, and in the Americas generally, was deeply contaminated by "the most implacable race-consciousness yet observed in virtually any society… (Elkins,1959: 61)." Although, it may not always be easy to disentangle those features of slavery in the USA that originated in racism from others that were germane to the status of slaves as property (Arnold Sio: 1965).

Consider the fundamental asymmetry between workers and the capitalists in free labor markets. Barring minor exceptions, lacking the means of production, a proletarian cannot organize production, and this forces her to sell her working capacities to a capitalist to make a living. Nearly always, it is the capitalist – with command over the means of production – who organizes production; and since she creates jobs, she also decides whom to hire for these jobs. In consequence, the proletarian in our economy appears before the capitalist as a supplicant, seeking a job that is nearly always her only chance of survival. As a consequence, there exists an asymmetry between the capitalist and wage-worker – even in their individual capacities – where the capitalist 'creates' jobs and, thereby, exercises the power to *hire* workers, while the worker appears before the capitalist seeking to be *hired*, and, therefore, secure a means of subsistence.

Other factors augment this asymmetry. A capitalist may close her business – for whatever reason – and survive for weeks, months, even years on her savings, and likely in comfort too. In our economy, without labor unions, charities or help from friends and relatives, a proletarian who withholds her labor may survive for a few days if she owns some household effects that she can exchange for food. What this means is that a worker who turns down one job, in the expectation of a better one – if disappointed in her expectations – may find herself facing starvation, sickness, and, ultimately, death, within a few days. On the other hand, except in very tight labor markets, the capitalist can pick and choose from multiple applicants for the any given job. This endows the individual capitalist with power to discriminate against people she may not like because of their race, religion, gender or ethnicity. In other words, the free labor market may endow the individual capitalist with the power to engage in discrimination.

This fundamental weakness of the proletarian in relation to the capitalist, we can expect, will adversely impact her ability to make free choices about the manner in which she disposes of her working capacities. In examining the proletarian's occupational freedoms, we also have to consider a host of other factors, including the characteristics of a proletarian, the state of the economy, and the state of labor markets for particular skills. We are now ready to consider, one by one, the ability of workers to exercise some of the most important occupational choices.

Are Proletarians Free to Sell their Labor?

A proletarian is legally free – that is, she owns her own person – but is she free to decide whether to sell or not to sell her labor to an employer?

According to John Locke's conception of negative freedom, when a person undertakes a course of action, **A**, she does so freely if at least one alternative course of action, **B**, is also available, so that "had [she] willed to do otherwise [she] would have been *able to do otherwise* (italics added)."[11] What are the alternatives to wage work that are available to a proletarian? You might think that the proletarian has at least three alternatives to wage work. She may steal, live off the charity of society, or engage in self-employment. Few persons choose to steal as a way of making a living since this has its risks. If caught, they will suffer the confinement of prisons or face the severe justice of mobs. Charity is ruled out as an option in our analysis of primordial

[11] This is how William Rowe (1987: 45) puts it: "An act is free if it is voluntary *and* it is true that had you willed to do otherwise you would have been able to do otherwise."

labor markets; this requires that workers make a living by selling their working capacities. Transfers to workers amount to external interventions in labor markets.

The proletarians are free to engage in self-employment in our primordial economy, but these opportunities shrink as the economy advances. By definition, it is quite unlikely that proletarians will possess any collateral against which she can borrow money to start a business. In a few rare cases, a proletarian with a compelling business plan may be able to attract venture capital and start her own business. A proletarian with some talent, say, for performing card tricks or possessed of a singing voice, may be able to find an audience for her talents; if she possesses no particular gifts but has access to a small amount of capital, she may become self-employed in activities that require little or no initial capital, as street hawker, house-cleaner, grass-cutter (using a sickle), or ragpicker; and if she possessed neither talent nor small amounts of capital, she could sell the use of her body, sell her blood, or make a one-time sale of her kidney.[12]

Cohen (1982: 7) has argued that the proletarian does have an acceptable alternative to wage work; some of them do "secure positions in the petty bourgeoise and elsewhere…" The initial capital for this exit, she claims, consists typically of savings and some form of external assistance. We have ruled out external assistance in our primordial capitalist economy. As for the chances a proletarian might have of breaking out of wage work, most likely these may be quite rare since the great majority of workers receive wages that are close to subsistence. In addition, the kinds of self-employment that Cohen has in mind require quite a bit more than trivial amounts of capital – such as funds to invest in an office, cab, truck, shop, stock of goods, or tools – hence, the great majority of proletarians will be excluded from these forms of employment. In other words, the vast majority of them have only one option before them for making a living: they must rent themselves out for a wage.

Have we left out an obvious alternative to wage work: might not some proletarians see death as an alternative to the indignity of wage work, as an alternative to wage work? Few people choose to starve themselves to death in order to avoid wage-work; instead, starvation is the consequence of the failure to find work that will pay for food. Further, death cannot be considered as an alternative to wage work. For an option to be considered an alternative to wage work, it must be another way of fulfilling the objective of wage work, that is, earning a wage that sustains life. Death cannot be said to sustain life: it ends life.

Are workers really free to *choose* to die of starvation? Faced with growing deaths from starvation, capitalists would worry about the resulting rise in wages, and, most likely, would seek to criminalize it. As a result, workers starving themselves may well be force-fed, and when they have recovered their strength, given the choice of wage work or going to prison. In other words, the starvation option may well be illusory, ensuring that the overwhelming majority of workers have no alternative to wage work.

There is another problem with the options that a worker often faces: some fraction of workers may not be able to find a job at the going wage rates. A recession has occurred roughly every ten years, during which the economy faces generalized unemployment; less frequently, the economy also goes into a depression which lasts longer and produces much higher rates of

[12] Also, see Denning (2010: 81) on what she calls the 'wageless life.' She writes, "You don't need a job to be a proletarian: wageless life, not wage labor, is the starting point in understanding the free market."

unemployment.[13] Some workers face seasonal unemployment every year; others face structural unemployment due to shifts in demand or supply. When such unemployment lasts for weeks and months, those workers who lacks savings will face starvation, homelessness, sickness and death in a primordial economy. On the other hand, when slave masters encounter adverse markets for their products, it is unlikely that they will let their slaves die, not because they are kinder than capitalists but because slaves are an important part of their wealth. If some masters find that they cannot feed their slaves, they will sell them to others who can feed them. Thus, barring major catastrophes, the logic of slavery works to preserves the lives of slaves.

Are Proletarians Free to Switch Job/Employers?

If nearly all proletarians have no choice but to work, is she not at least free to exercise choice over her place of work, her job or her employer?

Implicitly, the answers to these questions are contained in the discussion of the previous subsection. Let us start with a proletarian doing a job that requires some set of skills, with an employer, and location, all of which may have been determined by the accidents of birth and family history. Assume that she does not like the demands of her current job, her employer and location. Changing all the dimensions of her job will likely be a daunting undertaking, since each of these change will likely be costly in information, time, money, and other adjustments, depending on how she goes about changing the dimensions of her job.

The cost of changing any of dimension of her job may well be higher than the resources available to most proletarians for two reasons. First, given the long working hours that were common during the nineteenth century, they may not have had the time to engage in job search, especially if search involves knocking on the doors of employers. Since most factories are likely to be closed on Sundays and holidays, they can engage in job search or appear for interviews only if they can take time off from work without risking loss of the current job. Second, job search and moving to a new job will require savings, and workers with wages barely above subsistence may not have the necessary savings.[14]

In order to minimize the costs of search and moving to a new job, a worker may choose the change which produces the greatest benefit to her and her family. If this happens to be a change in what she does on the job, she may have to acquire new skills *before* she starts the job search. If her work week is long, as it was during the nineteenth century, very few workers may have the free time to acquire new skills, and if she has the time, she may not have the money to pay for learning these skills. A few workers may be able to learn the new skills at the workplace by observing workers with these skills in action. Even after she has acquired the new skills, she may lack the time and money to engage in job search. She will then have to wait – while cultivating contacts at her current workplace – for an opening to emerge with her current employer. Alternatively, she may use her new skills and current location, and, instead, find a new employer.

[13] According to one study, there were around 30 depressions across the world between 1720 and 1990 (Kindleberger, 1996).

[14] According to a report of the Fed (2019), 39 percent of American households in 2018 would be unable to cover an emergency expense of $400 from cash or its equivalent.

Changing the location of one's job may involve multiple associated costs. Some workers may be tied by fixed-term rental agreements; their spouses if they work and their school-going children too may be tied to the same location. The choice of new locations may also be restricted for some workers because discrimination by employers on the basis of race, religion or ethnicity – because of the fundamental asymmetry between workers and employers – is costless in all but the tightest labor markets.[15] The chances of finding a new employer may also run into difficulties because of the worker's age, gender, or some disability. Considering the long list of factors that may adversely affect the mobility of workers, it is likely that workers with several of these handicaps will face significantly lower chances of switching jobs or locations even if they have long hated their present jobs.

In a primordial capitalist economy, employers may also use the power they derive from the asymmetric employment relations to impose restrictions on the mobility of workers. During the nineteenth century, there existed a variety of labor practices in the mining and agricultural sectors of Britain that restricted the mobility of the workers; under 'tied cottage' a worker who rented a cottage from her employer had to vacate the cottage if she lost her job; or they could not leave their jobs without the employer's permission; etc.[16] According to a report from the Environment, Food and Rural Affairs (EFRA) Committee of the House of Commons, 2003, such coercive employment practices are still to be found in Britain.[17] In recent years, major corporations have turned to two similar practices: under no-poach agreements, corporations require franchisees not to hire employees from other franchisees; at the same time, non-compete clauses in job contracts may prevent employees from taking jobs in rival companies.[18] Similar restrictions on worker freedoms exist in developing countries, even when they are in violation of existing laws. According to a report of the India Committee of the Netherlands (2016), half of the 743 spinning mills surveyed in South India confined their workers to factory-operated hostels after the end of the workday, and withheld part of their wages until they had completed their contracts. In addition, the young female workers in these factories "face intimidation, sexually colored remarks and harassment, which they can hardly escape."[19]

Some asymmetries in the employment relationship have stayed with us; and new ones have been added in the past few decades. While the capitalist in the USA can fire her workers at will,

[15] According to report published by Liberties (The Civil Liberties Union for Europe), "Older job seekers and job seekers with a foreign background are invited twice less often for job interviews than native Dutch under the age of 35, the Ministry of Social Affairs and Employment wrote on September 1, following a survey ordered by a government minister. The outcome confirms research by the Netherlands Institute for Social Research from earlier this year." Liberties (Sep. 08, 2015).

[16] See Tom Brass (2004: 317). Tied cottages consisted of dwellings owned by employers and rented to their employees only as long they stayed on the job.

[17] "What emerges clearly from this EFRA Committee Report is the degree to which forms of labor recruitment/control/coercion long associated either with a developing capitalism in the nineteenth century, or with backward agriculture in so-called Third World countries during the twentieth, are in fact a characteristic of current agribusiness in metropolitan capitalist contexts. In this regard, the Report merely confirms the presence of a global trend in the relational forms and employment practices utilized by capital, but a trend that has not always been recognized (Tom Brass, 2004: 325)."

[18] Ashenfelter and Krueger (2018: 5-6) studied 2016 franchise agreements from the largest franchise chains in the United States, each of which had more than 500 units in the USA. They found that 58 percent of these agreements contained some version of no-poach clauses.

[19] India Committee of the Netherlands (2016).

the employee cannot 'fire' her employer at will – even when she is not obligated – without fear of paying a price; some are contractually obligated to serve a notice before leaving.[20] Some economists have offered a rationale for this discrepancy. The departure of a worker may impose costs on the capitalist; but sudden dismissal of workers is likely to impose a greater proportionate burden on the employee, since this may produce months of joblessness and even homelessness. In contemporary USA, some major corporations contractually limit the employment choices of their workers.[21]

All things considered, it would appear that a significant portion of workers in a primordial economy will likely face reduced chances of mobility, thus making them vulnerable to coercion from employers. This is contrary to the simplistic argument offered by Milton Friedman (1962: 14-15) to rule out the existence of coercive pressures by employers against employees. "The employee is protected," she argues, "from coercion by the employer because of other employers for whom she can work…" That is, the free market itself would eliminate employers' coercive practices against workers. Perhaps aware of her weak logic, Friedman adds a smear, "Underlying most arguments against the free market is a lack of belief in freedom itself." Friedman is unwilling to acknowledge that her logic – that free markets will eliminate coercion of workers – will only obtain where costless mobility is available to all workers, a condition that rarely holds, if at all, for any real-world labor market.

Are Workers Free to Choose their Work Schedule?

Are workers in a primordial economy free to choose their work-schedule: their working days, work hours per day and per week, the hours of work, and breaks during work?

In a celebrated paper, Clark (1994) has shown that the rigid discipline of the factory became the norm over the nineteenth century; before that workers controlled the work schedule and the pace of work. This transition, he argues was the result of competition between factories with discipline and those without it. The discipline imposed on workers led to higher productivity, but this was proportionately less than the higher wages paid to them. But this solution is problematic. It assumes that all workers have the same trade-off between autonomy at work and wages, so that higher wages induced all of them to sacrifice autonomy. In the real world where workers' preferences are not identical, we would expect to observe an industry equilibrium with varying levels of autonomy inversely related with the varying levels of wages.
Clark arrives at her conclusion by ignoring two properties of real-world labor markets. The first point she misses is that rigid work schedules most likely result in higher rates of worker injuries, greater stress on the job, unmet family needs, and, in the long run, poorer health, and lower life expectancy. Initially, the factories with rigid discipline may produce at lower costs, but over time productivity would begin to decline as the deleterious effects of this tyranny begin to accumulate. The capitalists, however, could externalize these costs by firing workers whose

[20] If the workers leave without serving a notice, she may lose her remaining pay and other benefits; she cannot ask her present supervisor for a reference; and it is unlikely that her present employer will ever employ her again.

[21] We will mention only two here: just-in-time scheduling by retail businesses requires that workers stay on call 24 hours a day during some days of the week; and as many as 20 percent of workers in USA were bound by employment contracts with noncompete clauses in 2014 (Starr, Prescott and Bishara, 2018).

performance fails because of these deleterious effects. At the same time, faced with competition from factories with work discipline, the others too would be forced to adopt work discipline or become extinct. Before long we would have an industry where all factories would impose a tyrannical work regime on their workers. Factories with flexible work would become extinct.

On the contrary, slave masters have a property interest in their slaves, so that they will view any degradation in the working capacities of their slaves – hence, their resale value – as their internal costs. What this means is that the slave boss will be forced to take account of the impact of the work schedule of the slaves on their health, morale, and rate of injuries at work and off work. As a result, we may expect that the slave master who designs a work schedule for her slaves is likely to be cognizant of the medium- and long-term deleterious effects on the rate of injuries and the lifespan of the slaves. A capitalist has no stake in her workers beyond the day or the hour; while the slaves are like capital goods, the longer they last the greater the returns to the slave master.

The differences just described between workers and slaves implies that the latter are likely to have a greater measure of control over their work, despite the threat of the master's whip. Occasionally, she could avoid work by malingering or even injuring herself; she could employ other subterfuges, such as foot-dragging whenever round-the-clock supervision was not possible or too costly. Plantation slaves may get time off from work because of sickness, injuries, rain, storm, extreme heat, snow or flooding; on any one of these occasions, a capitalist would likely lay off her workers. Further, given the nature of plantation work, it might not be possible to keep the slaves doing a full day's work all year round. In societies free from the scourge of racism, slaves could gain their freedom through manumission agreements; under Islamic law they had the right to demand such agreements.[22] Slaves could also gain conditional freedom under contracts which stipulated making regular payments -- to their owners -- from their earnings as wage-workers or from self-employment. On the other hand, workers are nearly always laid off when there is no work or they are unable to work, whatever the reason.

Are Proletarians Free to Acquire Skills?

Although slaves are unfree and proletarians are free, they may well be better skilled than proletarians in our primordial economy.[23]

This paradox is easily explained. While they are free to do so, most proletarians lack the means to do so. Investing in skills requires time, and, often, money. Proletarians may lack the time because of inordinately long working hours; and their subsistence wages may not permit any savings, unless they are single and do not have to support their old or sick parents. At the same time, the capitalist bosses generally lack the incentive to pay for their workers to acquire transferable skills.

[22] "Islamic law provides a number of ways," writes Lewis (1990: 8), in which a slave could be set free. One was manumission…" Manumission included the children of the slave.

[23] It is easy to identify some skills – such as picking locks, sword fighting, pugilism – which the master may well prevent her slave from acquiring unless the former can put them to her own use.

On the other hand, in the absence of racism that strives to reinforce their low status by keeping them illiterate and unskilled, the slave masters have a direct interest in enabling and helping their slaves to acquire new skills. As we explained in an earlier subsection, farm and plantation slaves were also likely to have more spare time than proletarians. In the Islamic world, from the ninth century until the eighteenth, several dynasties bought or captured slaves – known as *mamluks* – at a young age, educated and trained them, according to their aptitudes, for service in different branches of the government, and those who had talent could reach the highest military or civilian offices in the realm.[24]

Despite the deep racism in the American South that sought to keep the black slaves both illiterate and unskilled, the economic interest of the slave masters sometimes proved stronger than their racism. Contrary to the popular conception that black slaves in the Americas were used only for their brute strength, the historical record from the last three decades of the antebellum South reveals that slaves were not limited to menial jobs. According to Fogel and Engerman (1974: 40), "over 25 percent of males were managers, professionals, craftsmen, and semiskilled workers…." Although only six percent of the slaves lived in cities and towns, more than a quarter of the slaves in one Southern city – Charleston – consisted of artisans. In two of these crafts, carpentry and masonry, slaves outnumbered the whites, and a few even rose to become architects and engineers. A significant portion of the slaves living on plantations also held skilled jobs. Seven percent of the male slaves on the plantations held managerial positions, about twelve percent were craftsmen, and 7.4 percent held skilled and semi-skilled jobs in the domestic sector: working as teamsters, coachmen, gardeners, stewards and servants.[25] Although data on the occupational structure of slaves in the eighteenth century are sparse, Fogel and Engerman (1974: 42) write, "A substantial share of blacks were artisans throughout the slave experience."

Are Workers Exempt from Corporal Punishment?

Slave masters employed corporal punishment to discipline their slaves – many have argued – because they had no other recourse; while capitalists could use the threat of firing to discipline their workers. And this, supposedly, makes capitalism the more humane system of organizing production.

There are two problems with this argument. First, Nardinelli (1982: 283, 294) reminds us that employers in Britain during the nineteenth century "whipped, hit, kicked, slapped, and thrashed their child employees." Physical punishment against adult workers too was common during the eighteenth century, but it had "all but disappeared" in Britain by the middle of the nineteenth century. If this was the result of market forces, why did it take another century – or longer – to end corporal punishment of child-workers? Is it because the parents themselves used corporal punishment to discipline their children? Will parents who slap their children also allow strangers to slap them? Child labor disappeared as rising wages made it easier for parents to feed their children, family size declined over time, some schooling became compulsory, schooling brought a wage premium, and social norms about starting age for work changed over time.

[24] Charles Lindholm (1996: Chapter 14).

[25] Fogel and Engelman (1974: 39-40).

It is also a mistake to suppose that slave-owners had no alternative to the whip for disciplining the slaves. A master could sell or rent a recalcitrant slave; if this involved family separation – as it was likely to do – the horror of such separations might have sufficed to keep the slaves on tenterhooks. Corporal punishment carried risks for the slave master. It could result in injuries that might render the slave unfit for work for some time. would be injurious to slave master's profits. Frequent whippings might also increase the risk of flight or push some of them to retaliate against the master. In a plantation with many slaves, it might not be very difficult to damage tools, poison horses or cattle, unbolt the barn door, or start a fire on the masters' property without detection. Would not a slave master seek to minimize these risks? More importantly, capitalism is not necessarily more humane if, unlike slavery, it does not whip workers. Firing a worker, since it could and did result in starvation, homelessness, and eventually death, is a more lethal action than a slap. It is the myopia of our thinking that convinces us self-righteously to regard corporal punishment as necessarily more reprehensible than firings.

4. Occupational Freedoms of Non-Proletarian Workers

Non-proletarian workers (NPWs) – whose earnings exceed subsistence wages – are potentially better placed than proletarians in making occupational choices, but this potential may also be eroded by the social pressures to increase consumption with rising income.
Consider how wages in excess of subsistence may improve the potential for making occupational choices in a primordial economy. As the earnings of NPWs begin to exceed their subsistence needs, they may invest some or most of this excess in income-earning and non-income earning assets. As income flows from their assets accumulate, the NPWs can spend more time on job search; they may use their assets to become self-employed; they may use these assets to acquire new skills allowing them to enter new lines of work; they may reduce the time they spend working and, at some point, they may choose to live a life of leisure. As more and more NPWs exercise these freedoms, this is likely to improve their leverage – individually and as a class – against capital, resulting in improvements in wages and working conditions.

However, as their incomes rise above subsistence, the NPWs will come under the sway of powerful social and family pressures to spend this excess income on themselves or importunate members of their families. The urge to keep up with the Joneses is nearly universal, but this urge grows stronger in a capitalist economy where incomes as well as income inequalities tend to increase with time, and as corporations provide a growing array of non-durable and durable consumption goods. Capitalist competition also pushes in the same direction as corporations continually launch new (or supposedly new) products and improved (or supposedly improved) ones. Corporations also spend vast sums of money on advertising, packaging and marketing to maintain or increase their market shares.[26] For several decades now, banks too have been aggressively pushing consumer spending by making new forms of consumer credit available: including credit cards, lines of credit, home equity loans, and reverse mortgages.[27] Taken

[26] Knight (1922: 457) writes, "…Clark [1918: 8] … observes that the wants which impel economic activity and which it is directed toward satisfying are the products of the economic process itself: "In a single business establishment one department furnishes the desires which the other departments are to satisfy."

[27] According to two surveys, most workers in the United States and Britain live from paycheck to paycheck. See CareerBuilder (2015 and 2017) and Mui (2016).

together, these forces exert a constant, if not growing, upward pressure on consumption levels, thus canceling much of the ameliorative potential of higher incomes on occupational choices.

Corporations also act to temper or even reverse rising wages by directing R&D towards labor and skill-saving technologies. They also lobby governments to loosen the restrictions on immigration of skilled workers from lower-wage countries. Taking advantage of the new communications technologies, corporations have also been outsourcing operations that are intensive in the use of high-cost skills. All in all, capital can depend on, or activate, a variety of market forces to keep the bargaining power of the workers in check.

Most likely, capitalist bosses have known – long before economists – about how they benefit from unemployment. In 1845, Engels (1845: 117) – himself an industrialist – wrote that "an unemployed reserve army of workers" allowed businesses to ramp up production during periods of rising demand without pushing up wages. Marx added that the reserve army helps to discipline workers who are already employed (Darity, 1999: 492).[28] Michael Kalecki (1943: 326) offers similar reasoning for why business leaders oppose government policies in support of a permanent full employment economy. "Indeed," she writes, "under a regime of permanent full employment, the 'slack' would cease to play its role as a disciplinary measure. The social position of the boss would be undermined, and the self-assurance and class-consciousness of the working class would grow. Strikes for wage increases and improvements in conditions of work would create political tension." In pursuit of the same objective, Wolff (2013) maintains that most capitalists reject all-round reduction in hours of work – or shared unemployment – in lieu of firing or laying off some workers.

5. Summary of Important Results

It may be useful now to bring together the principal results of our comparison of the occupational freedoms available to workers and slaves in a primordial capitalist economy free of racism.

In the short-run, the free proletarians and the unfree slaves have few chances of exiting their respective conditions. Self-employment without owning the means of production may be open to only a tiny sliver of proletarians. Without racism and racial markers distinguishing slaves from proletarians, slaves would have a better chance of escaping their condition, as they did in Islamic societies.[29]

Proletarians face multiple constraints on their ability to change their employers, principally because job search and moving between jobs are likely to be costly – with these costs increasing with the length of the work week – given the constraints they face in a primordial economy. A slave may persuade her master to permit her to earn money on her own provided she shares some fraction of her earnings with her master.

[28] Until the end of World War II, both classical and neoclassical economics did not acknowledge the existence of unemployment; governments too did little about it. When the economics profession could not deny the presence of unemployment, some economists invented the notion of the "natural rate of employment," and this became conventional wisdom in the 1970s. Recent research shows that the natural rate of unemployment used by the Federal Reserve System in the USA is quite a bit higher than what it should have been (Bernstein: 2019).

[29] See Watkins (2016: 853-58) on slave resistance in USA despite restrictions imposed by a virulent racism.

At the workplace, the worker and slave differ little in their freedoms. In principle, neither has any control over her work or work schedule. If they do enjoy some measure of control, that is because of the nature of their job, not their status as workers or slaves on the job. On a farm or plantation, where monitoring is costly, both would have greater control over the pace of work. In a factory, because of the greater spatial density of workers and the greater use of machine-paced operations in manufacturing, the pace of work is likely to be more tightly regulated.

In principle, a proletarian is free to acquire any new skills but, in practice, she lacks the means to do so, given her long working hours and low wages; and capitalist bosses prefer to hire skilled workers rather than pay their unskilled ones to acquire new skills that would increase her value on the market. On the contrary, since the master benefits from the higher productivity of new skills, she will be happy to invest in these skills unless deterred by racism or these skills increase chances of flight.

In general, proletarians are masters of their time off the workplace.[30] However, given their long hours of work, their six-day work week, the hours spent commuting, and the time spent sleeping, they had very little leisure time away from work. In a primordial economy, the capitalist had little incentive to pay regard to the long-term deleterious effects of a strenuous work regime on the health of workers; they could replace them with younger and healthier workers. On the contrary, slave masters were less likely to impose a work regime on their slaves that would lower their productivity, since they would bear the cost of lower productivity of their slaves.

It has been argued that slaves were whipped, while workers were not whipped because they could be fired. Slave masters too could 'fire' their slaves, that is, sell or rent them out. Until 1875, under the Master and Servant law, capitalist bosses in Britain could criminally prosecute workers who left their job before their employment contract ended.[31]

At the same time, firing of workers only appears to be more humane than whippings if we ignore the costs borne by fired workers and their families because of the loss of wages.

6. Concluding Remarks

Since there is room for misconstruing the intent of this essay, it may be worth reiterating my goals.

First, the claim that capitalism, when compared to slavery, advances occupational freedom is an ideological ploy that has little basis in history. Historically speaking, the overwhelming majority of workers in most economies – before the twentieth century – were self-employed peasant-proprietors, artisans, retailers, foragers, before they became wage workers. The serfs too were mostly free once they had performed their obligatory work on the lord's demesne. When wage workers are compared to self-employed persons, the capitalist case for occupational freedoms of wage-workers loses its legs.

[30] In addition, some industries – domestic work and textiles – housed their workers next to the workplace. With telephones, computers and internet, this separation between the workplace and home began to erode.

[31] Naidu and Yuchtman (2013: 107).

Second, even if we accept the capitalist framing of occupational freedom – based on comparing workers to slaves – the argument fails to convince once we place these workers in primordial labor markets. The advocates of capitalism argue vociferously that private property in the means of production is the indispensable basis of freedoms, yet it strips its labor force -- as much as 90, 95 or even 99 percent of its population – of the means of production. As far as occupational freedoms are concerned, we find that the legal freedom of workers in primordial labor markets did not put them in a distinctly better place than slaves.

Thirdly, as for the positive freedoms, many of which arise from the security of livelihood, slavery provides this security to nearly all slaves, while capitalism fails to provide this security to its workers. Moreover, there is nothing in the logic of capitalism that ensures that the jobs it creates will support an adequate livelihood that takes care of the basic human needs for food, shelter, clothing, and health care. The capitalist will not incur expenses to reduce injuries to workers if it is cheaper to replace injured workers. Slavery cannot externalize the cost of injuries to slaves, since the financial cost of these injuries – obviously, not the pain – is borne by the slave master. All these failures of primordial capitalism are truly astonishing since most humans are likely to choose slavery when the only alternative available – as wage-workers – involves the ever-present risks of unemployment, starvation and death for them and their family. These failures of capitalism explain why capitalist ideologies emphasize freedom, *not* the right to jobs, or the right to a living wage, food, shelter, healthcare, and safe and healthy working conditions. Imagine all the efforts, obfuscations, distortions, censorship, media manipulation, and brain-washing it takes to make us turn a blind eye to these failures of capitalism: and instead glorify capitalism, based on wage-labor, as the best possible destination for mankind.

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Book Review

Steve Keen, (2021) *The New Economics: A Manifesto*, Polity Press, Cambridge, U.K., 140 pages, ISBN: 978-1-509-54528-5

Shimshon Bichler and Jonathan Nitzan[1]

Steve Keen's book, *The New Economics: A Manifesto* (2021), offers a new path for economics, and for good reason. In his view, neoclassicism, the paradigm that rules modern-day economics, has become a serious menace:

> I regard Neoclassical economics as not merely a bad methodology for economic analysis, but as an existential threat to the continued existence of capitalism – and human civilization in general. It has to go. (155).

Strong words? Of course, but they are wholly warranted. Neoclassical economics is the official scientific underpinning of capitalism as well as its main ideological defence, and according to Keen, it fails in both tasks.[2] Contrary to received opinion, neoclassicism *cannot* explain capitalism – either in detail or in the aggregate – and the policies it prescribes do not support but *undermine* the very system it defends. It must be scrapped, says Keen, and the purpose of his book is to explain why and outline what should come in its stead.

Half a century worth of research and writing on the subject has made Keen one of the world's foremost critics of neoclassical economics. His previous bestseller, the rigorous-yet-accessible *Debunking Economics* (2011), dismantled neoclassical microeconomics. His new volume hammers its macro framework.

The book focuses on three key issues: (1) the bizarre neoclassical perspective that money, credit and debt do not matter for the macroeconomy; (2) the neoclassical insistence that the economy's complex, nonlinear turbulences are best explained in linear, self-equilibrating terms;

[1] Shimshon Bichler and Jonathan Nitzan teach political economy at colleges and Universities in Israel and Canada, respectively. Their publications are available for free on their CreativeCommons website, *The Bichler & Nitzan Archives* (http://bnarchives.net/). The writing of this review was partly supported by the Social Sciences and Humanities Research Council of Canada.

[2] Although many mainstream economists would reject being labelled 'neoclassical', their core concepts – including perfect competition, rationality, utility, optimization, demand, supply, equilibrium, productivity, 'real quantities' and the belief that the 'capital stock' can be measured and aggregated in material terms (along with the endless 'distortions' of and 'deviations' from these concepts) – attest that they certainly are.

and (3) the fact that neoclassicists have hijacked the economics of climate change, using patently false assumptions to justify do-nothing policies with untold future consequences.

1. Economics sans Money

Everyone knows that capitalism is about money, that credit is king, and that debt is everywhere. Or perhaps we should say, everyone except neoclassical macroeconomists. In their view, money, credit and debt, although prevalent, don't really matter.

To backtrack a bit, economists, both orthodox and heterodox, divide the economy into two separate realms – real and nominal. The more important of the two is the real sphere. This is where you find what economists think really matter: production, capital and labour, technical knowhow, goods and services, consumption, wellbeing, utility and exploitation. The nominal sphere is about money, prices and finance, including credit and debt, and this sphere is deemed secondary. Metaphorically, the nominal sphere is like a giant mirror, a mere reflection of the real economy – though exactly what is being reflected, how accurately, and to what effect is subject to much debate.

Heterodox economists think the reflection is inaccurate, that the mismatch distorts the real economy, and that the result is booms and prosperity alternating with instability and hardship.

By contrast, neoclassicists view the reflection as accurate. In their opinion, the nominal sphere doesn't distort the real economy, it facilitates it. Money and its financial derivatives mediate the economy. Operating as a lubricant, they eliminate the friction of commodity-for-commodity barter while bridging the past with the future. But a lubricant doesn't make things, it merely makes them move more easily. In and of itself, the nominal lubricant produces nothing and generates no utility. It is simply a veil we can see through and safely ignore.

And that is exactly what neoclassicists do. Their basic models, both micro and macro, are articulated in real terms, usually without any reference to money, nominal prices, debt and credit. These latter entities enter the picture mostly as final decorations, addons whose main purpose is to account for inflation, deflation, currency fluctuations and other nuisances brought about – or so we are told – by the distorting interventions of governments.

According to this perspective, points out Keen, private credit and debt are inconsequential. A money loan of one person is a money debt of another. They cancel out. And since banks simply translate the saving deposits of some into loans made to others, they too are inconsequential.

Of course, banks are not useless. They help eliminate the friction of barter and facilitate the creation of deposits-read-money through the money-multiplying cycle. But according to the neoclassicists, says Keen, they do so merely as *instruments* of the state. It is the state that issues high-powered money; it is the state that injects this high-powered money into the banking sector; and it is the state that uses its reserve ratio and interest rates to regulate the subsequent money-multiplying cycles in which bank loans turn into bank deposits. The private sector – both banks and borrowers – can only limit this process by lending and/or borrowing less than the maximum, but it has no control over that maximum. Only the state does.

The neoclassical view of public finance is very different. Unlike private debt, which neoclassicists claim is offset by private credit and therefore has no macro consequences, public debt eats into private activity. When the state spends – usually inefficiently and unproductively according to the neoclassicists – it 'crowds out' efficient private investment. Moreover, to finance its spending without stocking inflation, the state must borrow from the private sector, and as this borrowing and its associated debt services accumulate, they choke the country's finances, causing more crowding out and lowering economic growth even further. In the neoclassical universe, government is bad business.

But this view, Keen argues, puts the world on its head. To start with, as heterodox economists have long claimed and MMT (Modern Monetary Theory) recently formalized, deficit spending does not require the state to borrow anything: its very spending *creates* new-deposits-read-new-money. In this context, the only reason for government to tax is to eliminate this newly created money. Moreover, when the economy has unused capacity – and modern capitalism almost always does – state spending crowds out nothing. Putting unused capacity to work boosts economic activity, not undermines it. Finally, unlike private debts, the public debt, provided it is issued domestically, cannot drive a government that creates its own money 'out of business'. In this sense, it is rarely if ever destabilizing.

The situation with private credit and debt is exactly the opposite. First, contrary to the neoclassical stand, says Keen, banks are not passive intermediaries under the thumb of their government regulators. Far from it. According to recent Bank of England and Bundesbank publications, private banks extend loans – and in so doing create new money – *independently* of their existing deposits and usually with full accommodation from their central-bank regulators. In other words, the new money they create does *not* cancel out, which means that neither the banks nor the money they create can be ignored by macroeconomic theory. Moreover, the size of this newly created privately money can be as big as one third or more of aggregate demand, so it has enormous impact on the level of economic activity. Finally, and crucially, this 'bank-originated money and debt', or BOMD, as Keen calls it, is highly volatile. According to Keen, these three considerations imply – and long-term time series confirm – that bank-originated money and debt are a key driver of the economy and a major contributor to its booms and crisis. And this situation, he adds, must be changed.

In his opinion, high private debt, which neoclassicists are indifferent to and even encourage, is in fact the biggest threat to capitalist stability. And this threat, he and others argue, can and should be defused in two main ways. One is a 'modern debt jubilee' that will replace private bank debt with new fiat money and corporate debt with newly issued equity. This scheme will keep the overall amount of money in the economy unchanged, but in substituting fiat currency for private debt it will curtail the risk of triggering what Irving Fisher famously called 'debt deflation'. The other way to reduce the risk posed by private debt is to redirect private lending from speculative to productive activity and limit unproductive debt-boosting trading on the secondary equity market.

This analysis is exactly opposite to the one offered by neoclassical macroeconomics, and if credit money and debt – along with the private banks that create and regulate them – matter as much as Keen insists, it means that neoclassical macroeconomics must be rejected. And that's just for starters.

2. Economics sans Complexity

Keen's second point is that, regardless of their theory, neoclassicists are locked into an outdated mode of analysis. The economy, just like our brain and the ecosystem, he points out, is a 'complex system'. Its components interact in *nonlinear* ways, and the outcomes of these nonlinear interactions are *inherently* unstable. Neoclassical analysis, though, is oblivious to these patterns. In general, its models are linear rather than nonlinear, and the way in which they are conceived and constructed leads to stability rather than instability.

To non-economists, this latter type of modelling may seem puzzling. If the neoclassical emphasis on linearity and equilibrium is right, where do business cycles and major crises such as the Great Depression of the 1930s and the Global Financial Crisis of the late 2000s come from? The neoclassical answer is simple: they are 'exogenous'. They come from *outside* the model. In their scheme, the business cycle is the fault of technological shocks; stagflation is the fault of greedy labour unions, Middle East oil sheiks and the weather gods; and great depressions are due to monetary policy errors and other sundry distortions. According to the neoclassicists, these factors are all important; but since they are external to the economy proper, they are someone else's problem, not theirs.

And that's even stranger. If important factors affecting economic change come from outside the model, why not internalize them? Just think how flaky it would look if physicists kept the bending of space/time, entanglement, dark matter and black holes exogenous to physics proper.

But neoclassical economists aren't physicists. Yes, they claim to be scientists. In fact, in their view, their economics is the 'hardest' social science of all.[3] Unlike physicists, though, neoclassicists have another role, which is to protect and defend the capitalist system, and to do so at all costs. And when these two roles conflict, it is always science that yields.

The question of whether to use complex or linear models is a case in point. Neoclassical dogma emphasizes the 'invisible hand'. A free market economy, it stipulates, doesn't need instructions from God or his earthly representatives. It governs itself, automatically and optimally. Left to its own devices, it leads to prosperity, stability and justice, and this supposed outcome serves a purpose. It makes capitalism look like the best of all possible worlds and offers an effective slogan against alternative forms of social organization. Clearly, it cannot be given up. And since complex-systems analysis shows this outcome to be practically impossible, it will be suicidal for neoclassicists to ever endorse let alone adopt it. Science be damned.

Of course, throwing away science has consequences. During the 1970s and 1980s, post-Keynesian economist Hyman Minsky proposed his 'financial instability hypothesis', arguing that a relatively stable capitalism encourages borrowing that is initially hedged (with enough earnings to cover both repayment and interest), subsequently speculative (with earnings

[3] Here is a telling anecdote. In the late 2000s, just after the Great Financial Crisis, one of us (Nitzan) requested to have his political science undergraduate seminar, 'Political Economy of Capital Accumulation', cross-listed with the economics department at York University. The economists rejected the request with a one-liner: 'we do things rigorously'.

covering only interest payments), and finally Ponzi-like (where earnings cover neither repayment nor interest).

The surface tranquillity of this process, Keen points out, misled neoclassicists to celebrate the apparent dampening of the business cycle (the 'great moderation') while blinding them to the incessant build-up of hedged-turned-speculative-turned-Ponzi private debt. No wonder they were dumbstruck when the Global Financial Crisis of 2007-10 finally popped the bubble.

Keen himself wasn't fooled by this great moderation. In the mid-1990s, he predicted the coming financial crisis, and his prediction was not a mere hunch (Keen 1995). Impressed by complex-systems analysis, he developed a nonlinear Minsky-like model (and subsequently named his software package after him!). Using very simple macroeconomic aggregates, the model shows how increasing economic stability encourages the build-up of private debt till the system eventually crumbles under the weight of debt deflation. Instability, his model demonstrates, is *inherent* in the complex-systems nature of capitalism.

The success of such models puts neoclassicists in a bind. On the one hand, having celebrated the end of deep crises while a major calamity was brewing right under their nose made them look incompetent, if not plain silly. On the other hand, they remain politically forbidden from adopting nonlinear models such as Keen's, lest these models show that crises come not from outside capitalism, but from within.

Their usual justification for rejecting nonlinear modelling is that they lack 'micro-foundations' – or, in simple words, that they don't rely on autonomous, maximizing agents. But this justification is mis-founded, and for the most embarrassing of reasons.

First, as Keen points out, macroeconomic models cannot be derived from neoclassical micro-economic foundations, because these micro-foundations lead to macro-contradictions. In and of themselves, the individual atoms of the neoclassical world – namely, its autonomous utility-maximizing consumers and profit-maximizing producers – tell us exactly nothing about market demand and supply curves. As neoclassical economists (should) know full well, movements on downward-sloping individual demand curves change the distribution of income and therefore shift those very curves; if the individual downward-sloping demand curves shift, the *ceteris paribus* assumption (all else remaining the same) no longer holds; and without *ceteris paribus* these curves cannot be aggregated, let alone aggregated into downward sloping market demand curves.[4] Similarly with the supply side. In neoclassical theory, individual supply curves comprise the portion of the firm's marginal cost curve above its average cost curve. But as neoclassical economists (should) know full well, empirical cost curves of individual firms do not rise with output, but rather move sideways or down. In other words, they lie either on or below average cost, leaving nothing to be aggregated into a market supply curve! In short, the so-called micro-foundations of macroeconomic models are a null set.

Second, the very idea that one can deduce the overall rules of any system from its so-called micro particles is dubious to put it politely. If this were the case, says Keen, we would need

[4] Neoclassicists bypass the problem by making all consumers identical and assuming their preferences don't vary with income, so that the redistribution of income no longer matters. Apparently, replacing autonomous liberalism with a mind-numbing caricature stricter than Aldus Huxley's *Brave New World* is a tiny price to pay for theoretical consistency. Way to go.

nothing other than the elementary particles of physics to explain the whole of chemistry, biology, physiology, society, the ecosystem and everything in between. Even if neoclassical economics had legitimate micro-foundations (which it doesn't), they would not be enough to explain the system's macro behaviour.

3. Economics sans Nature

The last key point in Keen's journey is that neoclassical economics abstracts from nature (there are no energy inputs or waste in the standard neoclassical production function), and that this abstraction is not only theoretically misleading but deeply dangerous for capitalism, the human race and planetary life more generally.

If the economy continues to grow as fast as it did over the past century, at roughly 2.3 per cent annually, in about 1400 years humanity will need the entire energy emitted by sun, and in roughly 2500 years it will require the energy generated by the entire Milky Ways – that is, assuming we don't toast ourselves out of existence much earlier (Murphy 2021: Table 1.3, p. 9).

And toast ourselves we will. In slightly more than 400 years, even without counting global warming, the waste energy of human industry will raise the average temperature to 100 degrees Celsius, which is when water boils – though, by then, the plant would have been made uninhabitable already (ibid, Table 1.4, p. 12).

The neoclassicists, though, don't see it this way. For those of them dealing with this subject, climate change is really a non-issue. Even if it occurs, they argue, its impact on the economy will be negligible. According to one consensus estimate cited by Keen, a global rise of 3 degree Celsius by 2090 will reduce annual GDP growth by a minute 0.015 per cent. In other words, humanity is safe doing nothing about it.

The problem with these easy-going predictions and do-nothing policy recommendations, says Keen, is that they are baseless. Not only are they senseless, but they contradict the consensus view of real scientists that climate change will make large parts of the world uninhabitable, while undermining vegetation and other forms of life.

So where does this deep divide between the 'two cultures' come from? For Keen, the original culprit is Milton Friedman, who convinced his fellow neoclassicists that, in science, assumptions don't matter. You can assume anything you like. The only thing that matters is your predictions. And that's exactly how neoclassicists model their world.

They begin by observing that planetary temperatures have a range. To illustrate, the difference between cold Canada and hot Burkina Faso is nearly 34 degrees Celsius. And since this large cross-section difference is tolerable, so must be a temporal increase in average global temperature, particularly if that increase is only a few degrees Celsius.

The problem, says Keen, is that cross-section differences in temperatures are nothing like temporal changes in the climate of the entire plant. And there is more. Since assumptions don't matter, the neoclassicists go on to ignore the rise of 'wet-bulb temperatures' that scientists warn will make large sections of the world lethal. They also disregard changes to atmospheric and

ocean currents that could radically alter climate patterns around the world. And, most importantly, they snub the numerous climate tipping points that scientists warn about, as well as the possibly of a 'tipping cascade' that might amplify climate change many times over.

And that isn't the end of it. In their works, neoclassicists disregard the socio-political turmoil that will begin way before the full impact of these natural processes is felt. And they are totally silent about financial markets, whose forward-looking anticipation of these changes could rock the world before any of their material and social consequences come to bear.

For the neoclassicists, assuming these conditions away is sensible. After all, their main role is not to search for the truth, but to defend capitalism. And since most scientists are convinced that capitalism warms the plant, the neoclassical reply is that this warming is inconsequential.

And that is where Keen sees a bitter-sweet ray of hope. In his view, the rosy neoclassical climate predictions will prove dead wrong; the gravity of this failure will help expose the fraudulent underpinnings of the neoclassical dogma; and this exposure will open the door to a 'new economics' where assumptions matter, and where money, complexity and nature are taken seriously. Hopefully, we'll survive to see it happen.

4. Beyond Economics

This is a brilliant book. It deals with a crucial subject, and it does so with precision, wit and accessible prose (though some parts are more demanding than others). We recommend it highly to anyone who wants to understand the key challenges of our time. Even neoclassicists might find it educational!

But the book also has one important limitation: it is about economics.

Keen offers to replace neoclassical dogma with a new way of thinking, researching and engaging with the economy. And while we agree that neoclassicism is a religion dressed as a science, in our view, what should come in its stead is not a different type of economics, but a new theory of capitalism more broadly.

This isn't semantic nit-picking. All economic theories – including neoclassicism – engage with non-economic entities and forces. They all agree, willingly or reluctantly, that politics, sociology, anthropology, psychology, international relations and other aspects of society affect the economy. But these effects, whether supportive or distortive, are assumed external to the economy proper. And this assumption is pivotal. Although the effects of these so-called external factors alter economic outcomes, they leave the economic *categories* themselves intact. And this bifurcation, we argue, is the Achilles' heel of all economic theories, orthodox and heterodox, old and new.

In our view, capitalism is not an economic system, but a conflictual *mode of power*. Those who rule this mode of power – its dominant capitalists, politicians, mainstream academics, opinion makers and the various organizations they control – make every effort to conceal its power features. This is why neoclassical economics, beholden to its masters, can never be a science. But the problem besieges every and any economic theory that keeps power external to its basic categories. In our opinion, it is only when the study of capitalism substitutes for the narrow

understanding of its economy that power can assume centre stage to reveal what economics is structured to conceal.

Hopefully, Keen's next project can expand in that direction!

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Book Review

Fullbrook, E. and Morgan, J. (2020)

Modern Monetary Theory and its Critics,

World Economics Association Books, Bristol, U.K., 434 pages, ISBN-13: 978-1911156512

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The book edited by Fullbrook and Morgan is a collection of articles published in Issue 89 of the journal, *Real-World Economics Review*. It assembles eighteen articles from experts who offer their vision or criticism of Modern Monetary Theory (MMT) that has been popular in the media given fiscal austerity, stagnating wages, rising inequality, and climate change. This review focuses on salient ideas that could be presented to economics students in a way that would challenge mainstream viewpoints including that budget deficits crowd out private investment, that government spending is constrained by taxes and borrowing, or that money is solely created by the central bank. Another motivation for this review comes in the context of the economic crises faced by countries like Pakistan that reel under currency depreciation, dependence on imports for food, medicines, and energy, and the unhelpful conditions stipulated by IMF loans. The idea is to explore whether MMT has any hope to offer such countries or whether it is predominately applicable to the U.S. whose dollar serves as the world reserve currency. Thus, the key ideas presented in this book are systematically delineated below.

A Review of Salient Ideas

In his article, Wray introduces the readers to a primer on MMT. He highlights the conditions for monetary sovereignty that forms the basis of MMT. These include a government that borrows and collects taxes in a currency that it issues, and which therefore faces no financial budget constraint (p. 10). Additionally, this currency issuing government can set the interest rate on its obligations by buying bonds (p. 11). Wray emphasizes that MMT does not justify that the government "spend without limit" or that the central bank "print money" to finance deficits (p. 11). Instead, while downplaying financial constraints, MMT upholds real resource constraints so that it recognizes that excessive spending or poorly targeted spending can cause inflation (p. 12-13). However, Wray adds that the size of deficits and debt do not accurately reflect the "inflation potential of additional government spending", as modern economies operate with enough underemployment and unused production capacity (p. 13).

Wray states that MMT is critical of monetary unions, pegged exchange rates, dollarization, borrowing in foreign currency, tight budgets or austerity, and independent monetary policy with high interest rates, as despite being promoted by institutions like the IMF, they have not helped either advanced or developing countries (p. 15, 16). He rejects the textbook theory that money developed as a medium of exchange to replace the inefficient barter system and instead states

that money arose as a unit of account to facilitate tracking debt and credit and also to pay taxes (p. 17-18). He adds that taxes are not to generate revenue but to incentivize people to hold money and to withdraw money from circulation to curb inflation (p. 19-20). Moreover, in contrast to the textbook idea that savings lead to deposits, he highlights the endogenous money theory where banks issue loans that create deposits and that therefore banks create money (p. 28-29). Thus, MMT challenges the textbook depiction of the creation of money.

According to Wray, MMT challenges the ideas that deficits crowd out private investment, that the government is leaving debt for future generations, and that the U.S. is dependent on Chinese lending (p. 29-30). Instead, he states that budget deficits create private sector income and crowd in private investment, that such income supports imports, that current account deficits lead to the Chinese buying safe American assets where the U.S. government can meet obligations by issuing currency and by setting the interest rate and that therefore the U.S. is not dependent on Chinese lending (p. 30, 34, 35). Similarly, MMT challenges the idea of central bank independence to prevent hyperinflation as illusory for such independence is limited to choosing the overnight interest rate (p. 38-39). Finally, Wray states that capital flight causing an interest rate hike and exchange rate depreciation in response to government debt is overblown, as the central bank controls the interest rate by simply announcing a target rate (p. 42).

Overall, Wray provides a useful primer on MMT, stating that a currency issuing government faces real resource constraint on inflation but not financing constraints, that spending is not dependent on taxes and borrowing, that austerity measures proposed by institutions like the IMF are unhelpful, that budget deficits crowd in private investment, that the U.S. can meet its domestic and foreign obligations denominated in dollars, that monetary unions reduce monetary sovereignty, and that deficit and debt concerns are overblown for a government that issues its own currency and controls the interest rate.

In his article, Andresen highlights injecting electronic parallel money (EPM) that would help countries facing crisis in the eurozone. Addressing the debt crisis, he states that raising taxes is problematic, selling public property is unsustainable, and raising net exports is difficult for it entails having wage and price devaluation to increase competitiveness (p. 48, 49). Instead, he supports circulating a parallel electronic currency with the euro to mobilize unemployed workers and unutilized capacity (p. 50). Countering the criticisms, he argues that people would accept EPM due to economic need and because of a positive feedback loop that would engender trust, and that they would not immediately get rid of it by paying taxes because of the time delay between EPM injection and taxation (p. 56, 57). Finally, he critiques that MMT has not offered much for euro countries except the suggestion to revert to national currencies (p. 63). Overall, Andresen states that an EPM can help countries that have abandoned monetary sovereignty to achieve full employment by mobilizing unemployed workers and unutilized capacity and critiques that the MMT prescription of reverting to national currencies is insufficient.

In his article, Armstrong states that according to mainstream thinking the government is constrained by taxing, borrowing, or printing money to finance its spending and that taxing leads to disincentives to work, borrowing crowds out private investment, and printing money leads to inflation (p. 67-68). In contrast, according to MMT, a currency issuing government with floating exchange rates is not constrained to spend and can choose interest rates at which it borrows (p. 68-70). Armstrong states that mainstream theory treats banks as intermediaries that take deposits to issue loans, whereas according to MMT, bank loans create deposits (p. 72).

Moreover, in contrast to the crowding out effect in mainstream theory, MMT indicates that there is no positive correlation between deficits and interest rates and that issuing bonds is not about borrowing but maintaining the overnight interest rate (p. 74, 87). Armstrong adds that according to the mainstream, higher interest rates are contractionary and lower interest rates are expansionary, whereas according to MMT, it is the other way around, as higher interest rates add interest income and that decades of near zero interest rates have not instigated aggregate demand or inflation (p. 82).

He states that the mainstream argument against debt monetization or the government borrowing from the central bank was to curb inflation, whereas according to MMT the central bank cannot monetize debt by buying government bonds, as government spending would increase reserves in the banking system, which the central bank would reverse by selling government bonds to support the target overnight interest rate (p. 85-87). He mentions that under the gold standard it made sense to limit debt as higher spending increased the risk of conversion to gold, whereas with fiat money, government spending can be maintained to achieve full employment (p. 85). Overall, Armstrong contrasts mainstream theory with MMT, highlighting that currency issuing governments are not financially constrained, that bank loans create deposits, that deficits do not crowd out private investment, that issuing bonds is about targeting the overnight interest rate, that higher interest rates are expansionary, that debt monetization is not possible, and that without a gold standard, government spending can be maintained to achieve full employment.

In their article, Bonizzi, Kaltenbrunner, and Michell argue that MMT does not help much in the context of developing countries with limited monetary sovereignty, as they face debt denominated in foreign currency and the need for fixed exchange rates to import food and energy (p. 98, 115). This is even though MMT prescribes policies including sufficiency in domestic food and energy through employer of last resort or job guarantee programs (p. 98, 115). However, the authors critique that MMT contributes little, as much of what it offers is already found in post-Keynesian economics except for job guarantee programs and debt monetization (p. 99, 124). The authors state that many developing countries may have to devalue exchange rates to boost exports to get foreign exchange, but such a strategy is problematic due to low price elasticity of exports and cost push inflation due to food and energy imports (p. 116-117). Alternatively, developing countries can attract foreign portfolio and direct investments but the former can lead to exchange rate and asset price volatility, whereas the latter may encourage a race to the bottom to attract such investments and lead to outflow of dividends and remittances (p. 117-118).

The authors reiterate that MMT prescriptions of flexible exchange rates and no foreign currency debt for monetary sovereignty do not apply to developing countries that manage exchange rates to import food and energy. They highlight that dismissing balance of payment constraints is problematic as developing countries are dependent on food and energy imports, that deficit monetization is problematic because of capital flight, and that the strategies of boosting exports or attracting foreign investment have limitations. Overall, they critique that MMT has not much to offer much beyond post-Keynesian economics save for the job guarantee program and debt monetization (in contrast to Armstrong).

In his article, Colander critiques that while MMT has received attention in the mainstream, it has not been much of an “intellectual success” (p. 132). He upholds money as arising from society than the state to eliminate the need for recording credits and debits in a ledger (p. 136,

139). This credit theory of money suits the rising use of cryptocurrencies (p. 141). As such, he critiques MMT for connecting money only to the state (p. 142). He also states that MMT could be supported by "supply siders" if it were framed as justifying lower taxes instead of supporting government spending (p. 146). Additionally, he critiques the idea that the government maximizes a social welfare function with only an inflation constraint by highlighting the rent seeking pursued by various political groups that vie for government power (p. 147). Therefore, he states that policies including balancing the budget, limits on debt, and monetary expansion can be explained as upholding a social contract between such groups (p. 149). Overall, Colander critiques aspects of MMT that connects money only to the state, the idea that the government acts in the interests of the people whilst ignoring rent seeking by political groups and provides a rationale for balancing the budget and having limits on debt.

In their article, Ehnts and Hofgen state that governments don't need taxes to finance spending but to create demand for currency, lower inflationary pressures, address inequality, and disincentivize some behaviour (p. 162). Similarly, they don't need bond sales to raise funds but to drain excess reserves because of government spending to curb downward pressure on interest rates (p. 162-163). On the eurozone, they state that fiscal deficit rules are a major reason behind anemic aggregate demand and high unemployment, which could be relaxed by the European Central Bank buying government bonds (p. 167-168, 171). Finally, they highlight job guarantee programs on community and environmental care as stabilizing the economy at full employment and providing the national minimum wage (p. 172-173). Overall, Ehnts and Hofgen present the MMT perspective that taxes and bond sales are not required to finance government spending but to temper inflation and manage interest rates, that fiscal deficit rules cause anemic demand, and that job guarantee programs help achieve the goal of full employment.

In his article, Lavoie states that MMT is part of post-Keynesian economics, as both are skeptical of proposals on universal guaranteed income but supports new policies like job guarantee programs where the government acts as the employer of last resort (p. 208-209). He adds that both MMT and post-Keynesian economics state that the main tool to stabilize the economy should be fiscal policy not monetary policy and that both reject that deficits crowd out private investment (p. 214-215). However, he critiques the efficacy of flexible exchange rate for countries with low monetary sovereignty, and the potential impact of job guarantee programs on wages and prices (p. 216). He also critiques that it was post-Keynesian economics and not MMT that first pointed out that loans create deposits (p. 219). Overall, Lavoie states that MMT and post-Keynesian economics share ideas on the primacy of fiscal policy and rejection of the crowding out effect, criticizes that several ideas like loans creating deposits were initiated by post-Keynesianism not MMT and highlights the limits for countries with low monetary sovereignty and the potential consequences of job guarantee programs.

In her article, Mayhew critiques that MMT exponents provide simplistic solutions to complex problems and that they come close to rejecting the endogeneity of money, which is a major tenet in MMT (p. 279). She critiques that money has value not because the government accepts taxes in the issued currency, but that money has value because people accept it as payment (p. 282). Additionally, she critiques that the MMT treatment of the political context that informs fiscal policy is inadequate (p. 289). She adds that MMT has focused on the affordability of job guarantee programs instead of the political difficulties in having them approved (p. 290). She also critiques that the MMT prescription of not worrying about debt works in the context of the U.S. dollar that is used as an international reserve currency but that such a condition may not

hold forever (p. 293). Finally, she criticizes MMT downplaying of debt in the context where such debt is acquired for "frivolous expenditures" (p. 294). Overall, Mayhew critiques that MMT offers simplistic solutions, that some MMT exponents come close to rejecting the endogeneity of money, that MMT ignores the political context that informs fiscal policy, that MMT downplaying of debt is problematic in the context of "frivolous expenditures" and the context where the dollar no longer remains the international reserve currency.

In his article, Murphy argues that if MMT is to succeed then it must be accompanied by MTT that focuses less on balancing the budget and more on social and economic policy (p. 313-314). He critiques that MMT focuses on the role of taxes in managing aggregate demand, as taxing more than spending causes unemployment but that it ignores taxing the wealthy, as it suggests that taxation is not required for redistribution (p. 299-300). He goes on to state that modern taxation theory (MTT) would not focus on revenue maximization but on supplying public services through reallocation of resources (p. 305-306). Moreover, the tax rate under MTT would be different from the standard optimal efficient tax rate (p. 310). Overall, Murphy critiques that MMT upholds taxes to manage aggregate demand but does not deem it necessary for redistribution (unlike Ehnts and Hofgen that mention taxes to address inequality) and that MMT should be accompanied by MTT that focuses on social and economic policy including the provision of public services.

In his article, Palley states that mainstream economics has embraced the effectiveness of counter cyclical fiscal policy, as fiscal stimulus has been successful in addressing the recession of 2009 whereas fiscal austerity has been "disastrous" (p. 318). He adds that it is now accepted that the Keynesian multiplier is larger under recession and that debt is sustainable if the interest rate is less than the growth rate (p. 319). However, he critiques the MMT claim that spending can be financed by printing money without causing inflation (p. 320). He also critiques that the MMT rejection of interest rate policy by keeping interest rates close to zero would exacerbate the inflation situation (p. 324). He adds that debt monetization would cause inflation in both asset and goods markets and would lead towards exchange rate depreciation (p. 327). Moreover, the combination of budget deficits and high inflation would cause a financial crisis and necessitate tax increases that could lead towards a voter backlash (p. 328-329). Overall, Palley recognizes the role of fiscal stimulus under recession but critiques MMT for debt monetization (a charge rejected by Wray), as it would cause inflation, exchange rate depreciation, and a financial crisis.

In his article, Rochon states that, unlike post-Keynesian economics, MMT has succeeded in simplifying complex ideas (p. 333). He states that both MMT and post-Keynesians agree on full employment, endogenous money, the primacy of fiscal policy over monetary policy, and rejection of the crowding out effects but that disagreements remain on issues including whether MMT applies to developing countries (p. 339). He also mentions that in making the case for the government role in circulating money, MMT seems to have undermined the idea of endogenous money (p. 340). Finally, he states that it is important for MMT scholars to engage with post-Keynesians that have raised legitimate arguments and who can help in the development of arguments (p. 349). Overall, Rochon expresses concern that despite the similarity between MMT and post-Keynesianism on full employment, the primacy of fiscal policy, and the rejection of crowding out effects, there are issues on the applicability of MMT to developing countries and the undermining of endogenous money, which necessitates a dialogue between the two.

Finally, in his article, Sawyer dismisses claims that job guarantee programs or employer of last resort programs would cause inflation, stating that inflation could be curbed through more productive capacity (p. 354, 367). Additionally, he argues that while MMT has argued for the consolidation of central bank and the government, the central bank should be recognized as independent and constrained in the creation of money (p. 359-360). On job guarantee programs, he critiques that labour is not homogeneous or paid uniform wage, that such jobs must be offered at minimum wage to prevent people avoiding other employment, that a Green New Deal requires workers qualified beyond minimum wage workers, and that beneficial jobs in social care are long term that cannot be based only on declines in private employment (p. 366-370). Overall, Sawyer states that the MMT prescription of job guarantee programs has several issues including the duration of jobs offered, the qualifications of workers required and the concern on drawing workers away from other sectors, but that inflation is not a concern, as it can be mitigated by additional productive capacity.

Consolidating the Salient Ideas

The following salient points can be distilled from the review above. Supporting MMT, Wray provides a useful primer, stating that a currency issuing government faces real resource constraints on inflation but not financing constraints, that spending is not dependent on taxes and borrowing, and that budget deficits crowd in private investment. He is clear that MMT does not justify deficit monetization and that excessive spending can cause inflation. Similarly, Armstrong highlights MMT ideas that issuing bonds is about targeting the overnight interest rate, that bank loans create deposits, that debt monetization is not possible, and that government spending can be maintained to achieve full employment. Likewise, Ehnts and Hofgen reiterate the MMT perspective that taxes and bond sales are not required to finance government spending but to temper inflation and manage interest rates and that job guarantee programs help achieve the goal of full employment.

In contexts beyond the U.S., Bonizzi, Kaltenbrunner, and Michell reiterate that MMT prescriptions of flexible exchange rates and no foreign currency debt for monetary sovereignty do not apply to developing countries that face balance of payment constraints especially as they are dependent on food and energy imports. They critique that MMT has not much to offer much beyond post-Keynesian economics save for the job guarantee program and debt monetization in contrast to Armstrong, who states that debt monetization is not possible. Similarly, in the eurozone context, Andresen critiques that the MMT prescription of reverting to national currencies is insufficient and instead propose an electronic parallel money (EPM) that could help countries that have abandoned monetary sovereignty to achieve full employment by mobilizing unemployed workers and unutilized capacity. However, it is not clear whether EPM would help developing countries like Pakistan to address their balance of payment crisis.

In terms of criticisms, Mayhew critiques that MMT offers simplistic solutions, that some MMT exponents come close to rejecting the endogeneity of money, that MMT ignores the political context that informs fiscal policy, and that MMT downplaying of debt is problematic. Similarly, Colander critiques MMT for ignoring rent seeking by political groups and for downplaying the rules on balancing the budget and limits on debt. Additionally, Sawyer critiques that the MMT prescription of job guarantee programs has several issues including the duration of jobs offered, the qualifications of workers required and the concern on drawing workers away from other sectors. In the context of taxes, Murphy critiques MMT for not deeming taxes as necessary for

redistribution unlike Ehnts and Hofgen who mention taxes to address inequality. Likewise, while Wray is clear that MMT does not justify deficit monetization Palley critiques MMT for debt monetization, as it would cause inflation, exchange rate depreciation and lead to a financial crisis.

Finally, both Lavoie and Rochon draw similarities between MMT and post- Keynesian economics whilst critiquing MMT on its limitations. Thus, Lavoie depicts the limits of the applicability of MMT to countries with low monetary sovereignty whilst highlighting that both MMT and post-Keynesian economics share ideas on the primacy of fiscal policy and the rejection of the crowding out effect. Similarly, Rochon expresses concern on the applicability of MMT to developing countries and on the undermining of endogenous money. While he reiterates the similarity between MMT and post-Keynesianism on full employment, the primacy of fiscal policy, and the rejection of crowding out effects, he calls for a dialogue between the two to flesh out arguments in MMT circles.

Overall, this book offers a detailed and nuanced read on MMT, as it draws out the central points of MMT, the inconsistency of its claims when various MMT exponents undermine the endogeneity of money, and the criticisms especially from post-Keynesian economics (with whom MMT shares much in common) on issues of debt monetization, the goal of taxes, downplaying of debt, and the issues of job guarantee programs. The book shows the limitations of MMT for developing countries like Pakistan but also offers ideas like the EPM that could prove promising in contexts beyond the U.S. Additionally, this book would be a difficult read for ECON 101 students, who may be directed to the more popular books including Kelton (2020) and Wray (2022). Nonetheless, this book makes for an effective reading for advanced undergraduate students and instructors who require a more comprehensive perspective on MMT.

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