Enlightened Economics

Why the Law of Supply and Demand Is Inadequate

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We Need a Proper Economic Science.

Contemporary economics fails as predictive science, and has no clear relation to physical science. Economic scientists argue that their mathematics applies to reality. All science may be mathematical, but not all mathematics is science.

Early economics did use physical science models – the wrong models. Adam Smith in 1776 compared his Law of Supply and Demand to Newton's Law of Action and Reaction.[1] Mid 19th Century economists inserted economic variables into the Law of the Conservation of Energy,[2] the First Law of Thermodynamics. Neither law can explain an expanding economy, an expanding universe, or the accumulation of profit. Both are laws of balance that cannot account for anything new.

We propose to describe a macro-economy as an engine that works according to the Second Law of Thermodynamics. A gasoline engine consumes fuel, accomplishes work, and produces waste. The thermo-economic engine consumes currency, performs economic work, and produces profits. Economic work is the recovery of value; value refers to all labor and material costs-to-market. Because of intrinsic energy losses (inefficiency), it requires excess economic fuel to produce profits.

Supply-demand compares an economy to a pendulum, or to a cradle that rocks as opposing forces equilibrate toward price stability. The model supports the claim that the free pursuit of self-interest in a competitive economy maximizes economic efficiency,[3] because competition minimizes profits. Supply-demand projects ethical responsibility onto a supernatural mechanism, the "Invisible Hand" that is the "genius" of the free market. Free marketeers invoke Smith's law as a moral force that can keep a marketplace in balance better than government regulation can.

It matters most that supply-demand is a theory of price, not profit. In supply-demand, profit is an inefficiency (like friction) that keeps the economic mechanism from perfect price equilibrium. In a theoretical state of perfect competition, profit would reduce to "normal profit", the minimum necessary to make running a business worthwhile. Profits beyond normal are "economic profits". Good business (maximum profit) is therefore bad (inefficient) economics. (Figure that out!)

Supply-demand price reckonings build in normal profits as cost. "Normal" profits are thus *un-eliminable inefficiency*, like the residual friction that slows down a pendulum. Sneaking in normal profits as cost hides that inefficiency requires fuel

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[1] Copious references include "Isaac Newton's Influence on Adam Smith's Natural Laws in Economics", Norriss S. Hetherington, Journal of the History of Ideas, Vol. 44, No. 3 (Jul.- Sep., 1983), pp. 497-505, University of Pennsylvania Press

[2] *The Economist Has No Clothes* by Robert Nadeau, **Scientific American**, April, 2008

[3] http://www.answers.com/topic/economic-efficiency#ixzz1L8ubcdZu

to overcome. There is no notion of economic fuel in supply-demand except motivation. Motivation might describe why someone starts an engine, but an engine works according to universal physical laws.

Supply-demand describes profit as market inefficiency. Thermo-economics interprets profit as a sign of economic life. Both are correct.

Instant communication, mega-databases, superfast computation, and canny mathematical chicanery all foment a newfangled chaos that only a proper economic science can grasp. Such an economic science would account for innumerable Buyers and Sellers, and their individual transactions. Statistical mechanics is accepted mathematical theory that quantifies interactions among billions of entities, the results of which reduce to and confirm the Second Law of Thermodynamics.[4]

The Enlightenment and the Free Market

Recent US history makes it hard to deny that a free market produces a society more like fairy-tale feudalism than like democracy. We are developing a class system supported by perception of the rich as charismatic, benign leaders whose wise investments create employment. The truth is that free market economics rewards some, demolishes others, and protects no one. "Due process" and "equal protection from discrimination" are the "get-out-of-jail-free cards" of civil liberty that level the power-playing field. These do not exist in free market economics.

Today's free market advocates market their economics by rebranding wealth as "job creation". Former Bain Capital partner Edward Conard in 2012 published a book arguing that a steep wealth "gradient" between rich and poor motivates the most talented and charismatic risk-takers to generate jobs.[5] Where would the poorer 99% of the population be without the likes of Henry Ford and Mark Zuckerberg? Perhaps the religiosity latent in free market economics appeals to the hope that god might anoint anyone to be the next Steve Jobs.

There is no scientific or historical justification for this argument. The Great Depression was not a great era of business innovation. Prosperity not poverty produces innovation. It is more likely that economic growth generates the opportunity platform for an occasional genius to pop up and innovate upon.

Why Nations Fail offers a different view.[6] "Extractive institutions" that allow an elite to serve itself first may lift an economy (like China's) out of poverty, but may also sow the seeds of violent revolution. "The foundations of prosperity are political struggle against privilege", summarizes a reviewer.[7]

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[4] Thanks to Robert P. Wolf, Prof. Emeritus, Physics, Harvey Mudd College, Claremont, CA.

[5] E. Conard, "Unintended Consequence: Why Everything You've Been told about the Economy Is Wrong". (June 2012)

[6] *Why Nations Fail: The Origins of Power, Prosperity, and Poverty* by Daron Acemoglu and James Robinson. (Deckle Edge, 2012)

[7] Paul Collier, "The Observer" in The Guardian Newspaper, March 10, 2012.

We turn to history. By the 17th Century, Copernicus, Galileo, and Newton had used mathematics to describe the universe as a friction-free, perpetual motion mechanism in no need of god (or fuel) to keep moving. Acceptance of these provable, objective ideas in the 17th and 18th Centuries was the European Enlightenment.

In the late 18th Century, Adam Smith coined free market economics in the Enlightenment spirit. Business could now seem more natural and scientific than willful, and profit more a product of grace than of sin. The Pope objected to scientific objectivity, because a lawful, regulated universe precludes miracles. This was still the era when doctrine insisted that god is perfect and circles are perfect, and that therefore the planets must travel in circular orbits.

The Enlightenment was not an effective antidote to arbitrary religious perception. The Enlightenment merely polarized religion and science as the adversaries we know today. Classical science is as absolutist as religion; religion and science are alike enough subjectively to compete for socio-psychological "market share", alternating as good and evil characters in fiction, drama, and politics.

Enlightenment science creates this insoluble antagonism because it does not address the foundational problem of experience any better than religion does. Religious time is "Eternity". Newtonian time is reversible. Neither accounts for time, as it moves irreversibly into the future and leaves us with memories we call the past. The past exists for us mortals as Information, and the future as Uncertainty.

Eternity outranks time, death, and the laws of physics. Eternity thus implies hierarchy, a condition of unequal influence that subordinates the world to a god-king who can intervene in history, perhaps according to a divine plan. Time on earth might just be preparation for a return to eternity, or for reincarnation.

Newtonian time is not hierarchical. Instead, it is interactive, a condition of exactly reciprocal influence. Newtonian time is circular or reversible, a universal present moment from which the past and future look identical. One can prove that this is so; solving Newton's equations of motion with either positive or negative time yields the same result. If the Laws of Motion were not perfect predictors of repetition, the sun would not rise everyday as expected.

Hierarchy can however harbor the *idea of law as equal applicability*, such as the Ten Commandments that apply to all people (but not to god). If the conception of law was *in utero*, then the Enlightenment delivered it into the light. Newton's Laws rebut the perception of a hierarchical universe. Hierarchical Eternity and Newtonian Circularity exist only in distinction to each other, however. Neither can explain the universe alone.

Smith's economics focuses the problem, because supply-demand embodies both the divine and the Newtonian. This "bestial and celestial"[8] chimera ought to

[8] A favorite phrase of fundamentalist preacher Elmer Gantry in the eponymous novel by Sinclair Lewis.

make no sense, but Nobel Prize economists and fundamentalist religionists both love the free market.

A Cautionary Tale

If we ignore subjectivity, we invite alienated and angered religion to define us as human. Scientists try "whack-a-mole" to use measurement to suppress the perception of hierarchy, but it pops right back up.

The Sleeping Beauty fairy tale imagines the origin of the problem. A witch who was not invited to the christening of a princess crashes the party, and casts a spiteful spell: the child will die at age 16, as she pricks her finger on a spindle.

A good fairy also in attendance cannot neutralize the spell, but can alter it so that the princess will merely sleep deeply until the kiss of true love awakens her. A spindle spins atop a spinning wheel, which is a pre-industrial piece of machinery.

The European Enlightenment was a birth to whose christening Christianity was not invited. The spinning wheel here is the steam engine, the invention of which put much of science into a deep sleep, which both isolates religious feeling from intellectual life, and avoids the logical implications of irreversible time.

Hierarchy today is disowned perception that curses us who would be purely objective. We unwittingly build up social hierarchy and create "tea party", fundamentalist backlash, as we insist that mathematical objectivity rules the world, especially in economics. The more we rely upon a pseudo-scientific, libertarian free marketism, the more we create the social hierarchy that promotes class warfare.

The Division of Knowing (unpaved road; proceed cautiously)

Separating knowledge into "faith-based" and "scientific" divides how we know into "subjective" and "objective". We propose to re-label subjectivity and objectivity as *hierarchical* and *interactive* ways of knowing. We can then as if algebraically substitute **hierarchy for subjectivity**, and **interaction for objectivity**. Hierarchy and interaction are terms more friendly to each other than are subjectivity and objectivity, or religion and science. The latter pairs are not on speaking terms. Hierarchy and interaction are perceivable as complements, or even as marriage partners. If one is vertical and the other horizontal, together they form x and y axes.

Subjectivity is knowing according to "how it feels". Faith in religion is subjective; faith requires no logical evidence, only confirming emotion. "Subject" is from roots meaning, "thrown under". One is the subject of a monarch; one is subject to illness. Subjectivity is passive. One is subject to emotions; "passive" and "passion" are from roots meaning "to suffer", which means "to be acted upon". (The Easter story is *The Passion* because Jesus could not escape being acted upon.)

Because subjectivity is hierarchical, subjectivity is "vertical", implying the perception of **rank**. *Different rules apply at different ranks*. As a result, **A** may affect **B**

more than the reverse. A god affects life on earth, and a boss affects workers more than the reverse. A scripted, dramatic role affects an actor more than an actor may interpret the role. A better football team may defeat a poorer, but this is not hierarchy, because both teams accept the same rules of play.

Because *hierarchy* implies *unequal influence*, subjectivity is not zero-sum perception. Laws of conservation do not apply. Subjectivity may imply creativity, destruction, and Hollywood endings that defy logic and physical laws.

Objectivity is "horizontal". It refers to the world as mathematical logic and experiment interact with it as equals according to knowable, universal laws. Scientists dismiss subjectivity as un-interact-able, and therefore as illusory.

"Object" is from roots meaning "thrown against", like particles that bounce off of each other. Interaction implies exactly reciprocal effect, as in Newton's, "every action has an immediate, equal and opposite reaction". Interaction is thus zero-sum. Playing by the same rules, one football team defeats another. Winning is +1 and losing is -1; their sum is zero.

The scientific world-view perceives lawful process to operate as if democratically among the particles and forces of nature. No particle is anything in particular; no force is magical. Everything that exists interacts according to mathematical rules that spread impartially across existence.

Political democracy is also horizontal perception. In democracy, individuals may interact freely; all are entitled to the protection of the law from forces greater than themselves, including the influence of religion and of the state.

We Have Met the Future, and "They Is Us".

The Enlightenment froze religion and science in place as hierarchical and interactive ways of knowing. Because neither deals with irreversible, asymmetric time, neither system of universal explanation can be satisfying.

Hierarchy is a condition of unequal influence, A over B. Asymmetric time is also a condition of unequal influence. The past affects the present more than the future affects the present. Or, one might say that the past affects the future more than the future affects the past. Either way:

Recognizing time asymmetry brings hierarchical perception into science.

Furthermore, different rules affect "the past" and "the future". We cannot travel physically into the past; all we have to do to travel into the future is to wait.

But, what is the science? There was no accounting for asymmetric time until mid-19th Century, when it was time to harness steam engine power to the industrial age. Suddenly fuel mattered. When it became obvious that one could not use the same fuel twice – that there was no perfect energy recirculation – some people recognized that time must go one way, and not the other. This was progress.

The intellectual result was the Second Law of Thermodynamics, the Law of Laws that none may contradict. The Second Law is unique among the fundamental laws. All others are zero-sum, laws of conservation. The Second Law is about the net loss of order and creation of chaos. The realization that order and chaos are as fundamental and as quantifiable as matter and energy was real progress.

Fuel stores energy as atomic or molecular order. The Second Law describes how engines extract work, as fuel ignition releases energy and destroys that order. No use of fuel creates new order perfectly efficiently; even the most elegant action wastes energy, and so creates overall more disorder than order. The losses of order inherent in converting heat energy into work make each release of energy irreversible. *Increasing entropy* measures that waste – the energy lost to order forever.

Nothing can be new without increasing entropy. Waste happens.

Time is our everyday, non zero-sum quantity. The universe is older and fainter every day (as it burns up fuel), and so are we. Time and space expand together; the universe is older and bigger today than yesterday. As the only quantity that increases everywhere *with* time, increasing entropy is known as the "arrow of time". Ludwig von Boltzmann put it: "Gravity defines the sense of down, and increasing entropy defines the sense of forward time".

Realizing that order and chaos are as basic as matter and energy was the great advance that led to the computer age. Thermodynamics thus indirectly generated the 20th Century mathematical "information theory" that broke enemy codes during World War II, and that empowers your smart phone to talk to you today.

Profit Invents the Economic Future

Supply-demand is inadequate because it implies that the universe is zero-sum, which it is not. The more we try to stuff the universe into a zero-sum suitcase, the more the suitcase overflows. That stuff has to accumulate somewhere. In economics, wealth accumulates where very few people can get to it. This result is science. It bears no necessary relation to virtue, liberty, or talent.

Barter exchange is zero-sum. A cow and a horse may exchange places, but nothing changes overall. Each barter exchange exists in its own present moment.

A profitable transaction is not zero sum, so profit must have some relation to increasing entropy and forward time; free marketeers say as much by defining profit as inefficiency. A profitable exchange is by definition *successful,* in that another transaction may inherently *succeed* or follow it, and expand upon it. (Transactions that lose money are not successful for very long.) So, we say that profit introduces forward time into economics.

Time is therefore not money. Time is profit. But, forward time is increasing entropy, which is waste, not fuel. What can this mean about profit?

A model economic engine extracts work from currency that ignites at a point of sale and releases energy to flow across a gradient from warmer Buyer to cooler Seller. Accepting that time is profit and that profit is time suggests developing a "thermo-economics" to address the relation of profit to increasing entropy. Such a study might compare the flow of currency from warmer Buyer to cooler Seller to the flow of heat, and connect Buyer-Seller currency flow to profit generation.

This comparison is not far fetched. It may be startling to learn that we do not need to measure economic temperature precisely. *Any temperature scale that rises (monotonically) from absolute zero that we may imagine and estimate is valid in thermodynamics*. We just need to know which side of a difference is hotter than the other. (The universal economic motivation is to cool off, which is a pleasure.)

Because relativity to absolute zero is all that we need, we can imagine a subjective scale of Buyer desire, and still treat Buyer-Seller transactions objectively. In "Beyond Supply and Demand"[9] we propose a temperature scale of economic desire or *libido*. Buyer economic temperature is the microeconomic equivalent of the macroeconomic, Consumer Confidence Index.

The first thermo-economic implication is that economic success starts with employing the consumer, even if government is the employer. Employed people are consumers whose purchases immediately employ other consumers; investment produces employment much more slowly and less directly.

Profit cannot be the same as fuel. That profit resembles increasing entropy suggests that profit may be recycled into new product value much as manure fertilizes a field. Recent history confirms that un-recycled profits are toxic.

Remedies

From all accounts, economic officials at high level meetings addressing the global financial collapse of 2008 realized that something fundamental had shifted.[10] The law of supply-and-demand and its "invisible hand" had restored nothing. That left no theory to light the path beyond *ad hoc* remedies.

Without using the names, these officials identified "thermoeconomic equilibrium" or "heat death" as they reported that a financial bubble had burst, that economic work had ceased, and that no one could say where all the money had gone. They even prescribed a thermoeconomic fix. The fastest and biggest money deal in the history of economics came to pass - a fuel injection of massive sums to the banking system ($2.3+ trillion by some estimates). The solution was however

[9] *Beyond Supply and Demand: Entropy and Information in Economic Science"*, Goldwater and Jonath, www.profitandentropy.com

[10] Meetings included Paulsen, Gaertner, and Bernanke See Henry M. Paulson, Jr., "On the Brink", www.HachetteBookGroup.com, 2010.

very partial – because it was very partial to the financial classes. Allocation of new economic fuel to consumers was much less generous and direct than to the banks.[11]

This top-down stimulus did show immediate, short-term benefits. Unfortunately, the banks used their bailout money not to pump the economy, but to fix their various financial ratios. By 2011, because of its huge stimulus spending on employment, the economy of China was on a fast track to recovery.

Can creative innovation replace economic fuel injection as a stimulus? Some extoll the power of the inventive, human mind to lift us out of collapse. They cite farmers who rebound from drought by cutting costs and saving seed,[12] and refer to Benjamin Franklin's, "a penny saved is a penny earned". But when ideas enter the world, they must conform to laws of physics.

This is maxim is credible only in the reversible, Newtonian ethos of Franklin's era. Economic progress depends upon coining new pennies, not on tax cuts. Economic recovery models that resist the contribution of adequate stimulus offer no realistic way to pull the economy back from equilibrium, and restart it.[13]

In the asymmetrical, non-reversible macroeconomic world, *a penny saved is not enough*. A farm is not a perpetual motion machine; farming requires new energy from the sun. Any recovery model that supplies no new economic energy can only erode further the economic well-being of the middle class to the cynical pleasure of those who consider themselves Masters of the Universe.

Introducing the NVAT

Profits that arise from productivity and that are promptly recycled into value do not need much financial regulation. We shall find that profits from finance are more subtle to understand, because of their participation in bubbles.

Events since 2008 demonstrate that compounding profits purely financially (such as from bogus mortgages) leads to a trading frenzy of "value-less profits" that inflates profit bubbles, and leads to events like our most recent meltdown. When bubbles burst, only the richest people still have cash. Each new bubble-burst cycle increases the feudalistic wealth gap in favor of the super-rich.

We suggest our solution here. Many nations use value added taxation or VAT. We would use a Non-Value Added Tax or NVAT to address failed profit recycling. Many financial products will score a high NVA and be commensurately taxable. Statisticians and econometricians now perform such analyses for applications far more complicated than financial transactions.[14]

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[11] See http://money.cnn.com/news/storysupplement/economy/bailouttracker/

[12] Brian Wesbury, Chief Economist, First Trust (Personal correspondence.)

[13] The combination of deficit spending necessary for victory in WWII, followed by large increase in marginal tax rates, fueled the economy out of the Great Depression and into the huge, sustained growth of the 1950s and 1960s.

[14] William L. Sanders "Comparisons Among Various Educational Assessment Value-added Models" SAS Institute, Inc. White Paper, October 16, 2006 *Accessed June 25, 2011*

Thermoeconomics would eliminate reams of "gotcha" government regulations. Our model is keen only to distinguish profit-with-value from the profit-without-value that drives toward equilibrium. Careful application of NVAT will reduce chaos-forming pressures in financial markets. Any NVAT collections would create a financial disaster recovery fund.

Imagine that such an NVA Tax were in place prior to the blow-up of the housing market. Any profits made from trading in the negligibly value-added, bundled mortgage securities market would have been taxed at the highest rates, say 90+%. This would not outlaw or even regulate such trading vehicles; it would just make the Government (the Public) a partner in their "upside" potential by collecting revenue to ameliorate against any "downside" caused by collapse.

The NVAT is very different from financial transaction taxes based on price, such as the Tobin tax[15] or Spahn tax,[16] suggested during the past several decades to curb excesses in the currency market. NVAT differs from the Bank tax suggested to be levied against balance sheets. It also differs from a Financial Activities Tax (FAT) on the sum of bankers' excessive remuneration and bank profits (without regard to their value-added content).[17]

Common among all such financial taxation ideas other than NVAT is the problem that implementation policies depend jointly on ideology and political will. Only NVAT, with its thermoeconomic basis, brings the clout of science into the discussion.

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[15] James Tobin (July/October 1978). "A Proposal for International Monetary Reform". *Eastern Economic Journal*: 153–159.

[16] Paul Bernd Spahn (June 16, 1995). "International Financial Flows and Transactions Taxes: Survey and Options". University of Frankfurt/Main; Paper originally published with the IMF as Working Paper WP/95/60.. Retrieved 2010-01-13.

[17] International Monetary Fund (April 16, 2010). "A FAIR AND SUBSTANTIAL CONTRIBUTION BY THE FINANCIAL SECTOR INTERIM REPORT FOR THE G-20". International Monetary Fund; Excerpt and LINK TO FULL REPORT as a PDF - republished online by Global Print Monitor on April 22, 2010. Retrieved 25 June 2011.