

Reversing the Thermoeconomic Arrow of Time

The Returns to the Economic Factors of Production Analyzed for Efficiency through a Thermodynamic Engine

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Introduction

Thermoeconomics is a field combining thermodynamics (the study of heat and heat transfer) and economics (the study of resources and resources transfers). It was pioneered by thinkers such as Georgescu-Roegen in his *The Entropy Law and the Economic Process* and later by John Bryant in his *Thermoeconomics: A Thermodynamic Approach to Economics*. Both thinkers, base their models upon the second law of thermodynamics, the “entropy law,” as well as upon conventional reasoning in economics stemming from the Marginal Revolution.

What is the entropy law? And what is the Marginal Revolution?

The *entropy law*, or *second law of thermodynamics*, states that the entropy of a closed system is always increasing. *Entropy* is chaos or disorder, so the law suggests that chaos or disorder always increases for a closed system (a system without external inputs).

The *Marginal Revolution* was a period in economics in which classical views of economy were challenged, primarily by the Austrian school. The Marginal Revolution put forward the concept of marginal utility as a theory of value. *Marginal utility* refers to the subjective benefit gained from (producing or) consuming an additional unit. The proponents of this new approach put it forward as a challenge to the *labor* or *cost theories of value* that were at the foundation of classical economics. This led to *neoclassical* economics.

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The entropy law and the theory of marginal utility established conventional approaches to thermodynamics and economics. Along with other ideas, the assumptions behind marginal utility and the entropy law make their way also into thermoeconomics. I differ in my approach to thermoeconomics, because I still accept the soundness of the labor theory of value and I do not accept the absoluteness of the second law of thermodynamics.

To my understanding, there is a fundamental difference between mechanical and organic processes, a difference that limits the application of the second law of thermodynamics. Mechanical (machine) processes are clearly governed by entropy, while organic (life) processes contain something else that is responsible for their self-organization. This *syntropy* is the opposite of entropy, and refers to increasing organization and order, as is seen in biological evolution. Living things have metabolic systems that take energy from outside and bring it in, they self-replicate, express various kinds of symmetries, and pursue purposeful ends. While life is not a closed system, but receives its energy from the Sun, that energy is used in the fashion of self-organization, not organization from without. The energy is sourced from outside, but the morphology is sourced apparently from within.² While life eventually succumbs to entropy, there is a period in which life expresses syntropy. And this makes organic processes fundamentally different from mechanical processes, which are dominated by entropy. Because economy contains human action and is the life-blood of society, which is a biological entity (or the beginnings of one), economy is relatable to an organic, rather than purely mechanical, process.

When it comes to the marginal utility theory of value, the issue is that the question remains what the subjective evaluation is of. That is, what is the nature of the *object* that is being subjectively valued? And here, it is clear, that the object is a product of labor. And so the marginal utility theory is really the ‘marginal utility of labor’ theory of value, and describes the subjective value for the objective phenomenon of labor. Its being posed as counter to the labor theory of value comes either from misunderstanding of the labor theory of value or from deceitful political ambitions. The classical labor theory of value or cost was often stated in subjective terms. For instance, Josiah Warren³ makes clear that the “cost” or the

² I say “apparently” because the source could also be said to reside outside of the present individual, in that individual’s future.

³ Josiah Warren actually speaks, in *Equitable Commerce*, of value as separate from price, but of a just price being equal to cost. Nonetheless, prices are exchange values, according to thinkers such as Francis Dashwood Tandy. And so Josiah Warren does fit

labor being exchanged is the same as the “repugnance” to the laborer, and that under just conditions this is the amount of cost the laborer can ask in return from another laborer in exchange⁴. Conceptualizations such as this already have assumed, within them, the idea that labor—and objective phenomenon—is valued subjectively. The Marginal Revolution’s “displacement” of classical economics was largely, like Marxism, a political maneuver. But the goal of the Marginal Revolution— quite contrary in appearance from that of Marxism— was to include idle income not derived from labor in the equation, to include not only the cost of labor, but loss of plunder. Purely subjective approaches to value can ignore objective differences between laboring and plundering. And that was largely the point.

Because I am not convinced of the absoluteness of the second law of thermodynamics in the application of socioeconomics, nor of the displacement of classical economics by the Marginal Revolution, I believe it necessary to address the matter of thermoeconomics from another perspective, that of a classical economics rooted in the labor theory of value, and of an eternalist and syntropian model of thermodynamics, oriented more in the first law (the “conservation law,” that matter/energy cannot be created or destroyed). In order to establish such a model, we will look at the economy as a thermodynamic engine. This is done by taking the three classical factors of production and their returns, and analyzing their throughput in the economy as if it were a thermodynamic process.

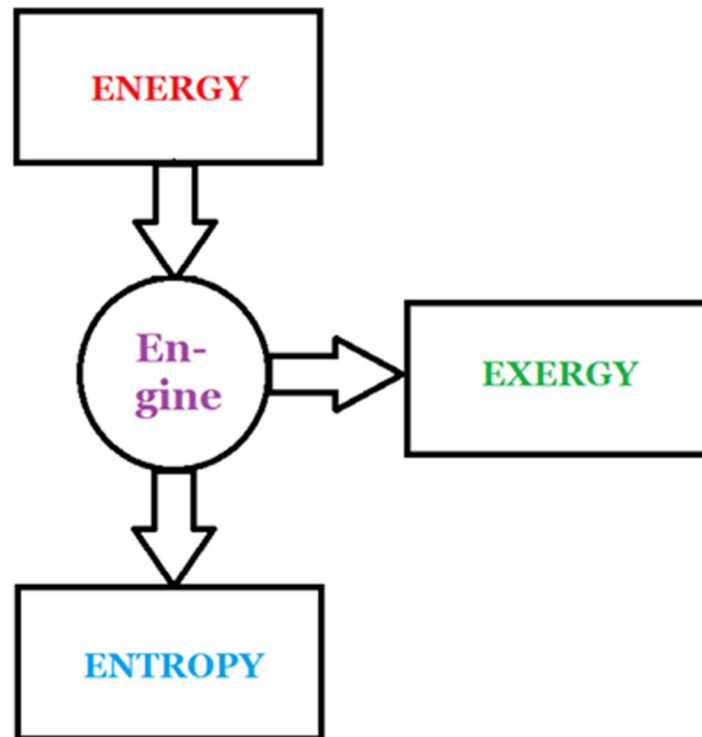
Alongside economic waste, which is analyzed, there is much material and energy waste (production waste) that is not accounted for in this model. A more thorough model would also consider the physical production process and the specifics of material waste and products (known as *thermoecological costs*), including consumption of non-renewable exergy (useful energy) and introduction of pollutants into the environment. This model is focused on economic throughput. Please keep that in mind as we continue.

The Thermoeconomic Engine

the bill for a rendition of a labor theory of exchange value. He just uses different terminology.

⁴ The gain in value comes from the exchange itself. Each gets from the exchange something they value in use more than their own product, and forgo the costs of switching trades to get them, thereby reducing costs for both parties.

Our thermodynamic engine will be composed of a *hot reservoir* (in red), an *engine* (in purple), a *cold reservoir* (in blue), and an *output* (in green). The hot reservoir will contain the total *energy*, the engine will define the process, the cold reservoir will collect *entropy*, and the output will be considered *exergy*. When energy is taken from the hot reservoir and put through the engine, some of that energy is released as entropy into the cold reservoir, and some of it is released as exergy into the output basin. *Exergy* is useful energy or work.



We will analyze the three factors of economic production and their returns, using this simple thermodynamic engine.

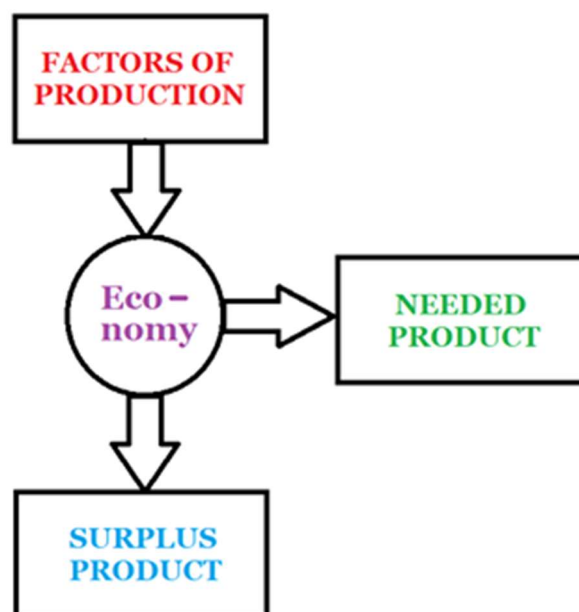
The three factors of production, according to classical economics, are land, labor, and capital (the mixture of land and labor). *Land*, in economics, includes all natural resources of any sort. *Labor* is human effort. And *capital* is the mixture of land and human effort into something productive like a tool or a machine. In order to produce, all three of these factors must be present. And there are no factors outside of these (labor includes mental work and land includes all-natural resources such as broadcasting space and wild animals).

The owners of these factors of production receive returns called *rent*, *wages*, *interest*, and *profit* (profit and wages are different kinds of returns to labor, as we will see). *Rent* is the return to land, *wages* and *profit* are returns to labor, and *interest* is the return to capital. These

returns can be spoken of in terms of product value (for instance, economic wages) or in terms of money value (contract wages) or price. This is because each return is a real thing that can also have its value represented by money.

Land: Rent
Labor (of Self): Wages
Labor (of Other): Profit
Capital: Interest

When the factors of production are used in the economy, they produce *needed* products and *surplus* products as the returns. When applied to the model of a thermodynamic engine, our thermoeconomic model shows the factors of production feeding into the economy, which produces and distributes those surplus products and needed products.⁵

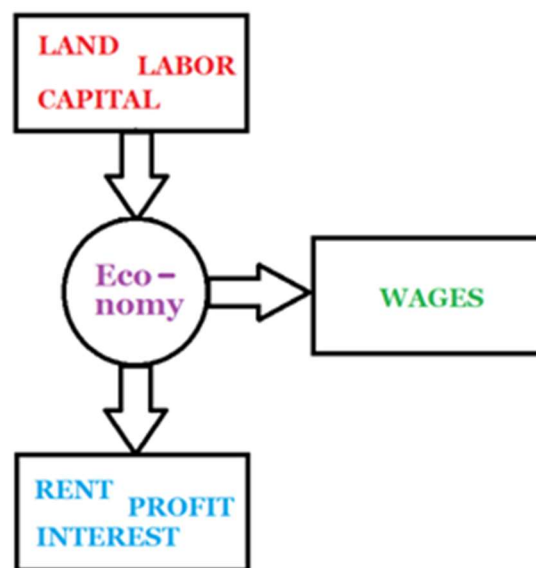


⁵ Also, very important to remember, as it is not shown in the graph (as I am emphasizing economic returns rather than material processes), is that there are physical losses in the production and distribution process that should also be accounted for as entropy, such as from burning fossil fuels and calories, wearing down clothing, losing cells, splintering, etc. This model exists primarily for analyzing economic flows, rather than physical production flows.

Economically speaking, *needed returns* (or needed products) are those returns that are necessary for sustaining a satisfactory life (within the natural limits of one's circumstances, as unhindered by artificial conditions). We know a product is economically needed (and not just wanted) when someone is able and willing to endure a cost for it voluntarily in exchange. Wages are a needed return, because they are compensation to the worker, who endured a cost in order to receive it.

A *surplus return* (or surplus product) is one that is not needed, but that is created involuntarily, under duress, because someone else wants it. For instance, the product of a slave is needed by the slave if the slave would sacrifice for it even outside of slavery, but is a surplus return when dependent upon slavery by another for its production. This is because the slave would not produce it voluntarily and the slave "owner" is not willing to sacrifice his or her own labor for it either. So, it isn't needed in that sense, the economic sense used here. Similarly, workers without access to land and capital are forced, under duress, to involuntarily produce surplus returns. Any return above cost or gained at the cost (loss of comfort, wear and tear of personal property, or lost time due to work) of another, without full compensation, is a surplus return. Surpluses can only occur by way of exploitation of those who *have not*, by those who *have*. Because land and capital only derive a return under monopoly or monopsony conditions (when there are haves and have-nots), and not under informed competition, and because profit is only accrued by way of the monopsony of labor (licensing or accreditation requirements), these three returns—rent, interest, and profit—are properly understood to be surplus returns.

Surplus Returns: Rent, Interest, Profit
Needed Returns: Wages



For the sake of this model, a *rentier* receives rent from land that they lease, a *speculator* receives profit from licenses and other permissions to perform labor that they let,⁶ and a *usurer* is someone who receives interest for leasing industrial or financial capital.⁷ These are the recipients of the returns.

Rentier (or landlord): Rent
Speculator (or boss): Profit
Usurer (or lender): Interest
Worker (or laborer): Wages

Labor and Cost

Even under conditions of extreme market competition, labor derives a return called *wages*. These wages —unlike rent, interest, and profit— are socially necessary production, or

⁶ Employees are really just leasing the licensing or capital of their employers in order to do work they could otherwise do independently. Employment contracts are really rental agreements laying out the rental (not of the worker, as a Marxist might suggest, but) of the legal privileges of the employer by the employee. In return for using the employer's licensing or private property, for instance, an employee must agree to pay the employer a rental fee for all that is made, minus the contract wage, and agree to oversight by the employer.

⁷ These words are not always defined this way in my works.

compensation for that production, which is a cost to the worker. *Cost*, or economic *labor*, is anything that is negatively experienced by the worker in the production process, including loss of time, boredom, exhaustion, danger, attentiveness, or etc.

The *natural wage* is the amount needed to compensate the worker enough that they would accept that rate voluntarily without duress; that is, enough to cover their cost. Any return up to the point of compensating for costs is, in economics, a wage, or a needed return. *Economic wages*—wages considered economically— never rise above the natural wage, though may be lower (if contract wages so dictate).

Contract wages are wages as agreed in a contract. In primitive conditions, one contracts with oneself and controls one's own contract wages by controlling one's own product solely and directly. Everything is voluntary, and tasks are performed because of the value they bring. But, in modern times, money is used to compensate one for all (full wages) or some portion (partial wages) of one's product being given up. Giving up a product is at a cost to the worker, and a loss in their capacity as consumer, renter, letter, or debtor (but is just a loss, not a cost, to a rentier, speculator, or usurer in the same capacities). The cost of giving up one's product is made up for either by exchanging that product for something of greater utility (compensation, as by contract wages), or by relieving some form of human-imposed duress (such as government oppression or economic exploitation). Under voluntary conditions, all of the workers' costs are compensated by contract wages or by full control of the value they contributed to their product, in exchange with other workers. Under *involuntary* conditions the costs may not be fully compensated, and exchanges may be made between worker and non-worker, guaranteeing an unequal exchange in the non-worker's favor to the expense of this worker or another one (from whom the value was extracted). In involuntary circumstances, contract wages compensate for some of the costs of economic production, but they do not cover the full value of the product, and so do not cover the full cost of production or the natural wage. Involuntary circumstances, such as economic duress, cause workers to accept compensation that is less than the value of their product, its cost. The rest of the value of their product is controlled by the person or people they are contracting with under duress. The worker, under duress, agrees to only a portion of their total product, in the form of contract wages. The rest of their product belongs to the rentier, usurer, and speculator, whose monopolies on land, capital, and licensing are the source of all rent, interest, and profit.⁸ Rent, interest,

⁸ This relationship rests upon legal fictions, such as private (as opposed to personal) property in land, legal tender laws and licensing, and various other forms of governmental

and profit are returns over and above the cost that is compensated by contract wages, and so are surplus returns.⁹

As rentiers, speculators, and usurers do not add value, but merely control value that others created, they have no value with which to make an equal exchange of costs in the capacity under which they are operating. In reality, workers rent the land, capital, and licensing required in order to have the permission to do the work that they would otherwise do under their own direction, or forgo doing, if allowed to by the system. The rental price for the land, capital, and licensing is rent, interest, and profit, all of it costing the owner nothing, but enriching them nonetheless.

This must be stressed. Not all losses are costs. Lost profits, rents, and interest payments are not costs. Property paid for by these means does not cost anything to the purchaser. Costs are felt by labor. Only *loss* is felt by land, capital, and idle employers. The difference between lost rent, interest, or profit and the cost of wages is much like the difference between a lost gift and lost product. The person who produced the gift felt a cost, but the person who received and then lost the gift felt only a loss (not a cost). In this model, we are considering all rent, interest, and profit to be costs felt by the laborer before they enter into the cold sink (where they could be later felt as losses by their claimants). By this time, the social benefit of these costs has already been misplaced, and cannot be further misplaced except by those who have usurped them (which is no defeat to society, and so here considered cold).

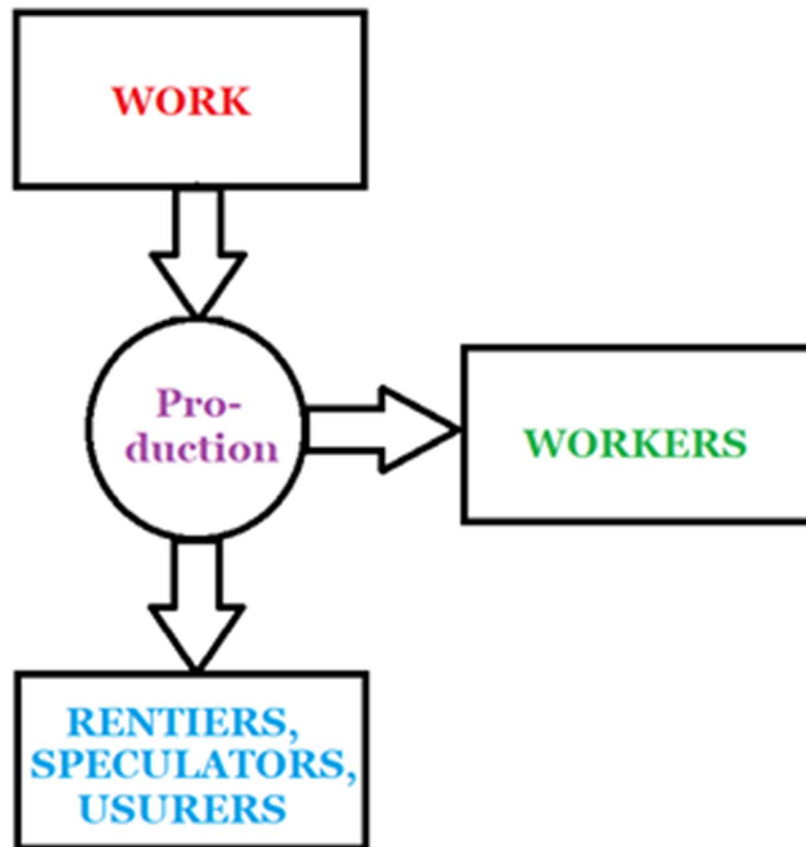
Back to the Thermoeconomic Engine

We can now set up our thermoeconomic engine in the following manner, with the factors of production representing our heat reservoir, which feeds the production engine, and

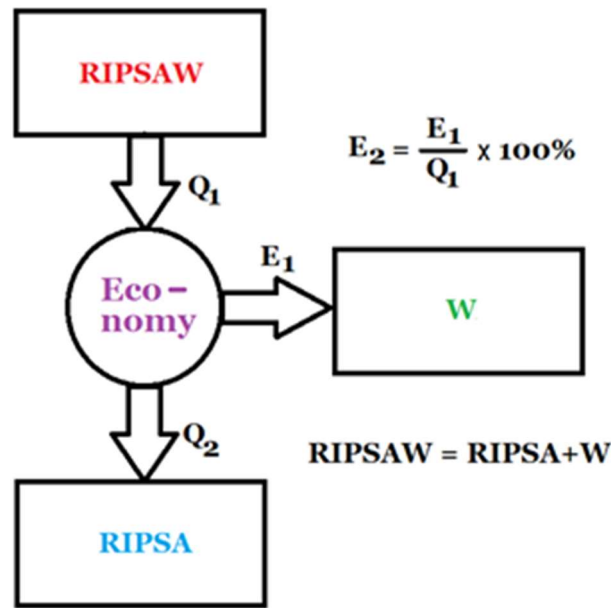
authority, which have no basis in natural fact, but which persist merely as superstitions awaiting their abolition by Enlightenment and collective reason.

⁹ These are often over and above the sum of the individual workers' products, but result also from control of the forces of combined efforts. In other words, many industries benefit from what are called *economies of scale*, and so produce more with group effort and specialization than the same individuals working separately could produce. These benefits of working together, which may otherwise increase wages for some time, decrease production needed per worker, or allow for a reduction in price to the consumer, are often privatized by non-working owners in the form of rent, interest, and profit.

provides returns to rentiers, speculators, usurers, etc. or to the workers themselves (in some instances, the rentiers, speculators, or usurers may do some real labor, mental or manual, in which case they too deserve wages in compensation, which may be taken from their profit of account). The work of production has returns that are split between the workers who do the work and others who gain from that work.



The productivity of an economy is often measured in terms of the Gross Domestic Product, or GDP. One method for measuring the GDP is the RIPSAN method, with Rent, Interest, Profit, Structural Adjustment, and Wages contributing to the total GDP. Unlike the others, Structural Adjustments refer not to returns to the factors of production, but to distortions to those returns (as by way of government policy).



**E₂ is the Efficiency of the Engine*

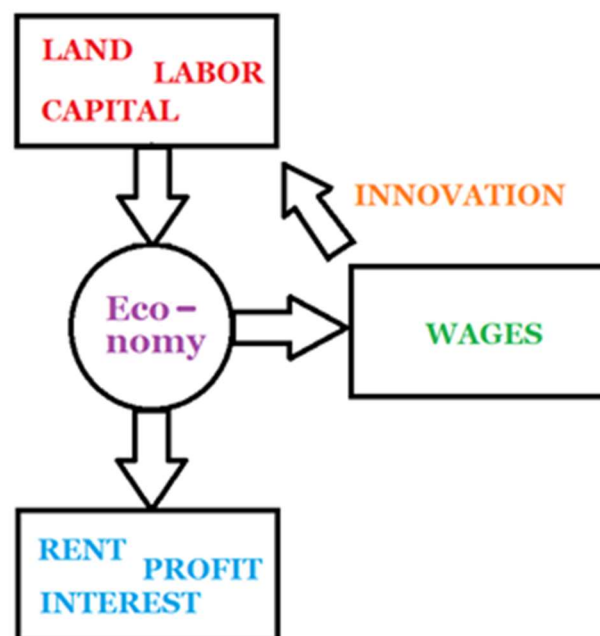
However, the GDP is not only a measure of thermoeconomic output, but also of thermoeconomic entropy. As can be clearly understood, the entire RIPSAW portion of the GDP represents economic production which is involuntary and due to socially-induced (and so non-accidental) economic duresses. Because these are wasteful, or un-needed returns, rather than needed ones, they are surplus returns. What is not needed, but is produced, is wasteful or gluttonous, a surplus. Only the W portion of RIPSAW represents needed returns.

Now, it should be pointed out that products that are needed—that is, that one would endure a cost in order to possess—are products that are going to have their thermodynamic exergy value maintained as long as is possible before it goes into the cold reservoir. Products that are not needed, but that are merely wanted or controlled, also often face neglect, and so material loss. People tend to neglect things that they did not work to have, but care for things they had to sacrifice for. It is at this point that we find a connection between economic entropy—or surplus production—and thermodynamic entropy. This connection becomes glaringly obvious any time there is a glut in the market such that brand-new automobiles are put on an island to rust, milk is poured out by the hundreds of gallons, or crops are plowed under or left to rot, etc. This is an example of the difference between surplus (which always correlates with want) and abundance (which abolishes want). Abundance would look like everyone who needs milk getting milk.

Surplus is milk getting thrown out that could be put to use. This is potential exergy that goes into the cold reservoir.

Increasing Efficiency by Decreasing Entropy

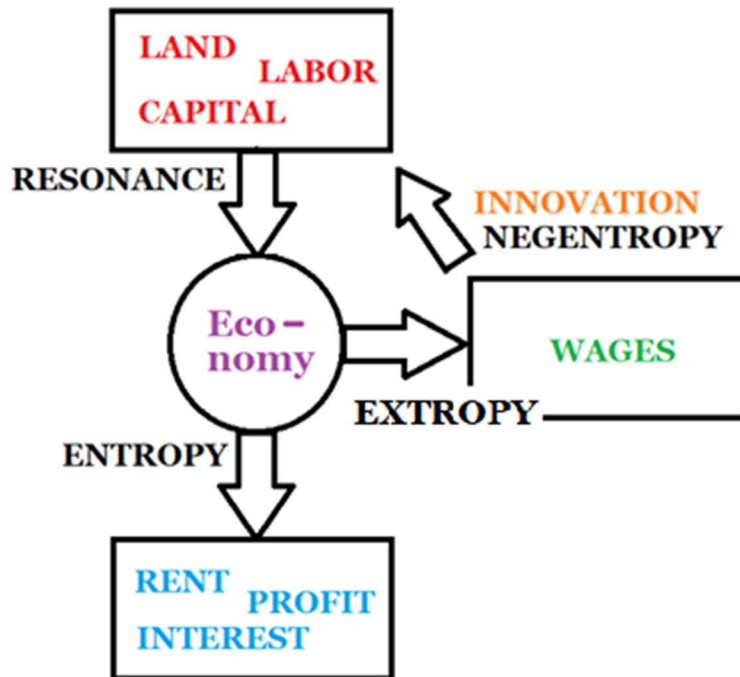
We can use the wages that we consume to fuel the mental labor (often done during “leisure”) needed to make innovations to the way that we manage our land, labor, and capital. In so doing, we can find ways to reduce thermoeconomic losses that occur in the form of rent, profit, and interest (as well as thermodynamic losses that occur in the production process).



Remaining true to the first law of thermodynamics, the “conservation law,” we know that all of the energy that we have at a given moment (I say this because Earth is not a closed system, but receives support from the Sun) is all that we have to work with. No more can be created, and none of it can be destroyed either. With this in mind, we can analyze our thermoeconomic throughput in thermodynamic terms once more.

Our heat reservoir is composed of the three forms of production: land, labor, and capital. As these resonate (interact) in the production process together, and are put through the economic engine, they produce one of two outcomes. One outcome is thermoeconomic entropy, which comes in the forms of thermodynamic entropy (physical loss, not shown

in the diagram) and of economic entropy (economic loss, shown). The other is thermoeconomic exergy, which comes in the forms of thermodynamic exergy (not shown) or of economic exergy (shown). This life-sustaining exergy allows for new ideas, or innovation, to occur, which reduces the entropy of the thermoeconomic system (in a process related to syntropy called *negentropy*) by allowing for better management of production and economy.

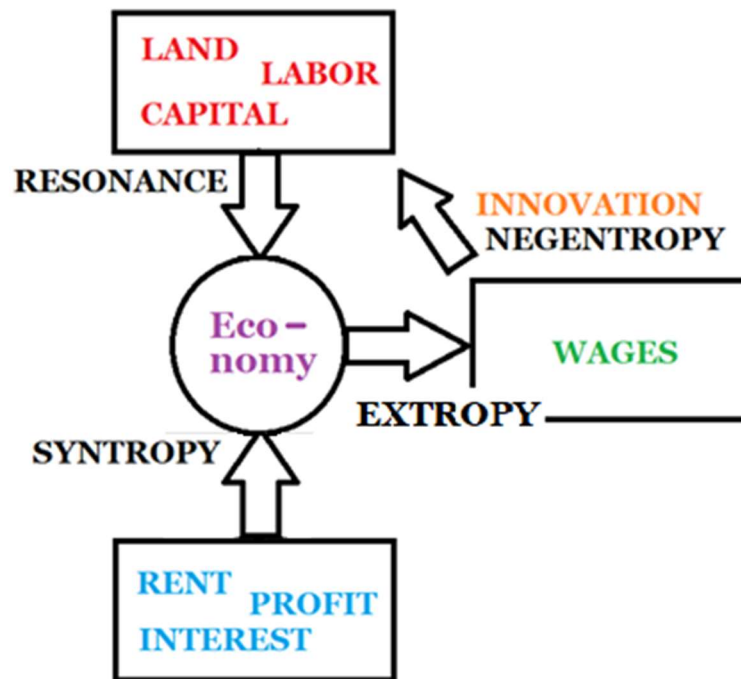


Conserving Energy by Allowing Syntropy

As with the goal of an efficient production process, the goal of a healthy economy should focus on reduction of entropy and increase of exergy. While the mechanistic processes of production and economy may only, overall, increase entropy and decrease exergy, the natural autonomic processes of biology and ecology actually increase syntropy (as by spreading life on the planet, “awakening” dead matter and “animating” it), which in turn increases exergy stores, in a process I refer to here as *extropy*.¹⁰ These exergy stores then

¹⁰ This is not necessarily the original use of the term, but I use it here because it deals with both entropy and syntropy; extropy has been described as “clumping,” which I see as something of a middle ground between things coming together and coming apart. So I use it here for that reason.

provide energy as a heat reservoir to another process. By decreasing entropy (as by increasing productive efficiency and decreasing surplus returns), and increasing syntropy (as by allowing life and Nature to do her job unhindered, or by helping her along, allowing workers to retrieve what they produce), maximum exergy can be maintained.



One way to allow rent, profit, and interest to re-enter the economy in a syntropic fashion is to allow external competitive and internal associative forces to incentivize dividends being paid to members or policy-holders of cooperative or mutual associations. One associative method to convert or challenge existing monopolies, and to establish restorative justice, is through the use of consumer, tenant, worker, and debtor unions practicing revolutionary syndicalism. Another way, a competitive method, is to wield mutual credit to finance local competition to existing institutions. By reducing (by way of competition) and recapturing (by way of dividends) rent, interest, and profit, society can establish a thermoeconomically sound economy. I can only speculate about what a thermoeconomically sound production process might look like (appropriate technology, passive energy, polyculture, etc.) at this point, so I won't do it here. But it may be of interest to note the dialectical relationship that exists between the exergy basin and the heat reservoir in this model. Because exergic wages are used to continue and even grow the factors of production in the heat reservoir, the exergy of the wages becomes the energy store of the heat basin. Traditional engineering models, as employed here, are incapable

of doing justice to organic organization of this sort, but certainly make for useful mechanics and for fun organizing tools.

Economic and Thermodynamic Entropy

It should be noted that there is a difference between economic “entropy” and thermodynamic entropy.

Once it enters the cold reservoir, thermodynamic entropy really can’t be retrieved by mechanical processes without additional energy. Of course, few cold reservoirs are at near-zero degrees Kelvin, and so are not at all near absolute cold. They may be able to be treated as a relative heat reservoir in another process. These engineering models are not intended to be cosmological models.

What is different about economic entropy is that entropy is retrievable to some extent. The economy is an organic system that we experience from within. Like our bodies—which are experienced by us largely as autonomic (that is, not at all) or unconscious processes that reduce entropy and increase syntropy, but which may also be considered in some way the conscious projects of our cells (as multicellular organisms evolving from communities of single-celled creatures)—, the collective human project of socioeconomy is, phenomenally, largely under our control, from the inside, as member-parts, with a mission of decreasing entropy and increasing syntropy. And, as the socioeconomy is a community of multicellular organisms reaching toward combination into multiorganism organisms (or superorganisms), we are administering the same kind of negentropic and syntropic forces to our socioeconomy that our cells are administering to us. It is the same sort of organic, self-organizing process coming from the “within of things.” These same forces may exist to some extent in “nonliving” matter also, as in the atomic and molecular forces binding the atoms and molecules together, but this dead matter is subject more to the law of entropy than that of syntropy relative to our scale, accounting for its degrading status (“nonliving”). So, while we may not participate in thermodynamic or biological syntropy, we can participate in the syntropy of socioeconomy.¹¹

¹¹ However, we are, ourselves, the constructs of our cells and their reactions to our environments, and, before we can act consciously as individuals in the construction of society, we must first become aware of the fact that we are products of both determined

As can be seen, there is a relationship between acts of aggression such as theft, fraud, extortion, vandalism, and inciting violence; and acts of exploitation such as the taking of rent, interest, profit, or causing distortions to wages by making structural adjustments. All of these have at their heart the infringement of the principle of *reciprocity*. These represent socio-economic entropy, which exists at the cost of living systems such as human individuals and the ecology they exist within.¹² This desire for growth at the expense of everything else is a cancerous characteristic. But such is not an artifact sourced in the future, in syntropy, but in the past, in entropy.

We are each other's self-organized environments. As such, we will continue to increase the entropy of one another, while increasing our own syntropy. But if we behave more as a self-aware *holon* (both a part and a whole), we may increase the syntropy not just of ourselves, but of the entire socioeconomic system.

Objections and Refutations

Objections to this model may include disagreement about the nature of the economic cold sink explicated here. For instance, one may hold that rent, interest, and profit are not entirely lost, but are instead reinvested into the economy. And this is true. However, these returns exist as artifacts of labor that the holders of rent (rentiers, or landlords), interest (usurers, capitalists), and profit (speculators, bosses) did not engage in or make a fair exchange for, and that did not provide wellbeing to the worker who engaged in the work. While it is true that some of the rent, interest, and profit is reinvested into the economy in the form of infrastructure, this infrastructure investment is ultimately under the control of the class of people who are extracting surplus returns (and destroying the environment). And so this infrastructure typically serves to increase these returns to the landlords, capitalists, and bosses, rather than to provide a higher standard of living or quality of life

and teleological necessity and not of metaphysical free will. We are fated by determinism and destined by teleology.

¹² The aggression and exploitation of man and woman further incentivizes a similar attitude to be taken toward Nature, whose exploitation occurs by way of combusive technologies, monoculture, clearcutting, induced extinction, etc. as is made permissible by mechanistic philosophies.

to the actual producers of this value. And so this is entropy to the worker, fate to the worker rather than syntropy, destiny.

Some of the infrastructure does offer positive externalities to workers. Workers do use private and public infrastructure such as sewers and businesses, for instance. But to consider if these externalities are an actual benefit to the worker, it is necessary to consider the opportunity costs to the worker, the cost of forgoing other options in order to secure these ones. What is the worker giving up in having access to positive externalities of ruling class investments?

If we do not consider this matter while envisioning the surplus returns under the control of the workers, or forgone altogether, it appears that workers have nothing but gain from public infrastructure. This is because they have no other options; the options are limited by the ruling class of rentiers, usurers, and speculators (who set the rules for everyone else). And the opportunity costs of this are not considered. If we want to know if the worker benefits, we must ask the class-conscious worker the option they would choose, and if they have an alternative that would be preferred. If we are to consider the surplus returns to belong to the producers of those returns, we can imagine other options that the worker could have taken with the money that is currently invested into centralized infrastructure and business, of which they receive an indirect enjoyment of positive externalities. If workers were, instead, to control their surplus product, they would choose to either a) reduce production and enjoy leisure, or b) include that surplus into their wages as a needed product. If the latter, b, is chosen, workers could voluntarily invest or reinvest their wages into infrastructure that they control directly and consider valuable enough to bear the costs of. When the opportunity costs are considered, surplus (waste and want) exists at the expense of abundance (all basic needs met).

Because value is largely subjective, and because of the voluntary nature of surplus-free arrangements, organized workers could provide infrastructure of greater value to themselves than could be provided by non-workers (this is so long as we remember to include any mental or manual labor as work, of course). Workers often have much to gain by exchanging labor for labor, or wages for wages, because of emergent reasons (if you trade me cheese for bread, we can each have bread and cheese, which is of greater value together than apart).¹³

¹³ But this is not what happens when workers contract with individuals who are acting in the capacity of non-worker (rentier, usurer, speculator), but only when those individuals

At this point, one may question the ability of the worker to provide for themselves or look after their own interests. Aren't rentiers/landlords, speculators/bosses, and usurers/lenders necessary? Are not these individuals more industrious, and more fit to serve as trustees to the less fortunate? Won't workers just stop producing so much or waste their investments on unworkable ideas?

To answer these questions it is only necessary to drive the point home once more, that to the degree that rentiers, speculators, and usurers act outside of these capacities of idle extractors of others' labor value, and to the degree that they actually produce value for the enjoyment of others from their physical or mental activity, is that degree to which they also act in the capacity of worker, and thereby are due compensation. This capacity is established by way of voluntary exchange which occurs without the artificially-induced duress of the worker (duress which occurs under the control of monopoly, for instance). If a worker is willing to voluntarily pay another for that other's product (and not the surplus product of their employee, tenant, or debtor)—that is, to exchange wages for wages— then that other is a worker. If a worker is only willing to pay that other (as by allowing them to keep all of the profits of production in their employment contract, or by paying rent or interest) under conditions of duress (not having access to land or capital, due to the monopolization and so exclusion of these), they are not willing to make the exchange truly voluntarily (though there may exist some "virtual" or unreal voluntaryism, at the surface of an employment, tenant, or debtor contract). This is because they do not see a gain from making that exchange, except under duress. There are no agreements involving the extraction of surplus value from workers that are voluntary. The full compensation for the workers' labor is the control of the full value that they added to the process. Volunteers are willing to accept less, but workers are not volunteers. They accept less only under duress, which typically involves some threat of aggression—greater entropy to the worker— if they do not accept, such as homelessness, joblessness, transportationlessness, prison time, or— if they resist that— even death.

are also acting in the capacity of worker. Overall value is increased by exchanging value for equal value, but not when exchanging more for less value (as when a rentier, speculator, or usurer extract rent, profit, or interest from the laborer's natural wages; a condition which must be met for these returns to exist), as occurs under conditions of monopoly.