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TROPHIC CURRENCIES: ECOSYSTEM MODELING AND RESILIENT ECONOMIES

Marc Brakken*†, Preston Austin**†, Stephanie Rearick**† And Leander Bindewald†

* *University Of Wisconsin - Madison*

** *Dane County TimeBank*

† *Time For The World*

ABSTRACT

Wealth is limited. We propose that value is infinite. Any currency isolates certain forms of value to transform into wealth, but those other forms of value remain even as they are undervalued. An economic system with a single currency will only recognize a very limited set of activities as valuable. As a consequence, many of the activities that constitute a functional community, and in turn a functional economy, lie outside of the value analysis of our existing economies. In this paper we present a theoretical currency model analogous to trophic food chains. As plants, grazers, and predators all have different perspective on value and operate accordingly, so do similar distinctions exist in society. We suggest that appropriately differentiated currencies from supranational currencies to regional, sectoral and down to timebanking and nonreciprocal exchanges can help better activate the value in the world, empowering communities and economies.

* Email: mbrakken@wisc.edu

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1 INTRODUCTION

Every form of wealth is by definition limited. Wealth is that which is identified as valuable to any individual whereas value is that which has the potential to be valuable to anything. We cannot allow a lack of certain forms of wealth to equal an inability to resolve specific individual and social needs. The predominant currency structure in most economies today is a functional monoculture (Lietaer et al 2010). National and supranational currencies like the dollar and euro are used in an attempt to denote all value. These currencies, issued by fiat from banks and other centralized institutions, are expected to resolve all transactional needs. Fiat currencies are by their nature scarce, as they are used to calibrate use and importance of limited commodities.

There is a lot of wealth in the world. There is much in the way of dollars and other assets that can be used as leverage or bets on the future. Many of our communities, however, remain entrenched in apparent poverty. With all the wealth that exists in the world, how is it that so many of us are poor?

In this paper we present a theoretical answer to this question derived in part from ecosystem ecology. We posit that value is infinite. Value appears as unrealized potential beyond what any particular perspective recognizes as such. In philosophical terms, this can be understood analogously to Deleuze's concept of the virtual (Deleuze 1968; Deleuze and Parnet 2007), the undifferentiated infinity out of which actualities emerge. Stepping away from the conceptually laden framing of top-down relations we apply a center-edge relationship, which we believe captures aspects of hierarchic relations while remaining fluid. Centers of wealth define and actualize a limited set of value as valuable, namely that which they regard as the causal substance that reaffirms their position. Different centers have divergent views of what is valuable, but value transcends those individual perspectives. Overall, value extends beyond the substances or attributes any given center declares to be valuable.

In socio-economic terms, no single type of currency is capable of denoting and rendering as valuable the infinite value that exists in the world. The activities and objects banks and bankers find valuable are not identical to the value identified by programmers, teachers, the unemployed, or people who work as bankers once they are outside that role. Although banks and other issuers of currency may denote certain activities as valuable and employ dollars accordingly, the recipients of that currency will not simply share the same perspective. These unique perspectives are not easily translated across groups, but difficulties of translation are not the same as priorities of significance: just because we do not valuate our families and friends in dollars does not mean they are less important than the homes for which we pay rents or mortgages. The powerful currencies in use today are able to functionally overwrite these relations by focusing us on only one possible perspective; work to pay the rent can become seen as more important than time with family and friends.

Consequently, we require appropriately differentiated currencies capable of denoting different types of value: individual; networked; geographical. We suggest a model of currencies analogous to trophic pyramids of ecology (Lindeman 1942) whereby the layers of the pyramid represent the different functional perspectives of value and different currency types operate complementarily to facilitate the expression and recognition of this value which otherwise is elided by the dominant forms. Conventional currencies work in the perspective of the global market, but fail to recognize the value of our local communities.

Our economies operate with highly optimized national and supranational currencies, the apex predators of currency systems. However, apex species exist on the basis of the primary production system on the bottom of the pyramid and each following layer that refines sunlight into protein (Allen et al 1999). Consequently, ecosystems are not defined solely by the actions of apex species - wolves, humans, and so forth - and our understanding of our economies should also recognize the other layers of value. To this end complementary currencies can define and render functional the appropriately differentiated ranges of activity of different layers. We should think of complementary currencies as actually complementary and not competitive. They identify and make more active the value beyond that identified by dollars and euros. In a competitive scenario, the predominant currency will almost always win. It is at the apex because it already has. Only when we view complementary currencies as operating on levels different from the dollar driven economy can we demonstrate their different, complementary roles in facilitating active and productive communities.

In this regard, we recognize timebanking, the mutual exchange of services rendered through time, as providing an appropriately differentiated economic and social role that could be understood as denoting the primary production system of our economic ecology. The objective of the Time For the World project (TimeFTW.org) is to develop ways to leverage timebanking towards broader social and economic renewal and create and empower contexts that facilitate the emergence of more refined but community responsive economic systems. This paper presents part of the theoretic framework behind this project.

We believe that this trophic value model can be articulated for fields beyond currencies and economics: from business and entrepreneurial enterprise seeking unique value propositions, to social processes and change under frameworks of emergence, and back to ecology itself. The trophic model derives from ecology, but we view it through a general systems lens. By examining the model in complementary scenarios we believe we can gain better insight on a diverse set of rules and limits that allow for broader mapping of applications.

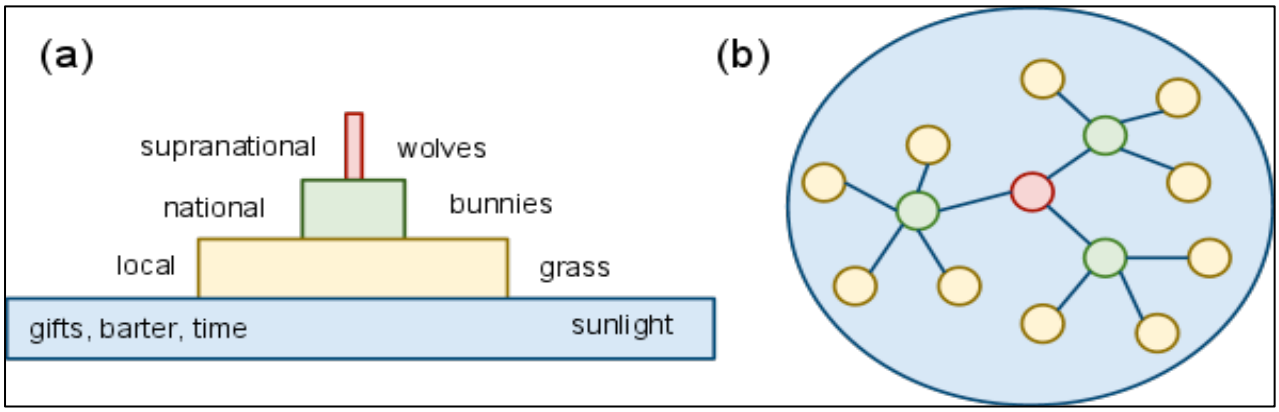

Figure 1: Representation of trophic relations in forms of a hierarchic pyramid (a) and heterarchic network (b). The biological example in (a) refers to the amount of energy flowing through an ecosystem; the currency example draws an analogy to our notion of value and wealth in economics. Value as described exists throughout the system but wealth is conventionally only recognized in its condensed, transformed, and more powerful forms on the top of the pyramid. Wealth is the allocation of certain forms of value as defined on one trophic level, which in turn becomes a valuable resource for the level that consumes it.

2. ACCOUNTING FOR SCARCITY

We orient our economies around scarce resources and act as though scarcity connotes value. In physiology this is like saying that food is more valuable than air - air is everywhere, but food only lives or grows in certain places. Organismal systems allocate stores of resources based on abundance or reliability. Humans typically store about two weeks of food in our bodies. We store about five days worth of water. We store about five minutes of oxygen.

We store little air not because storage is difficult but because we seldom need to rely on our stores. We store lots of food because in human prehistory food could be difficult to acquire. When what you eat runs away from you instead of sitting prepared on shelves, your dinner is never certain.

Air is no less valuable than food, and in conditions where air is unavailable getting more air becomes the most important thing you can do. The existential question of ten minutes without air or ten minutes without food leans heavily towards the former. However, these instances are rare and as a result we do not have to allocate many resources towards accounting for air. We do not all have tanks of breathable air sitting nearby, but nearly everyone reading this has a refrigerator or pantry. We all have some bank of food upon which we rely.

Similarly, when we look at the sources of energy for ecosystems, sunlight is not a scarce resource for most of the world most of the time. Other energy sources are by contrast much more scarce. Nearly all other energy resources are derived from the sun. Plants transform sunlight into biomass that we burn in ovens and our bodies. Fossil fuels stem from ancient sunlight concentrated and refined through biomass, time and pressure. Globally, these are all more scarce but more energy dense than sunlight. Hence, we already have markets for them.

Markets generate and transmit information about resources, providing contexts that inform other actors. With this information, actors can assess sets of options and decide what they want to pursue. In an idealized market scenario actors engage in degrees of competition, collaboration, and innovation as they settle into niches through which they render unique value. This process of innovation and differentiation can be seen as analogous to species differentiation. Thus, just as we have different types of predators, different species of wolves, different packs, and different individuals, so we also have money lenders, banks, credit unions, and so forth.

In this manner we can draw an analogy and model between economies and ecologies as illustrated in Figure 1. Economies do not begin with global financial markets. Those markets are derived from and ultimately still depend on interactions within and between communities. Following this thread, though, we face certain problems in our current mode of economics. Our primary currencies, dollars, euros, yen, are scarce, issued as fiat currency by banks. These currencies are sensible when they are used to determine allocation of scarce resources, like the food the wolves eat. However, just as the wolves do not pay attention to or account for the air, grass, and sunlight upon which they depend, so too are these currencies incapable of providing appropriate valuation of resources that are relatively more abundant. From the perspective of our economic systems, CEOs are valuable because they are scarce. The majority of people become worthless because cheap labor is abundant. However, without lots of different people trying to do lots of different activities that may require further coordination we would have no need for CEOs.

3. ACTIVATING VALUE

Resources in an ecosystem derive from several sources. They derive from the detritus of dead and decaying organisms. They derive from geological processes that slowly

turn ocean beds into mountains, allowing a slow release of scarce compounds like phosphorus required by plants. Synthesizing these compounds into other molecules requires energy. The vast majority of the energy available to life derives from sunlight. Without the sun, there would be very little life on earth. Sunlight, the most abundant and predictable energy source, is fundamental to the configuration of life on this planet.

However, when we look at an ecosystem we typically prioritize the final products of trophic processes: the animals that live within it (Allen et al 1999). Thus, we recognize, for example, a wolf as a symbol of a rich ecosystem. The wolf recognizes as valuable and accounts for the protein of the rabbit. The wolf leaves to the rabbit the task of accounting for its resource. That wealth, however, was processed from the carbohydrates of the grass which has processed the energy of the photon. The wolf values a highly refined, concentrated, and reduced form of solar energy, not the solar energy itself.

Ecosystem ecology considers the flow of material and energy through a system (Allen and Hoekstra 1992). It considers how that energy is captured, transformed, stored, and dispersed. That energetic flow is described through models like food webs and food chains, called trophic models. A plant is able to convert the energy of light at around 36% efficiency through photosynthesis. The rest is radiated off as heat, a necessary byproduct of the process of creating complex molecules out of raw matter.

Animals eat plants for the carbon and the energy embedded in the chemical bonds. Of that energy, increasingly marginal amounts get captured and incorporated by the consumer. Terrestrial trophic chains typically have four to five levels, from primary producers - plants - to apex predators - wolves, lions, hawks, and so forth. Approximately 90% of the energy is lost in the transition between levels through processes of transformation, be it in the formation of different compounds or in the behavioral requirements of the consumer. Thus, in a four level system, for every 1000 calories of plant material, the wolf only gets one calorie. The energy of the different layers are in different forms and those forms are able to do different things - fats or lipids make for much more compact storage than carbohydrates, for example - but the energy loss along the way means that apex predators are typically rare. There simply is not enough energy available for it to be refined and concentrated into massive populations of lions.

The predator searches for lipids and proteins because they offer a more powerful form of energy for those species. Lipids and proteins are therefore valuable to the predator. The processes that create and refine the energy to becomes those compounds are important, but the lion and wolf do not focus further down the chain. They focus on what they eat. The predator's survival is partially contingent on plants' ability to engage in their production and exchange, but the predator does not need to tend to those processes. Hundreds of million years of evolution has largely solved that problem, and evolutionary processes of local and global death and extinction have for the most part stabilized ecologies. There are and will always be episodes of death and extinction - these are critical components to an functional system - but in most cases the large battles have been resolved.

Human economic systems have not had that time to evolve and resolve. Recent rates of growth and innovation have been spurred by the unprecedented availability of powerful yet limited energy sources, but have not provided the time for over-extensive behavior to resolve. New predatory players have emerged rapidly over the past several hundred years, and each has competed for position. Perhaps only now, when global economic systems appear to be shuddering, is this resolution underway.

4. VALUE ELIDED AS NOISE

National and supranational currencies have been in competition for apex status. Territorial and trade network expansion through the past century has applied pressure towards currencies able to address movement over broad stretches of time and space. As a result, those national cur-

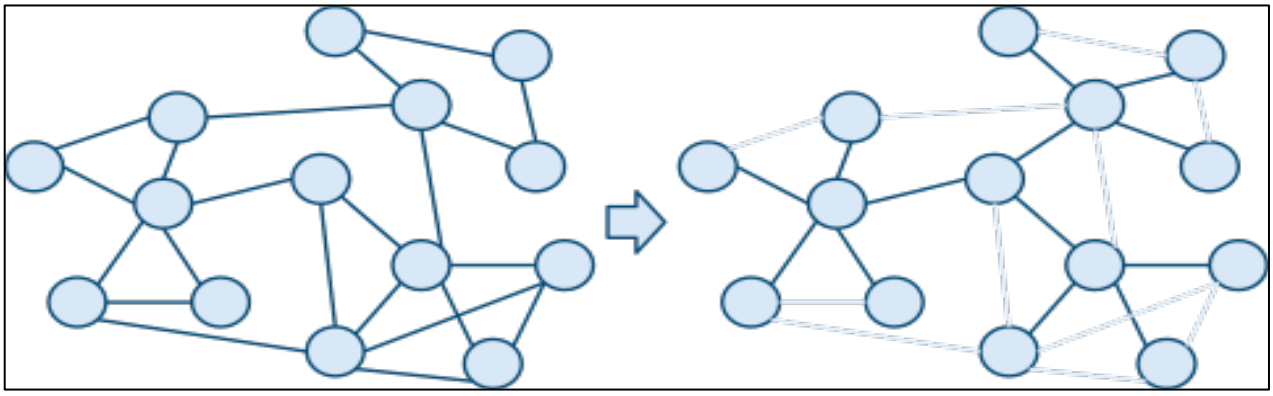

Figure 2: Network elision by emergent structuring. In order to normalize flow of information, energy and material, structures recode relationships between components. Those relationships persist, but become pathological towards goals of structure, like the word of mouth that slips beyond official information channels.

rencies now actively compete for significance. Replacement by the Euro of most national European currencies illustrates this process. Just as most European currencies have become subsumed into the Euro as those countries have pursued broader market access, so too have more geographically localized currencies been subsumed by national currencies as central authorities extended their reach. Proposals for global currencies or non-topographic currencies like the Terra TRC, Ven, and bitcoin attest to a recognized need by some for a translocational currency structure able to normalize accounting and transactions in disparate locales.

The replacement or outcompetition of localized currencies by more global ones has not been without cost. Emergent structures redefine the context from which they are derived to accentuate or prioritize the particular relationships and flows that constitute them. (Figure 2) Once established, structures redefine their foundation. They rewrite the network or system to support and affirm their existence. In the process of this operation, prior relationships are devalued, elided, and treated as system noise, much as word of mouth or rumor runs askew of official information channels. These alternate flows may be ignored or suppressed as they are identified as valueless or dangerous to the goals of the system. The value of activities are reduced to value as assessed through issuers of currency. Activities are reduced to monetized costs and benefits. In economic terms, the world becomes defined by dollars.

To illustrate this with an fictional example: A prehistorical community could have operated with gift and barter exchanges to fulfill needs if exchanges were not too complicated. As more people or more types of objects are involved in the exchanges, calibrating value into the future can become more difficult. A local currency could emerge to solve this difficulty by affixing value to a particular object like an amount of wheat. Prices become assigned to declare how much wheat any other object or service is worth. The local economy problem has been solved.

If people with a wheat-based economy wish to trade with others with a shell-based economy, new difficulties emerge. How does a shell compare to an amount of wheat? The solution to this problem may involve the addition of or replacement by a currency that can address trade between communities. Either wheat or shells may become this regional currency, or a third alternative like beads could take over. If it was one of the initial two currencies, one of the communities may have capital advantage over the other. One area might have better farming conditions; the other might have more shellfish. Regardless of what is chosen, we may assume that the initial currency would remain stable. It did work in its local context, after all.

We might think that the new currency will simply add capability. Local trade still matters. However, this new currency is defined in terms between the two communities and will not just replace the older versions. Relations that are deemed nonessential to the recognized goal of the emergent structure are pruned. These tangential or lateral relationships do not vanish, but are disregarded. Currency or information no longer moves as well along that connection. Functionality has been lost in favor of optimization.

5. REFINING THE INFINITE

Through this discussion we can see an elision of value by wealth. We reduce the types of substances or activities we consider valuable through the lens of aggregated wealth. Wealth is the concentrated center in our center-edge relationship. Wealth defines what is immediately valuable to itself and prunes away that which is outside its perspective. Wealth is limited and scarce. Some have it, most do not. Value is not wealth. Value is infinite. Value is everything that could become different forms of wealth, but it always extends beyond the reach of any particular wealth. The wolf seeks protein and values sources that offer it. Our dominant economies value what can be expressed in dollars. But this never captures the full potential of our communities. Everything has value.

Value refines upward in the trophic chain. Just as sunlight is processed and transformed, so value is transformed into particular forms of wealth. Value refined into wealth may be identified as valuable to something else, as the rabbit is valuable to the wolf. This is what entrepreneurs attempt. They seek alternate forms or dimensions of value, activities that are outside of the market's gaze, and render or reduce it to a concentrated form that is more recognizable. Many of these efforts will be dismissed. Most entrepreneurial efforts will not gain traction. This is part of the energy loss function involved in moving between levels of activity. A few appropriately configured or positioned efforts will succeed, like the microcomputer or the automobile, and many of our activities will become recoded in the process - how we work and where we live is largely determined in the context of computers and cars.

Refining value increases its tractability and power, but at significant loss. Ninety percent of the energy that is in grass does not make it into the rabbit for the wolf. Without that loss, however, there would not be a rabbit. The loss is part of the rabbit's functional physiology. When we refine materials, we dismiss most in favor of the parts we prefer. This would be a problem if sunlight was scarce. Although it is on certain dimensions - it goes away every night - it has a persistence that renders it functionally infinite. Although all of our personal time is finite, the aggregate number of us with time now and in the future is infinite. The scope of possibility is infinite. We are only bounded by our limited perception of the possible and means of manifestation. Faced with limits in what we recognize, as with the limits of dollars and fossil fuels, we innovate on different dimensions - solar, wind, time. By recognizing the infinity of value and the potential that exists in yet untapped resources, assets, or dimensions, limits are merely system elements against which we calibrate and reorient.

Wealth, by contrast, degrades as it moves down. The thermodynamics of living systems declares that as we use concentrated resources they turn into forms less utilizable to

us, or less valuable. Use degrades. The food we eat is broken down and turned into manure. It is still useful, but differently so. Its use shifts to a long term consideration, such as the maintenance of soil fertility with which we will grow next year's crop. We do not eat the degraded product. We we eat what was grown from it.

Wealth flowing down the chain becomes of less quality and more scarce. If one person distributes $100 among ten people, each has $10 assuming no other loss and equal distribution. Each individual can do less with their $10 than the former could do with $100. Perhaps we could find a way to pool that money in order to leverage it for shared benefit, but even that would be at a loss due to costs of communication and coordination.

The capabilities of ten people with $10 will not be the same as one person with $100 if we render that capability only in dollar terms. If we render it more broadly than that, the group with a distributed $10 can be more capable. People's assets extend beyond what is denoted in dollars. If they can use their accumulated $100 to build tools to communicate and coordinate the richer value and assets that extends beyond themselves and the reduced but powerful currency they were given, they can potentially do more than one person with $100. If we can find ways of expressing the value that extends beyond the view of wealth we can indeed generate more wealth, but that wealth like all new wealth will be generated through a broader recognition of value. The challenge lies in creating useful and flexible tools for communication and coordination and rendering the value that lies outside the scope of wealth.

We have poor neighborhoods not because there is not enough money or it is improperly distributed but because we are trying to use the wrong tool for the job and limit ourselves to one perspective, denominated in one currency. Dollars do not represent local, neighborhood, or individual value. They do not represent the value of safe communities, civic participation, or thriving arts communities. Saying Wall Street should be able to valuate those types of activities is like saying wolves should eat sunlight. Similarly, saying that we should value the benefits of functional neighborhoods with dollars and euros is like saying plants should capture and consume protein. They can't, they won't, and we shouldn't expect them to do so. That does not mean functional neighborhoods do not matter. Rather it means that today´s bank currencies are incapable of comprehending the infinite value of our neighborhoods.

6. IMPLICATIONS

We suggest that complementary currencies be treated as complementary and either established as non-competitive with dominant currency structures or seek to be competitive in different modes by redefining sets of relations. Rabbits do not compete with wolves for resources. Rabbits compete with other herbivores when the need for competition arises. Local currencies that attempt simply to copy national transactional dynamics will in most cases have only marginal penetration. The national currency is better optimized for the economic context within which it operates. It helped define that context. Changing only the scale of exchange is insufficient.

Better implementations of complementary currencies are likely to be those which reconsider sets of relations that constitute an economy and empower the relations and value that is unrecognized or elided by dominant structures. Efforts to facilitate neighbor exchange of goods and services in value-flexible ways such as lending circles and timebanking are examples of exchange structures that attempt such a re-transcription.

Our trophic model for currency systems, though early in development, offers a potentially powerful framework for considering structural relations and interceding in entrenched system pathologies. Additionally, it helps illustrate the extended value proposition that all complementary currencies offer. In analogy to the energy in trophic food chains, the overall value is greater on lower levels or towards the periphery and only gets refined and scarce on higher levels or towards the center. Complementary currencies offer a way to express and activate value in different economic or social sectors in contexts ranging from local to global. However, we cannot propose how complementary currencies ought to be structured or define value. In particular, we do not wish to recommend iterative movement down the chain of currencies from national to local. Rather we suggest that sustainable economies should begin by reconstituting gift, barter, and time exchanges where valuation is more flexible and expansive. Further currency experiments should seek to address the unresolved or newly discovered challenges of more coordination.

Resilient economies begin in the household, neighborhood, and other forms of local community. They level up to broader reaches of exchange as needs arise. All economies depend on globally abundant resources and calibrate towards global scarcity. We should not expect currencies focused on global scarcity to be able to address global abundance. Rather, we need currency structures that can be calibrated for disaggregated local scarcity.

Functional ecosystems are those with a context that facilitates capturing globally abundant sunlight as best plants can, not as we think they should. By leveraging locally or individually scarce but globally or collectively abundant resources like time, through the valuative reconstitution of interpersonal relations, and by creating an empowering context that encourages all of us to do our best, we can create a context for functioning resilient communities and resilient economies. By appropriately differentiating currency systems as complementary we can better activate the unique and abundant value of life.

REFERENCES

Allen, T.F.H. and T.W. Hoekstra. (1992) Towards a unified ecology, (New York: Columbia University Press).

Allen, T.F.H., J.A. Tainter, and T.W. Hoekstra. (1999) 'Supply-side sustainability.' Systems Research and Behavioral Science. Vol 16(5) pp. 403-427.

Deleuze G. (1968) Difference and Repetition. Translated by P.R. Patton, 1994. (New York: Columbia University Press).

Deleuze G. and C. Parnet. (2007) 'The virtual and the actual.' Translated by E.R. Albert. Dialogues II, (New York: Columbia University Press) pp. 148-152.

Lietaer B., R. Ulanowicz, S. Goerner, and N. McLaren. (2010) 'Is our monetary structure a systemic cause for financial instability? Evidence and remedies from nature.' Journal of Future Studies. Vol 14(3) pp. 89-108.

Lindeman, R.L. (1942) 'The trophic-dynamic aspect of ecology'. Ecology. Vol 23(4) pp. 399-418.