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Social Heteronomy And Contrasting Economic Epistemology A Mathematical Approach

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Abstract

An original socio-scientific theory is developed out of a contrast with the rationalist paradigm. This new worldview arises from the epistemology of unity of knowledge and its *functional* ontological implication of unity of the world-system. The Kantian epistemological meaning of heteronomy is shown to be one of the permanent socio-scientific problems of rationalism. The methodology is of the topological mathematical nature by virtue of the complex problem that inheres in the criticism of Kantian heteronomy and rationalism.The emergence of the new epistemological worldview of unity of knowledge and the world-system is formalized. Several theoretical constructs and applications of the episteme of unity of knowledge are pointed out in diverse fields.

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Keywords: epistemology, rationalism, unity of knowledge, mathematical complexity, economics and finance

Objectiveand Background

The objective of this paper is to developa quantitative concept in complex system modeling. Its foundation rests on an epistemological approach of unity of knowledge contrasted with the notion of heteronomy that abounds in mainstream socio-scientific thought. These contrasting concepts are understood as follows: Heteronomy manifests the mainstream epistemological concept of demarcation between *a priori* and *a posteriori* reasoning (Carnap, 1966). Unity of knowledge as episteme means the continuous and inseparable organic unity by relationship between the ethically accepted things that are symbolized by variables. In the latter case, themethodical approach is characterizedby complex systems along with the inherent non-linear and pervasively endogenous relations that exist between variables and their relations in such systems (Choudhury, 2013).

As a specific example of the general worldview, we define the social perspective of economic theory in relation to the endogenous ethical value of the portfolio of economic, financial, and social elements symbolized by

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variables. The knowledge-inducing ethical values are embedded into our choices by the text of laws and the consequentialist nature of the selection on the wellbeing of society. The immanent Wellbeing Function as the objective criterion, isin turn defined by the episteme of unity of knowledge and of the consequentialquantitative application derived in the light of the moral and ethical induction. The emanation of such choices is from the text of moral laws that form human preferences and prove to be universally and uniquely acceptable to ethical forms of socialbehavior. Within this domain is the individual induction endowed by value-loaded preferences that are collectively developed to enable social determination.

The Social Wellbeing Function (SWF) is thus an evaluative criterion premised on the universality and uniqueness of unity of knowledge as methodology and the consequentialist unity of the world-system. Within the world-system we will particularize to economic theory. The immanent formalism is an undertaking in analytical ethics. Edel (1970) has written emphatically about such analytical ethical methodology in science.

Because of the complex nature of the epistemological investigation in this paper leading to a new theoretical perspective on the understanding of our unified world-system we will draw on the results of certain theorems. Edel's methodological approach will be combined with the original one in this paper. We refer to Edel's approach as EP, the Existentialist Praxis.

Theorem 1: There exists a Universal Topology from which the universal EP is derived and formalized in the *functional* ontological form.

Let T denote the Truth (Ethical) set. F denotes the Falsehood set (ethically neutral). M denotes the Undetermined set between Truth and Falsehood sets. The properties of these sets are: $T \cap F = \phi$, when T and F are fully determined. But, $T \cap M \neq \phi$; $F \cap M \neq \phi$ in the presence of evolutionary knowledge between T, F, and M.

Let $\{\boldsymbol{\theta}\} \in T$ denote the set of knowledge-flows, such that, as learning towards gaining knowledge is acquired, then in the limiting case, $\{\boldsymbol{\theta}\} = T$. Likewise, there exist the Falsehood category of 'de-knowledge' flows. Let the Falsehood 'de-knowledge' flows be denoted by the set $\{\boldsymbol{\theta}\sim\}$ as the mathematical opposite of the set $\{\boldsymbol{\theta}\}$. Consequently, as $\{\theta\} \rightarrow T$, then $\{\boldsymbol{\theta}\sim\} \rightarrow F$, and $M \rightarrow \phi$, the null set. Thus for either case, $\{\boldsymbol{\theta}\} = T$ or $\{\boldsymbol{\theta}\sim\} = F$, $M \rightarrow \phi$ in these limiting conditions of convergence resulting in the well-determination of M into either T or F as the case may be.

With the above description of the sets T and F we can write for the limiting case of knowledge acquisition (or 'de-knowledge' acquisition), $\{\boldsymbol{\theta}\} \cup \{\boldsymbol{\theta}\sim\} \subseteq T \cup F$.

Define the topology (Ω,S) by the usual properties of a topology (Maddox, 1970), where Ω denotes the universal set; S denotes the well-defined mapping (relational correspondence) that preserves the properties of the topology. These properties are namely,

$(\boldsymbol{\Omega},S) \supseteq T \cup F$; $(\boldsymbol{\Omega},S) \supseteq T \cap F = \phi$. Thus, $(\boldsymbol{\Omega},S)$ includes itself. This means $(\boldsymbol{\Omega},S)$ self-references. Thereby, all combinations of T and F, denoted by (T,F), like $\cup\cap(T,F) \subset (\boldsymbol{\Omega},S)$.

. Consequently, any positive monotonic continuous and compact mapping on $\cup\cap(T,F) \subset (\Omega,S)$* preserves the properties of the topology. In other words, every proper set of mappings on$\cup\cap(T,F)$ belongs to (Ω,S), and is thereby a sub-topology within the Universal Topology.

Define such a well-defined continuous and bounded mapping 'f' on (Ω,S). 'f' converts into the following correspondence in (Ω,S):

$f(\boldsymbol{\Omega},S) = f(T) + f(F)$, in the limit of $M \rightarrow \phi$, or likewise, a similar g(.)-correspondence causes, $g(T,F,M) = g(T) + g(F) + g(M)$, with the result arising from mathematical opposite (complementation) on the (T,F,M)-set that states: as $(\boldsymbol{\theta}\uparrow \Rightarrow \boldsymbol{\theta}\sim\downarrow$ and vice-versa) $\Rightarrow M \rightarrow \phi$, etc.

* Also compound functions defined on $\cup\cap(T,F) \subset (\Omega,S)$ comply with the stated property here. Such compound functions are monotonic transformation of given functional relations. They together represent simulacra of simulated forms.

The mathematical phenomenological model of {Ω,S,θ,x(θ)} in continuity and continuums of the evolutionary processes explains both Truth and Falsehood in terms of their organic property of unity of being, and the differentiated world-system, respectively

Theorem 2: (Ω,S) as supercardinal topology is unique in its determination of (T,F,M).

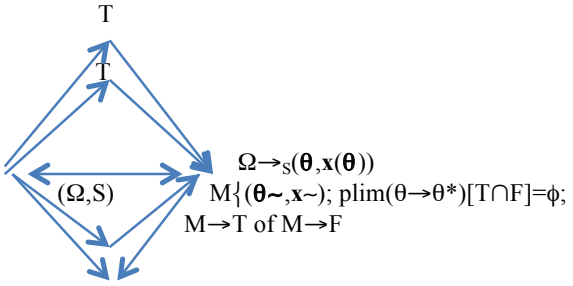
To prove this we simply note the result of self-referencing mentioned above as a logical property derived from the topological definition. Hence, f(Ω,S) = (Ω,S); together with the compound functions of f(.). The exception is the case of the Falsehood domain, {F}, over which a demarcation of ethical values from scientific inquiry occurs (Popper, 2004), otherwise emulating Edel's methodology of EP. Systemic differentiation occurs both between T and F ($T \cap F = \phi$); as well as in the limit of evolutionary processes, $\cap\{F\} \rightarrow \phi$.

T and F as topological sub-sets governed by (Ω,S), have theirdistinctly unique equilibrium points of the evolutionary kind in evolutionary sets of T,F,M, leading to their ultimate null intersection. This is denoted by evolutionary neighborhoods of $\mathbf{h(\theta)} = \{\mathbf{x}(\boldsymbol{\theta})\}$ around the initial Identity map, (**I**), relating to the existence of equilibrium for the relationship, $\mathbf{I}.\theta = \mathbf{f}(\{\mathbf{x}(\boldsymbol{\theta})\})$; **f** as vector topological mapping defined over $\{\mathbf{x}(\boldsymbol{\theta})\}$ in the domain of $\{\boldsymbol{\theta}\} \in (\Omega,S)$.[†] Hence, all subsets as sub-topologies of the self-referenced (Ω,S) are evolutionary in the learning sense of **θ**-ethical induction but are order preserving in respect of (T,F,M). The same kinds of method of deduction can be repeated to prove how (Ω,S) defines uniquely:$\forall\boldsymbol{\theta}\sim \in$ F, etc. This is the meaning of uniqueness of (Ω,S) in characterizing (T,F,M).

Unity of knowledge is impossible in the Falsehood (rationalist) system. It is central to the epistemology of $\{\Omega,S,\theta,\mathbf{x}(\theta)\}$ explaining both Truth and Falsehood, $\{\Omega,S,\theta\sim,\mathbf{x}(\theta\sim)\}$, in continuity across continuums. Hence, the epistemology of unity of knowledge is uniquely universal across all verities of systems.

The supercardinal representation of (Ω,S) in respect of (T,F,M)

Note that, T by itself cannot imply F. F by itself cannot imply T. That is because, for $\forall\boldsymbol{\theta} \in$ T, $\exists\boldsymbol{\theta}\sim$, for which $\{\boldsymbol{\theta}\} \cap \{\boldsymbol{\theta}\sim\} = \phi$. Hence there is no correspondence between T and F. It requires a supercardinal topology that will include T, F and M. M is sifted into either T or F, as the case may be, as knowledge advances to its limiting values in each of these cases in the learning system categorizing (T,F,M)-relations, so as to explain these sets by their respective properties. Therefore, (Ω,S) is the topology that defines Reality universally according to the mutually disjoint nature of T and F and the limiting M, by using the functional ontological correspondence (mapping), S. We depict this nature of (Ω,S) and the mutually exclusive nature of T and F, and that of the M-set in Figure 1:



[†] $\mathbf{I}.\boldsymbol{\theta} = \mathbf{f}(\mathbf{x}(\boldsymbol{\theta}))$ is written in details as,

$$\begin{array}{llllll} 1\,0\ldots\,0 & \theta_1 & \theta_1 & f_1(\mathbf{x}(\theta_1)) & \text{and all monotonic functional evolutions such as} & \\ (f\bullet g\bullet h\bullet\ldots.)(\mathbf{x}(\theta)), & & & & \boldsymbol{\theta} = \{\theta_1, \theta_2, \theta_3, \ldots..\theta_n\} & \\ 0\,1\,\ldots 0 & * \ \theta_2 & = \theta_2 & = f_2(\mathbf{x}(\theta_2)) & x(\theta_1) = \{x_{11}, x_{12}, x_{13}, \ldots, x_{1n1}\}(\theta_1) & \\ \ldots\ldots\ldots & . & . & \ldots\ldots\ldots & \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots & \\ 0\ldots.\ 1 & \theta_n & \theta_n & f_n(\mathbf{x}(\theta_n)) & x(\theta n) = \{x_{n1,1}, x_{n,12}, x_{n1,3}, \ldots, x_{n1,n1}\}(\theta_n) & \end{array}$$

F

F

$[T \cap F \cap M][\theta] \subseteq f(\Omega,S]$ denotes an imperfect determination of M by T or F,
Aslim $(\boldsymbol{\theta} \rightarrow \boldsymbol{\theta}^*)[f(\Omega,S] \rightarrow_S (\Omega,S)] \supseteq [T \cap F \cap M][\theta] = \phi$.
Hence, each of T, F, and M is contained in its differentiated topological representation.
Therefore, (Ω,S) denotes the supercardinal topological space that gives definition to all categories.

Figure 1::The universal and uniqueness representation of (T,F,M) in respect of (Ω,S)

A consequentialist socio-scientific extension of the EP formalism

In the consequentialist socio-scientific system there is a one-to-one correspondence between knowledge formation and its representation in the revealed socio-scientific variables that are induced by the knowledge-flows $\{\boldsymbol{\theta}\}$ (accordingly, 'de-knowledge-flows' $\{\boldsymbol{\theta}\sim\}$).

That is, $\boldsymbol{\theta} \rightarrow_h \mathbf{x}(\theta)$ yields $\mathbf{h}(\boldsymbol{\theta}) = \{\mathbf{x}(\boldsymbol{\theta})\}$ and its monotonic transformation denoted by $(\mathbf{g} \bullet \mathbf{h})(\mathbf{x}(\theta))$; $= f(\mathbf{x}(\theta))$, say, with $(\mathbf{g} \bullet \mathbf{h}) = \mathbf{f}$; for $\forall$ element $\mathbf{x}(\boldsymbol{\theta}) \in \{\mathbf{x}(\boldsymbol{\theta})\}$. Bold letters represent vectors. An example is this: Knowledge of organizing organic unity of the financial system with the real-economy results in a unique way represented by the identity map, '**I**', such that, $\mathbf{I}.\boldsymbol{\theta} = \{\mathbf{x}_1,\mathbf{x}_2\}[\boldsymbol{\theta}]$. Denote, $\mathbf{x} = \{\mathbf{x}_1,\mathbf{x}_2\}[\boldsymbol{\theta}]$. Likewise, by the monotonic mapping **f**(.), we obtain, $\mathbf{I}.\boldsymbol{\theta} = \mathbf{f}(\{\mathbf{x} = \mathbf{x}_1,\mathbf{x}_2\})[\boldsymbol{\theta}]$, $\mathbf{x} = \{\mathbf{x}_1,\mathbf{x}_2\}[\boldsymbol{\theta}]$.

As an example, let $\mathbf{x}_1$ be the vector of financial variables; $\mathbf{x}_2$ is the vector of real-economy variables, both being induced by the knowledge of organizing the economy along lines of pervasive complementarities or systemic participation between finance and the real economy. Over this initial organizing experience further positive monotonic transformations can be induced by **h**(.) etc. as monotonic transformationsforming topological mappings.

The simplified result, $\{\mathbf{x}(\boldsymbol{\theta})\} = \mathbf{I}.\boldsymbol{\theta}$(see earlier footnote); or the monotonic positive transformation, $\mathbf{f}(\mathbf{x}(\boldsymbol{\theta})) = \mathbf{I}.\boldsymbol{\theta}$; evolves into compound functions, $\mathbf{I}.\boldsymbol{\theta} = \mathbf{f}[(.) \bullet \mathbf{g}(.) \bullet \mathbf{h}(.) \bullet \ldots.]$across intra- and inter- evolutionary learning processes. Such functional forms are defined over the continuously compact set of θ-values.The implication then is of the existence of evolutionary learning equilibriums by the functional ontology of $\boldsymbol{\theta}$-values according to Brouwer and Kakutani's Fixed Point Theorems (Nikaido, 1989).

By an extension of these Fixed Point Theorems to evolutionary continuous and compact subsets of the described topology, the following general result will also yield equilibriums.The results occur in evolutionary open sets: $T[\boldsymbol{\theta} = f(\{\mathbf{x}(\boldsymbol{\theta})\})] \Rightarrow \mathbf{I}.\mathbf{h}(\boldsymbol{\theta}) = \mathbf{f}(\{\mathbf{x}(\boldsymbol{\theta})\})$ and the functional compounding. See Choudhury (1993).

A similar formalism can be completed for the 'de-knowledge' topology: This is not shown here for maintaining the scope of the paper to *evolutionary knowledge* problem alone.

Generalizing the epistemological formalism to 'everything'

Such a methodology is consistent with and applicable to the broadest category of socio-scientific problems within organically unified domains of relationships. Thus the precepts of universality and uniqueness in their analytical sense can study the problems of differentiated domains as falsehood, meaning a false depiction of reality. As well as they can study the organically unified and interrelated learning domains of pervasive complementarities, that is participation(complementarities) by way of unifying linkages and the appropriate rules to attain this primal property of T. The latter case forms the domain of truth, meaning a systemic understanding of unity of knowledge across systems. Contrarily, the method of differentiation,methodological individualism, and functional independence betweensub-systems and their entities cannot explain the overarching theme of organic unity in the socio-scientific world.

The EP-framework in social economic and financial thought: Islamic economics as an example

In Islamic economics and finance, which is today a global academic reality, the epistemology of (Ω,S) is premised on the moral text of the *Qur'an* and the Prophetic (Muhammad) guidance called the *Sunnah*. *Sunnah* as the mapping 'S' explicates the guidance and rules out of the *Qur'an* for practical applications. Thus S serves as the primal

ontological mapping that carries the ultimate originary(Howard, 1985) premise of the supercardinal topology (Rucker, 1983) of Ω to the world-systems for use as guidance, rules, and functional instruments.

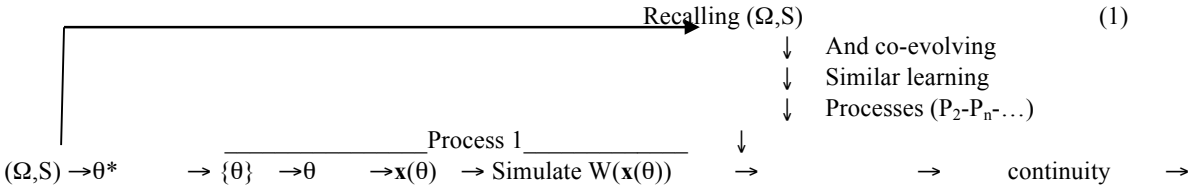
Once the epistemology of (Ω,S) is invoked to construct theory and application in respect of 'everything' in the world-system taken in particulars, the guidance and rules so invoked from (Ω,S) are discoursed for reasoned understanding among experts who deal with the problems under examination. It is at this level that the derived knowledge-flows, {**θ**} [hence also 'de-knowledge'-flows, {**θ**~}] appear in the functional ontological formalism (Gruber, 1993) of any particular problem under study, while using the learning formalism as a systemic approach premised on the epistemology of unity of knowledge. Along with these epistemological and ontological relations, the derivation of knowledge-flows invokes the guidance, rules, and instruments derived from the moral law and understood by discourse in the midst of interaction, consensus (integration), and co-evolution over learning processes.

The author here uses the term 'integration' for encompassing scientific phenomena for analytical discourse leading to consensus. This whole specification is characterized by the learning vector, {**θ**,**x**(**θ**); **θ**∈ (Ω,S)}. Following this determination of the learning vector at any given stage of knowledge-flow to be continuously evolved into subsequent processes of learning, there comes about the post-evaluation of the choice-vector comprising knowledge-induced preferences and menus (say represented by**ξ**(**θ**)). The prevailing (positivistic) socio-scientific results and their normative reconstruction along lines of guidance and rules are derived from (Ω,S).

In such positive-to-normative simulations of empirical results, a system of relations that simulates the Social Wellbeing Function W(**θ**,**x**(**θ**)), is derived torepresent the given process of circular causation. Such circular causation relations between (**θ**,**x**(**θ**)) represent the pervasively complementary, that is of the unifying nature of participatory relations within and between the tuples (**θ**,**x**(**θ**)). Circular causation means that every variable is inter-causally dependent on the rest of thevariables to attain pervasive complementarities between them.Pervasive complementarities explain unity of knowledge as the episteme of such a system.

Ordinal values of**θ**-variable appear asassigned rankings by observing the degrees of pairing between the**x**(**θ**)-values. The **θ**-values may be actual (positivistic) or normatively revised, expanded, truncated etc. in several ways in relation to the knowledge gained by invoking the epistemology of unity of divine knowledge in (Ω,S) in the problems at hand.

In Figure 2, this entire learning Process 1 of Figure 1 to be carried over in continuum by subsequent learning Processes is depicted by the following Chain Relations: (**1**) denotes the episteme underlyingunity of knowledge and the unity of the world-system (specified to the problems and issues under investigation).



1
Epistemology
Carried over by
The mapping of
S, as a
Mathematical
Topological
Relation

Subject to circular causation
between the (θ,**x**(θ))-variables

2. Interaction as ethical learning

3. Integrated discoursed
θ-value as rules and guidance:

4. knowledge-induced
socio-scientificvector

5.Post-evaluation according

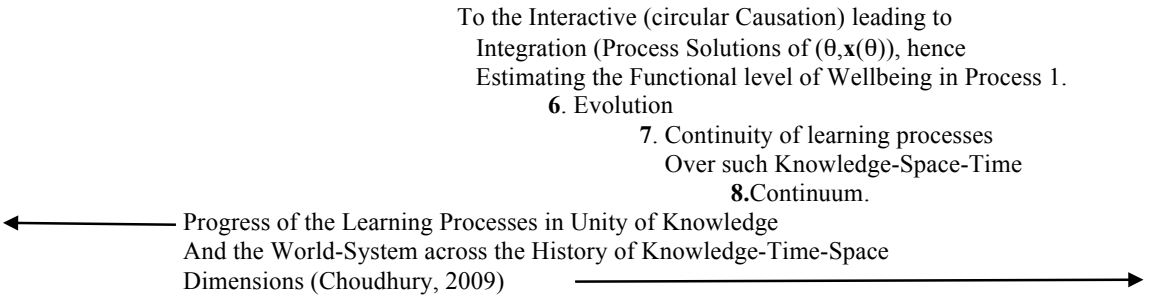


Figure 2: The computational learning process methodology of unity of knowledge

A financial problem of the real economy

In the epistemic study of ethico-economics the dynamics explained by expression (1) remains intact. Into it we now insert the knowledge-induced vector[‡] of variables.[§] In the specific Islamic financial system,such a vector is denoted by, $\mathbf{x}(\theta) = (\theta, r(\theta), i(\theta), Q(\theta), M(\theta), P(\theta))$. Here,$\boldsymbol{\theta}$ denotes levels of discoursed understanding.$r(\theta)$ denotes rate of return on the financial assets held in the real economy. $i(\theta)$ denotes unsustainable levels of interest rates left over in the imperfect money-finance-real economy interlinked system. $Q(\theta)$ denotes real output. $M(\theta)$ denotes the quantity of money in circulation (but may be in the M2 and M3 forms in the imperfect system). $P(\theta)$ denotes a bundle of policies, guidance, strategies and instruments.

A brief explanation of the symbol θ^* is needed here: The model of learning in evolutionary topological spaces implicates a study of the generalized methodology firstlyby establishing the general-system worldview. Then the generalized model is applied to sub-systems of the worldview in every minute detail and remains applicable to diverse problems. An example here is of the world-system as a generalized discipline. In it abides the study of political economy and economic issues that are induced by moral and ethical values comprising a study of ethico-economics.

Another example is that of the generalized theory of the fixed point theorem that establishes equilibrium not only in compact spaces but also unbounded and open spaces characterized by evolutionary learning (Georgescu-Roegen, 1981; Choudhury&Zaman, 2006). Thereby, as in economics and finance, the theory of steady-state equilibrium is a specific notion of the generalized theory of evolutionary equilibriums.

A quantitative explorationof the knowledge-induced processes in economic theory

The differences between the mathematical economic way of solving the optimization problem and a simulation problem in the light of the evolutionary learning model shown in expression (1) present an example that can be brought out by working through the following problem in the two cases – of optimization and process, distinct from each other:

Consider the constant returns-to-scale Cobb-Douglas production function (Mankiw, 2003) in three input variables. These are namely, capital (K), labour (L), and Human Resource Development expenditure (H). Y is the economic output in the growth model:

[‡] The use of 'knowledge-induced vector' is due to the ethical integration of the monetary, financial and real-economy sectors that comes about by the continuous mobilization of financial resources to link up the monetary and real-economy in the good things of life. In this matrix of circular causal interrelations, interest rate is a deterrent to resource mobilization; trade in the good things of life is a catalysis to it.

[§] Note however, that the θ-variable is not a vector in this vector of $\mathbf{x}(\theta)$-variables. That is because average ordinal values of the θ-variable hold for each sequence of data values for the $\mathbf{x}(\theta)$-vector. Such sequences of $\mathbf{x}(\theta)$- vector values could be over time, regions, projects, etc.

$$Y = K^{1/3}.L^{1/3}.H^{1/3} \quad (2)$$

How is the change in output related with those of the input variables?

1. By the neoclassical optimization method

By taking logarithmic transformation on either sides of expression (2) we can write,
$\partial Y/\partial K = (Y/K)$. By multiplying by price level P we convert the two sides of money values and write according to economic theory,

Value of marginal product of capital = Value of output per unit of capital. This is also the value of the productivity of capital.

Therefore, the payment to capital = value of productivity of capital = value of marginal productivity of capital.

Likewise, the paymentstolabor = value of productivity of labor = value of marginal productivity of labor.

The payment of human resource input H = value of productivity of H = value of marginal productivity of H.

The relative payments to these factors = respective input ratios.

In this case,$dY/Y = (1/3).[(dK/K + dL/L + dH/H]$

In terms of rates of change, $g(Y) = (1/3)[g(K) + g(L) + g(H)]$ (3)

Due to the permanence of substitution and competition between inputs in maximizing Y by the rates of change, there will always be substitution between the inputs. The result then is push-and-pull between the rates of change of inputs as shown; while growth of output stabilizes.The rate of change of H also plays an independent (exogenous) role played out in such neoclassical economic models (Solow, 1980).

2. By the method of simulation by circular causation in the θ-induced case

We re-write expression (2) as,

$$Y = (K.H_1)^a.(LH_2)^b$$

This we will write as,

$$Y^* = K^{*a}.L^{*b} \quad (4)$$

Where, $K^* = (K.H_1)$; $L^* = (LH_2)$

'a' and 'b' are elasticity coefficients of Y* in respect of K* and L*, respectively.

In expression (4), K* is augmented by the HRD-index, H_1. L* is augmented by HRD-index H_2. Such input augmentations of Y are realized through the common induction by a complementing factor, θ (implied). Contrarily, in the absence of θ, as in expression (2), the effect of H remains independently exogenous in relationship with the other input variables.

With the endogenous (inter-causal) effects of θin all the input variables, the income-shares are worked out in the following ways:

$$dY^*/d\theta = a.(Y^*/K^*).(dK^*/d\theta) + b.(Y^*/L^*).(dL^*/d\theta) \quad (5)$$

Due to circular causation with inter-causal effects between all the variables, each in terms of the rest of the variables by inter-relations, the following expressions are obtained:

$$dK^*/d\theta = (\partial K^*/\partial L^*).(dL^*/d\theta) + (\partial K^*/\partial Y^*).(dY^*/d\theta) \quad (6)$$
$$dL^*/d\theta = (\partial L^*/\partial K^*).(dK^*/d\theta) + (\partial L^*/\partial Y^*).(dY^*/d\theta) \quad (7)$$

By substituting expressions (6) and (7) in expression (5) and organizing the result we obtain:
$$dY^*/d\theta = a.(Y^*/K^*).(\partial K^*/\partial L^*).(dL^*/d\theta) + b.[(Y^*/L^*).((\partial L^*/\partial K^*).(dK^*/d\theta) \quad (8)$$

$$(dY^*/d\theta).[1 - a.(\partial K^*/\partial Y^*)] - b.(\partial L^*/\partial Y^*)] =$$
$$a.(Y^*/K^*).(\partial K^*/\partial L^*).(dL^*/d\theta) + b.(Y^*/L^*).(\partial L^*/\partial K^*).(dK^*/d\theta) \quad (9)$$

$$dY^*/d\theta = a.(Y^*/K^*)^+.(\partial K^*/\partial L^*)^+.(dL^*/d\theta)^+ + b.(Y^*/L^*)^+.(\partial L^*/\partial K^*)^+.(dK^*/d\theta)^+]$$
$$/ [1 - \{a.(\partial K^*/\partial Y^*)^+ + b.(\partial L^*/\partial Y^*)^+\}] \quad (10)$$

In expression (10) the impact of the learning parameter θ on the pervasively complementary nature of circular causation relations between the variables would yield the signs as indicated in express (10). The implication is that expression (10) will be higher in value than expression (3) due to inter-variable complementarities and the multiplier effect of the denominator, $1/[1 - \{a.((\partial K^*/\partial Y^*)^+ + b.(\partial L^*/\partial Y^*)^+)\}]$.Yet this result on the enhanced increase in output Y* is solely due to the θ-effect of endogeneity between the inter-causal variables of circular causation relations; with a+b> 1. These results on process-oriented approach to economic modelling are quite contrary to the neoclassical approach on optimal science.

The contrast in the workings of the two economic models examined here points out that, neoclassical economic methodology is annulled.Yetit is capable of studying the neoclassical model by the evolutionary learning model and methodology of the process-oriented type (Nelson and Winter, 1982). The methodology of such a model, as exemplified here, is derived from the knowledge of Figure 2.

For instance, the presence of the key learning variable denoted by θ induces the vector $\mathbf{x}(\theta) = (Y,K,L,H)(\theta)$ and causes pervasive complementarities, as explained by the simulated version of the circular causation inter-relations between the variables of this vector. Circular causation is the mathematical way of signifying the underlying episteme of unity of knowledge in quantitative manifestation.

A further extension can be obtained here. The wellbeing objective denoted by W(Y,K,L,H)[θ], can be represented by its monotonic positive functional in the form of measured rankings of θ-variable with respect to the socio-economic data.We can write therefore,

$$\theta = W(Y,K,L,H)[\theta] \quad (11)$$
Say, $$\theta = Y.K.L.H, \quad (12)$$
or $$\ln\theta = \ln Y + \ln K + \ln L + \ln H$$

Thereby, $$d\theta/\theta = (1/Y).(dY/d\theta) + (1/K).(dK/d\theta) + (1/L).(dL/d\theta) + (1/H).(dH/d\theta) \quad (13)$$

The expressions (6), (7), (8) would be inserted into expression (13). The result and interpretation would be similar to expression (10) with economies of scope and increasing returns to scale in the evolutionary learning model of process. Such a process model is absent in neoclassical economics because of the independence between the variables and the consequential properties of the neoclassical linear model of time rates of change in the separate variables that so ensue.

Besides, θ-variable has continuity properties intra-systems and inter-systems across continuums. Therefore, the results of wellbeing and inter-variable causality in the evolutionary learning models derived from the theoretical substance of this paper, and as depicted in Figures 1 and 2, remain the most general properties of all systems. The same model can be used to show degeneration into the neoclassical model. But due to the continuity of the nature of independence, marginalism, and rationality of neoclassical economics, this field of economics cannot be made to explain the evolutionary learning model of unity of knowledge (complementarities and participation) in the process-oriented worldview.

A computer-generated configuration of the interactive, integrative, and evolutionary (IIE-learning) model in

the domains of 'T' (Truth) and 'F' (Falsehood)

This section further extends the field of visual application of the generalized phenomenological model of unity of knowledge of expression (1) into the sociological field with economic embedding. In this way, the generalized model is exemplified by its particular application in yet another specific problem. This is the problem of unity of knowledge between religion and socio-scientific thought contrary to the present state of demarcation between these domains.

To study this problem we use the Spatial Domain Analysis (SDA)method of Geographical Information System (GIS). SDA is a specialized sub-project of GIS. It is here applied to socio-scientific relationships involving economics and religion. Both of these domains are governed by the epistemology of unity of knowledge. In actual practice, the SDA forms a pervasive field of numbers that arise as all possible estimated and simulated values of coefficients representing inter-causal relations between selected variables as of the inter-systemic wellbeing function. The wellbeing function relates to the study of integration between economics and religion as two inter-disciplinary systems. The pervasive field of numbers next allows simulation choices of improved and revised numerical values of the 'estimated' coefficients in order to build on the principle of complementarities between the inter-causal variables of the wellbeing function. The underlying method in such integration arising out of interaction, and thereby growing outwards into evolutionary learning processes is that of circular causation. Although numbers are invoked in actual estimation and simulation by the SDA method, in our case, the representation remains non-parametric and hence illustrative.

The origins of **E**conomics and **R**eligion denote those of initially disjoint systems. The improvising of the epistemology of unity of knowledge causes the disjoint systems to become knowledge-induced and the circular causation method works causing progress towards greater integration by the interactive, integrative, and evolutionary learning processes (IIE-processes).

The epistemic principle of unity of knowledge over the universal field of 'everything' causes the regions extensively denoted by TU and VS to move toward their complementary integration in the region around the point A. The evolutionary SDA waves as shown signify the progressing IIE-processes wherein estimated values of inter-variable relational coefficients represent non-parametric simulations. Such parametric evaluations gain on the deepening of unity of systemic knowledge as itsfoundational epistemology. The method underlying the immanent dynamics of the inter-causal relations between the selected variable is the circular causation method. Myrdal (1958a,b) referred to similar sociological method in his study of the social phenomena from economic viewpoints as cumulative causation.

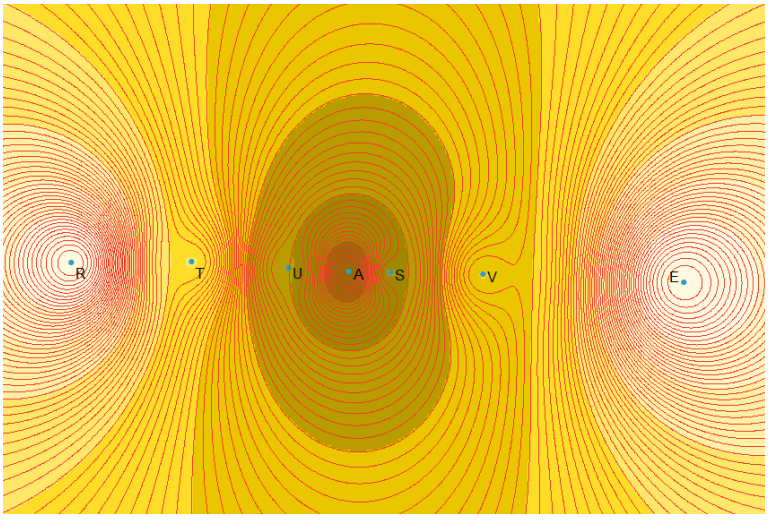


Figure 3: From social differentiation to integration between *R*eligion and *E*conomics when embedded in the epistemology of unity of systemic knowledge as methodology

Conclusion

In the systemic sense of process-oriented interrelationships,socio-scientific modelling is not well served by the optimal models of resource allocation and steady-state equilibriums. In the case of socio-scientific modelling with this contrary approach of process-orientation, evolutionary learning becomes the true alternative.

In this paper, we have modelled the generalized nature of the evolutionary learning model in respect of the episteme of unity of knowledge, while explaining the dichotomous nature of Kantian heteronomy in socio-scientific reasoning. Within this generality we have exemplified the contrasting modelling results for the particular case of economic modelling. The formalism of this latter kind of model in its generality and specificity to economic, financial, and social issues, has proved the need for pervasive complementarities between the good things of life and concomitant choices.Such choices imply an interdisciplinary holistic understanding of the embedded world-systems.

Such an approach is contrary to the pervasive marginal substitutions and competition models of mainstream economic theory in particular and scientific reasoning in general as exemplified by the Kantian principle of heteronomy (Kant, trans Friedrich, 1949). On the other hand, the continuity between deductive and inductive reasoning; between the normative and positive epistemological methodologies, and between noumenon and phenomenon in comprehensive phenomenological thought, establishes higher levels of ethical values and economic efficiency of the process-oriented models of unity of knowledge in evolutionary learningfield across continuums. Ethics and economics are thus endogenously interrelated by the episteme of organic unity of knowledge.

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