Short Elucidating Note 112: How to expand the deep paradigm's conjunctural falsification theorem to cover all paradigms claiming to have or assuming to have the inherently conjunctural form of K = L?

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ABSTRACT : *When reality is inherently interconnected, theory, practice, and testing must be structurally consistent. Any framework based on conjunctural maximization or conjunctural optimization, such as K = L, where K and L are codependent components without sustainability gaps, is structurally validated under both maximization and optimization thinking. In contrast, any framework based on unilateral maximization or unilateral optimization, such as K ≠ L, where K and L are treated as independent components with sustainability gaps, is structurally falsified under both approaches. The general structural paradigm falsification theorem has established this distinction. This paper expands the theorem by moving beyond its binary formulation to examine its applicability across paradigms, its role as a pre-empirical filter of theoretical validity, and its implications for distinguishing structurally consistent from structurally flawed scientific and development frameworks. The expansion shows that structural consistency is a necessary condition for valid theorizing in interconnected systems, and that failure to meet this condition leads to systematic paradigm-level errors that cannot be corrected through empirical adjustment alone.*

I. OBJECTIVES

i) To sum up the structural paradigm falsification theorem of deep paradigms that assume a conjunctural form K = L already out there
ii) To expand step by step the structural paradigm falsification theorem to include all paradigms of the for Ki = Lj
iii) To summarize all in a single compressed theorem

II. KEY CONCEPTS

1) Structural consistency, the condition that exists when the components of a system are modeled as mutually codependent such that their joint determination eliminates sustainability gaps; formally, this is represented as K = L, where K and L cannot be specified, optimized, or realized independently without loss of system coherence.

2) Structural inconsistency, the condition that exists when system components are modeled as independent when they are in fact codependent, generating sustainability gaps; formally, this is represented as K ≠ L, where K and L are treated as separable in determination, optimization, or evaluation.

3) Sustainability gap, the divergence between the outcomes generated by independently determined components and the outcomes required for coherent system reproduction under their actual interdependence.

4) Conjunctural maximization/optimization, the simultaneous determination of system components under conditions of codependence, where no component can be maximized independently without affecting the others.

5) Non-conjunctural maximization/optimization, the determination of system components under assumptions of independence, where components are treated as separable without requiring explicit consideration of their effects on other components.

6) Conjunctural thinking, a mode of analysis in which system components are treated as structurally co-determined, such that their joint specification is required to maintain system coherence (K = L), reflecting conditions of strong interdependence.

7) Non-conjunctural thinking, a mode of analysis in which system components are treated as analytically separable, either independently or through coordination under constraints, without requiring joint determination consistent with K = L.

8) Assumed conjunctural thinking, a modeling condition in which a framework claims or presumes conjunctural structure (K = L), but it operationalizes it through non-conjunctural methods, leading to structural inconsistency and potential sustainability gaps.

9) Structural validity as pre-empirical filter, the condition under which structural consistency is a necessary requirement for theoretical admissibility prior to empirical testing; models that fail this condition are structurally mis-specified and cannot yield reliable empirical validation.

III. INTRODUCTION

The general structural falsification theorem (GSFT) was shared recently, and applied to invalidate on structural grounds the traditional economic development model(D = B)(Muñoz 2026a), where B = economy only model of Adam Smith(Smith 1776); the red socialism model (M = A)(Muñoz 2026b), where A = society only model of Karl Marx(Marx and Engels 1848); and the deep environmentalism model (E = C) (Muñoz 2026c), where C = environment only model, ideas that bring Karl Popper's thinking(Popper 1965) into the structural falsification world and that bring Thomas Kuhn's thinking(Kuhn 1970) into the conjunctural paradigm shift world through bringing in structural falsification as a pre-empirical condition as well as the idea of paradigm testing consistency. Below the key aspects of the general structural falsification theorem (GSFT) are shared in detail.

The key aspects of the general structural falsification theorem

i) General Structural Falsification Theorem

A model that claims a conjunctural structure (K = L) is structurally falsified if: a) it applies unilateral adjustment (e.g., maximization), or b) it assumes component independence incompatible with conjuncturality, such that:

$$K \neq L \Rightarrow |K - L| > 0 = \text{structural sustainability gap}$$

ii) General Structural Validation Theorem

A model that claims a conjunctural structure (K = L) is structurally valid if: it preserves or restores equality through joint determination or joined optimization (*), such that:

$$(K = L)^* \Rightarrow |K^* - L^*| = 0 = \text{No structural sustainability gap}$$

iii) The mechanisms at play

a) The case of maximization: Maximization of one component holding the other component fixed or assumed away or held as independent or assuming no codependence in an inherently conjunctural system such as K = L leads to gap creation; and therefore Maximization (MAX) ⇒ divergence mechanism:

$$\text{MAX (K) subject to L} \Rightarrow K \neq L \text{ as the conjunctural balance is broken.}$$

$$\text{MAX (L) subject to K} \Rightarrow K \neq L \text{ as the conjunctural balance is broken.}$$

The definition above holds for true conjunctural maximization (joint) under no separability, not under pseudo-conjunctural maximization with separability under constrains.

b) The case of optimization: Optimization of an inherently conjunctural system such as K = L does not lead to structural gap creations, and therefore Optimization (*) ⇒ convergence mechanism

$$(K = L)^* = K^* = L^* \text{ as conjunctural balance is maintained or restored.}$$

Hence, since the structure of optimization enforces joint determination, then the *form* of optimization as indicated above cannot violate conjuncturality. In other words, optimization does not violate conjuncturality when joint determination is correctly specified.

c) Implication: Therefore, structural operators applied to a conjunctural system or a model that claim to have or assume to have an inherently conjunctural structures (K = L) such as the traditional market of Adam Smith, the red socialism market of Karl Marx, and deep environmentalism based models lead to structural falsification as recently shown as indicated above.

iv) The model testing inconsistency principle

A condition in which a model claiming to have or assuming to have the structure K = L is empirically tested using methods that are not structurally consistent with the nature of the system the model represents, leading to misleading or delayed falsification. Here structural model validation tests are not carried out creating the possibility of a current world under model testing inconsistency.

v) One-line conclusion

The theorem applies any paradigm claiming conjunctural structure (K = L), regardless of whether that structure is genuinely enforced or only assumed.

The Extended General Structural Falsification Theorem (EGSFT)

A universal structural test for any paradigm that claims conjunctural form (Ki = Lj) is developed below step by step below to expand the general structural paradigm falsification theorem.

A) The extended theorem building process

Let's assume that a general system has the following conjunctural structural condition:

$$\mathbf{Ki = Lj}$$

Where Ki and Lj are the codependent components that define the integral structure of the system. Please, notice that this is a balance condition — a conjunctural equality.
It tells us the general system is in a state where two components are co-determined. Therefore, all paradigms that claim or assume an inherently conjunctural structure fall within the structure Ki = Lj.

1) The extended conjunctural consistency requirement

Any method that claims to have the structure above is structurally valid if and only if: it preserves or restores the requirement Ki = Lj through joint adjustments of Ki and Lj.

2) The extended structural falsification requirement

Any method that claims to have the structure above is structurally falsified if: It imposes unilateral change (e.g., maximization) on Ki or Lj such that $Ki \neq Lj$, thereby violating the defining conjunctural requirement. See that this thinking of unilateral change applies to true conjunctural maximization (joint) methods where there is no separability; it does not apply to pseudo-conjunctural maximization methods under separability with constraints.

3) The necessary Outcome of Falsification

If $Ki \neq Lj$, then: a structural gap necessarily emerges, defined by $|Ki - Lj| > 0$ or by $|Lj - Ki| > 0$, depending on where the unilateral change is applied indicating system distortion or sustainability gap (SG). Therefore, the extension suggests that sustainability gaps are mismatches that arise when interdependent components are treated as independent in theory or practice.

4) The extended expected overall result

Therefore: Any framework based on unilateral maximization is structurally falsified whenever the system it represents is inherently conjunctural (Ki = Lj). This is because the theorem's primary domain of application is paradigms operating under assumed conjunctural thinking, where conjunctural structure is claimed but not methodologically enforced.

5) Elucidation

You can optimize a conjunctural system, but you cannot maximize within it without structurally falsifying it. Notice that any method described above Ki = Lj before falsification there is structural admissibility, whether the paradigm structure is valid or not. If valid the paradigm is structurally consistent, and if invalid the paradigm is structurally flawed. If the paradigm is invalid but it is assumed valid it is structurally flawed. As for example outcomes are empirically interdependent, then any model that treats them as separable components is structurally mis-specified, regardless of whether externalities are assumed away or internalized.

6) The extended maximization paradigm inconsistency and demonstration

Maximization is at the heart of additive thinking, let's pick side Ki, then we treat Lj as a constrain or left over and what we see in this case is that the equality breaks analytically when we maximize Ki as Ki is maximized subject Lj. Therefore, the system is no longer Ki = Lj as maximizing Ki while holding Lj as fixed or adjustable term leads to losing the conjunctural balance and to transforming the system into a directional system or one sided pressure system; and since Ki increases without jointly adjusting Lj, then a distortion gap or sustainability gap is created ($|Ki - Lj| > 0$). Therefore, unilateral maximization in true conjunctural systems or true conjunctural systems assumed separable leads to structural inconsistency.

Implication 1: ***Maximization within inherently conjunctural systems is a special case of system distortion, not a neutral analytical tool as its application leads to the breaking of the balance Ki = Lj creating distortions gaps or sustainability gaps. Hence, maximization of Ki breaks or distorts Ki = Lj balance. And therefore, maximization leads to structural falsification*** *only when applied to systems that are inherently conjunctural (Ki = Lj).* ***Notice that while maximization can be represented as a special case of optimization under separability, this equivalence collapses under true conjuncturality, where unilateral objective functions violate joint determination***.

7) The extended optimization paradigm consistency and demonstration

Optimization in the conjunctural sense reflects the joint determination of Ki and Lj as it aims at seeking a best configuration of the system as a whole; and therefore when the equality is optimized[$(Ki = Lj)^*$] the equality is maintain or rebalanced($Ki^* = Lj^*$), and this means that optimization is not a directional process as it seeks the best combination (Ki, Lj) such that the system works best given their interdependence, which leads to no distortion gaps or sustainability gap creation since [$(|Ki - Lj|) = (|Ki - Lj|)^* = (|Ki^* - Lj^*)| = 0$]. Therefore, the result of optimizing a conjunctural equalities such as Ki = Lj is that the system remain coherent as there is component and system optimality consistency ($S = (Ki = Lj)^* = Ki^* = Lj^*$, adjustments are mutual, not unidirectional, and balance equality is maintained as systems expand or contract. Notice here that conjunctural optimization eliminates structural mis-specification by enforcing joint determination (Ki = Lj), but it does not preclude errors in the identification or functional representation of system components. Therefore, joint/conjunctural optimization leads to or restores structural consistency. And this is because if the structure enforces joint determination**,** then the form of optimization cannot violate conjuncturality. In other words, optimization does not violate conjuncturality when joint determination is correctly specified.

Implication 2: ***Optimization is a special case of non-distorted systems, a neutral analytical tool as its application leads to maintaining the balance Ki = Lj without creating distortions gaps or sustainability gaps. Therefore, optimization preservers or restores Ki = Lj balance. Hence, conjunctural thinking constrains the*** **logic** ***of optimization in a way non-conjunctural thinking does not. In other words, in conjunctural thinking, optimization cannot be structurally inconsistent with conjuncturality when it enforces true joint determination because joint determination ensures consistency with the condition Ki = Lj; any remaining mis-specification arises from incorrect component identification or functional representation, not from the optimization structure itself.***

8) Comparing the nature of extended structural falsification-structural validation

The implications of comparing the nature of extended structural falsification and structural validation are summarized in the table below:

Table 1

Maximization → creates divergence:

$Ki \neq Lj$

And this is the requirement for structural falsification for methods claiming to have the structure Ki = Lj

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Optimization → manages convergence:

Ki ↔ Lj

And this is the requirement for structural validation for methods claiming to have the structure Ki = Lj

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The comparison points out the gap-generating mechanism at play in any system when maximizing and a gap fixing or elimination mechanism at work in any system when optimizing.

We can see in table 1 above that while maximization creates distortions or sustainability gaps optimization eliminates distortions or sustainability gaps. The relevant implications of Table 1 above are: 1) with respect to maximization: the component Ki grows = Ki↑, the component Lj deteriorates Lj↓ so that Ki ≠ Lj, and gap emerges = sustainability gap; and 2) with respect to optimization: the component Ki and Lj jointly optimize (*) = (Ki = Lj)*, no component deteriorates Ki* = Lj*, and no gap emerges = no sustainability gap.

9) The general structural falsification theorem through maximization

You cannot maximize (MAX) any method that is inherently conjunctural without leaving Ki = Lj as if you MAX (Ki) subject to Lj or if you MAX (Lj) subject to Ki or when you maximize them separately, then Ki ≠ Lj and structural gaps or sustainability gaps are created since then |MAX (Ki) − Lj| > 0 and |Ki – MAX (Lj)| > 0, and therefore, that method is structurally falsified through maximization as balanced equality is broken. However, keep in mind that maximization leads to structural falsification only when applied to systems that are inherently conjunctural or assumed to be conjunctural (Ki = Lj)**.**

Implication 3: ***If the component that drives any system is shown to be inherently conjunctural this means that the maximization of this system breaks conjunctural equality, and structural falsification occurs. In other words, you can optimize within Ki = Lj, but you cannot maximize without leaving Ki = Lj.***

10) The extended general structural validation theorem through optimization

You can optimize (*) any method that is inherently conjunctural without leaving Ki = Lj as if you optimize Ki and Lj jointly [(Ki=Lj)*], then method optimality consistency exist and no sustainability gaps are created since |Ki* − Lj*| = 0, and therefore, that method is structurally validated.

Implication 4: ***If the component that that drives any system is shown to be inherent conjunctural this means that the optimization of this system keeps conjunctural equality. In other words, if you can optimize within Ki = Lj, then structural validation exist, but you cannot maximize without leaving Ki = Lj. And this means that if you can optimize within Ki = Lj while keeping the balanced equality the method is structurally validated. In other words, if you can optimize within Ki = Lj while keeping the balanced equality the method is structurally validated.***

11) The extended general structural falsification theorem through optimization

If you have a system claiming to have the structure Ki = Lj that is not inherently conjunctural and hence it is a system that has component independency and component fixing properties or it is assumed to have component independency and component fixing properties to allow for the method to work, that method cannot be optimized in a way that results in system consistent optimality conditions [S = (Ki = Lj)*] so that Ki = Lj ≠ S = (Ki = Lj)*, and this optimality inconsistency leads to the creation of structural gaps or sustainability gaps since then |Ki − Lj| > 0 = Ki*-Lj* = 0 and |Lj – Ki| > 0 = Lj*-Ki* = 0; and therefore, that method is structurally falsified through optimization as balance equality is violated. In this case, the failure does not come from optimization itself, but from the incorrect assumption that the system is conjunctural when it is not.

Implication 5: ***If the component that drives any system is shown not to be inherent conjunctural or it is independent, then maximization can take place, but not in ways consistent with system optimality consistency***

(S), which means that the maximization of this system breaks conjunctural equality as the system cannot be maximized without leaving Ki = Lj.

The key parts of the general structural falsification theorem

i) The Extended General Structural Falsification Theorem: Any paradigm that claims a conjunctural structure (Ki = Lj) is structurally falsified if: a) it applies unilateral adjustment (e.g., maximization), or b) it assumes component independence incompatible with conjuncturality, such that:

$$\mathbf{Ki \neq Lj \Rightarrow |Ki - Lj| > 0 = structural\ sustainability\ gap}$$

The expansion shows that structural inconsistency is a necessary condition for invalid theorizing in interconnected systems, and that meeting this condition leads to systematic paradigm-level errors that cannot be corrected through empirical adjustment alone.

ii) General Structural Validation Theorem: Any paradigm that claims a conjunctural structure (Ki = Lj) is structurally valid if: it preserves or restores equality through joint determination or joined optimization (*), such that:

$$\mathbf{(Ki = Lj)^* \Rightarrow |Ki^* - Lj^*| = 0 = No\ structural\ sustainability\ gap}$$

The expansion shows that structural consistency is a necessary condition for valid theorizing in interconnected systems, and that failure to meet this condition leads to systematic paradigm-level errors that cannot be corrected through empirical adjustment alone because the error originates at the structural (pre-empirical) level**.**

iii) The mechanisms at play

a) The case of maximization: Maximization of one component holding the other component fixed or assumed away or held as independent or assuming no codependence in an inherently conjunctural system such as Ki = Lj; and therefore Maximization (MAX) ⇒ divergence mechanism:

$$\mathbf{MAX\ (Ki)\ subject\ to\ Lj \Rightarrow Ki \neq Lj\ as\ the\ conjunctural\ balance\ is\ broken.}$$

$$\mathbf{MAX\ (Lj)\ subject\ to\ Ki \Rightarrow Ki \neq Lj\ as\ the\ conjunctural\ balance\ is\ broken.}$$

b) The case of optimization: Optimization of an inherently conjunctural system such as Ki = Lj does not lead to structural gaps; and therefore Optimization (*) ⇒ convergence mechanism

$$\mathbf{(Ki = Lj)^* = Ki^* = Lj^*\ as\ conjunctural\ balance\ is\ maintained\ or\ restored.}$$

c) Implication: Therefore, structural operators applied to paradigms that claim to have inherently conjunctural structures or assume to have one such as the traditional market of Adam Smith, the red socialism market of Karl Marx, and deep environmentalism based models lead to structural falsification.

iv) The paradigm testing inconsistency principle: A condition in which a paradigm claiming to have the structure Ki = Lj is empirically tested using methods that are not structurally consistent with the nature of the system the model represents, leading to misleading or delayed falsification. Here structural paradigm validation tests are not carried out creating the possibility of a current world under paradigm testing inconsistency.

v) Two-line conclusion: The theorem applies any paradigm claiming conjunctural structure (Ki = Lj), regardless of whether that structure is genuinely enforced or only assumed. In other words, any paradigm claiming conjunctural structure (Ki = Lj) is subject to structural falsification if its methods do not enforce joint determination consistent with that claim.

Key food for thoughts related to the nature of the extended general structural falsification theorem Ki = Lj

i) It doesn't matter whether the world under consideration is fully conjunctural or not, what matters here is whether the model's methods match its claimed structure**,**
ii) Most mainstream models that claim this structure are not purely non-conjunctural, they are assumed conjunctural,
iii) The issue is not maximization alone, the issue here is maximization applied within assumed conjunctural thinking, and
iv) Assumed conjunctural thinking is the analytical condition underlying the paradigm testing inconsistency principle.

The extended structural paradigm falsification cycle

1) A paradigm asserts or claims to have a conjunctural structure (Ki = Lj);

2) It uses separable or constraint-based tools as a method;

3) This creates the assumed conjunctural thinking condition**;**

4) Which places the paradigm inside paradigm testing inconsistency principle and for test failure**;**

5) And this ends with the structural falsification (Ki ≠ Lj, gap emerges) outcome.

IV. FINAL NOTE

Readers will observe that the extended structural falsification theorem (Ki = Lj) introduced above is closely linked to several underlying concepts: consistency vs. inconsistency, hard vs. soft model failure, strong vs. weak sustainability, and the theory–practice consistency principle. These connections are expected but not formally developed here; they will be explicitly defined and clarified in subsequent short notes.

V. CONCLUSIONS

First, it was pointed out in the extended general structural falsification theorem that any development model that claims to be represented by the form Ki = Lj is implying that Ki and Lj are codetermined and that the system is inherently conjunctural. Second, it was indicated that if Lj is treated as the independent driver of the system and Lj is maximized independently of Ki, then the conjunctural balance is broken. Third, it was highlighted that any model claiming to represent Ki = Lj, but operating through Lj-only maximization, is structurally falsified. And fourth, it was stated that any conjunctural system (Ki ↔ Lj) that is modeled as a separable system (Ki → Lj or Ki ← Lj) will generate structural inconsistency under unilateral methods.

In general, it was shown that a conjunctural system cannot be validly represented through a one-sided (Lj-only) framework without breaking its defining equality. Therefore, any such representation leads to structural falsification and the emergence of sustainability gaps. In other words, the paper introduces the need of a pre-empirical filter test as now structural consistency becomes a necessary condition before empirical testing, creating in the process a generalizable structural testing framework for paradigms that assume a conjunctural structure Ki = Lj, but made operational outside joint consistency requirements.

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