

Shaded General Equilibrium: A Unified Framework for Choice and Market Viability*

*Working Paper Summary. Full draft available upon request.

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Abstract—This paper unifies two minimal extensions of classical economic theory: Shaded Expected Utility Theory (Shaded-EUT) and Shaded Arrow-Debreu General Equilibrium. We introduce a single, shared modification across both frameworks: a structural viability function, $\lambda(x) \in [0, 1]$, which represents the degree to which an economic choice is structurally activated or available. At the micro level, this term allows EUT to explain behavioral paradoxes like Allais and Ellsberg by treating them as issues of feasibility, not preference distortion. At the macro level, it extends the Arrow-Debreu model to account for missing or "silent" markets as structurally inactivated segments of an otherwise complete system. The resulting "Shaded General Equilibrium" preserves the core axioms of rational optimization and market clearing while providing a unified, structurally grounded explanation for a wide range of empirical anomalies. This framework bridges the gap between formal theory and observed behavior by reintroducing structural viability as a fundamental component of economic analysis.

Index Terms—General Equilibrium, Expected Utility Theory, Structural Feasibility, Missing Markets, Allais Paradox, Choice Architecture

I. INTRODUCTION: THE STRUCTURAL SILENCE IN ECONOMIC THEORY

Classical economic theory, from Expected Utility Theory (EUT) to the Arrow-Debreu model of general equilibrium, rests on an implicit assumption: that all theoretically available options are fully and equally "activated" for agents. However, empirical evidence consistently reveals phenomena—such as the Allais paradox in individual choice and missing markets in macro settings—that challenge this premise.

This paper proposes a unified framework, **Shaded General Equilibrium**, that addresses these anomalies through a single, minimal modification. We argue that many deviations from classical predictions are not failures of rationality but consequences of unmodeled structural constraints. Choices or markets may not be absent; they may simply be **structurally silent**.

II. THE CORE MECHANISM: THE VIABILITY FUNCTION $\lambda(x)$

The foundation of our unified framework is the introduction of a ****structural viability (or feasibility) function****, $\lambda(x) \in [0, 1]$. This function is integrated into the

core optimization problems of both micro and macro theory.

$\lambda(x)$ represents the degree to which a choice x is structurally available or activated, determined by factors like institutional rules, cognitive load, or framing. It is not a preference or a probability but an **accessibility filter**.

- When $\lambda(x) = 1$, the choice is fully active, and the model behaves like its classical counterpart.
- When $\lambda(x) = 0$, the choice is structurally inert or "shaded," effectively excluded from consideration, regardless of its potential utility.

III. SHADED-EUT: REINTERPRETING PARADOXICAL CHOICE

At the individual level, we modify the EUT decision rule to create **Shaded-EUT**:

$$\max_{x \in X} \sum_x \lambda(x) \cdot p(x) \cdot u(x) \quad (1)$$

This simple change provides a powerful reinterpretation of behavioral paradoxes without altering preferences ($u(x)$) or beliefs ($p(x)$):

- **Allais Paradox:** The "certainty effect" is explained as a higher structural viability ($\lambda(x) \approx 1$) for certain outcomes, making them dominate seemingly superior probabilistic options.
- **Ellsberg Paradox:** Ambiguity aversion is modeled as the structural deactivation ($\lambda(x) < 1$) of ambiguous options, which are not disliked but are simply less available for engagement.

IV. SHADED GENERAL EQUILIBRIUM: MODELING SILENT MARKETS

At the macroeconomic level, we extend the Arrow-Debreu model. The individual consumer's problem becomes one of maximizing viability-weighted utility:

$$\max_{x \in B_i(p)} \lambda_i(x, z_i) \cdot u_i(x) \quad (2)$$

where $B_i(p)$ is the budget set and z_i represents contextual variables.

A **Shaded General Equilibrium** is a set of prices and allocations where agents optimize this shaded utility and markets clear. This framework allows for a new interpretation of market failures:

- **Missing Markets:** Markets may not appear not because they are incomplete or subject to friction, but because the choices they represent are structurally inactivated ($\lambda(x) = 0$). These markets are not absent, but **silent**.
- **Policy as Activation:** Policy interventions (e.g., legal reforms, information campaigns) can be modeled as mechanisms that "turn on" markets by shifting $\lambda(x)$ from 0 to 1, expanding the set of viable choices.

V. CONCLUSION: A UNIFIED, STRUCTURE-PRESERVING FRAMEWORK

Shaded General Equilibrium offers a unified and parsimonious way to bridge the gap between normative theory and empirical observation. By introducing a single structural concept—the viability function $\lambda(x)$ —we can explain anomalies at both the micro (paradoxical choice) and macro (missing markets) levels without discarding the foundational logic of rational optimization.

This approach does not reject classical theory but completes it by giving it a language to describe when and why certain choices, though theoretically possible, remain structurally unrealized. The theory is intact; the terrain upon which it operates is now visible.

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