

The Regime Diagram: Mapping Any Market

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A Map for Every Market

Imagine you could take any market in the world — semiconductor fabs, used cars, subprime mortgages, wheat futures, hospital operating rooms — and drop a pin on a single diagram that immediately tells you whether that market is healthy, fragile, or broken. That diagram exists. It has two axes, both derived from the CES framework introduced in *Emergent CES* and the *information friction* framework.

This article is about reading that map.

The Two Axes

The horizontal axis is ρ , the substitution parameter from the CES production function (Arrow1961). It answers one question: *how interchangeable are the inputs?* Values near $\rho = 1$ mean inputs are nearly perfect substitutes — one bushel of Kansas wheat is as good as another. Values well below zero ($\rho \ll 0$) mean inputs are strong complements — an operating room needs *both* a surgeon and an anesthesiologist, and neither alone is worth much.

The vertical axis is T , the information friction parameter from the CES potential. It answers a different question: *how costly is it to tell good inputs from bad?* When T is near zero, markets are transparent — buyers can easily evaluate quality, and prices reflect true value. When T is high, markets are opaque — participants cannot distinguish a reliable supplier from a shaky one, a sound mortgage from a toxic one [Akerlof1970; Sims2003].

These two numbers — how substitutable, how opaque — are enough to classify the economic character of any sector.

The Four Quadrants

The (ρ, T) plane divides naturally into four regions. Each has a distinctive economic personality.

Low ρ , Low T : The Precision Corner

Markets in the bottom-left combine strong complementarity with good information. Think semiconductor fabrication: dozens of tightly coordinated inputs — photolithography, ultra-pure wafers, specialized chemicals — where missing any one is catastrophic ($\rho \approx -3$), but specifications are precise and testable (low T).

These markets function well. The diversity premium from *Emergent CES* is fully exploitable because agents can identify and combine the right complementary inputs. Effective curvature is close to raw

curvature K , and all four roles operate at full strength. Surgical teams and Formula 1 pit crews live here too.

Low ρ , High T : The Danger Zone

The top-left corner is where crises brew. Inputs are strong complements, but information friction is high — participants cannot tell good from bad.

The poster child is subprime mortgages in 2006–2008. Securities bundled thousands of loans whose individual quality was extremely difficult to evaluate (high T), designed to exploit geographic diversification (low ρ). As information friction rose, the diversity premium evaporated. The *CES potential* article describes the resulting crisis sequence.

(Kremer1993) described this corner with his O-ring theory: when production requires many complementary steps and quality is hard to observe, a single weak link destroys the entire chain. In CES terms, the O-ring economy sits where $\rho \ll 0$ and T exceeds the critical threshold.

High ρ , Low T : The Commodity Corner

The bottom-right is home to competitive commodity markets. Inputs are near-substitutes (ρ close to 1), quality is easy to verify (low T). Wheat, crude oil, standardized metals. These markets are efficient but unexciting — K is small, so there is little diversity premium to exploit. They work by being simple.

High ρ , High T : The Noisy-but-Resilient Corner

Surprisingly robust. Inputs are near-substitutes and information is poor — think generic retail or used cars. Buyers cannot easily tell good from bad, but it does not matter much: if one option is a lemon, switching is cheap. Markets here are noisy but they do not catastrophically fail. High T matters less when K is small.

The Critical Boundary

The most important feature of the diagram is not a quadrant but a curve: the **critical boundary** $T = T^*(\rho)$.

Theorem (Critical Boundary).

The effective curvature under information friction is:

$$K_{\text{eff}} = K \cdot \left(1 - \frac{T}{T^*(\rho)}\right)^+$$

where $[x]^+ = \max(x, 0)$. Above the critical curve $T = T^*$, the effective curvature is zero — the diversity premium vanishes entirely, regardless of the underlying production technology.

This result, formalized as *effectiveCurvatureKeff*, means the diagram has a sharp boundary. Below the curve, markets function. Above it, they break down. Not gradually — the $[x]^+$ operator means effective curvature hits zero and stays there.

The critical friction T^* is higher for more complementary sectors (lower ρ). Strong complements have steep curvature that takes more friction to flatten. This explains a pattern that otherwise seems paradoxical: the same regulatory change — say, relaxing disclosure requirements — can be harmless in one sector and catastrophic in another. A moderate rise in T might leave semiconductor manufacturing safely below its T^* while pushing a weakly complementary financial market above its T^* . The regime diagram makes this visible at a glance.

The Smirl Curve: What Effective Curvature Looks Like

The *Smirl curve* traces K_{eff} as a function of T at fixed ρ . It starts at $K_{\text{eff}} = K$ when $T = 0$ and declines linearly to zero at $T = T^*$. Beyond T^* , $K_{\text{eff}} = 0$ — the market behaves as if all inputs were perfect substitutes.

What does “effective curvature equals zero” mean in practice? All three roles from *Emergent CES* shut off simultaneously: the diversity premium disappears, portfolios designed for diversification become correlated, and the Nash equilibrium that held agents in cooperative allocation breaks down.

The *empirical test* checks this prediction by examining whether cross-country variation in institutional quality (a proxy for T) predicts the pattern the Smirl curve implies.

Plotting Real Markets

Here is where the diagram earns its keep. We can place real sectors on the (ρ, T) plane using estimated substitution elasticities and proxies for information friction:

Market	ρ (approx.)	T (relative)	Quadrant
Semiconductor manufacturing	-3	Low	Precision corner — strong complements, transparent supply chain
Subprime MBS (pre-2008)	-1	Rising fast	Moving into danger zone — moderate complements, opacity increasing
Commodity wheat	+0.8	Low	Commodity corner — near-substitutes, easily graded
Used cars	+0.5	Moderate	Noisy-but-resilient — some differentiation, limited quality info
Hospital surgery	-2	Low-moderate	Near precision corner — strong complements, moderate info costs

The semiconductor and surgery entries sit in the bottom-left, safely below the critical curve. Wheat sits in the bottom-right — low curvature, but also low friction, so it functions fine. Used cars are in the upper-right — moderate friction, but low enough curvature that the market muddles through despite the lemons problem (Akerlof1970).

The alarming entry is subprime MBS. Its ρ placed it in complementary territory (diversification was supposed to help), but T was rising toward T^* as the underlying mortgage quality became unobservable. Once T crossed the critical boundary, K_{eff} dropped to zero and the three-stage *crisis sequence* unfolded.

Movement Through the Diagram

Static placement is useful, but markets move. The regime diagram becomes most powerful when you track a sector's trajectory over time.

Consider banking in 2005–2008. In 2005 the sector sat at moderate ρ and low T — below the critical curve. Between 2006 and 2008, T rose sharply while ρ stayed fixed. The pin moved straight up, crossing the critical boundary. The policy response — stress tests, TARP, guarantee programs — moved the pin back down by lowering T .

(Williamson1975) observed that firms integrate vertically when asset specificity is high. In regime-diagram terms, vertical integration replaces market-level T with lower internal T when a firm's critical suppliers sit in the danger zone.

Reading the Diagram: A Checklist

For any market or sector, you can now ask three questions:

1. **Where is it?** Estimate ρ (how substitutable are the inputs?) and T (how costly is quality evaluation?). Plot the point.
2. **Which side of the critical curve?** If the point is below T^* , the sector is functioning — effective curvature is positive and the diversity premium is exploitable. If above, the sector is broken regardless of its underlying production technology.
3. **Which direction is it moving?** A sector with rising T (increasing opacity, regulatory rollback, growing complexity) is moving toward the critical boundary. A sector with falling T (better disclosure, standardization, improved monitoring) is moving away from it.

This three-step diagnostic applies whether you are evaluating a supply chain, designing financial regulation, or deciding whether to outsource a production step. The regime diagram does not tell you the answer, but it tells you the right question: *where are you on the map, and which way are you headed?*

What Comes Next

The regime diagram is a static map. *The Economic Landscape* puts the economy in motion on this map, and *Seeing Crises Before They Hit* shows how approaching the critical boundary produces measurable warning signs — rising variance, slowing adjustment, increasing autocorrelation — all proportional to $(1 - T/T^*)^{-1}$. *Conservation Laws* constrain how fast the economy can move between regions. The map not only tells you where crises happen; it tells you when one is coming.

References