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The Play Readiness Index

A subnational diagnostic for green industrial policy. Integrates capability with scope-2 credibility at the state-by-play resolution that CBAM and IRA-linked procurement actually evaluate.

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Forthcoming Aug 2026 — refactor for *Research Policy* / *ICC*

00 Abstract

~245 words

Industrial policy has shifted to operating on subnational geographies while its diagnostic apparatus remains national. We introduce the **Play Readiness Index (PRI)**, an integrated subnational diagnostic that combines five dimensions of readiness — a subnational specialization ratio (state vs national, not country-vs-world Balassa), relatedness density, labor-market depth, clean-energy share, industrial-park infrastructure — with a binary scope-2 grid-credibility gate and an absolute minimum-scale filter for anchor classification, operationalizing how CBAM and IRA-linked procurement actually evaluate manufacturer qualification. The state export denominator comes from INEGI's entidad-federativa series, which corrects the customs fiscal-HQ attribution bias present in standard subnational trade data.

We classify each state-play cell into one of **eight archetypes** (anchor, near-anchor, fragile exporter, latent reserve, stranded capacity, infrastructure orphan, peripheral, transitional) and validate the framework across an 18-specification methodological cross-product, a 1000-draw weight bootstrap, and benchmark comparisons against three alternative measures.

> On Mexico's three top green industrial plays across all 32 federal entities (96 cells), 85 cells classify identically across every methodological specification; the Spearman rank correlation between PRI and the Hidalgo-Hausmann ECI for auto-

> supplier is **−0.733** — a strong inverse relationship, not orthogonality, showing that complexity diversity does not predict play readiness.

Removing the scope-2 binary gate flips 23 cells: each is a state with strong capability whose grid carbon intensity is, today, the binding constraint on preferential access. That the gate alone moves them confirms it operates as a binding constraint, not a continuous scoring dimension. The archetype each cell lands in determines which intervention is in scope (supplier development, clean-PPA procurement, blended finance, or grid reinforcement) and who owns it; the companion paper applies the framework to that diagnostic question.

CELLS	STABLE CELLS	PRI VS ECI P
96	85/96	-0.733
32 states × 3 plays	across all 18 specs	auto-supplier; inverse

SCOPE-2 FLIPS
23
when gate removed

SECTIONS

01 Introduction

three structural shifts

The diagnostic apparatus for industrial policy is at the wrong unit of analysis. National-level instruments — the Economic Complexity Index (Hidalgo & Hausmann 2009), the standard Revealed Comparative Advantage ranking (Balassa 1965), the Green Complexity Index (Mealy & Teytelboym 2022) — answer questions about countries when industrial policy has shifted to operating on states, regions, and metro areas.

Three structural shifts in the policy environment of 2024-2026 make the unit-of-analysis mismatch increasingly costly:

- **The post-2020 revival of targeted state action** documented by Juhász, Lane & Rodrik (2024). The IRA's Section 30D, the EU's Net-Zero Industry Act, and Mexico's PIIRCE 2024-2038 all share a granular state-by-play structure.
- **Scope-2 grid credibility as a binding force** under the EU CBAM (Mehling et al. 2022) and US IRA-linked procurement preferences. Both regimes evaluate manufacturer qualification on grid-sourced emissions intensity at state level — Mexico's national grid average ~430 gCO2e/kWh sits within CBAM threshold, but auto-supplier corridor states source from grids at roughly 500-800 gCO2e/kWh (Nuevo León ~500, Querétaro ~560, Coahuila ~800), at or above the CBAM-compatibility ceiling.
- **Capital-allocation patterns under nearshoring**. Investment committees no longer treat "Mexican auto-supplier" as a unitary thesis; they treat each state-play cell as a distinct option whose readiness depends on a multidimensional configuration.

The empirical literature has begun to address each piece of this diagnostic gap separately, but none integrate capability with scope-2 credibility at the state-by-play resolution that policy now requires.

02 Conceptual foundation

5 dimensions + 1 gate

The PRI assembles five dimensions of subnational green industrial readiness, each addressing a distinct question implementers and investors actually ask:

- **Revealed comparative advantage (RCA-MX)** — what does the state currently export competitively in the play's HS6 basket? A subnational specialization ratio (state vs national, not Balassa's country-vs-world): play exports from BACI 2024, state denominator from INEGI's entidad-federativa export series (Method-B rescaled), which corrects the customs fiscal-HQ attribution bias that inflates CDMX and understates producing states.
- **Relatedness density** — how close is the state's existing capability basket to the play's product space? (Hidalgo et al. 2007; co-occurrence proximity at HS4.)
- **Labor-market depth (DENUE)** — what manufacturing employment exists in SCIAN sectors concorded to the play? Location quotient relative to national.
- **Clean-energy share** — what proportion of state generation capacity is zero-emission? (PRODESEN 2024 cuadros.) The scope-2 gate's carbon-intensity reading comes from Climate TRACE v7 (2024 facility-level emissions).
- **Industrial-park infrastructure** — net-zero-readiness scoring across AMPIP-registered parks (composite of grid-proximity, clean-PPA potential, play-relevant occupier mix).

The scope-2 credibility constraint operates as a **binary gate**, not a sixth scoring dimension. CBAM and IRA-linked procurement evaluate qualification at thresholds (qualify or not) rather than continuously. A state with strong capability but a carbon-intensive grid does not yet clear the threshold for preferential access: its PRI summarizes the production architecture, while the gate isolates the grid as the binding constraint, a fixable input (clean-power procurement, grid reinforcement) rather than a verdict on the state's capability.

03 PRI construction

composite + archetypes

The composite is a weighted sum of the five within-play min-max-normalized dimensions (RCA and relatedness 0.25 each, labor-market depth 0.20, clean-energy share and park infrastructure 0.15 each). Because normalization is within-play, PRI

ranks each state against its peers in the same play and is not comparable across plays; the archetype rules add the absolute floors — the fossil-share scope-2 gate and a $300M minimum-scale filter for anchor status — precisely to inject non-relative anchors (Figure 6). The eight-archetype taxonomy (anchor, near-anchor, fragile exporter, latent reserve, stranded capacity, infrastructure orphan, peripheral, transitional) is rule-based, not clustered, so each cell's archetype follows from a published rule book combining within-play percentiles, absolute gates, and the scale floor (Figure 7). Transitional is the rule book's residual branch and the largest single class (37 of 96 cells): for most cells no single constraint binds, and diagnosis is play-by-play.

The **fragile-exporter construct** identifies state-play cells with high export specialization (RCA ≥ 3) but a thin capability basket (relatedness density ≤ 0.30) — exporters whose position would not survive a moderate platform shock. Tlaxcala in EV components is the canonical case: RCA 7.4 on relatedness 0.03. This is distinct from the standard RCA-only ranking and is what the standard literature misses.

Figure 6. PRI construction: five weighted dimensions plus two binary gates

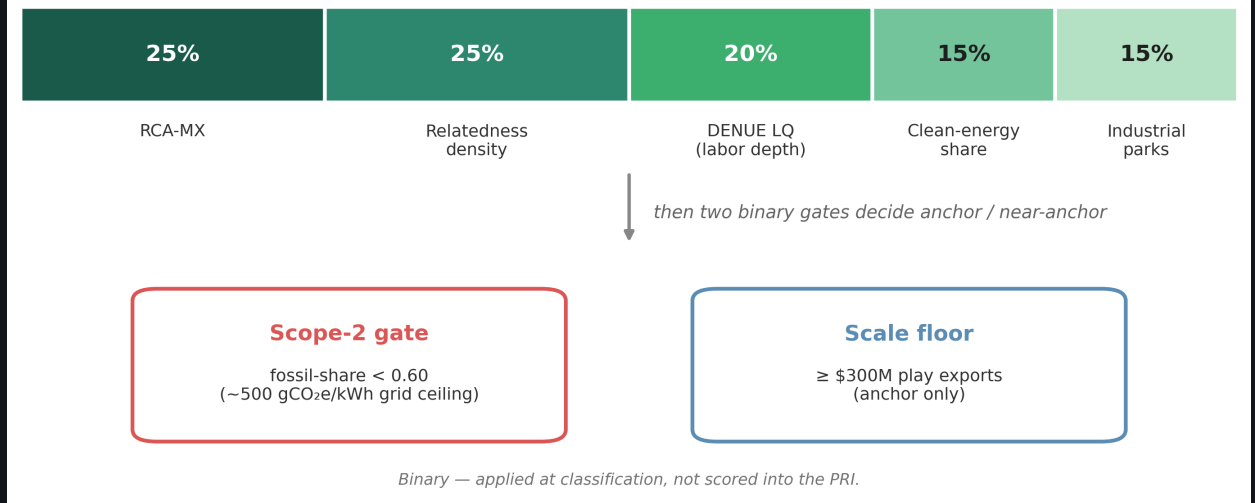
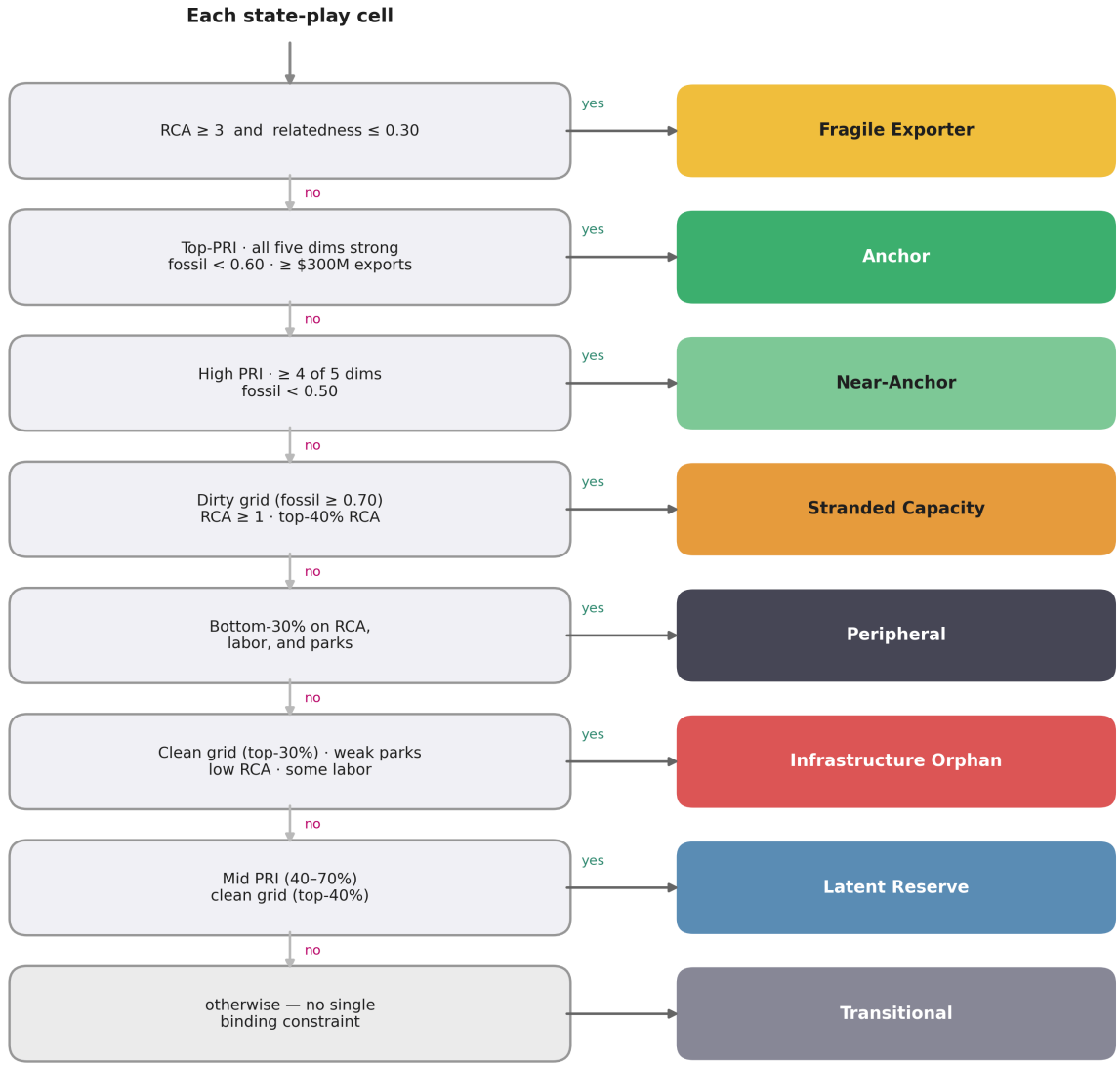


Figure 6. The PRI composite is a weighted sum of five within-play–normalized dimensions (RCA 0.25, relatedness 0.25, labor-market depth 0.20, clean-energy share 0.15, parks 0.15). Two binary gates — the scope-2 fossil-share guard and the $300M minimum-scale filter — then decide anchor and near-anchor status; neither is scored into the PRI.

Figure 7. Archetype rule book: the classifier as a sequential cascade
First matching rule assigns the archetype; transitional is the terminal else.



The archetype rule book as a sequential cascade. Each cell falls through the tests top to bottom; the first matching rule assigns its archetype, and transitional is the terminal else. This is what makes the taxonomy interpretable: a cell's archetype is reconstructable from its dimension percentiles plus the two gates, with no clustering.

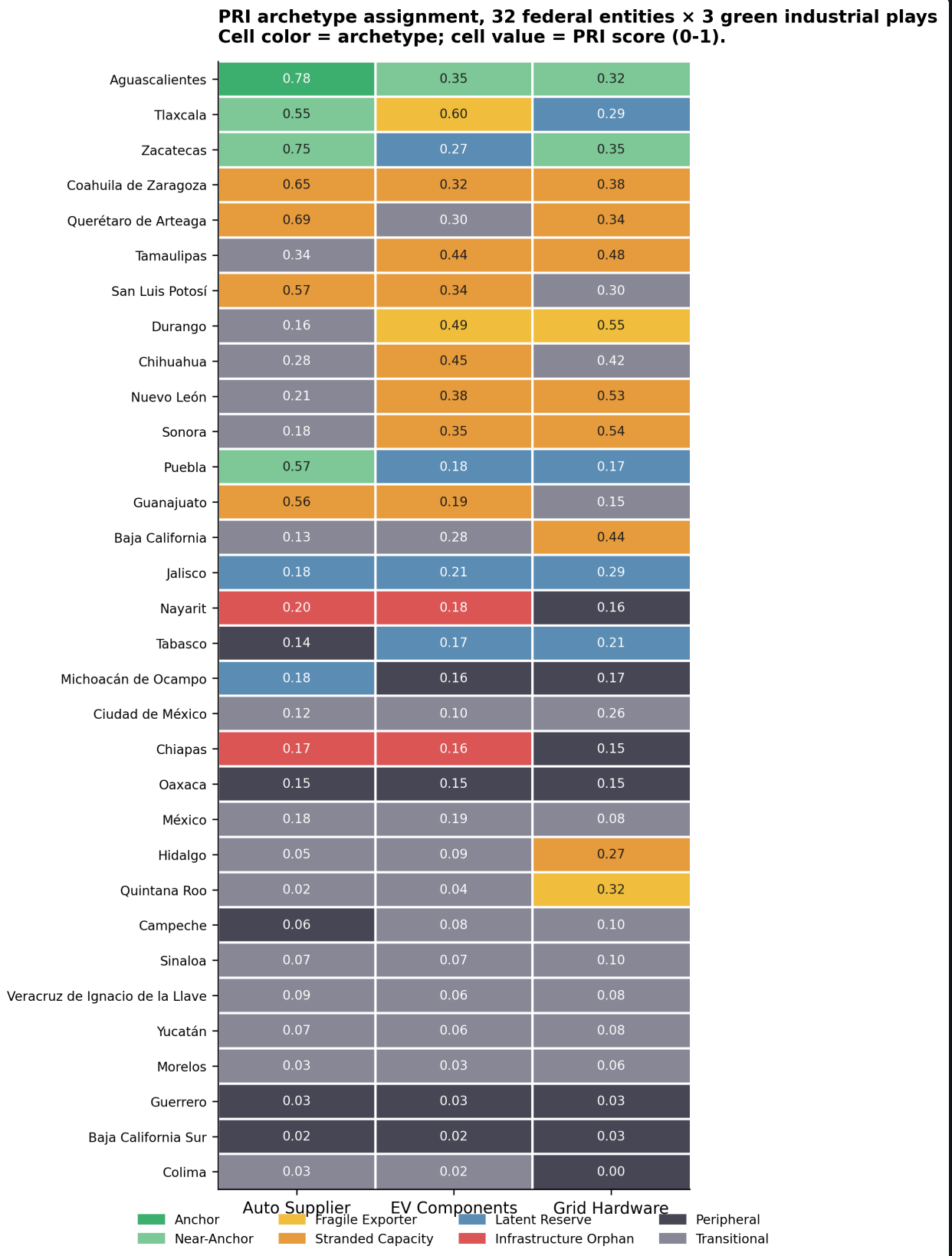


Figure 1: Archetype distribution across 32 federal entities × 3 plays (96 cells), sorted by mean PRI (strongest at top); each cell's value is its PRI score. The single anchor (Aguascalientes) and the near-anchor cells are Bajío and Northeast states; the stranded-capacity cells mark where the scope-2 gate binds: real manufacturing capability on grids that do not yet meet the carbon threshold.

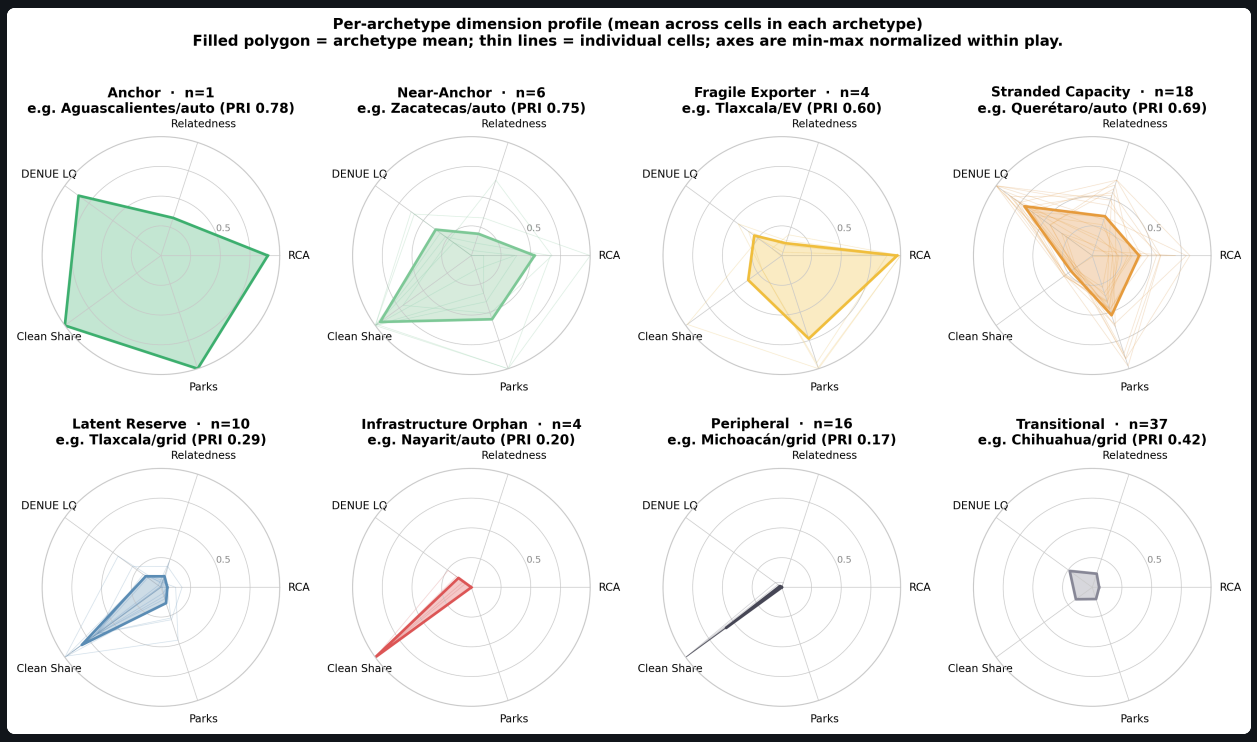


Figure 2. Per-archetype dimension radars (axes min-max normalized within play). Each archetype occupies a distinct configuration of the five dimensions. Transitional, the largest class (37 of 96 cells), is the rule book's residual branch: cells with no single binding constraint.

04 Validation

cross-product + bootstrap + benchmarks

Three validation exercises:

- **Cross-product sensitivity (18 specifications).** Vary the weighting scheme (equal / informed / PCA), the composite aggregation (arithmetic / geometric), and the park-score aggregation (mean / median / max) across the 18 combinations. 85 of 96 cells classify identically across every spec; the 11 that move cluster on the near-anchor / latent-reserve boundary.
- **1000-draw weight bootstrap.** Perturb the informed weights by ±0.10 (uniform) and re-classify across 1000 draws. 91 of 96 cells (95%) hold their archetype in ≥90% of draws; the rest sit on the near-anchor / latent-reserve boundary.
- **Benchmark comparison to three alternative measures** (Balassa RCA-only, the Hidalgo-Hausmann ECI, the Mealy-Teytelboym GCI), plus a PRI-without-gate counterfactual. PRI vs ECI Spearman ρ = **−0.733** for auto-supplier (n = 25 states with

a defined ECI) — the negative correlation is the point: ECI rewards diversity in complex products, PRI rewards depth in green plays under credibility constraints. Different objects, by design.

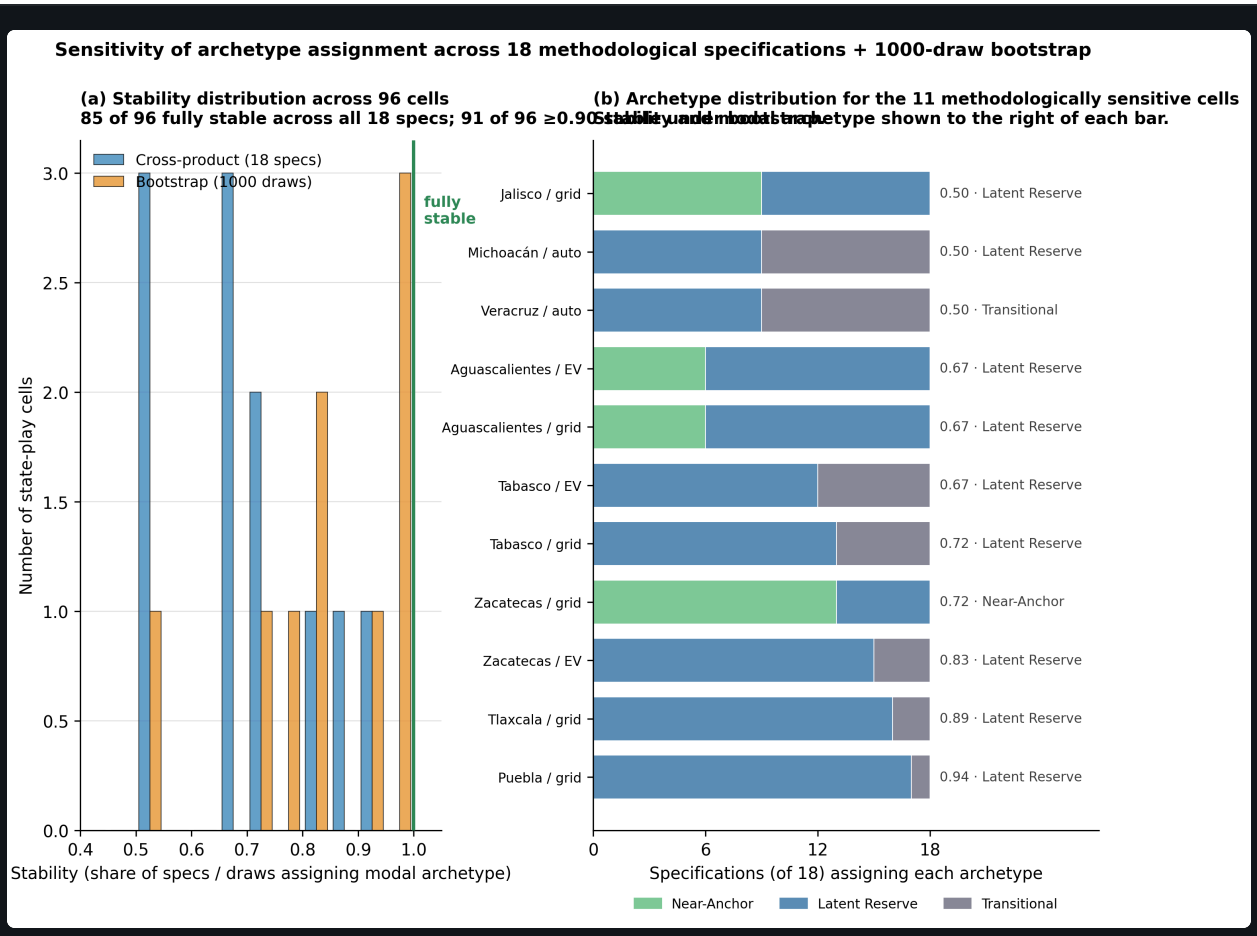


Figure 3. Left: the stability distribution across all 96 cells (85 fully stable across the 18 specs; 91 of 96 ≥0.90 under the bootstrap). Right: the 11 methodologically sensitive cells, showing the archetype each received across the 18 specifications.

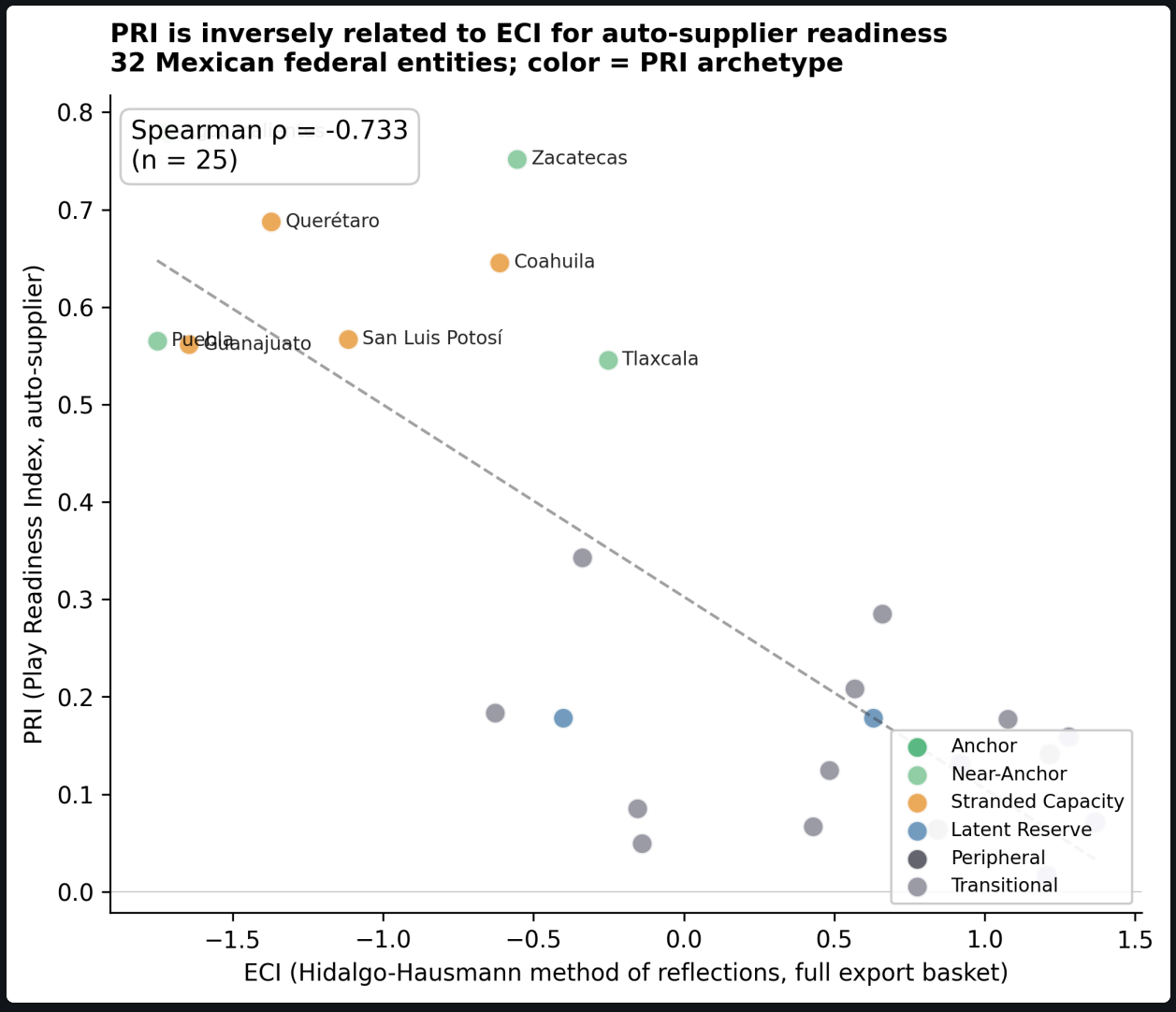


Figure 4. PRI vs ECI for auto-supplier across the 25 federal entities with a defined ECI. Spearman ρ = −0.733 (n = 25). The negative slope is the validating result: PRI is not ECI in disguise.

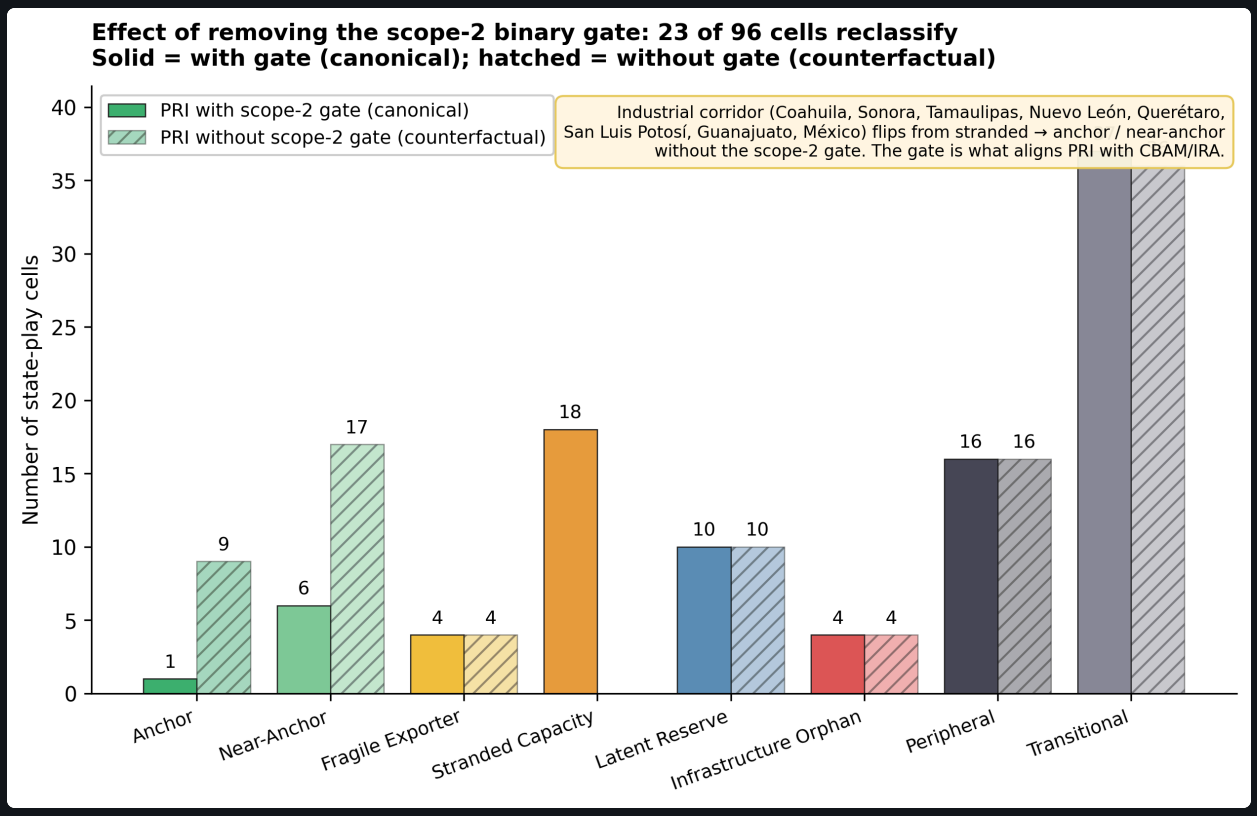


Figure 5: Scope-2 gate effect. Removing the binary gate flips 23 cells: each is a capable state (Coahuila, Sonora, Tamaulipas and Nuevo León among them) moving from stranded-capacity up into anchor or near-anchor. The gate holds capable but carbon-intensive grids out of the anchor pool until the grid clears the threshold: binding, not decorative. The constraint is the grid, a fixable input, not the state's capability.

05 Worked example

three Mexican plays

The three plays in NZIPL Mexico Cycle 1 — auto-supplier upgrading, EV components, grid hardware — produce different cell-level pictures:

- **Auto Supplier (the discriminating case).** Aguascalientes is the play's only anchor; Zacatecas, Puebla and Tlaxcala are near-anchors (1 anchor, 3 near-anchors, 4 stranded-capacity cells). Zacatecas clears every dimension and the scope-2 gate but its ~$69M of play exports fall below the $300M minimum-scale floor, so it stays near-anchor rather than becoming a denominator-artifact anchor. The deepest-capability corridor states (Querétaro, Coahuila, San Luis Potosí) are stranded-capacity: capability is in place, and their grid's carbon intensity is the binding

constraint the scope-2 gate isolates, the one a clean-power build would lift. Across the three plays the framework yields 1 anchor : 18 stranded-capacity.

- **EV Components (the fragile-exporter case).** Tlaxcala ships heavily (RCA 7.4) on almost no relatedness (0.03) — high specialization with no diversification cushion: the fragile-exporter archetype, a position that would not survive a platform shock. No state reaches anchor; Aguascalientes is the lone near-anchor, and the capability leaders (Chihuahua, Tamaulipas, Nuevo León) sit in stranded-capacity: capability on grids that do not yet meet the carbon threshold.
- **Grid Hardware (the no-anchor case).** No state qualifies as an anchor: the capability leaders (Sonora, Nuevo León, Tamaulipas) are stranded-capacity, with real manufacturing depth on grids that do not yet meet the carbon threshold. Only Aguascalientes and Zacatecas reach near-anchor, on clean-grid plus park and labor strength rather than play-specific RCA. The play shows how few states today pair manufacturing depth with the clean grid investment-grade buyers require, and where a clean-power build would change that.

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Companion paper (forthcoming) applies these classifications to the
diagnostic question — which finance instruments and procurement asks fit
each archetype, and what bottleneck removal each policy lever would
actually unlock.
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06 Limitations and extensions

- **Unit of credibility evaluation.** Scope-2 thresholds in CBAM/IRA evolve. The binary gate's threshold is parameterized; the framework is robust to threshold movement, but specific cell archetypes shift.
- **Trade-data vintage and denominator.** Play exports use BACI 2024 (the latest pre-publication vintage); the state denominator uses the INEGI entidad-federativa series. Updates revise RCA-MX scores at the margin, and the 85/96 stability ceiling is a property of this vintage.
- **Coverage and small samples.** RCA is observed for 65 of 96 cells (the rest are structural export zeros), relatedness for 63, parks for 60; 56 cells have all five

dimensions observed. The ECI comparator is defined for 25 of 32 states and the GCI for 17-22 states per play. Archetypes for thin-coverage cells are directional, not precise.

- **Relatedness method.** These v3.2 results use the HS4 co-occurrence relatedness heuristic; the production platform now ships an international product-space (phi) relatedness on a different scale. Adopting phi into the PRI is a deliberate v3.3 change, not a refresh — the fragile-exporter ≤ 0.30 threshold is defined on the v3.2 scale.
- **Geographic resolution.** Federal-entity is the operating scale; corridor and metropolitan-area resolution is feasible (and partially built into the production deploy) but introduces stronger sample-size constraints in DENUE.
- **Generalization.** The methodology applies to any country with state-level trade + employment + grid data. Brazil and India are next; other LMICs depend on subnational data availability.

07 Methodological appendix

archetype rules + weights + reproducibility

The full archetype rule book, the composite formula and weights, reproducibility instructions, computational footprint, output schema, and figure index live in the source manuscript (~9,900 words, sections §1-§7 plus appendix A.1-A.7).

> This page is the working-paper synopsis: the abstract, a walk-through of all seven sections, and the figures. Download it as a PDF. The complete manuscript and the reproduction pipeline are available on request; the paper is being refactored for *Research Policy* / *ICC* (forthcoming Aug 2026).

08 Selected references

in-text anchors

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Full bibliography (20+ anchor works) ships with the complete manuscript.
