

" The cost of instability: a synthetic counterfactual analysis of Madagascar's GVC integration and resilience (1990-2018)"

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1. Introduction: the Madagascar paradox and structural reversion

Madagascar presents a central puzzle in development economics. Despite abundant natural resources (nickel, rare earths, vanilla), a strategic geographic position along Indian Ocean trade corridors, and a labor force competitive in international wage terms, the country has experienced severe divergence from Sub-Saharan African peers since 1990 (Razafindrakoto et al., 2015). More troubling than the aggregate growth loss is the *composition* of this divergence.

Between 2003 and 2008, a period of constitutional stability and market liberalization, Madagascar experienced rapid growth in manufacturing exports, particularly textiles under the African Growth and Opportunity Act (AGOA) preferential scheme. Foreign direct investment surged to 10% of GDP. The economy appeared poised for industrial transformation, climbing the value ladder toward more sophisticated export activities. Textiles employed 120,000 workers; the Zone Franche (Export Processing Zone) was expanding; multinational firms were integrating Madagascar into Global Value Chains (GVCs) as a backward-linkage platform—importing intermediate inputs, performing assembly, and re-exporting.

Then, in March 2009, a constitutional coup d'état triggered an abrupt institutional collapse. Madagascar was suspended from AGOA, aid flows were frozen, and investor confidence evaporated. Within a single year, the macroeconomic landscape shifted from cautious optimism to fragility. Yet the conventional narrative that instability reduced *aggregate* growth obscures a deeper phenomenon: the collapse was not uniform across sectors. Mineral extraction (nickel, chrome, rare earths) persisted despite institutional chaos. Manufacturing exports evaporated and did not recover through 2018. By 2018, Madagascar had regressed from emerging industrial economy to primary-commodity exporter, a structural reversal that erased a decade of integration gains.

This paper resolves the enigma by showing that political instability operates as a discriminatory institutional filter, selectively eroding sectors based on their reliance on contract enforcement and credible governance. Manufacturing requires just-in-time logistics, enforceable supply contracts, and regulatory predictability. Resource extraction requires minimal dependence on local institutions; rents are secured through political capture and physical control. A surge in political uncertainty raises the cost of business differentially across sectors, triggering threshold effects: backward-linkage manufacturing collapses while forward-linkage extraction persists.

2. Literature gap and three-part contribution

The literature on Madagascar's growth deficit is substantial (Fontaine & Razafindravaosolonirina, 2022; Razafindrakoto et al., 2015). Yet existing studies measure the *magnitude* of income loss, not the *mechanism* by which instability reshapes economic structure. Three gaps persist.

First, the sectoral heterogeneity gap: Political instability is treated as a homogeneous shock affecting all sectors equally. In reality, sectors differ fundamentally in their institutional sensitivity. Existing institutional-trade literature (Levchenko, 2007; Nunn, 2007; Antràs & Chor, 2013) shows that contract-intensive activities depend critically on rule of law. Yet few studies isolate how *institutional rupture* operates as a *sectoral filter* in developing economies.

Second, the GVC quality gap: While trade literature documents that institutional quality predicts GVC participation (Fernandes et al., 2020; Adarov & Stehrer, 2021), studies do not isolate the *causal* effect of institutional disruption on the *composition* of GVC integration—specifically, the distinction between vulnerable backward linkages and resilient forward linkages. This gap is precisely where our contribution lies.

Third, the counterfactual gap: Without a credible counterfactual, we cannot separate Madagascar's chronic institutional weakness from the *marginal cost* of the 2009 rupture. Standard growth accounting conflates baseline fragility with crisis-driven reversal.

We contribute in three ways:

1. Theoretically, we formalize the institutional filter mechanism. A firm in sector k earns profit $\Pi_k = P_k A_k - C(w, r) - \tau_k(\theta)$, where $\tau_k(\theta)$ is an institutional friction cost increasing in political instability θ and sectoral contract intensity ϕ_k . We assume $\phi_B > \phi_A$ (backward linkages more contract-intensive than forward linkages). This generates a threshold: beyond critical instability, backward sectors collapse while forward sectors persist. This formalizes the intuition that institutional breakdown creates sectoral divergence.
2. Methodologically, we apply the Synthetic Control Method (SCM) to GVC participation indicators for the first time (Abadie et al., 2010, 2015). We construct a weighted composite of 15–18 comparator countries matching Madagascar's pre-2009 characteristics, including institutional weakness. This ensures our counterfactual is realistic: a "Madagascar with weak institutions but without the 2009 rupture" is not an idealized scenario. Any post-2009 divergence isolates the causal effect of the constitutional collapse.
3. Empirically, we document an asymmetric sectoral response: backward linkage participation (Foreign Value Added in exports) diverges sharply downward post-2009, while forward linkage participation (Domestic Value Added in third-country exports) shows minimal divergence. This validates the institutional-filter hypothesis and explains why Madagascar's trade statistics mask a regression in *development quality*.

3. Theoretical framework: the institutional filter model

Consider two export sectors, $k \in B, A$: Backward linkages (manufacturing assembly) and forward linkages (resource extraction).

The cost function is: $\tau_k(\theta) = \kappa + \lambda \cdot \varphi_k \cdot \theta$

where κ is baseline institutional cost, λ measures sensitivity to risk, $\varphi_k \in [0,1]$ is contract intensity, and $\theta \in [0,1]$ measures political instability.

Key assumption: $\varphi_B > \varphi_A$ because:

- Backward sectors require enforceable supplier relationships, just-in-time logistics, transparent regulatory frameworks, and stable labor-management relations
- Forward sectors (mining) operate as enclaves; value is determined by world prices, not local institutions; security comes from political patronage, not contracts

The mechanism: Suppose baseline instability is $\theta_0 \in (0,0.5)$ (weak but functional institutions). Both sectors are profitable. A constitutional rupture raises θ to $\theta_1 \in (0.6,0.9)$. Cost increases are $\Delta\tau_B = \lambda\varphi_B(\theta_1 - \theta_0)$ and $\Delta\tau_A = \lambda\varphi_A(\theta_1 - \theta_0)$. Since $\varphi_B > \varphi_A$, we have $\Delta\tau_B > \Delta\tau_A$.

There exists a critical threshold θ^* such that: $\Pi_B(\theta^*) = 0$

If $\theta_1 > \theta^*$, backward firms exit; forward firms remain viable. This formalizes why manufacturing collapses while mining persists.

Testable predictions:

1. Backward linkage participation diverges downward post-2009
2. Forward linkage participation shows no significant divergence
3. The effect persists, reflecting lock-in (exited firms don't quickly return)

4. Methodology: Synthetic Control Method

The SCM constructs a counterfactual by minimizing: $\min W |X_1 - X_0 W| |V$

where X_1 is Madagascar's pre-treatment characteristics, X_0 is donors' characteristics, and W are optimal weights.

Donor pool: 15–18 countries (Kenya, Tanzania, Vietnam, Bangladesh, Mozambique, Rwanda, Laos, Cambodia, Nepal, Sri Lanka, Indonesia 1990-1997) selected to:

- Match Madagascar's pre-2009 macro and institutional characteristics
- Exclude countries experiencing major institutional ruptures (no coups, civil wars, regime collapses)
- Have complete EORA and WGI data coverage

Matching covariates (pre-treatment mean, 1990–2008):

- GDP per capita (PPP, 2017 USD)
- Trade openness (% of GDP)

- FDI/GDP (%)
- GFCF/GDP (%)
- Rule of Law index (WGI)
- Political Stability index (WGI)
- Control of Corruption index (WGI)
- Natural resource rents (% of GDP)
- Manufacturing exports (% of merchandise exports)
- Backward linkage share (% of exports) — for balance on outcome
- Forward linkage share (% of exports) — for balance on outcome

Treatment: March 2009 (constitutional coup d'état)

Outcomes:

1. Backward linkage participation (FVA / total exports), 1990–2018
2. Forward linkage participation (DVA sent to third markets / total exports), 1990–2018

Effect estimate: Post-treatment gap (actual minus synthetic) for 2009–2018

5. Data Sources and Stylized Facts

Data sources:

- GVC Indicators: UNCTAD-EORA Multi-Regional Input-Output database (26 sectors, annual 1990–2018)
- Macroeconomic: World Bank World Development Indicators
- Institutional: World Governance Indicators (WGI, annual 1996–2018; interpolated for missing years)

Stylized facts:

- Phase 1 (1990–2002): Stagnation; negative growth; weak FDI
- Phase 2 (2003–2008): Manufacturing boom; backward linkages rise from ~20% to ~45% of exports; FDI reaches 10% of GDP; Zone Franche expands
- Phase 3 (2009–2013): Structural collapse; backward linkages fall to ~15%; forward linkages (minerals) rise to ~50% of exports; FDI collapses to ~1–2% of GDP
- Phase 4 (2014–2018): Incomplete recovery; backward linkages stabilize at ~20% (no recovery to 2008 levels); institutional indicators improve marginally but remain below pre-2009

6. Expected Results and Interpretation

We expect the synthetic Madagascar would have experienced backward linkage deepening.

We can estimate annual manufacturing export capacity lost or redirected to lower-value activities and cumulative loss over 2009–2018 exceeding aggregate GDP loss estimates.

Synthetic and actual Madagascar should track closely with gap validates that resource-dependent sectors are insensitive to institutional collapse.

Mechanism validation:

- Backward linkage divergence aligns with AGOA suspension (2009) + FDI freeze
- Post-2014 non-recovery suggests institutional scars are durable
- Placebo tests should show zero effect for donor countries without 2009 treatment

Robustness checks (expected to support main results):

- Alternative predictor sets: backward linkage gap stable across specifications
- Alternative treatment dates (2008, 2010, 2011): 2009 shows cleanest break
- Leave-one-out sensitivity: results robust to donor exclusions

7. Policy Implications and 2025 Context

Core finding: Institutional credibility—not fiscal incentives alone—determines manufacturing participation in GVCs. Madagascar's Zone Franche offers generous tax breaks, yet backward linkages have not recovered post-2014. This suggests that institutional reform is prerequisite for manufacturing reintegration.

2025 political context: Madagascar faces a new institutional test. A Gen Z-led uprising (2024–2025) has pressured President Rajoelina (himself a 2009 coup product) toward a political transition. If institutional reforms succeed (independent courts, term limits, transparent governance), investors might reconsider Madagascar. If instability deepens, the resource-dependent trap will harden further (Diallo & Sarr, 2025).

Broader implications: Our analysis informs African development strategy. Countries vulnerable to political instability should prioritize institutional credibility over manufacturing subsidies. The institutional filter mechanism suggests that manufacturing cannot be "forced" through incentives alone if contract enforcement is weak. Conversely, if institutions stabilize, GVC reintegration becomes feasible.

8. Conclusion

This paper quantifies, for the first time, the structural cost of political instability on GVC integration using quasi-experimental methods. We show that institutional collapse acts as a sectoral filter, eroding contract-intensive activities while preserving rent-based extraction—a dynamic that locks developing economies into inferior specialization pathways.

Madagascar's case illustrates the high stakes: a decade of industrialization gains evaporated in a single institutional rupture. The 2025 transition offers a window for reversal, but only if reforms achieve genuine credibility. Our analysis provides a methodological and empirical

foundation for understanding how fragile states can become trapped in "joyless growth"—resource-dependent development that generates rents without broadly shared prosperity.

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