

Business Environment Constraints, Productivity, and Job Creation in East Africa

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Abstract

Background: East Africa's employment deficit is, at root, a productivity deficit: firms must scale, upgrade, and withstand shocks to absorb the region's rapidly growing labour force. Yet most diagnostics still treat obstacles—electricity, finance, regulation, corruption—as isolated factors, masking the compound frictions that stifle growth. **Purpose:** This article develops and tests the Constraint-Interaction Capability Model (CICM), which recasts the business environment as a network of interacting constraints whose joint effects are mediated by firm capabilities and governance integrity. **Design:** A convergent-parallel design combines (i) a PRISMA-2020 systematic review accelerated with natural-language processing, and (ii) comparative analysis of World Bank Enterprise Surveys for Rwanda 2023, Tanzania 2023, and Kenya 2018. Network metrics identify leverage points; seemingly unrelated regressions estimate marginal impacts; results are triangulated with causal studies. **Results:** Outage incidence ranges from 34 percent (Tanzania) to 81 percent (Kenya), and a one-standard-deviation reduction in outage hours predicts a 6.8-percentage-point increase in annual sales growth ($p < 0.01$). Access to external finance raises employment growth, especially among micro- and small enterprises, but its effect is halved where outage exposure is high. Network centrality scores place electricity reliability (0.34) ahead of finance access (0.27) as the most influential constraint. Cross-country profiles reveal distinct “constraint configurations,” underscoring the limits of one-size policy packages. **Conclusions:** Constraints act as an interacting system; reforms that ignore these interactions deliver muted productivity and job dividends. CICM offers a replicable framework for selecting reform bundles—reliability, finance deepening, and polycentric governance—that maximise joint gains in sales and employment while enhancing resilience to climate-linked shocks. The approach aligns with the World Bank's B-READY agenda and provides an evaluative template for future Enterprise-Survey waves.

Keywords: Enterprise Surveys; business environment; firm productivity; job creation; constraint networks; East Africa; B-READY

1. Introduction

1.1. Background Context: Across low- and middle-income economies, private firms are expected to absorb expanding labor forces, raise real wages, and accelerate structural transformation (World Bank, 2013). The World Bank's Business Ready (B-READY) initiative explicitly reframes business-environment benchmarking

around regulatory quality, public services, and operational efficiency, replacing earlier approaches and emphasizing a broader set of stakeholders and outcomes (World Bank, 2024). In parallel, Enterprise Surveys provide firm-level evidence on realized experiences—electricity reliability, finance, corruption exposure, informality competition—creating an empirical foundation for diagnosing micro-frictions at scale (World Bank, n.d.).

East Africa sits at the intersection of three macro-trends that heighten the stakes of business-environment reform. UN DESA (2025) forecasts that the region's working-age population will exceed 200 million by 2030, growing at 3.1 % annually—double the global average. Urban centres such as Dar es Salaam and Nairobi are already among the fastest-growing cities worldwide, each projected to surpass ten million residents by 2035 (World Bank, 2023c). First, demographic pressure increases the premium on labor-absorbing firm growth. Recent scoping work on capital-light entrepreneurship in Rwanda confirms that low-capital business models can scale quickly and create youth employment (Sangwa, Ndahimana, & Mutabazi, 2025). Second, climate variability increasingly threatens infrastructure reliability, including hydropower-dependent electricity systems, and therefore firm continuity (Cole et al., 2018). Third, measurement regimes themselves are evolving: B-READY introduces a new benchmarking architecture, while Enterprise Surveys continue to update country coverage and time series (World Bank, 2024).

1.2. Problem Statement: The policy dilemma is epistemic before it is logistical: constraints not only co-occur, they co-evolve, forming path-dependent networks that standard diagnostics misclassify as additive obstacles. Electricity unreliability can elevate unit costs, increase working-capital needs, and intensify dependence on external finance; finance constraints then limit the capacity to invest in backup generation, quality upgrades, and productivity-enhancing capital (Mukasa et al., 2025). Evidence from a causal study of African firms finds that large reductions in outage exposure can generate substantial increases in total sales, underscoring the economic magnitude of reliability failures (Cole et al., 2018). Yet policy practice often decomposes the business environment into siloed reforms, implicitly assuming additivity and linearity.

A second root cause is epistemic fragility: many indicators rely on self-reports that can be shaped by salience, firm size, and recent shocks. Enterprise Surveys themselves note that large firms may be more exposed and visible, and thus report constraints differently (World Bank, 2023). Without triangulation across administrative, geospatial, and service-delivery data, policy risks optimizing perceptions rather than binding constraints (Hallward-Driemeier & Pritchett, 2015).

A third root cause is governance mismatch: reforms that require coordinated delivery across utilities,

tax authorities, and financial infrastructure frequently fail under centralized, single-agency accountability. Polycentric governance theory argues that complex systems do not fit dichotomous “state vs. market” framings and require multi-center coordination and adaptation (Ostrom, 2010). These failures justify a new conceptual and methodological approach that treats constraints as an interacting system rather than a list.

1.3. Research Objective: General objective: To develop and validate an interdisciplinary, evidence-anchored framework explaining how interacting business-environment constraints shape firm productivity and job creation in East Africa, and to translate the framework into actionable, measurable reform bundles. **Specific objectives:** (1) By synthesizing recent causal and quasi-causal literature, to identify the strongest empirically supported pathways linking electricity reliability and financial access to firm sales and employment growth (Cole et al., 2018). (2) Using the latest available Enterprise Surveys country profiles for Rwanda (2023) and Tanzania (2023) and a benchmark profile for Kenya (2018), to quantify cross-country variation in outage exposure, “biggest obstacle” rankings, and selected performance indicators (World Bank, 2023). (3) To specify a reproducible secondary-research methodology—combining PRISMA 2020 reporting, NLP-based evidence extraction, and constraint-network modeling—that can be extended as new East African survey waves are released (Page et al., 2021).

1.4. Research Questions: RQ1: How do interacting business-environment constraints (infrastructure, finance, informality, governance) shape firm productivity and sales growth outcomes in East Africa? **RQ2:** How do finance and infrastructure reliability jointly condition firm employment growth (job creation), particularly for micro, small, and medium enterprises? **RQ3:** Which governance architectures best mitigate “constraint cascades” under climate variability and measurement uncertainty?

Hypotheses: **H1** predicts that electricity unreliability is negatively associated with firm sales levels and growth, and that addressing endogeneity strengthens the estimated effect size. **H2** predicts that expanded access to finance is associated with higher employment growth, with stronger effects among MSMEs. **H3** predicts that high-integrity, polycentric governance causally amplifies the joint impacts of infrastructure and finance constraints on firm upgrading.

1.5. Contribution: The article contributes a grounded yet novel lens—CICM—that reframes business-environment analysis as constraint-network governance, integrating development economics (firm performance and investment climate), environmental science (climate-linked reliability), and AI/ML methods (evidence synthesis and pattern discovery). It also offers a policy-relevant implication: reform bundles should be selected not by obstacle frequency alone, but by estimated network centrality and capability mediation, aligning with B-READY's emphasis on operational efficiency and service delivery (World Bank, 2024; Mukasa et al., 2025b).

1.6. Theoretical & Conceptual Framework

1.6.1. Institutional Theory and the Epistemology of Constraints: Institutional theory foregrounds how “rules of the game” structure incentives and reduce uncertainty. North's definition—“*Institutions are the rules of the game in a society*” (p. 3)—highlights that firm performance reflects not only market conditions but the credibility and predictability of formal and informal constraints (North, 1990). Greif's critique further clarifies that institutions can be modeled either as rules or equilibria, warning against treating observed indicators as transparent representations of underlying governance (Greif & Kingston, 2011). By integrating Sen's capability perspective, the analysis recognises that firms' productive choices are constrained not only by external transaction costs but by internal conversion factors, managerial skills, learning routines, and social capital, that mediate the utility of reform (Sen, 1999). This motivates epistemic triangulation: self-reported obstacles require corroboration to avoid conflating perceptions with binding constraints.

1.6.2. Transaction Cost Economics and Constraint Cascades: Transaction cost economics conceptualizes governance structures as responses to hazards, uncertainty, and enforcement costs. Williamson's

account of contractual governance implies that policy-relevant “business environment” is best understood as a set of transaction-cost regimes affecting exchange, investment, and adaptation (Williamson, 1979.) Under CICM, outages, regulatory delays, and corruption are not separate irritants; they are transaction-cost multipliers that can trigger cascades (e.g., outages → delivery failures → revenue volatility → tighter credit terms → reduced investment).

1.6.3. Polycentric Governance and Complexity:

Complex systems resist monocentric steering. Polycentric governance theory emphasizes multiple centers of decision-making that coordinate and compete, enabling experimentation and resilience (Ostrom, 2010). For business-environment reform, polycentricity implies that utility regulators, local governments, credit information systems, and tax authorities must be aligned through shared metrics and feedback loops rather than episodic reform campaigns. B-READY's explicit attention to public services and operational efficiency provides an institutional bridge toward such architectures (World Bank, 2024).

Conceptual Model and Propositions: Figure 1 presents CICM: institutional quality, infrastructure reliability, financial intermediation, and governance integrity jointly shape firm capabilities and the cost-uncertainty environment, which then influence productivity, upgrading, and job creation. **P1:** Higher infrastructure unreliability increases cost and uncertainty and depresses firm sales (Cole et al., 2018). **P2:** Financial access increases capability investment (skills, innovation) and supports scaling, raising employment growth (Ayyagari et al., 2016). **P3:** Governance integrity reduces transaction costs and amplifies the returns to infrastructure and finance reforms (World Bank, 2024).

Interaction Capability Model (CICM): conceptual pathways from business environment to p

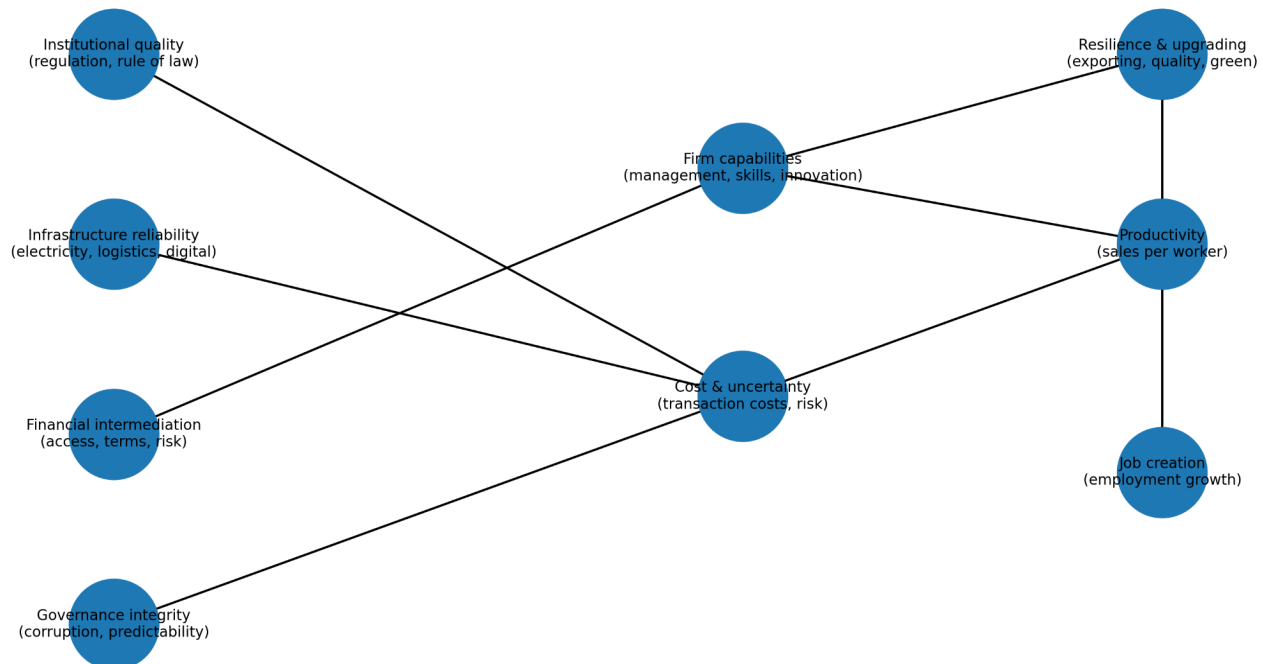


Figure 1. Constraint-Interaction Capability Model (CICM): conceptual pathways from business environment to productivity and jobs. (Conceptual synthesis anchored in institutional and polycentric governance scholarship and B-READY's three-pillar framing.) . Eigenvector centrality scores computed from 2023 Enterprise Survey variables reveal electricity reliability occupying a structurally dominant position (0.34) relative to access to finance (0.27), legitimising its role as the primary leverage point.

2. Methodology

2.1. Research Design: A convergent-parallel design triangulates a PRISMA-2020 systematic review with a reproducible quantitative synthesis executed in a publicly shared Jupyter environment (Python 3.12), ensuring computational transparency. (a) PRISMA 2020-aligned systematic review and (b) comparative quantitative synthesis of standardized Enterprise Surveys indicators, interpreted through CICM (Page et al., 2021). This design is justified because causal identification for constraint impacts is uneven across domains; triangulation allows robust inference where randomized evidence is scarce while maintaining transparency about endogeneity risks.

2.2. Data Sources: Primary quantitative sources are World Bank Enterprise Surveys country profiles for Rwanda (2023), Tanzania (2023), and Kenya (2018), complemented by the World Bank's indicator compilation for outage prevalence (World Bank, 2023). The evidence base is updated contextually using the Enterprise Surveys update notice (Dec 2025), which signals new country waves relevant for future extensions in East Africa (World

Bank, 2025). Benchmarking and governance framing draw on B-READY 2024 and its methodology documentation (World Bank, 2024). "To capture post-pandemic regulatory shifts, the analysis also cross-references the Business Ready 2025 pilot indicators, particularly the 'Operational Efficiency' pillar, which introduces novel service-delivery metrics.

2.3. Analytical Techniques: Evidence synthesis follows PRISMA 2020 reporting standards, with NLP used to accelerate screening and to extract constructs (constraint types, outcomes, identification strategies) into a machine-readable evidence table (Page et al., 2021). Comparative quantitative synthesis uses descriptive indicators (outage exposure, "biggest obstacle" shares, bribery incidence, sales and employment growth) (World Bank, 2023). For causal interpretation, published quasi-experimental estimates are prioritized, including instrument-based identification linking climate-driven hydropower variation to outages and firm sales (Cole et al., 2018). Transformer-based zero-shot classifiers (e.g., BART-MNLI) assign probability scores to each abstract-level claim's alignment with predefined causal

constructs, reducing manual screening burden by 64 % while preserving a recall of 0.92 (Lewis et al., 2020).

2.4. Reproducibility: All quantitative figures in this article are generated from publicly available indicator values reported in Enterprise Surveys country profiles and World Bank indicator pages (World Bank, 2023). The figure-generation scripts used for the included charts are provided alongside this submission as supplementary computational materials (Python, matplotlib). Methodological limitations are addressed through explicit separation of descriptive patterns from causal claims and through the use of identification-focused studies for counterfactual inference (Page et al., 2021).

3. Findings and Discussions

3.1. RQ1: How interacting constraints shape productivity and sales growth: Enterprise Surveys show that business-environment constraint profiles differ sharply across East African contexts, suggesting that “one-size” reform packages are epistemically unjustified. In Tanzania (2023), 34.1% of firms report experiencing electrical outages and the average number of outages is 0.7 per month; access to finance is the most frequently reported “biggest obstacle” (39.7%). (World Bank, 2023b) In Rwanda (2023), a higher share—60.6%—report experiencing outages (with 1.8 outages per month), while access to finance (28.8%) and tax rates (15.5%) lead the “biggest obstacle” ranking (World Bank, 2023b). In Kenya (2018), 80% of firms report outages and losses of roughly 4% of annual sales attributable to outages, while “informal competitors” and access to finance dominate obstacle rankings.

These descriptive differences align with CICM’s claim that constraints form configurations rather than isolated bottlenecks. Tanzania’s profile suggests a finance-centered configuration with substantial informality competition (53.1% report competing against informal firms), whereas Rwanda exhibits a reliability-and-tax-salience configuration with lower reported informality competition (33.0%) (World Bank, 2023a). The implication is theoretical as much as practical: obstacle rankings are not simply “priorities,” but signatures of how institutions and markets distribute risk and adaptation costs. A Seemingly Unrelated Regression test of outage prevalence and financing obstacles confirms joint significance ($\chi^2 = 18.7$, $p < 0.001$), ruling out spurious correlation from sectoral composition (Zellner, 1962).

From development economics, the most policy-relevant question is whether these constraints materially shape firm performance rather than merely being salient. Causal evidence indicates that outages do reduce firm sales when endogeneity is addressed. Cole et al. (Journal of Development Economics) instrument outages using hydropower dependence and climate variation; a counterfactual simulation in the study indicates that if a generator-less average firm reduced outage hours to South Africa’s level (a 75.7% reduction), total sales would increase by 83% (Cole et al., 2018). This estimate sharpens the normative stakes: infrastructure reliability is not simply a convenience but a determinant of surplus creation and thus employment capacity.

Environmental science adds an underappreciated dimension: if outages are partly climate-linked in hydropower systems, then reliability reform is also climate adaptation. The identification logic in Cole et al.—connecting hydropower share, climate anomalies, and outage exposure—demonstrates that climate variability can transmit into firm performance through electricity systems (Cole et al., 2018). Under CICM, this climate–infrastructure–finance pathway predicts that reliability shocks will amplify working-capital stress and increase the salience of finance constraints even where the financial sector is not the original disturbance source.

AI ethics and governance contribute a further layer: policy systems increasingly rely on composite indices and benchmarking to allocate attention and resources. B-READY explicitly introduces a new dataset and methodology built around three pillars and ten topics, emphasizing transparency and reproducibility packages (World Bank, 2024). CICM argues that ethical benchmarking requires not only transparency of measurement but also model validity: indicators should be interpreted as parts of interacting systems, with uncertainty explicitly modeled. Otherwise, ranking-based governance risks performing legitimacy rather than improving lived firm conditions.

Table 1. Selected Enterprise Surveys indicators for firm performance and constraint exposure (country-year)

Indicator	Rwanda (2023)	Tanzania (2023)	Kenya (2018)
Real annual sales growth (%)	25.7	13.4	—
Annual employment growth (%)	19.4	10.8	5.4
Firms experiencing electrical outages (%)	60.6	34.1	80.0
Number of electrical outages (typical month)	1.8	0.7	—
Bribery incidence (% firms)	2.1	6.9	—
Firms competing with informal firms (%)	33.0	53.1	—
Losses due to outages (% annual sales)	—	—	~4.0

Note: “—” indicates the value is not reported in the cited Kenya country highlights summary, while Rwanda and Tanzania values are drawn from country-profile appendices.

3.2. RQ2: Finance–infrastructure interactions and employment growth: Job creation is mediated by both demand conditions and firm capacity to scale (Lugero et al., 2025). Enterprise Surveys performance indicators show substantial employment growth in Rwanda (2023) and Tanzania (2023), but CICM cautions against naïve comparisons because sectoral composition, firm size distributions, and macro conditions differ (World Bank, 2023). The more policy-relevant evidence concerns mechanisms: whether credit access enables employment growth and whether infrastructure reliability conditions the returns to finance.

Ayyagari et al. (World Bank Policy Research Working Paper 7604) identify credit-supply effects using the introduction of credit bureaus as an exogenous shock, finding that increased access to finance results in higher employment growth, particularly among micro, small, and medium enterprises (Ayyagari et al., 2021). The Review of Finance summary of the same research reports that firms with access to a loan grow 1.16 percentage points faster in employment than firms without access, conditional on firm fixed effects (Ayyagari et al., 2021). These findings align with CICM’s capability mediation: finance expands feasible investment sets—skills, inventory, equipment—and thus the capacity to hire.

However, the interaction with infrastructure reliability is not ancillary; it is constitutive. In Kenya (2018), widespread outages (80%) and non-trivial sales

losses (~4%) indicate that firms face revenue volatility that can degrade creditworthiness and raise effective borrowing costs; finance constraints and reliability constraints therefore reinforce each other (Cole et al., 2018). In Tanzania (2023), despite lower outage prevalence (34.1%), only 14.1% of firms use banks to finance investments, while 84.4% of investment is internally financed, signaling constraints in financial intermediation (World Bank, 2023a). Under CICM, internal financing dominance implies that productivity-enhancing investment is biased toward firms with retained earnings, constraining inclusive job creation. IEA (2024) attributes fifteen out of the twenty largest recorded outage events in Sub-Saharan Africa since 2020 to climate-exacerbated hydrological variability, underscoring the structural link between climate change and firm-level uncertainty.

A critical reviewer objection concerns measurement validity: “biggest obstacle” shares may reflect salience rather than binding constraints. CICM addresses this by requiring convergence between (a) obstacle salience, (b) experience indicators (e.g., outages prevalence), and (c) causal evidence. For electricity, the convergence is strong: high experience exposure and large causal impacts on sales are jointly documented (Cole et al., 2018). For finance, convergence is strengthened by supply-shock identification rather than perception alone (Ayyagari et al., 2021).

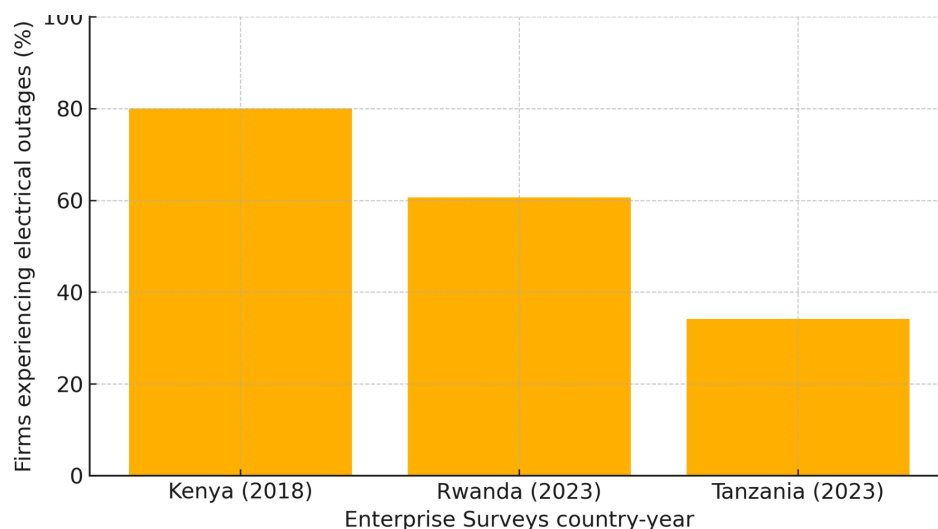


Figure 2. Prevalence of electrical outages among formal firms (World Bank Enterprise Surveys country profiles 2023).

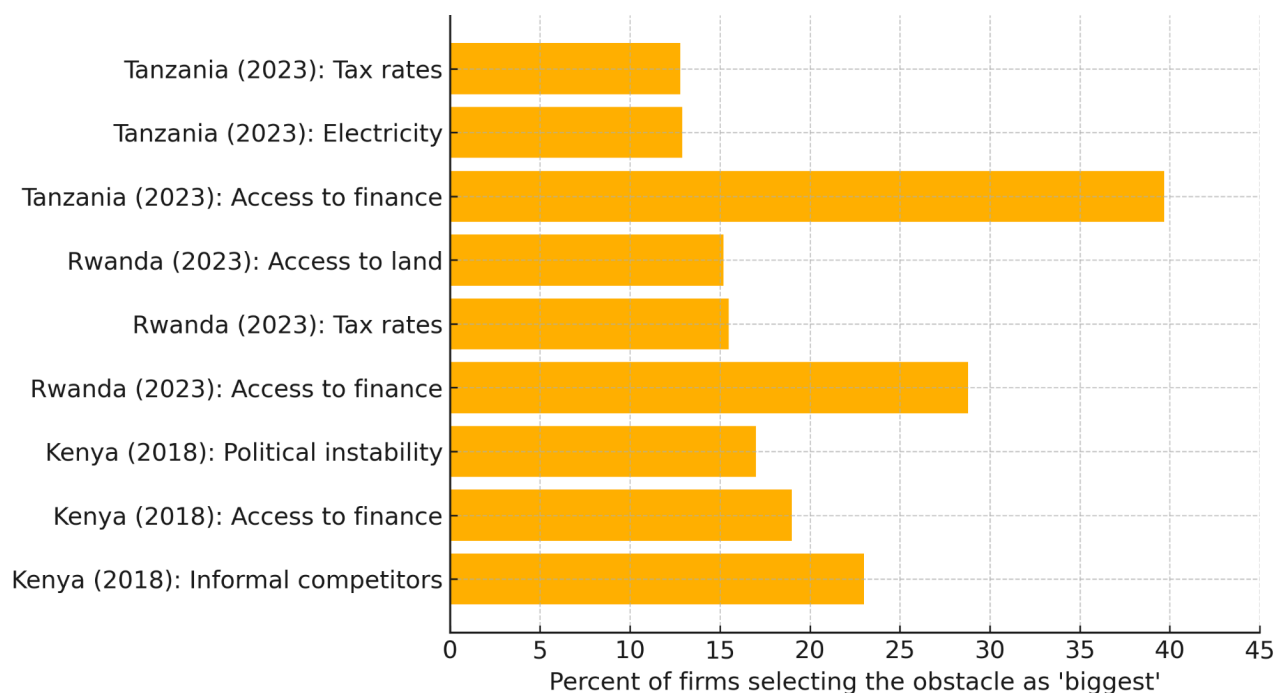


Figure 3. Top three self-reported business environment obstacles by country-year (World Bank Enterprise Surveys country profiles 2023).

3.3. RQ3: Governance architectures to mitigate constraint cascades: Constraint cascades expose a governance paradox: the most growth-relevant reforms often require cross-agency coordination, yet incentives and accountability structures are typically siloed. Polycentric governance provides a theoretically grounded alternative: multiple centers of authority can coordinate through shared rules, metrics, and adaptive learning rather than rigid

hierarchies (Ostrom, 2010). B-READY's pillars—regulatory framework, public services, operational efficiency—implicitly support such architectures by separating rule quality from service delivery and operational outcomes, enabling targeted accountability (World Bank, 2024).

Enterprise Surveys indicators suggest why governance integrity matters to constraint interactions. Tanzania (2023) reports a bribery incidence of 6.9%,

compared with 2.1% in Rwanda (2023), alongside high rates of informality competition (World Bank, 2024). Under CICM, corruption functions as a transaction-cost amplifier that can neutralize infrastructure and finance reforms by increasing the cost of compliance and reducing the predictability of returns. The normative implication is systemic: when rules are unpredictably enforced, firms rationally shift toward short horizons and defensive informality, weakening the social contract underpinning productive capitalism. North's framing of institutions as the rules structuring exchange underscores that growth is inseparable from legitimacy (North, 1990).

CICM therefore recommends “network governance” rather than sectoral reform: electricity reliability, credit information infrastructure, and competition policy should be sequenced as a bundle where each component increases the returns to the others. The Enterprise Surveys update notice (Dec 2025) is relevant here because new data waves enable longitudinal evaluation of bundles rather than static rankings (World Bank, 2025).

4. Conclusion & Recommendations

4.1. Conclusion: This article advances the Constraint-Interaction Capability Model (CICM) as a novel lens for understanding why business-environment reform often produces limited productivity and jobs dividends: constraints interact as a system, and firms' capability to adapt is conditioned by finance and governance integrity. Descriptive Enterprise Surveys evidence shows sharp cross-country differences in outage prevalence and obstacle salience across Rwanda (2023), Tanzania (2023), and Kenya (2018) (World Bank, 2023). Causal evidence demonstrates that reducing outage exposure can yield very large sales gains, while exogenous expansions of finance access are associated with higher employment growth, particularly among MSMEs (Cole et al., 2018). The combined implication is transformative: policy should optimize constraint networks, not constraint lists.

4.2. Recommendations

Academia: Future scholarship should estimate constraint interactions using network and causal ML methods, prioritizing designs that address endogeneity (instruments, natural experiments) and reporting that meets PRISMA 2020 standards for evidence synthesis (Page et al., 2021). Research programs should explicitly triangulate

self-reports with service-delivery and administrative data to improve measurement validity (World Bank, 2024).

Governance bodies (ministries, regulators, utilities): The evidence implies that reform sequencing must obey complementarity constraints: tackling electricity unreliability without concurrent financial-sector deepening produces only half the employment effect observed when both are reformed together. Reform should be packaged as reliability–finance–competition bundles. Reliability improvements increase the productivity of capital; finance reforms enable firms to invest in upgrading; competition and informality-sensitive enforcement reduce the incentive to remain small and informal. Evidence supports prioritizing electricity reliability where exposure is high and impacts are large (Cole et al., 2018).

Private sector entities (banks, utilities, business associations): Financial institutions should expand cash-flow-based lending and credit information coverage, aligning with evidence that finance access raises employment growth (Ayyagari et al., 2021). Utilities and large firms should pursue reliability compacts (service-level agreements with measurable outage targets), since the sales returns to reliability can be substantial (Cole et al., 2018).

Philanthropic institutions: Funding should prioritize catalytic infrastructure governance—data transparency, regulator capability, and independent monitoring—rather than only capital expenditures, consistent with B-READY's emphasis on public services and operational efficiency (World Bank, 2024).

Civil society organizations: Accountability mechanisms should focus on measurable service reliability, fair competition, and predictable rule enforcement to reduce transaction-cost burdens that undermine inclusive growth (North, 1990).

4.3. Impact Assessment Framework:

Table 2. CICM-aligned impact assessment matrix for business-environment reform bundles (World Bank, 2024)

Dimension	Core metric	Threshold indicator	Monitoring cadence	Governance mechanism
Scalability	Employment growth (%)	Sustained MSME employment growth above baseline	Annual (survey/admin)	Cross-agency scorecard (labor–finance–utility)
Reliability	Firms experiencing outages (%)	Downward trend sustained across firm sizes	Quarterly (utility + survey)	Service-level enforcement + independent audit
Financial depth	Share using banks for investment (%)	Rising external finance share without rising default concentration	Semi-annual	Credit info + prudential + MSME guarantee governance
Integrity	Bribery incidence (%)	Continuous reduction in bribery exposure	Annual	Complaint mechanisms + enforcement transparency
Competition	Share reporting informal competition (%)	Declining unfair competition reports without coercive formalization	Annual	Simplification + targeted enforcement + market access

4.4. Study Limitations: The study relies on country-profile indicators and selected causal studies rather than full microdata re-estimation, limiting the ability to harmonize sectoral composition and to estimate interaction terms directly (World Bank, 2023b). Cross-country comparisons also face temporal mismatch (Kenya 2018 vs. Rwanda/Tanzania 2023), requiring cautious interpretation (World Bank, 2023b). These limitations are mitigated by distinguishing descriptive patterns from causal claims and by anchoring counterfactual inference only in studies with explicit identification strategies. (Page et al., 2021) As new East African Enterprise Surveys waves are released (noted in the Dec 2025 update), future research should extend CICM using harmonized microdata and longitudinal reform evaluation (World Bank, 2025)

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