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Africa Synthesis

A diagnostic of the binding constraints to inclusive growth and structural transformation in African countries, drawing on the SDCGE engine.

AICTEM GROWTH DIAGNOSTIC

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Africa's Growth Story and Future

A Continental Synthesis of Forty-Nine Structural–Dynamic CGE Country Studies

Structural–Dynamic CGE (SDCGE) & MRIO Africa Programme

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Abstract

This report synthesises forty-nine country studies that pair a structural–dynamic computable general equilibrium (SDCGE) model with a multi-regional input–output (MRIO) diagnostic built on EXIOBASE 3rx (1995–2015). Part one tells Africa's forty-year growth story and locates the continent's central problem: growth without structural transformation. Part two maps the *structure* of the African economies in 2015 across ten dimensions — output, value added, exports, import dependence, the technical-coefficient (A) and Leontief (L) matrices, backward and forward linkages, the domestic/foreign value-added split of exports, and network centrality. Part three synthesises eight forward-looking growth-scenario families — crops, livestock, mining, manufacturing, infrastructure, education, health and services — simulated to 2040 across all forty-nine economies, decomposing each into its component interventions. Three results recur with striking regularity: **manufacturing is the highest-GDP growth lever in 47 of 49 countries**; **agro-processing is the single highest-return intervention in 44 of 49**; and **services and infrastructure, weak on measured GDP, are the strongest levers for *welfare*** — the GDP–welfare divergence that runs through the continent. Part four distils the low-hanging policy levers by country and part five prioritises the simulations into an executable, archetype-based agenda. Throughout, the model results are read against the recent empirical and policy literature on African structural transformation, the AfCFTA, agro-industry, critical-mineral beneficiation and the infrastructure deficit.

Contents

Executive summary

The problem. Africa grew rapidly in 2000–2014 but did not *transform*: manufacturing's share of GDP drifted down to about 11.5%, exports stayed concentrated in raw commodities, and the sectoral structure of output barely moved [4, 3]. A demographic wave — some 15 million new jobs needed each year by 2030 — now requires a model that creates wage employment at scale, which the commodity-and-informal-services model does not [23].

The evidence. This report synthesises forty-nine country studies, each pairing a structural–dynamic CGE model with an EXIOBASE 3rx input–output diagnostic, run on identical structural metrics and identical growth scenarios so the results are directly comparable. Part two maps the *structure* of all forty-nine economies in ten dimensions; Part three simulates eight growth-lever families to 2040, decomposed into roughly fifty individual interventions; Parts four and five turn the results into a prioritised, country-by-country agenda.

Five headline findings.

1. **Manufacturing is the dominant growth lever**, the highest-GDP family in **47 of 49** economies, with a median gain of about +6.5% by 2040 and a positive result in all 49.
2. **Agro-processing is the single highest-return intervention** of all (mean +2.7% GDP), the top individual lever in **44 of 49** economies — the bridge from the agricultural base to industry.
3. **Within every family, the *processing and productivity* components carry the gains** (agro-processing, dairy processing, mineral beneficiation, industrial parks, productivity upgrading, digital/ICT), while raw-expansion and pure trade-policy components (export crops, new mines, tariff reform, ports) often subtract from GDP.
4. **Infrastructure and (trade-and-transport) services are GDP-negative but welfare-positive** — the GDP–welfare divergence — so they must be evaluated as enabling and living-standard levers, not output engines. *Tradable* services (ICT, finance, business services, tourism) and digital infrastructure are exceptions that raise both.
5. **Education and health are slow, foundational complements**: small GDP gains by 2040 but rising ceilings on every other lever.

The agenda. Read off each economy's own structure, the priority is nearly universal in kind: *add value at home — process what you grow and mine, build tradable services and digital capability, and lay the enabling infrastructure and skills* — differing across the four archetypes (resource exporters → beneficiation; agrarian → agro-processing; diversifying → the full manufacturing package; services-led → deepening) only in detail. The policy architecture to execute it — Feed Africa and the agro-industrial processing zones, critical-mineral beneficiation, PIDA, and the AfCFTA's continental market — already exists [9, 10, 25, 24, 27].

1 Introduction: forty years of African growth

Africa's last four decades divide into three acts, and the central fact of all three is that rapid growth, when it came, rarely changed the *structure* of the economies that produced it.

1.1 Act I — the lost decades (1980–mid-1990s)

The commodity booms that had financed the optimism of the independence era collapsed at the start of the 1980s. Debt crises, overvalued currencies and state-led import-substitution that had run out of room tipped much of the continent into the structural-adjustment decade. Per-capita incomes fell across most of Sub-Saharan Africa, the manufacturing that had been built behind tariff walls contracted, and several economies — Cameroon, Côte d'Ivoire, Zambia, Nigeria — recorded declines in real income per head that took twenty years to recover [1, 21]. In the worst cases, war and state collapse (the DRC, Liberia, Sierra Leone, Somalia, Angola) destroyed the formal economy outright. The period left two legacies that still shape the structures mapped in Part two: a hollowed-out industrial base, and a deep dependence on a narrow set of primary exports.

1.2 Act II — the rebound and "Africa Rising" (late 1990s–2014)

From the late 1990s a combination of debt relief (HIPC and the Multilateral Debt Relief Initiative), macroeconomic stabilisation, political liberalisation and — above all — the China-driven commodity super-cycle produced more than a decade of rapid growth. Between roughly 2000 and 2014 Sub-Saharan Africa grew at 5–6% a year; oil and metals exporters (Angola, Nigeria, Ghana, Zambia, the DRC) boomed, a handful of reformers (Rwanda, Ethiopia, Tanzania, Mozambique) sustained 7–8% growth, and the "Africa Rising" narrative took hold. Poverty rates fell, mobile telephony leapfrogged fixed infrastructure, and a services economy — telecoms, banking, retail, construction — expanded quickly [20, 19]. But the growth was, in the main, an expansion of the existing structure rather than a transformation of it. The share of manufacturing in African GDP did not rise; it drifted *down*, from about 12.1% to 11.5% between 2000 and 2018, less than half the East Asian level, even as manufacturing employment grew [4, 7]. On average across 2000–2022 the agriculture/industry/services split of African GDP barely moved, holding near 16/33/51% [3].

1.3 Act III — the fragile present (2014–)

The 2014–16 oil-price collapse exposed the fragility of the boom. Growth that had rested on commodity rents and external demand stalled when prices fell; currencies and public finances came under strain; and debt — much of it newly contracted on commercial terms, some hidden (Mozambique) or owed to new creditors — mounted sharply. African external debt passed $1 trillion in 2024 (from about $500 billion in 2020); the IMF now rates 23 of 50 Sub-Saharan states in or at high risk of debt distress, up from eight in 2015, and debt-service costs rose more than threefold over the decade to roughly $74 billion in 2024 [22]. Ghana, Zambia, Ethiopia and Chad entered restructuring. The COVID-19 shock of 2020 produced Sub-Saharan Africa's first continent-wide recession in a generation, and subsequent inflation, monetary tightening and Sahelian instability have kept the recovery uneven.

1.4 The structural-transformation deficit — and the jobs clock

Behind these cycles lies a single, stubborn problem. The growth of the boom years was rarely *transformational*: it came from doing more of the same — exporting more oil, more copper, more cocoa, more cashews — rather than from moving labour and capital into higher-productivity activities. McMillan and Rodrik show that in much of Africa structural change was for decades

growth-reducing, as labour moved out of agriculture into low-productivity informal services rather than into industry [1, 2]. The African Development Bank's own assessment is that transformation has been "slow and uneven ... characterised by low industrialisation and predominantly by employment in low-skill, low-productivity services" [6].

This matters because of a demographic clock. Around 20 million young Africans reach working age each year, and roughly 12 million enter the labour market, but current growth patterns create only about 3 million formal jobs annually; Sub-Saharan Africa will need on the order of 15 million new jobs a year by 2030 to absorb its entrants [23]. The continent's working-age population, about 750 million in 2019, will exceed one billion before 2030. A growth model that does not create wage employment at scale — which means, in practice, a model that does not industrialise or build tradable services — cannot meet that demand. Whether Africa can industrialise at all in an age of automation and reshoring, or must instead build "industries without smokestacks" in agro-processing, horticulture, tourism and tradable services, is the defining question [12, 3].

1.5 Method: forty-nine comparable country models

This is the question the forty-nine country studies synthesised here are built to address. Each pairs an SDCGE model — a structural, dynamic, computable general equilibrium model solved as a mixed complementarity problem — with an MRIO diagnostic on EXIOBASE 3rx, and each asks the same disciplined question: given this country's *actual* economic structure, which growth levers would do the most to raise output and welfare by 2040? Because every study uses the same model, the same data and the same eight scenario families decomposed into the same component interventions, their results can be laid side by side. The structural diagnostics of Part two are computed identically for every country from the 2015 cross-section; the growth scenarios of Part three are identical dynamic experiments. What follows is therefore not forty-nine separate stories but one continental analysis with forty-nine observations — and the regularities that emerge are strong.

1.6 Data and method

The MRIO. The structural diagnostics are computed from EXIOBASE 3rx, a global multi-regional input–output database covering 1995–2015 that resolves each economy into roughly 200 product sectors and records the full matrix of inter-industry, final-demand and trade flows [29]. For each country we extract the 2015 cross-section — the domestic technical-coefficient matrix A, the gross-output vector, value added, and the bilateral import and export flows — and from these derive every metric in Part two: output, value-added and export composition; import penetration and the imported-input ratio; the Leontief inverse $L = (I - A)^{-1}$ and its column-sum multipliers; backward linkages (Rasmussen indices from L) and forward linkages (from the Ghosh inverse G); the Koopman–Wang–Wei decomposition of gross exports into domestic and foreign value added; and the network-centrality measures (out/in strength, eigenvector centrality, density) obtained by treating A as a weighted directed graph [15, 13, 14]. Sectors are aggregated to six broad groups (agriculture, mining and energy, manufacturing, utilities, construction, services) by a fixed concordance for the comparative maps.

The model. The growth scenarios are run in the CDCGE recursive-dynamic computable general equilibrium engine — the structural–dynamic (SDCGE) application of which is specified in full in Section 2. It is calibrated to each country's social-accounting structure from the same EXIOBASE data, carries multiple production activities, factor markets, household, government and external accounts, and is solved as a square mixed complementarity problem, with its input–output core disciplining how a shock in one activity propagates to the rest of the economy. Each scenario is a dynamic path to 2040: an exogenous improvement (productivity, capital, cost or access) is imposed in the relevant activities, and the model is solved forward for the resulting equilibrium

path of prices, quantities, incomes and trade.

The scenarios. Eight families of growth levers are simulated, aligned to the policy menu: *crops, livestock, mining, manufacturing, infrastructure, education, health* and *services*. Each family is decomposed into six or seven concrete interventions (for example, the manufacturing family comprises agro-processing, industrial parks, productivity upgrading, SME credit, beneficiation, power-cost reduction and trade measures), so that the synthesis can report not only which *family* pays most but which specific *intervention* within it carries the gain — the within-family ranking tables of Part three. In total the study spans 49 countries × 8 families, and roughly 49 × 50 individual interventions — over 2,300 simulated outcomes.

The two outcome metrics. Every scenario reports two numbers, and the distinction between them is central to the report. *GDP gain* is the percentage change in real output by 2040 relative to a business-as-usual baseline — the measure of *production*. *Welfare gain* is the equivalent variation, the percentage change in the income a representative household would need to be as well off as in the scenario — the measure of *living standards*, which captures the consumption value of lower prices and trade costs that GDP misses. Levers that build directly productive capacity (manufacturing, processing) score highest on GDP; levers that lower the cost of living and doing business (infrastructure, trade-and-transport services) score highest on welfare. Reporting both, and judging each lever on the right one, is the methodological backbone of the synthesis.

Scope and coverage. The study set comprises the following forty-nine African economies, grouped into the seven regions used throughout this report. *North Africa* (5): Algeria; Egypt; Libya; Morocco; Tunisia. *Sahel* (7): Burkina Faso; Chad; Mali; Mauritania; Niger; Senegal; The Gambia. *Gulf of Guinea* (9): Benin; Côte d'Ivoire; Ghana; Guinea; Guinea-Bissau; Liberia; Nigeria; Sierra Leone; Togo. *Congo Basin* (6): Cameroon; Central African Rep.; Congo (Rep.); DR Congo; Eq. Guinea; Gabon. *Horn & East Africa* (9): Burundi; Djibouti; Eritrea; Ethiopia; Kenya; Rwanda; Somalia; Tanzania; Uganda. *Southern Africa* (10): Angola; Botswana; Eswatini; Lesotho; Malawi; Mozambique; Namibia; South Africa; Zambia; Zimbabwe. *Island states* (3): Madagascar; Mauritius; São Tomé & P.. Five small or data-sparse economies (Cape Verde, Comoros, Seychelles, Sudan, South Sudan) are outside the study set and appear in grey on the maps. The grouping is geographic and climatic; the *structural* archetypes used in Parts four and five (resource exporter, agrarian, diversifying, services-led) cut across these regions.

2 The model

The growth scenarios of Part three are produced by the **CDCGE** model — a *Country-Disaggregated Computable General Equilibrium* model — run, country by country, in its recursive-dynamic mode; "SDCGE" in this report denotes that structural–dynamic application of the same engine. CDCGE is a multi-region, multi-sector, recursive-dynamic CGE model written in Julia and solved as a square mixed complementarity problem (MCP) with PATHSolver, calibrated directly from the same EXIOBASE 3rx MRIO that underlies the structural diagnostics of Part two, and structured along the lines of the World Bank/OECD *ENVISAGE* model (v10.01) in the WALRAS–RUNS–GREEN lineage [30, 31]. This section specifies the engine; the structural metrics and scenario design were described in Section 1.6.

2.1 Circular flow and data foundation

A CGE model is a numerical implementation of Walrasian general equilibrium: firms buy primary factors and intermediate goods to produce output; factor income accrues to households and government; these agents spend on goods and services; and equality of supply and demand on every market determines the equilibrium price vector. The model is *economy-wide* (a shock in one sector propagates through input–output links, factor markets and trade to every other sector and region) and *consistent* (every unit of income has a source and a use, every market clears, and the macro identities — savings equals investment, the balance of payments, the government budget — hold by construction). CDCGE is calibrated on a Social Accounting Matrix (SAM) built from EXIOBASE 3rx: a single `SEC` account per region–sector pair (the EXIOBASE product-by-product table has a diagonal make matrix, so each product is its own activity), three primary factors (unskilled labour, skilled labour and capital, with land, natural resources and water folded into capital), three final-demand accounts (households, government, investment) and seven tax instruments (production, indirect, import, export, factor-use, carbon and direct). Monetary magnitudes are in EXIOBASE units; the recursive dynamics step the economy forward from the benchmark in roughly five-year periods.

2.2 Production: a nested-CES technology

Production is a nested structure with a *Leontief* top tier — the non-energy intermediate bundle ($ND1$) and value added (VA) are used in fixed proportions to gross output XP — above a deep constant-elasticity-of-substitution (CES) value-added/energy tree:

$$
\begin{aligned}
XP &\xrightarrow{\text{Leontief}} ND1 \text{ (non-energy intermediates)},\ VA \\
VA &\xrightarrow{\sigma_v} \text{unskilled labour},\ KEF \\
KEF &\xrightarrow{\sigma_{kef}} KS,\ EN \text{ (energy)} \\
KS &\xrightarrow{\sigma_k} \text{capital},\ \text{skilled labour} \\
EN &\xrightarrow{\sigma_{erg}} \text{electricity},\ \text{non-electricity (coal, oil, gas)}
\end{aligned}
$$

Each two-input nest is a CES aggregator whose dual price and conditional demands are, with benchmark value shares θ_k and substitution elasticity σ,

$$
P^{1-\sigma} = \sum_k \theta_k\, p_k^{1-\sigma} \ \perp\ P, \qquad q_k = \theta_k \left(\frac{P}{p_k}\right)^{\sigma} Q \ \perp\ q_k. \tag{CES}
$$

The nesting lets producers substitute among energy carriers and between energy and the capital–labour bundle, and the electricity node further splits into fossil-fired and clean generation, so the structure that governs how a productivity, cost or capital shock to one activity ripples through the

economy is exactly the input–output architecture mapped in Part two. The top of the nest closes with a zero-profit condition equating the price of output (net of production and indirect taxes) to the cost of the intermediate and value-added bundles.

2.3 Final demand, trade and closure

Household demand follows a *linear expenditure system* (Stone–Geary): consumers first buy fixed subsistence quantities and then allocate supernumerary income across a CES commodity basket with an energy sub-nest, so income elasticities differ across goods. Government and investment demand are Leontief over a fixed basket. Trade is bilateral: imports enter through a two-level *Armington* nest (domestic versus imported, then imports sourced across partners by a CES), and output is allocated between domestic sales and exports by a *constant-elasticity-of-transformation* (CET) function, with a large price-taking Rest-of-World region anchoring world prices and closing the bilateral trade matrix. Markets clear for every commodity and factor; one price is fixed as the numéraire (PNUM = 1) and all others are relative to it; and the macro block enforces the savings–investment balance and the government and external budgets.

2.4 Solution as a square mixed complementarity problem

Following the ENVISAGE/GAMS paradigm, CDCGE pairs each free variable with exactly one equation as a complementarity condition, so the system is *square by construction* (variables = equations). At an interior solution with positive prices and quantities each pair reduces to an equality. Because benchmark prices are normalised to one and the SAM is balanced, the calibrated data are a fixed point: a no-shock solve reproduces the data (the standard CGE replication/homogeneity check), and a counterfactual is read as the deviation of the perturbed equilibrium from this reference. Inactive nodes (a CES child with zero benchmark value, e.g. a sector using no electricity) are pinned to a tiny positive constant so that squareness is preserved for any data configuration. The square system is solved with PATHSolver, a Newton method for complementarity problems [32].

2.5 Recursive dynamics

The model is stepped forward recursively. Between periods the capital stock evolves by the perpetual-inventory rule

$$K_{r,t+1} = (1 - \delta)\, K_{r,t} + I_{r,t}, \tag{G-1}$$

with current investment $I_{r,t}$ the solved investment outlay; labour supply grows by skill (skilled labour slightly faster, reflecting rising educational attainment); labour-augmenting (Harrod-neutral) total-factor productivity grows at a calibrated rate (default ≈1.2%/yr); and an autonomous energy-efficiency improvement lowers energy intensity over time. The reference is a *balanced-growth* path on which every exogenous anchor — factor endowments and autonomous final demand alike — grows by a common per-region factor each period, so the baseline neither stalls nor drifts and any deviation in a scenario is attributable to the policy rather than to an unbalanced baseline. It is along this dynamic path that each growth-lever scenario is imposed — as an improvement in productivity, capital, cost or access in the relevant activities — and solved forward to 2040, yielding the GDP and welfare (equivalent-variation) outcomes synthesised in Part three. (The engine also carries an in-model CO_2 emissions layer and a post-solve DICE-type climate module; these are not activated in the growth-scenario runs reported here.)

3 The structure of Africa's economies

Structure is destiny in these models: a country's input–output architecture determines which shocks propagate, which sectors pull others with them, and where value is captured. We summarise the 2015 cross-section of all forty-nine economies, computed identically from EXIOBASE 3rx. Maps show the continental pattern; bubble plots show where each economy sits in the relevant structural plane; and Table 1 reports the regional averages that anchor the discussion. (Sudan, South Sudan and the smallest island states are shown in grey where they are not part of the study set.)

Table 1: Regional structural averages, 2015 (EXIOBASE 3rx). VA = value added; DVA = domestic value added in exports; $\bar{L}$ = mean output multiplier; key = number of key sectors.

Region	Agric. VA %	Mfg. VA %	Serv. VA %	Mining exp. % exports	DVA %	$\bar{L}$	Key sec. #
North Africa	8	17	53	24	74	1.32	48
Sahel	19	19	47	13	82	1.35	45
Gulf of Guinea	25	19	45	5	80	1.37	44
Congo Basin	11	18	37	47	80	1.37	59
Horn & East Africa	20	17	50	2	82	1.36	42
Southern Africa	9	20	55	17	69	1.29	42
Island states	12	18	63	0	72	1.35	48

The table previews the whole of Part two. Agriculture's value-added share falls from a quarter in the Gulf-of-Guinea hinterland and a fifth in the Horn and Sahel to under a tenth in North and Southern Africa; manufacturing's share is remarkably flat at 17–20% *everywhere*, confirming that no African region has industrialised relative to the others; services dominate value added in every region; mineral exporters concentrate in the Congo Basin (47% of exports) and North Africa; domestic value added in exports is uniformly high (69–82%) for the wrong reason; output multipliers are low (1.29–1.37); and key-sector counts rise with economic size and the depth of the energy/heavy-industry core. We now take each dimension in turn.

3.1 Sector output shares

Figure 1 maps the leading broad sector by share of gross output, with the agriculture and services shares alongside. The continent splits cleanly. A services share above 55–70% marks the diversified and small open economies — Djibouti, Mauritius, Tunisia, South Africa, Botswana — where trade, transport, public administration and finance dominate. Agriculture still leads or rivals services in output across the agrarian economies of the Gulf-of-Guinea hinterland and the Great Lakes (Liberia, Guinea-Bissau, Sierra Leone, Ethiopia, Burundi). Mining and energy lead output only in the hydrocarbon and mineral exporters (Angola, the two Congos, Equatorial Guinea, Libya). The single most important structural fact on the map is what is *absent*: manufacturing leads output in *no* African economy at the broad-sector level. This is the continental signature of the industrialisation deficit, and it is the structural premise behind the manufacturing result of Part three.

3.2 Sector value-added shares

Value-added shares (Figure 2) sharpen the picture because they net out imported intermediates — they measure what an economy actually *makes*, not merely what passes through it. Manufacturing's share of value added exceeds a fifth in only a handful of economies — Eswatini (35%, on sugar and apparel processing), the Central African Republic, Somalia, Namibia and Zimbabwe — and

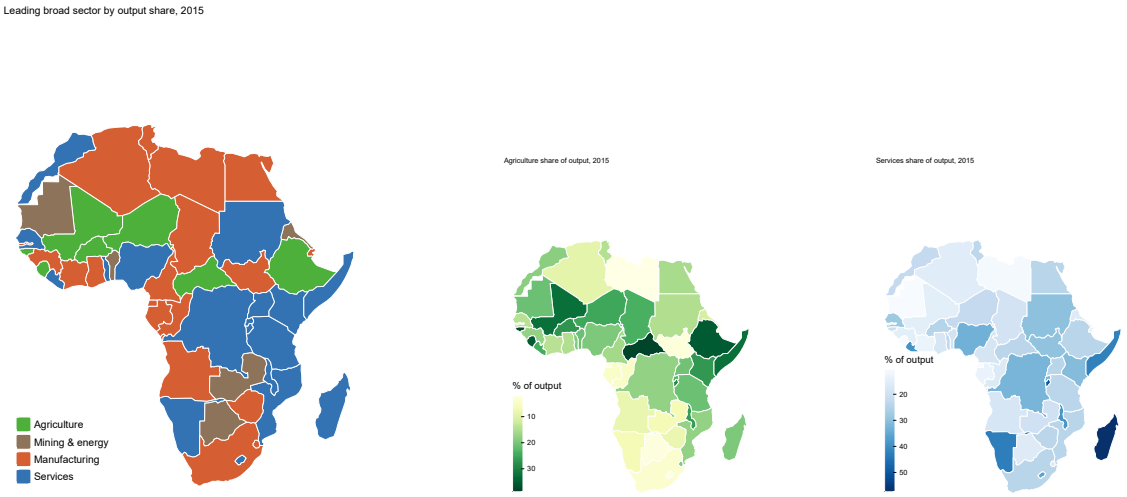

Figure 1: Output structure, 2015. Left: leading broad sector by output share. Centre: agriculture share of output. Right: services share of output.

falls below 10% in many resource exporters, where mining absorbs the value added. Services value added dominates almost everywhere, but the composition matters: much of it is low-productivity informal trade and personal services rather than the tradable, high-skill services (finance, ICT, logistics, business services) that drive transformation, which is precisely the distinction McMillan and Rodrik draw between growth-enhancing and growth-reducing structural change [1, 3]. The structural-transformation plane (the right panel and Figure 2) places every economy on the agriculture-versus-services axes, with bubble size proportional to total value added: Nigeria, Egypt and South Africa anchor the large diversified economies; Liberia, Sierra Leone, Guinea-Bissau and Ethiopia sit in the high-agriculture corner; and the oil economies (Equatorial Guinea, Congo) fall low on both axes because mining absorbs their value added. The vertical spread of the cloud — from under 40% services value added to over 70% — is the continent's structural diversity in a single chart.

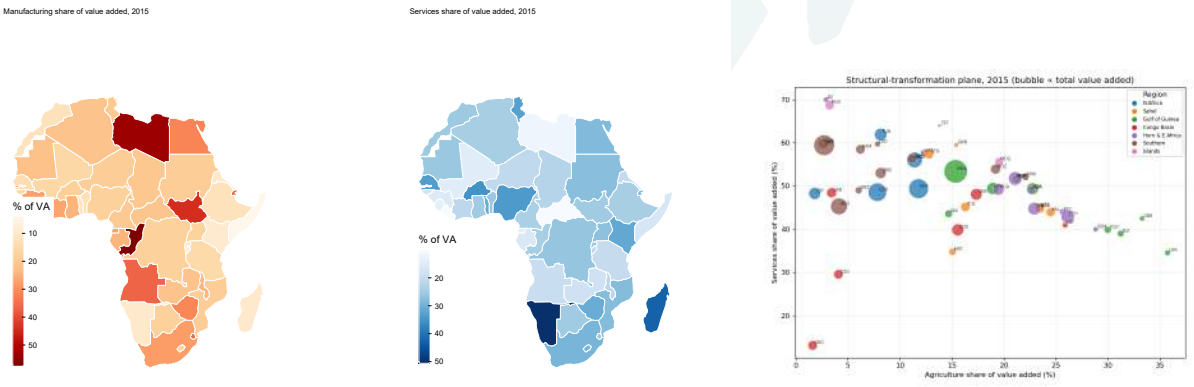

Figure 2: Value-added structure, 2015. Manufacturing (left) and services (centre) shares of value added; right, the structural-transformation plane (bubble $\propto$ total value added).

3.3 Export shares

Exports are the most concentrated margin of all (Figure 3), and the continent's external vulnerability lives here. Mining and energy supply 70–80% of gross exports in Congo-Brazzaville, Equatorial Guinea, Mauritania, the DRC, Angola, Libya and Nigeria; the Congo-Basin regional average is 47% (Table 1). Manufacturing's export share exceeds a third only in Tunisia, Morocco,

Eswatini and Lesotho — the economies plugged into European or regional production networks through apparel, automotive components and electrical goods. The continent, in aggregate, still exports what it digs and grows and imports what it makes; the corollary, developed below, is that its exports embody very little imported input and so almost no participation in global value chains. Concentrated commodity exports are also the transmission belt for the boom-bust cycles of Part one: when a single price moves, the whole external account moves with it.

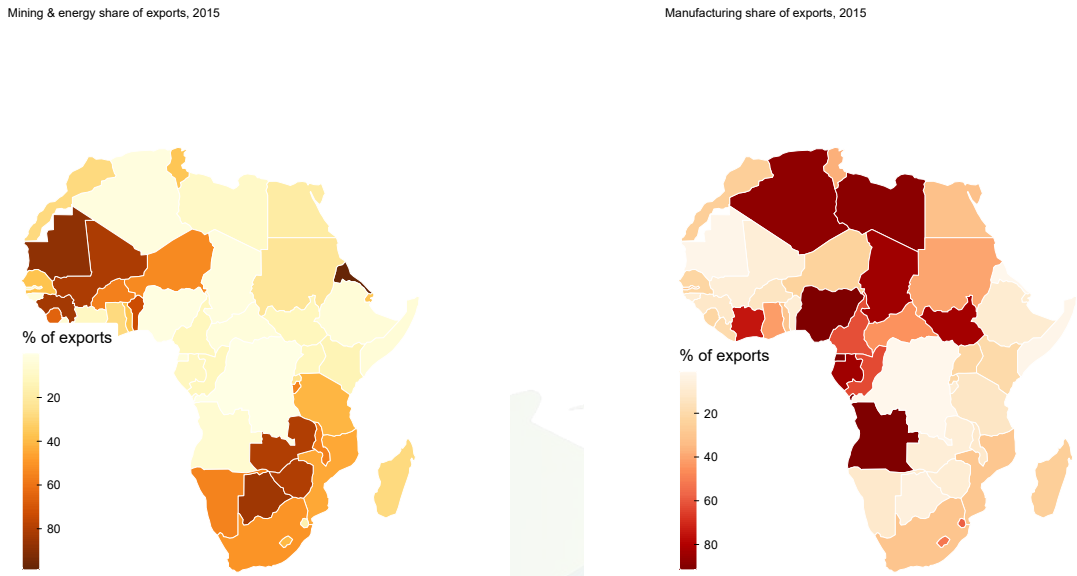

Figure 3: Export structure, 2015. Mining & energy (left) and manufacturing (right) shares of gross exports.

3.4 Import dependence

Import penetration — imports as a share of domestic absorption, output-weighted across sectors — measures how much of what an economy uses it must buy abroad (Figure 4). It is highest in the small, open and resource-rich economies (Mauritania 35%, Eswatini, Mauritius, the DRC), which import most manufactures and, often, food. The continental food-import bill alone — about $43–50 billion a year in the mid-2010s and projected to exceed $110 billion by 2025 — is the clearest single measure of the import dependence the agro-processing scenarios are designed to reverse [11, 9]. The bubble plot pairs import penetration against the manufacturing value-added share, and the negative tilt is the import-substitution opportunity that the manufacturing scenarios in Part three exploit: economies that make little at home import the most, and therefore have the most to gain from building a domestic industrial base behind the natural protection of distance and the new market of the AfCFTA.

3.5 Technical-coefficient matrix A

The technical-coefficient matrix A records the input each sector draws from every other per unit of output; its mean column sum is the economy's intermediate-input intensity — how "roundabout" (in Böhm-Bawerk's sense) production is. Africa's intensities are low (Figure 5): production chains are short, with little inter-industry depth, because so many intermediates are imported rather than sourced from a domestic supplier. A thin A matrix is the structural signature of weak industrialisation — there are few domestic firms selling inputs to other domestic firms — and it is exactly what one expects of economies that export raw commodities and import finished goods. It is also why local-content and supplier-development policies recur in the diagnostics of Part four: thickening A is the same task as building the missing domestic supply chains, and the World

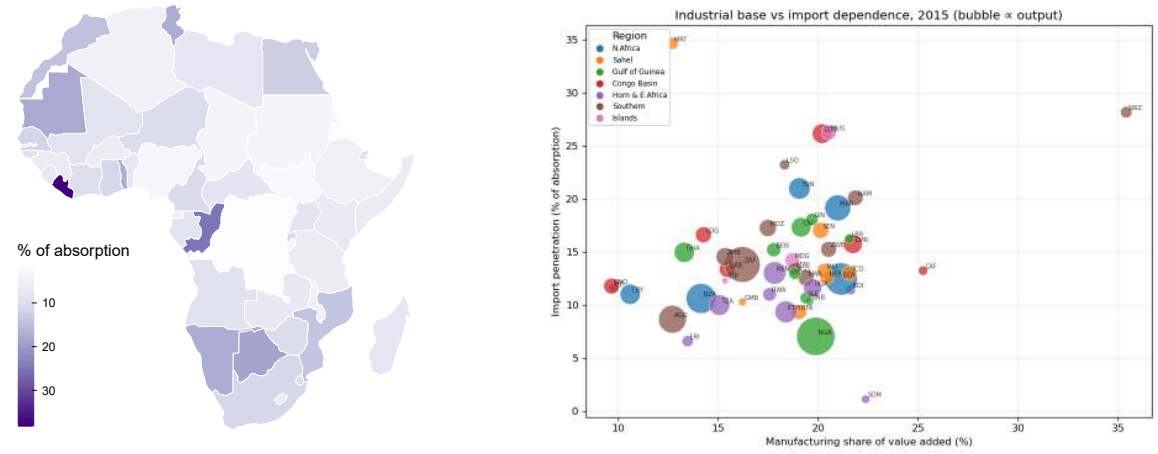

Figure 4: Import dependence, 2015. Left: import penetration (output-weighted). Right: industrial base vs import dependence (bubble $\propto$ output).

Bank's "compete, connect, create value" framing of African industrialisation is, in input–output terms, a programme to raise the off-diagonal mass of A [5].

3.6 Leontief inverse L

The Leontief inverse $L = (I - A)^{-1}$ converts the direct coefficients into total (direct + indirect) requirements; the mean column sum of L is the economy's average output multiplier — the total output generated economy-wide by a unit of final demand (Figure 6). Multipliers are modest across Africa (1.2–1.5) and, revealingly, are *highest* in some oil economies (Angola, Equatorial Guinea, $\approx$1.5), where a few capital-intensive sectors pull hard on a narrow base, and *lowest* in the small enclave economies (Lesotho, Eswatini, Namibia, Mauritius, $\approx$1.2), whose production leaks quickly into imports. A low multiplier means a demand stimulus dissipates abroad rather than circulating at home; raising it is the same task as thickening the A matrix. The right panel pairs the multiplier against network density and sizes each bubble by the number of key sectors — the larger, denser, more multiplied economies (Angola, Congo, Egypt, South Africa) sit upper-right; the thin enclave economies lower-left.

3.7 Backward linkages

Backward linkages (the Rasmussen index derived from L) measure how strongly a sector pulls on its suppliers when it expands — the Hirschman logic of unbalanced growth, in which the right investments are those that create the most pressure on the rest of the economy to expand with them [13]. Figure 7 maps the number of *key sectors* (those above average on both backward and forward linkages) and the strength of the single most backward-linked sector. Key-sector counts are high in the larger, more articulated economies (Angola 87, Congo 86, Equatorial Guinea, Libya, Egypt, South Africa) and low in the small agrarian and enclave economies. The sectors with the strongest backward linkages are almost always processing, construction and basic-manufacturing activities — which is the precise input–output rationale for prioritising agro-processing and industrial parks: they pull the widest set of domestic suppliers with them, and so deliver the largest indirect output gains, exactly as the simulations of Part three find.

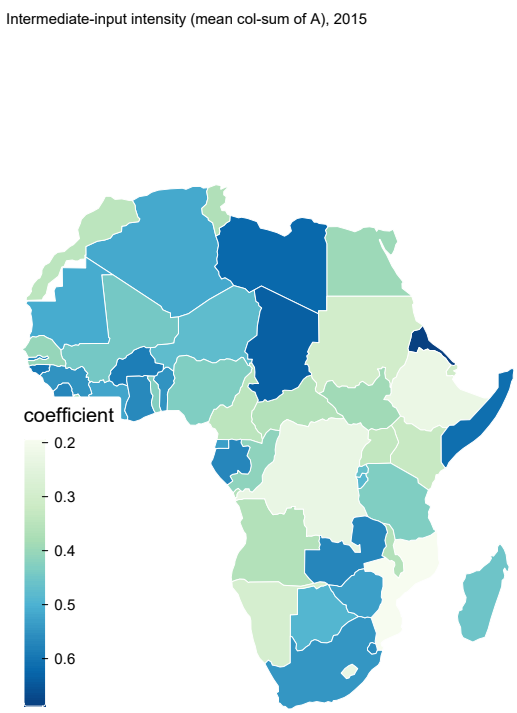

Figure 5: Intermediate-input intensity — mean column sum of the technical-coefficient matrix A, 2015.

3.8 Forward linkages

Forward linkages (from the Ghosh inverse) measure how strongly a sector pushes downstream by supplying others. They are dominated by energy, utilities, transport and basic-material sectors — the upstream activities whose cost and availability condition everything built on top of them (Figure 8). The policy reading is the mirror image of the backward case: a forward-linked bottleneck does the most damage, because a constraint there propagates to every downstream user. This is why energy cost and reliability, and transport, surface repeatedly as binding constraints in the diagnostics of Part four even though an energy or transport *push* scores poorly on GDP in Part three — the structural role of these sectors is to *enable* the rest of the economy, and their value shows up in the welfare and cost channels rather than in their own output. Over 640 million Africans still lack electricity and inadequate transport inflates trade costs by 30–40%, so the forward-linkage bottleneck is quantitatively large [24].

3.9 Domestic vs foreign value added in exports

Decomposing gross exports into domestic (DVA) and foreign (FVA) value added — following the Koopman–Wang–Wei accounting that underlies modern trade-in-value-added statistics [14] — shows how much of what a country sells abroad it actually *makes* at home (Figure 9). African DVA shares are strikingly high: above 90% in Somalia, Guinea-Bissau and Nigeria, and above 80% across most of the continent (regional averages 69–82%, Table 1). But this is high DVA for the *wrong* reason. It reflects raw-commodity exports with almost no imported-input content — not deep domestic value chains — and the corollary is very low GVC *participation*, since joining a value chain means importing intermediates and adding a stage. The economies with the *lowest* DVA (Lesotho 47%, Tunisia 60%, Eswatini 63%, Mozambique 66%) are precisely the ones that have actually plugged into international production networks — importing fabric, components or intermediates and exporting a processed good. The bubble plot makes the trade-off explicit: moving up the value chain means accepting more foreign content in exchange for more, and more

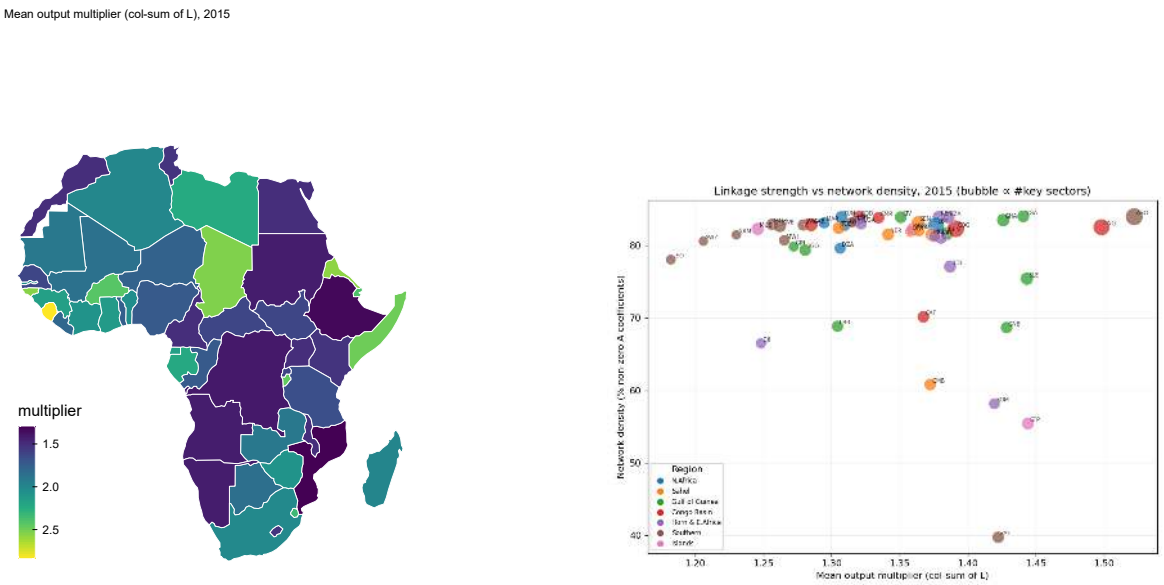

Figure 6: Output multipliers and network density, 2015. Left: mean output multiplier (column sum of L). Right: multiplier vs network density (bubble $\propto$ number of key sectors).

sophisticated, domestic activity. The right development objective is therefore not to maximise DVA but to raise the *level and sophistication* of domestic value added, even where its share falls.

3.10 Network centrality

Treating the A matrix as a weighted directed network of inter-industry flows, centrality measures identify the sectors that sit at the heart of the production web. Network density — the share of non-zero technical coefficients — and the eigenvector centrality of the most central sector are mapped in Figure 10. Denser, more centralised networks (the larger North African and Southern African economies) transmit shocks and stimulus more widely; sparse networks (the agrarian and enclave economies) fragment into disconnected activities, so that a push in one place stays in that place. Centrality identifies *where* a targeted intervention will ripple furthest — typically energy, transport, trade and basic processing — and so complements the linkage analysis in pointing to the same short list of high-leverage sectors. The network reading also explains a recurring asymmetry in Part three: interventions in central, well-connected sectors (processing, manufacturing) propagate into broad output gains, while interventions in peripheral sectors stay local and show up mainly in welfare.

Structural synthesis. Four features recur across all ten dimensions. African production is *shallow* (thin A, low multipliers), *concentrated* (commodity-heavy exports, few key sectors), *import-dependent* for manufactures and food, and *high-DVA for the wrong reason* (raw exports, not deep chains). Every one of these is an argument for the same thing: building domestic processing and supplier linkages. Part three tests, country by country and intervention by intervention, how much that would be worth.

3.11 Leaders and laggards across the structural metrics

Reading the cross-section as a league table sharpens the regional story into specific cases. **Manufacturing value added** is highest in Eswatini (35%), Central African Rep. (25%), Somalia (22%), Namibia (22%) and lowest in the oil economies; **services value added** peaks in Djibouti

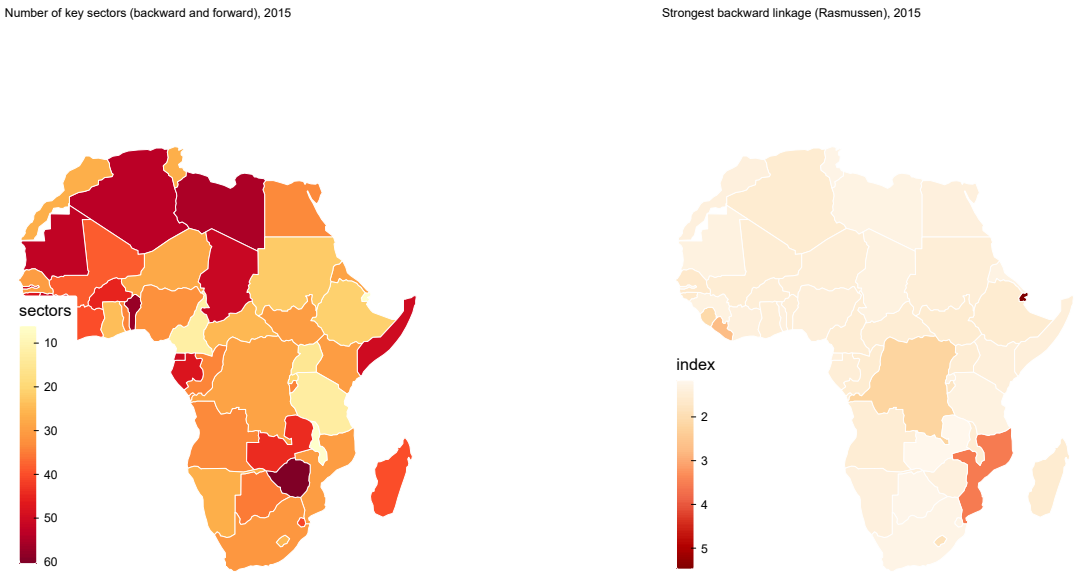

Figure 7: Backward linkages, 2015. Left: number of key sectors. Right: strongest backward linkage (Rasmussen index).

(70%), Mauritius (69%), São Tomé & P. (64%), Tunisia (62%); and **agriculture** still leads value added in Liberia (36%), Guinea-Bissau (33%), Sierra Leone (31%), Togo (30%). **Mineral-export dependence** is most extreme in Congo (Rep.) (80%), Eq. Guinea (80%), Mauritania (77%), DR Congo (69%), the clearest resource-curse cases on the continent. **Import penetration** is highest in the small open economies (Mauritania (35%), Eswatini (28%), Mauritius (26%), DR Congo (26%)), which must buy most manufactures and food abroad. The **output multiplier** $\bar{L}$ is largest in Angola (1.52), Eq. Guinea (1.50), São Tomé & P. (1.44), Sierra Leone (1.44) — capital-intensive economies pulling on a narrow base — and smallest in the enclave economies whose production leaks into imports. **Domestic value added in exports** tops out in Somalia (100%), Guinea-Bissau (97%), Nigeria (93%), Eritrea (88%) (raw-commodity exporters with negligible imported-input content) and is lowest in the GVC-integrated economies (Lesotho, Tunisia, Eswatini). **Key-sector counts** are highest in Angola (87), Congo (Rep.) (86), Eq. Guinea (79), Libya (77), the largest and most articulated economies. Each of these league positions is a structural fingerprint that the growth scenarios of Part three then act upon.

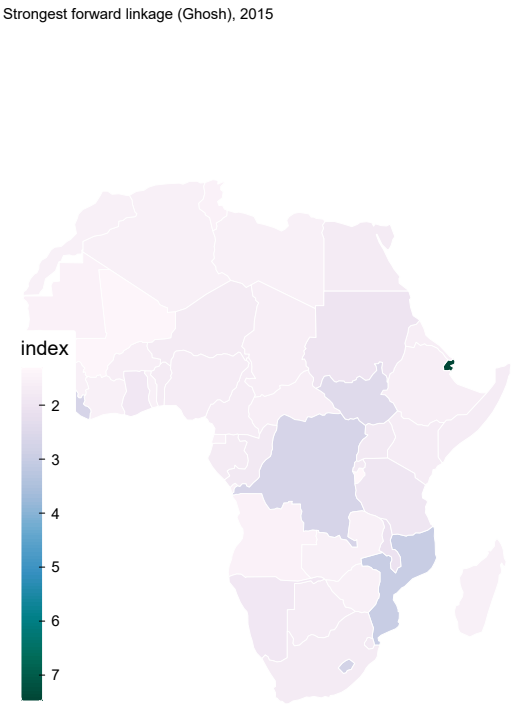

Figure 8: Strongest forward linkage (Ghosh index), 2015.

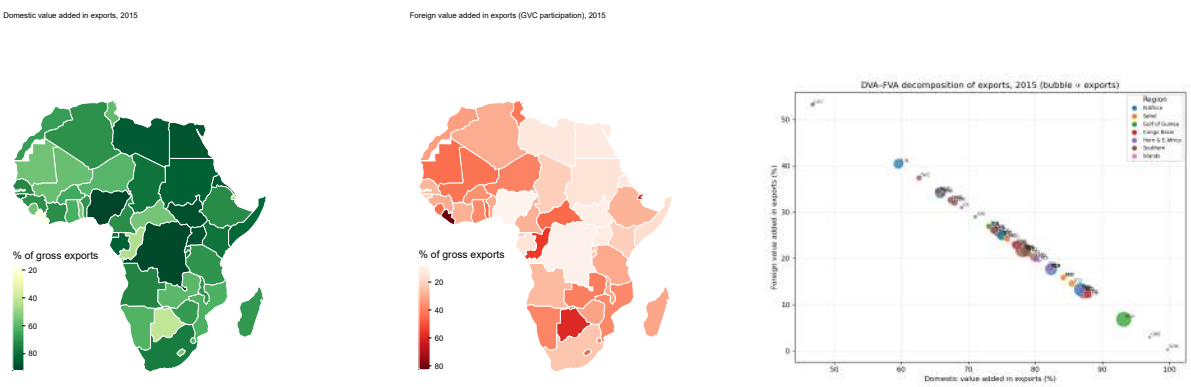

Figure 9: Value-added content of exports, 2015. Domestic (left) and foreign (centre) value-added shares; right, the DVA–FVA plane (bubble $\propto$ exports).

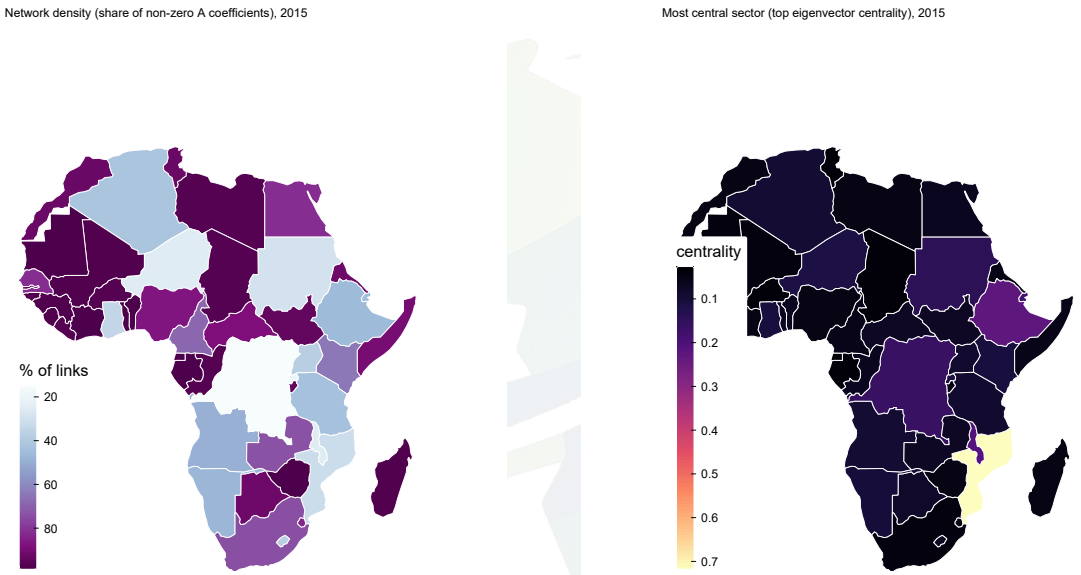

Figure 10: Network centrality, 2015. Left: network density (share of non-zero A coefficients). Right: eigenvector centrality of the most central sector.

4 Growth-scenario synthesis

Each country study simulates eight families of growth levers as dynamic shocks to 2040 and reports two outcomes: the percentage gain in **GDP** and in **welfare** (equivalent variation) relative to a business-as-usual baseline. Each family is built from six or seven component interventions, so the full experiment spans 49 countries × roughly 50 interventions — over 2,300 simulated outcomes. Aggregating them yields the clearest continental signal in this report. Figure 11 ranks the eight families by the distribution of their GDP gains across all forty-nine economies, and Table 2 gives the regional averages.

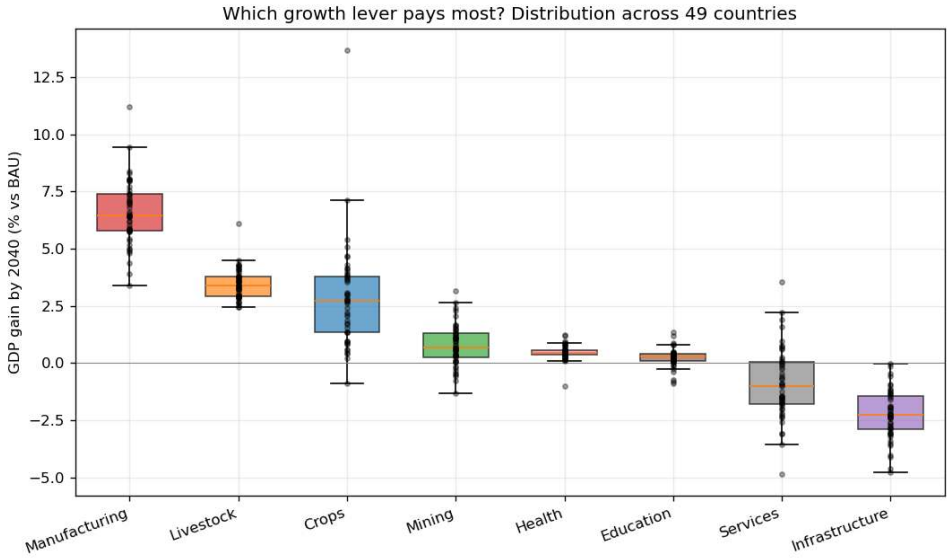

Figure 11: Which growth lever pays most? Distribution of 2040 GDP gains across 49 countries, by scenario family. Boxes are inter-quartile ranges; dots are individual countries.

Table 2: Regional average GDP gain by 2040 (% vs baseline), by scenario family. Manufacturing dominates every region; infrastructure and services are GDP-negative (but welfare-positive, see text).

Region	Crops	Lives	Minin	Manuf	Infra	Educa	Healt	Servi
North Africa	+1.5	+3.2	+1.3	+7.0	-2.0	+0.1	+0.5	-0.7
Sahel	+3.5	+3.8	+0.8	+6.8	-2.1	+0.6	+0.6	-0.5
Gulf of Guinea	+3.6	+3.2	+0.4	+5.8	-2.1	+0.0	+0.2	-0.9
Congo Basin	+1.5	+3.2	+1.4	+6.7	-2.0	+0.2	+0.5	-0.2
Horn & East Africa	+4.5	+4.1	+0.2	+6.1	-3.1	+0.5	+0.5	-2.3
Southern Africa	+1.9	+3.3	+1.2	+7.5	-1.9	+0.1	+0.5	-0.9
Island states	+1.7	+2.9	+0.2	+5.5	-2.8	+0.2	+0.8	+0.5

The ordering is unambiguous and holds in every region. **Manufacturing** delivers the largest GDP gain in 47 of 49 economies, with a median gain near **+6.5%** and a positive result in all 49; the regional averages run from +5.5% (islands) to +7.5% (Southern Africa). **Livestock** (median +3.4%) and **crops** (+2.7%) follow, strongest in the agrarian Horn, East Africa and Sahel. **Mining**, **health** and **education** cluster modestly above zero. **Services** and **infrastructure** are GDP-*negative* on average by 2040 — a result that is not a verdict against them but a statement about measured output, as the welfare analysis below makes clear. The master map and overview (Figure 12) report, for every country, the single family with the highest GDP return: manufacturing almost everywhere, crops in Somalia and Guinea-Bissau. We now take each family in turn, decomposing it into its component interventions (the within-family ranking tables) and naming the country leaders.

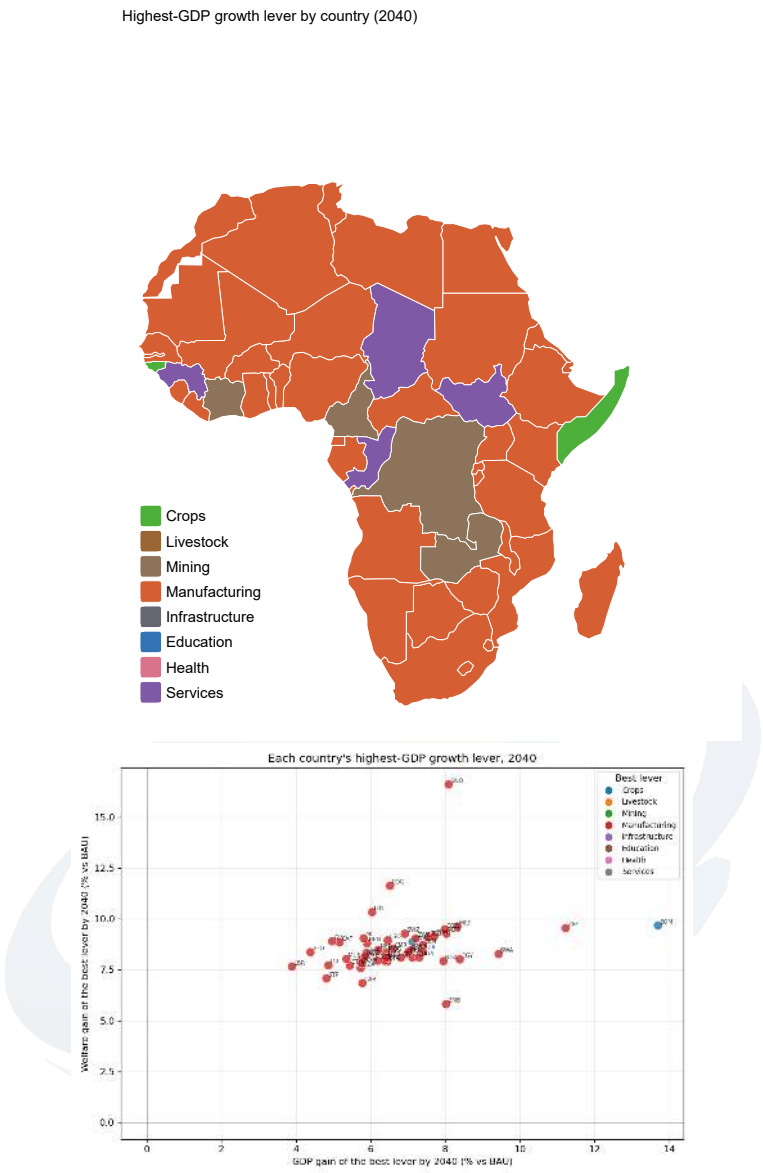

Figure 12: The highest-GDP growth lever by country, 2040. Left: continental map. Right: each country's best lever, GDP vs welfare.

4.1 Crops

A crops push bundles irrigation, fertiliser, mechanisation, post-harvest handling, feeder roads, crop diversification and export-crop promotion. It is the *best* GDP lever in the two economies where agriculture is overwhelming and processing almost absent — Somalia (+13.7%) and Guinea-Bissau (+7.1%) — and a strong second lever across the agrarian belt. Country leaders: Somalia (+13.7%), Guinea-Bissau (+7.1%), Malawi (+5.4%), Côte d'Ivoire (+5.1%), Burkina Faso (+4.7%). The within-family ranking (Table 3) shows where the gains originate: fertiliser and irrigation — the classic yield levers — dominate, followed by mechanisation and post-harvest handling, while *export crops* actually subtract from GDP in most countries because they divert land and labour into raw primary exports rather than into the domestic food-and-processing economy. The lesson aligns with the agricultural-transformation literature: the returns are in raising *yields* and cutting *post-harvest losses*, not in expanding raw cash-crop acreage [8, 9]. The map (Figure 13) traces the agrarian geography of the gain; it is largest where the farm sector is largest and weakest in the oil and small open economies.

Table 3: Crops: within-family intervention ranking (GDP % gain by 2040, across 49 countries). n^+ = number of countries with a positive gain.

Intervention	Mean	Median	n^+
fertilizer	+0.89	+0.92	46
irrigation	+0.65	+0.63	47
mechanization	+0.54	+0.49	46
postharvest	+0.54	+0.48	48
crop diversification	+0.41	+0.39	45
feeder roads	+0.19	+0.22	43
export crops	-0.10	-0.07	13

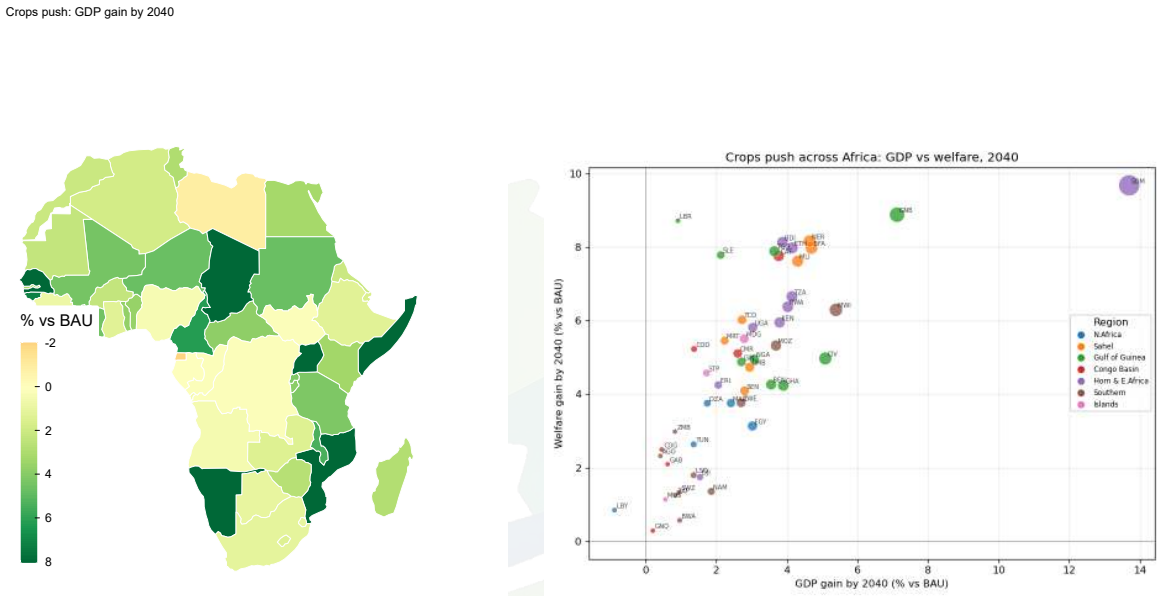

Figure 13: Crops push, 2040. Left: GDP gain by country. Right: GDP vs welfare across Africa (bubble $\propto$ |GDP gain|).

4.2 Livestock

Livestock interventions — veterinary services, improved breeds, feed, disease control, cold chains and dairy/meat processing — are the second-ranked family continent-wide (median +3.4%) and are strongest in the pastoral economies. Country leaders: Somalia (+6.1%), Chad (+4.5%), Rwanda (+4.3%), Tanzania (+4.3%), Nigeria (+4.3%). The within-family ranking (Table 4) is the single clearest illustration of the report's central theme: *dairy processing* (mean +1.96%) and the *cold chain* (+1.01%) dwarf every husbandry intervention — veterinary care, breeds, feed and disease control each add barely +0.1–0.2%. The value is not in producing more raw milk and meat but in *processing and preserving* it. This is "industries without smokestacks" in its most literal form, and it fits the pastoral endowment of the Horn, the Sahel and East Africa [12, 8].

4.3 Mining

A mining push bundles new capacity, local content, beneficiation, energy-cost reduction, transport corridors and royalty reform. It pays most where minerals already dominate. Country leaders: Eq. Guinea (+3.1%), Mauritania (+2.7%), Congo (Rep.) (+2.4%), Angola (+2.3%), Libya (+2.1%). But the continental median is only +0.7%, and the within-family ranking (Table 5) explains

Table 4: Livestock: within-family intervention ranking (GDP % gain by 2040, across 49 countries). n^+ = number of countries with a positive gain.

Intervention	Mean	Median	n^+
dairy processing	+1.96	+1.91	49
cold chain	+1.01	+1.04	47
veterinary	+0.16	+0.14	41
disease control	+0.16	+0.14	41
breeds	+0.16	+0.13	41
feed productivity	+0.11	+0.11	40

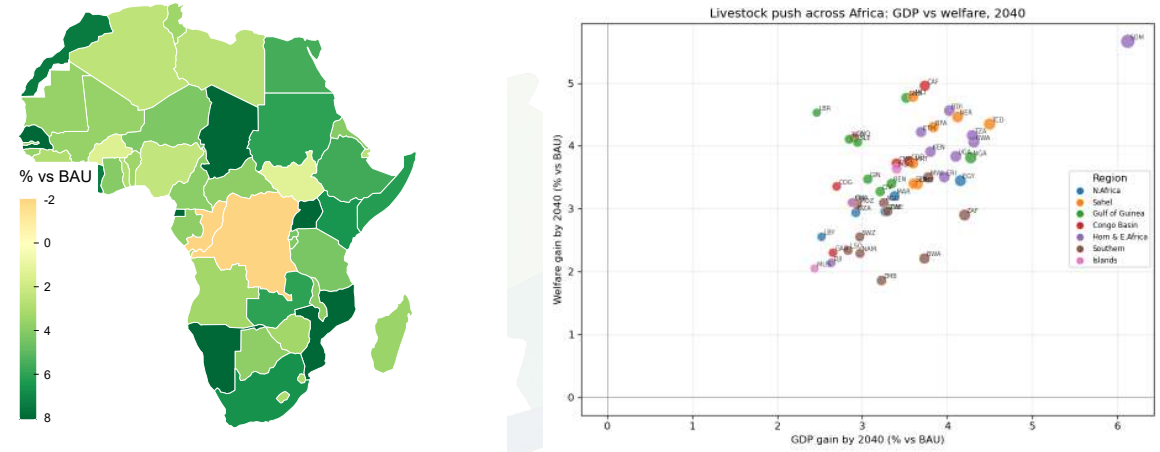

Figure 14: Livestock push, 2040. GDP gain by country (left) and GDP vs welfare (right).

why: *beneficiation* — processing ore into metal and concentrate into product at home — delivers essentially all of the gain (mean +1.93%), while opening new mines adds little, and a *transport corridor* push actually subtracts from GDP (it lowers trade costs, a welfare gain, while diverting investment from directly productive sectors). Digging more raw material barely moves output; moving downstream moves it a lot. This is exactly the agenda now crystallising around Africa's critical minerals: the IEA projects the value of Africa's refined-mineral output could rise from about $70 billion today to $120 billion by 2040 if a greater share is processed on the continent, and Zimbabwe (raw-lithium export ban) and Namibia (2025 ban on unprocessed lithium, cobalt, manganese, graphite and rare earths) are already legislating beneficiation at source [25, 26].

4.4 Manufacturing

Manufacturing is the headline of the entire report. A manufacturing push — agro-processing, industrial parks, productivity upgrading, SME credit, beneficiation, power-cost reduction and trade measures — is the highest-GDP lever in 47 of 49 economies. Country leaders: South Africa (+11.2%), Botswana (+9.4%), Egypt (+8.4%), Mauritania (+8.3%), Eq. Guinea (+8.1%). Gains exceed +5% almost everywhere and reach double digits in South Africa. The reason is structural, and was visible throughout Part two: African economies import most of their manufactures (high import penetration), make little at home (low manufacturing value added), and have thin inter-industry linkages (low multipliers, thin A). Building a domestic industrial base therefore

Table 5: Mining: within-family intervention ranking (GDP % gain by 2040, across 49 countries). n^+ = number of countries with a positive gain.

Intervention	Mean	Median	n^+
beneficiation	+1.93	+1.93	49
new mine	+0.22	+0.09	42
local content	+0.15	+0.05	39
energy cost	+0.05	+0.00	26
royalty reform	-0.06	-0.09	20
transport corridor	-1.24	-1.25	0

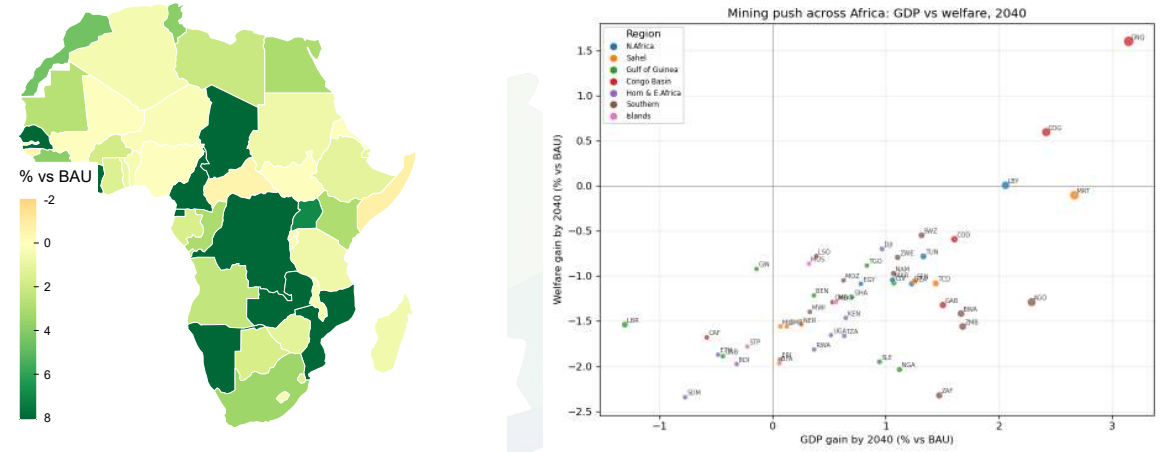

Figure 15: Mining push, 2040. GDP gain by country (left) and GDP vs welfare (right).

substitutes for imports, thickens A, raises the multiplier and pulls the widest set of suppliers — the largest available output gain. The within-family ranking (Table 6) is decisive: **agro-processing** (mean +2.70%) is the single highest-return intervention in the entire study, the lever that connects the agricultural base to the industrial opportunity; *industrial parks* and *productivity upgrading* (+2.27% each) and *SME credit* (+1.79%) follow. By contrast *tariff reform* and *export incentives* are GDP-negative — trade-policy levers alone, without the supply-side investments, do not build industry. This is the model's version of the World Bank's "compete, connect, create value" and the AfDB's Special Agro-Industrial Processing Zones, which have drawn $1.6 billion into 25 zones across 15 countries; and it is why the AfCFTA matters so much, since it could raise manufacturing output by about 8% and lift intra-African trade — led by manufactures — by well over half, giving processors a continental market rather than a national one [5, 10, 27, 28].

4.5 Infrastructure

Infrastructure is the great GDP–welfare divergence, and it must be read carefully. A pure infrastructure push — power, transport, water, digital and logistics — is GDP-negative almost everywhere by 2040, because over the horizon it diverts resources from directly productive sectors into long-gestation capital. Yet it is among the very *strongest welfare* levers. Welfare leaders: South Africa (+12.9%), Sierra Leone (+12.4%), Eq. Guinea (+12.3%), Ghana (+11.9%), Libya (+11.8%). Infrastructure raises living standards by lowering the cost of everything households consume and

Table 6: Manufacturing: within-family intervention ranking (GDP % gain by 2040, across 49 countries). n^+ = number of countries with a positive gain.

Intervention	Mean	Median	n^+
agro processing	+2.70	+2.67	49
industrial parks	+2.27	+2.25	49
productivity upgrade	+2.27	+2.25	49
sme credit	+1.79	+1.82	49
power cost	+0.05	+0.00	26
export incentives	-0.87	-0.91	2
tariff reform	-1.31	-1.27	0

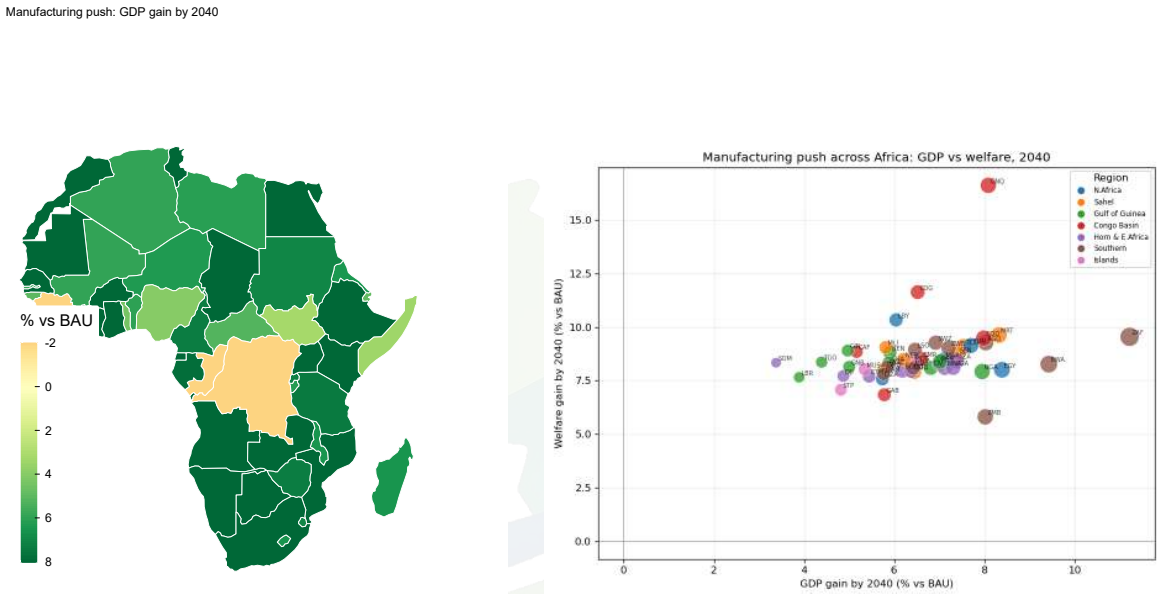

Figure 16: Manufacturing push, 2040. GDP gain by country (left, the strongest and most uniform of all eight levers) and GDP vs welfare (right).

firms ship, even when it does not flatter measured output. The within-family ranking (Table 7) refines the message: *digital* (mean +1.29% GDP) and *electricity* (+0.67%) and *irrigation* (+0.65%) are GDP-positive — targeted, productivity-raising infrastructure pays — while *ports* (−2.25%), *logistics* and *roads* are GDP-negative on the output metric precisely because their payoff is in lower trade costs (welfare), not own-sector output. The policy implication is not to under-invest — the continent's infrastructure financing gap is $68–108 billion a year, 640 million people lack power, and poor transport inflates trade costs 30–40% [24] — but to *evaluate* infrastructure on welfare and on its role as the *enabler* that makes the manufacturing and processing gains physically possible. Digital infrastructure, which scores positively even on GDP, is the highest-return infrastructure investment in the model.

4.6 Education

Human-capital levers act slowly. An education push — TVET, skills, broad human-capital and school-completion measures — produces modest GDP gains by 2040 (continental median +0.3%) because its returns accrue over a generation, beyond the simulation horizon, and depend on the existence of jobs that can absorb the newly skilled [17, 18]. The within-family ranking (Table 8) puts *TVET* and *skills* (vocational and job-relevant training) ahead of broad schooling measures

Table 7: Infrastructure: within-family intervention ranking (GDP % gain by 2040, across 49 countries). n^+ = number of countries with a positive gain.

Intervention	Mean	Median	n^+
digital	+1.29	+1.20	48
electricity	+0.67	+0.67	47
irrigation	+0.65	+0.63	47
water sanitation	+0.09	+0.09	41
roads	-0.21	-0.20	14
logistics	-1.28	-1.26	0
ports	-2.25	-2.28	0

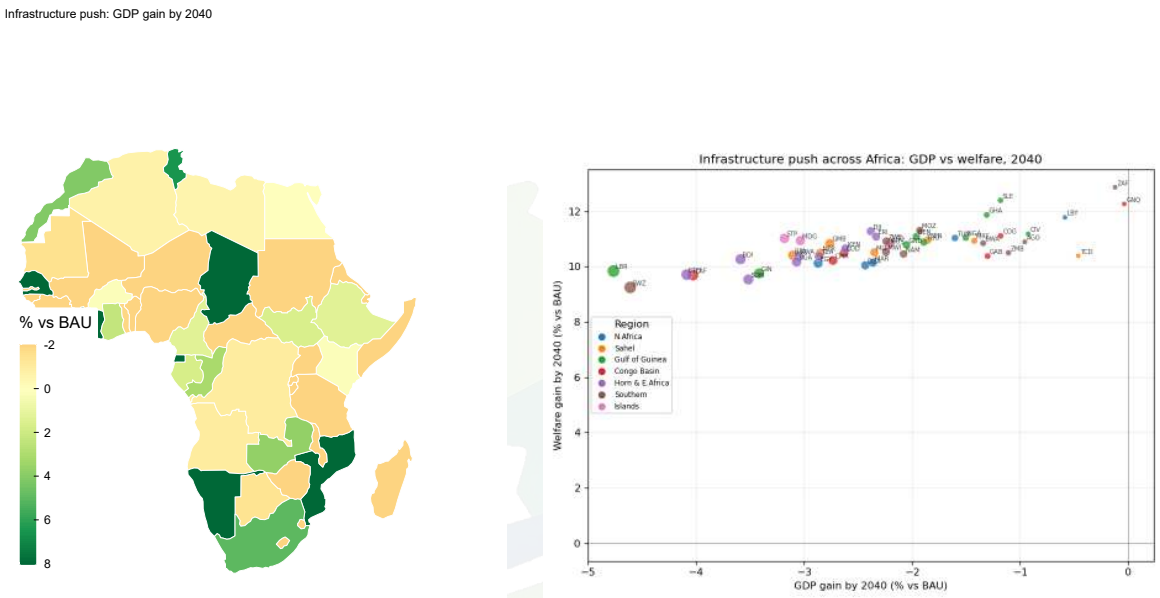

Figure 17: Infrastructure push, 2040. GDP gain (left) is weak or negative; the GDP vs welfare plane (right) shows the large welfare payoff.

— consistent with the evidence that Africa's binding education constraint is increasingly a skills *mismatch* rather than enrolment alone, and that foundational and job-relevant skills are what convert the demographic bulge into a dividend [23]. Education's value in this framework is as a *complement*: it raises the ceiling on every other lever, and the manufacturing and tradable-services opportunities cannot be realised without it. The geography of the gain (Figure 18) favours the faster-growing, more diversified economies that can actually employ skilled labour.

4.7 Health

Health interventions — health-sector employment, morbidity reduction, nutrition and health-productivity measures — raise the productivity and participation of the workforce and deliver small but reliably positive GDP gains (median +0.5%), strongest where the disease burden is heaviest and the baseline weakest [18]. The within-family ranking (Table 9) puts direct *health-sector employment* ahead, with morbidity, nutrition and productivity channels close behind and tightly clustered — health is a broad, foundational complement rather than a sharp, sector-specific engine. Like education, its welfare returns exceed its GDP returns, and its main contribution to growth is indirect, through a healthier and more productive labour force.

Table 8: Education: within-family intervention ranking (GDP % gain by 2040, across 49 countries). n^+ = number of countries with a positive gain.

Intervention	Mean	Median	n^+
tvet	+0.16	+0.10	45
skills	+0.13	+0.11	41
human capital	+0.04	+0.07	37
school completion	-0.03	+0.00	28

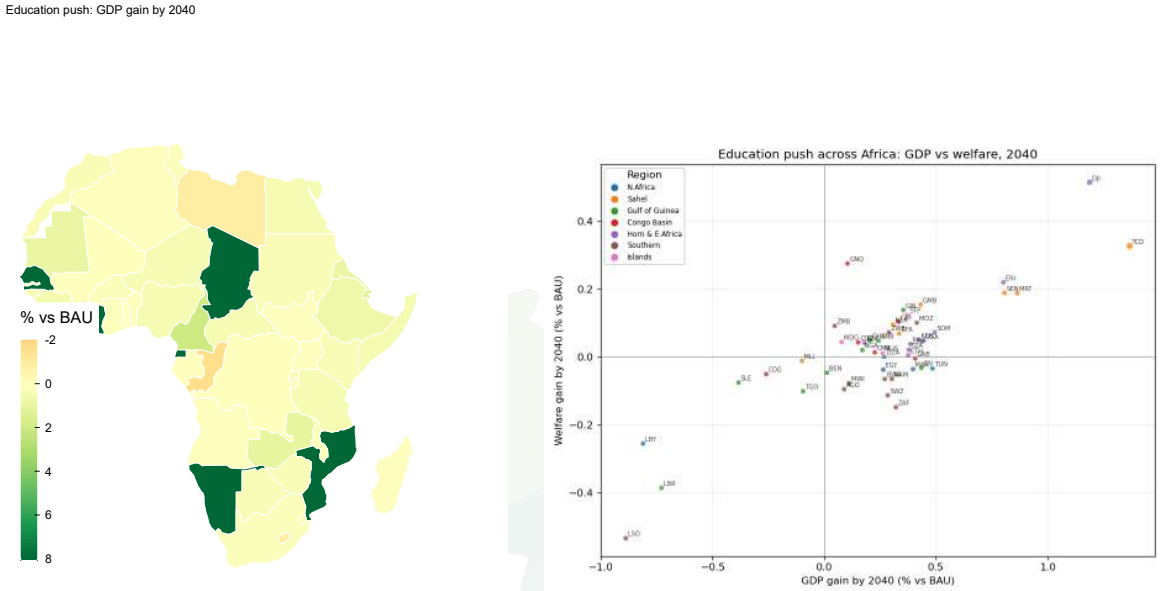

Figure 18: Education push, 2040. GDP gain by country (left) and GDP vs welfare (right).

4.8 Services

A services push — ICT, professional services, financial inclusion, tourism, transport services and trade facilitation — is GDP-negative on average by 2040 but, like infrastructure, a strong *welfare* lever. Welfare leaders: South Africa (+24.0%), Botswana (+20.1%), Angola (+19.3%), Gabon (+18.8%), Nigeria (+18.5%). The within-family ranking (Table 10) is highly informative: the *modern, tradable* services — ICT (+0.64%), professional services (+0.55%), financial inclusion (+0.48%) and tourism (+0.34%) — are GDP-positive and are exactly the high-productivity services that McMillan and Rodrik distinguish from informal trade; whereas *trade facilitation* (−1.61%) and *transport services* (−0.96%) are GDP-negative on the output metric because, once again, their payoff is in lower margins and higher welfare. The welfare gains are largest in the more urbanised economies (South Africa +24%, Botswana +20%, Angola, Gabon, Nigeria), where households spend a large share of income on services and lower trade-and-transport margins pass straight through to consumption. The lesson repeats and sharpens: *tradable* services (ICT, finance, business services, tourism) are genuine growth levers and belong in the transformation agenda; trade-and-transport services are welfare-and-enabling levers and should be judged as such.

4.9 Regional growth patterns

Table 2 aggregates the country results into the seven regions, and the regional signatures are clear. **North Africa** (Algeria, Egypt, Libya, Morocco, Tunisia) shows the continent's second-highest manufacturing return (+7.0%) on its comparatively developed industrial base, strong livestock

Table 9: Health: within-family intervention ranking (GDP % gain by 2040, across 49 countries). n^+ = number of countries with a positive gain.

Intervention	Mean	Median	n^+
health employment	+0.27	+0.26	42
morbidity	+0.09	+0.07	39
nutrition	+0.08	+0.07	40
health productivity	+0.07	+0.09	41

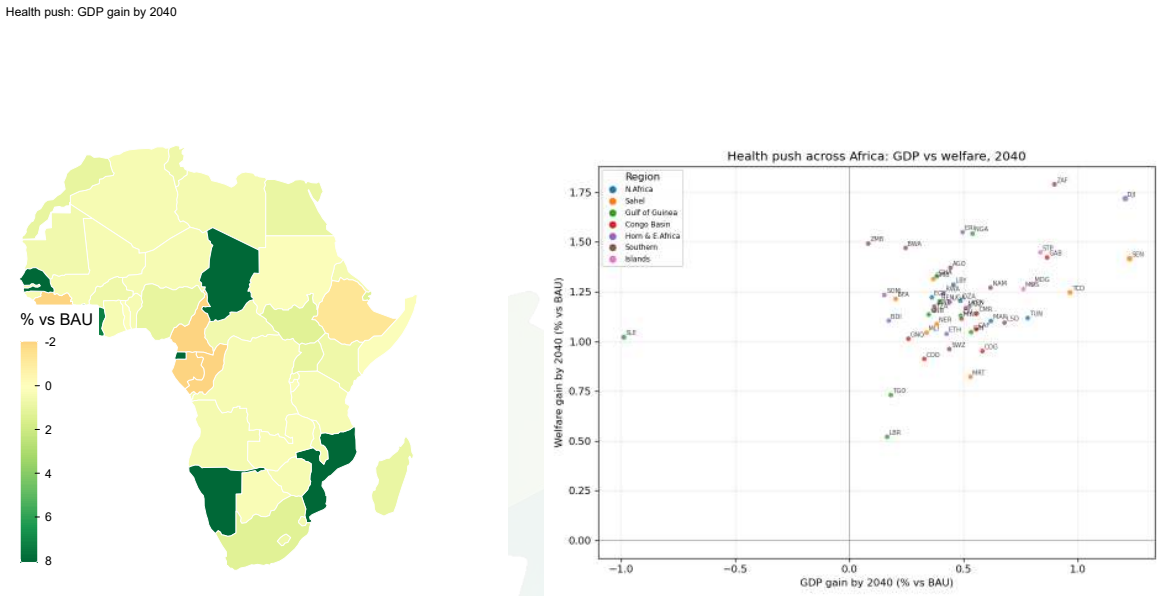

Figure 19: Health push, 2040. GDP gain by country (left) and GDP vs welfare (right).

processing (+3.2%) and the largest mining return outside the Congo Basin, but the weakest crops gain (+1.5%) since agriculture is a small share of these economies; its binding agenda is deepening existing industry and tradable services. **The Sahel** (Burkina Faso, Mali, Mauritania, Niger, Chad, Senegal, The Gambia) combines a high manufacturing return (+6.8%) with the agrarian profile of strong crops (+3.5%) and livestock (+3.8%) gains — its pathway is processing gold, cotton and livestock and raising rain-fed yields, under the overriding constraint of insecurity. **The Gulf of Guinea** (Nigeria and the cocoa-cashew-and-agrarian economies) has the agrarian signature in full — crops +3.6%, livestock +3.2% — with a manufacturing return (+5.8%) held down by Nigeria's oil structure; agro-processing of cocoa, cashew, oil palm and cassava is the regional lever. **The Congo Basin** (the oil-and-mineral economies) shows the highest mining return (+1.4%) and a strong manufacturing number, but its real story is the gap between its resource wealth and its thin non-resource base — beneficiation and economic diversification before the resource declines. **The Horn and East Africa** post the continent's strongest agricultural returns (crops +4.5%, livestock +4.1%), reflecting their large farming and pastoral bases, alongside a solid manufacturing gain (+6.1%); they are also where infrastructure and services are *most* GDP-negative (−3.1 and −2.3%), the sharpest expression of the divergence, because their baselines are the least developed and the diversion of resources into long-gestation capital bites hardest over the horizon. **Southern Africa** records the highest manufacturing return of all (+7.5%), on the continent's deepest industrial and mineral-processing base (South Africa, Zimbabwe, the mineral economies). **The island states** are the only region where a services push is GDP-*positive* (+0.5%), reflecting their tourism-and-services orientation, and they have the weakest mining and infrastructure numbers. Across all seven regions, manufacturing is first and infrastructure last on the GDP metric — the continental ranking is not an artefact of a few large economies but a regional regularity.

Table 10: Services: within-family intervention ranking (GDP % gain by 2040, across 49 countries). n^+ = number of countries with a positive gain.

Intervention	Mean	Median	n^+
ict	+0.64	+0.57	43
prof services	+0.55	+0.49	42
financial inclusion	+0.48	+0.42	44
tourism	+0.34	+0.21	36
transport services	-0.96	-0.98	0
trade facilitation	-1.61	-1.62	0

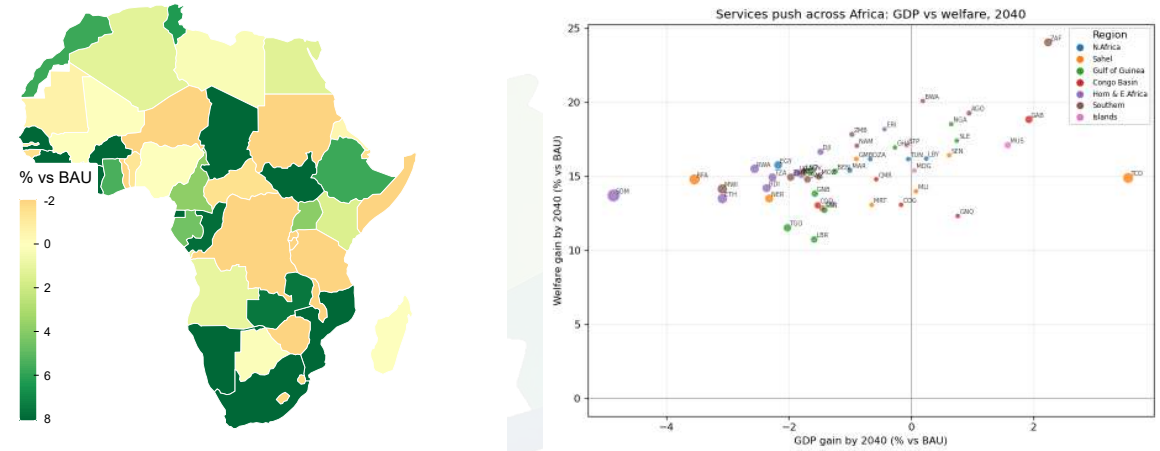

Figure 20: Services push, 2040. GDP gain by country (left) and GDP vs welfare (right).

Where growth comes from, by country and simulation. Putting the eight families together (Figure 12, Table 2) gives the central picture of this report. For *output*, the continent's growth lies overwhelmingly in **manufacturing and agro-processing** — turning what Africa grows and mines into things it makes — supported by agriculture (yield-raising crops and, above all, livestock *processing*) where the rural base is large, and by mineral *beneficiation* in the resource economies. For *welfare*, it lies in **infrastructure and tradable services** that lower the cost of living and doing business. Education and health are the slow-acting complements that raise the return on everything else. No country's best answer is a single lever — the simulations show the drivers compose, and a coordinated package exceeds any one intervention — but every country's best answer rhymes with its neighbours'.

5 Low-hanging policy levers by country

The country diagnostics translate these simulations into the "low-hanging fruit" — the highest-return, most executable levers given each economy's actual structure. Read across all forty-nine, they fall into a small number of archetype-specific agendas, each anchored in a binding constraint identified by the structural diagnostics of Part two.

Resource exporters (Angola, the two Congos, Equatorial Guinea, Gabon, Libya, Nigeria, Mauritania, and the mineral economies of the south). The binding problem is enclave extraction with shallow linkages: high key-sector counts concentrated in one or two sectors, mineral exports of 70–80%, and a thin non-resource base. The low-hanging levers are *beneficiation and downstream processing* (refining, petrochemicals, metal from ore — the single highest-return mining intervention), *local content* to thicken supplier linkages, and channelling resource rent into the non-resource base before the resource declines. Digging more raw material barely moves GDP; moving downstream moves it a lot — the same conclusion now driving continental critical-minerals policy and the export bans in Zimbabwe and Namibia [25, 26].

Agrarian economies (Ethiopia, the Great Lakes, much of the Sahel and the Gulf-of-Guinea hinterland — Liberia, Sierra Leone, Guinea-Bissau, Malawi, Burundi, Niger, Chad). The base is a large, low-productivity smallholder agriculture exporting raw commodities. The low-hanging levers are *agro-processing* (the single highest-return intervention almost everywhere), *post-harvest and cold-chain* investment to cut losses, *livestock processing* (dairy, meat) in the pastoral economies, and the *fertiliser, irrigation and feeder roads* that raise farm yields. These are the "industries without smokestacks" that fit the factor endowment, and they map directly onto the AfDB's Feed Africa strategy and its Staple Crop Processing Zones, designed to reverse a food-import bill heading for $110 billion [12, 8, 9, 10].

Diversifying economies (Kenya, Ghana, Côte d'Ivoire, Senegal, Tanzania, Uganda, Morocco, Egypt, Zambia, Zimbabwe, Cameroon). These have the broadest menus and the most to gain from pursuing *manufacturing productivity, industrial parks, SME credit and agro-processing* simultaneously, plus the digital and tradable-services levers that raise both output and welfare. They are also where regional integration under the AfCFTA can do the most, by giving manufacturers a market larger than the national one — the World Bank estimates full implementation could raise regional income by 7–9% ($450–571 billion) and lift 50 million people from extreme poverty, with the gains led by manufactures [27, 28].

Services-led and small open economies (Mauritius, Botswana, Tunisia, South Africa, Djibouti, and the island states). Here the agenda is *deepening* rather than starting: higher-skill and digital services, productivity in existing industry, and — for the resource-rich among them, such as Botswana — diversification of a successful resource economy through beneficiation and agro-processing. The constraint is moving *up* the value chain, not getting onto it; their low DVA shares already signal genuine GVC participation on which to build.

Cross-cutting lessons. Three hold for every archetype. First, *evaluate infrastructure and trade-and-transport services on welfare*, not GDP: they are enabling and living-standard levers, and the GDP metric understates them — but they remain indispensable, since they are the forward-linked bottlenecks that condition everything else. Second, *prioritise the processing and productivity interventions within each family*: agro-processing, dairy processing, beneficiation, industrial parks, productivity upgrading and digital/ICT are the components that actually carry the gains, while raw-expansion and pure trade-policy components often subtract from them. Third, *package, don't*

pick: because the levers compose, a coordinated processing-plus-parks-plus-skills-plus-digital package consistently beats any single intervention.

6 Prioritising the simulations by country

Table 11 prioritises the results for all forty-nine economies. For each it reports the structural archetype, the domestic-value-added share of exports (a summary of structural depth), the highest-*GDP* growth family and its 2040 gain, the highest-*welfare* family and its gain, and the three highest-return individual interventions from the full menu. The table is the operational core of this report: the country-by-country reading of where growth, and where welfare, come from. Countries are grouped by archetype — resource exporters, agrarian, diversifying, services-led — so that the common agenda within each group, and the differences across groups, are visible at a glance.

Table 11: Prioritised growth levers by country, to 2040. DVA = domestic value added as % of gross exports. GDP and welfare columns show the best-performing scenario family and its % gain vs baseline. Top interventions are the three highest-GDP individual levers from the full menu.

Country	Archetype	DVA	Best GDP lever	Best welfare lever	Top interventions
Angola	Resource exporter	87	Manufacturing (+8.6)	Services (+19.3)	agro processing, industrial parks, productivity upgrade
Congo (Rep.)	Resource exporter	75	Manufacturing (+6.5)	Services (+13.1)	agro processing, beneficiation, industrial parks
DR Congo	Resource exporter	77	Manufacturing (+8.0)	Services (+13.0)	agro processing, industrial parks, productivity upgrade
Eq. Guinea	Resource exporter	79	Manufacturing (+8.1)	Manufacturing (+16.6)	agro processing, industrial parks, productivity upgrade
Gabon	Resource exporter	88	Manufacturing (+5.8)	Services (+18.8)	agro processing, digital, industrial parks
Libya	Resource exporter	75	Manufacturing (+6.6)	Services (+16.2)	agro processing, beneficiation, industrial parks
Mauritania	Resource exporter	76	Manufacturing (+8.3)	Services (+13.1)	agro processing, industrial parks, productivity upgrade
Burkina Faso	Agrarian	87	Manufacturing (+6.4)	Services (+14.8)	agro processing, dairy processing, beneficiation
Burundi	Agrarian	81	Manufacturing (+6.2)	Services (+14.2)	agro processing, industrial parks, productivity upgrade
Côte d'Ivoire	Agrarian	74	Manufacturing (+6.8)	Services (+15.3)	agro processing, industrial parks, productivity upgrade
Central African Rep.	Agrarian	82	Manufacturing (+5.2)	Services (+12.8)	agro processing, industrial parks, productivity upgrade
Ethiopia	Agrarian	87	Manufacturing (+5.4)	Services (+13.5)	agro processing, industrial parks, productivity upgrade
Guinea-Bissau	Agrarian	97	Crops (+7.1)	Services (+13.8)	agro processing, fertilizer, industrial parks
Liberia	Agrarian	71	Manufacturing (+3.9)	Services (+10.7)	agro processing, industrial parks, productivity upgrade
Malawi	Agrarian	66	Manufacturing (+6.4)	Services (+14.1)	agro processing, industrial parks, productivity upgrade

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Table 11 – continued

Country	Archetype	DVA	Best GDP lever	Best welfare lever	Top interventions
Mali	Agrarian	84	Manufacturing (+5.8)	Services (+14.0)	industrial parks, productivity upgrade, dairy processing
Niger	Agrarian	82	Manufacturing (+6.2)	Services (+13.5)	agro processing, industrial parks, productivity upgrade
Rwanda	Agrarian	78	Manufacturing (+7.1)	Services (+15.5)	agro processing, industrial parks, productivity upgrade
Sierra Leone	Agrarian	79	Manufacturing (+7.0)	Services (+17.4)	beneficiation, dairy processing, sme credit
Somalia	Agrarian	100	Crops (+13.7)	Services (+13.7)	fertilizer, irrigation, irrigation
Tanzania	Agrarian	82	Manufacturing (+7.4)	Services (+14.9)	agro processing, industrial parks, productivity upgrade
Togo	Agrarian	73	Manufacturing (+4.4)	Services (+11.5)	agro processing, industrial parks, productivity upgrade
Algeria	Diversifying	87	Manufacturing (+5.7)	Services (+16.2)	agro processing, industrial parks, productivity upgrade
Benin	Diversifying	78	Manufacturing (+5.9)	Services (+15.3)	agro processing, industrial parks, productivity upgrade
Cameroon	Diversifying	80	Manufacturing (+6.6)	Services (+14.8)	agro processing, industrial parks, productivity upgrade
Chad	Diversifying	85	Manufacturing (+7.5)	Services (+14.9)	agro processing, dairy processing, beneficiation
Egypt	Diversifying	82	Manufacturing (+8.4)	Services (+15.8)	agro processing, industrial parks, productivity upgrade
Eritrea	Diversifying	88	Manufacturing (+6.4)	Services (+18.2)	agro processing, industrial parks, productivity upgrade
Eswatini	Diversifying	63	Manufacturing (+6.9)	Services (+14.8)	agro processing, industrial parks, productivity upgrade
Ghana	Diversifying	75	Manufacturing (+5.9)	Services (+16.9)	agro processing, industrial parks, productivity upgrade
Guinea	Diversifying	79	Manufacturing (+5.0)	Services (+12.7)	agro processing, industrial parks, productivity upgrade
Kenya	Diversifying	74	Manufacturing (+7.0)	Services (+15.1)	agro processing, industrial parks, productivity upgrade
Madagascar	Diversifying	76	Manufacturing (+6.4)	Services (+15.4)	agro processing, industrial parks, productivity upgrade
Morocco	Diversifying	66	Manufacturing (+7.1)	Services (+15.4)	agro processing, industrial parks, productivity upgrade

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Table 11 – continued

Country	Archetype	DVA	Best GDP lever	Best welfare lever	Top interventions
Mozambique	Diversifying	66	Manufacturing (+5.8)	Services (+15.0)	agro processing, industrial parks, productivity upgrade
Nigeria	Diversifying	93	Manufacturing (+7.9)	Services (+18.5)	agro processing, industrial parks, productivity upgrade
Senegal	Diversifying	73	Manufacturing (+7.4)	Services (+16.4)	industrial parks, productivity upgrade, agro processing
Uganda	Diversifying	80	Manufacturing (+7.3)	Services (+15.2)	agro processing, industrial parks, productivity upgrade
Zambia	Diversifying	74	Manufacturing (+8.0)	Services (+17.8)	agro processing, industrial parks, productivity upgrade
Zimbabwe	Diversifying	68	Manufacturing (+7.2)	Services (+14.9)	agro processing, industrial parks, productivity upgrade
Botswana	Services-led	77	Manufacturing (+9.4)	Services (+20.1)	agro processing, industrial parks, productivity upgrade
Djibouti	Services-led	69	Manufacturing (+4.9)	Services (+16.6)	agro processing, dairy processing, digital
Lesotho	Services-led	47	Manufacturing (+6.5)	Services (+15.3)	dairy processing, sme credit, industrial parks
Mauritius	Services-led	68	Manufacturing (+5.3)	Services (+17.1)	agro processing, digital, industrial parks
Namibia	Services-led	67	Manufacturing (+5.8)	Services (+17.1)	agro processing, industrial parks, productivity upgrade
South Africa	Services-led	78	Manufacturing (+11.2)	Services (+24.0)	agro processing, industrial parks, productivity upgrade
São Tomé & P.	Services-led	73	Manufacturing (+4.8)	Services (+17.1)	agro processing, industrial parks, productivity upgrade
The Gambia	Services-led	84	Manufacturing (+5.8)	Services (+16.2)	agro processing, industrial parks, productivity upgrade
Tunisia	Services-led	60	Manufacturing (+7.5)	Services (+16.2)	agro processing, industrial parks, productivity upgrade

The table makes the synthesis concrete. The *best GDP lever* column is manufacturing for all but two economies; the *best welfare lever* column is services for all but one — the GDP–welfare divergence in a single glance. The *top-interventions* column is dominated by agro-processing, with industrial parks, productivity upgrading and beneficiation recurring, and crop- or livestock-processing surfacing in the agrarian and pastoral economies. Read down the archetype groups, the priorities sort cleanly: resource exporters lead with beneficiation; agrarian economies with agro-processing and crop/livestock processing; diversifying economies with the full manufacturing-productivity package; services-led economies with deepening. The priority for nearly every African economy, read off its own structure, is the same in kind and different only in detail: **turn what you grow and mine into what you make, build the tradable services and digital capability that raise both output and welfare, and lay the infrastructure and skills that let people**

live better while you do it.

7 Conclusion

Africa's forty-year growth story has been one of cycles without transformation: lost decades, a commodity-fuelled rebound, and a fragile, debt-shadowed present, with the structural change that drives durable development largely missing. Manufacturing's share of output has not risen in a generation; exports remain concentrated in raw commodities; production is shallow and import-dependent; and a demographic wave is arriving — 15 million new jobs needed each year by 2030 — that the current model cannot employ [4, 6, 23]. The forty-nine country studies synthesised here explain why, and what to do about it, in a single consistent framework.

Structurally, African economies are shallow, concentrated, import-dependent and high-DVA-for-the-wrong-reason: they export what they extract and grow, and import what they make. The growth simulations turn that diagnosis into a prescription that is remarkably uniform across the continent. **Manufacturing and agro-processing** are the dominant levers for output, in 47 of 49 economies, with agro-processing the single highest-return intervention in 44; mineral *beneficiation* is the resource economies' route into the same logic; livestock and crop *processing* carry the agricultural gains; **infrastructure and tradable services** are the dominant levers for welfare and the enablers of everything else; and education and health are the slow, foundational complements that raise the return on all the rest. The recurring distinction between output and welfare is not a technicality but a guide to evaluation: build manufacturing and processing for GDP and jobs, and infrastructure and trade-and-transport services for welfare, and judge each on the right metric.

The unity of the result is its most important feature. Fifty very different economies — oil giants and island micro-states, Sahelian drylands and Southern African mineral economies — arrive, from their own distinct structures, at variations on one agenda: add value at home, thicken domestic linkages, and build the enabling infrastructure, digital capability and human capital that make it possible. The policy architecture to execute it is already taking shape — the AfDB's Feed Africa and Special Agro-Industrial Processing Zones, the continental critical-minerals and beneficiation push, PIDA's infrastructure programme, and above all the African Continental Free Trade Area, which gives the agenda its market by letting manufacturers and processors serve a continent rather than a country, with estimated income gains of $450–571 billion and 50 million people lifted from poverty [9, 10, 25, 24, 27]. The task of the next two decades is to execute it — to convert, at last, Africa's growth into transformation.

7.1 From diagnosis to delivery

The gap between this diagnosis and its delivery is not analytical but institutional and financial. The levers that the models reward — agro-processing zones, beneficiation plants, industrial parks, power and digital networks, vocational skills systems — are capital-intensive, long-gestation and coordination-heavy, exactly the investments that a fragmented, debt-constrained public sector struggles to finance and sequence. Three implications follow. *First, the financing model must change*: with 23 of 50 Sub-Saharan states in or near debt distress and debt service tripling over the decade, the processing-and-infrastructure agenda cannot be funded from stretched budgets alone, and will require domestic resource mobilisation, blended and private capital, and the reform of the global financial architecture that African governments are now pressing for [22, 6]. *Second, the market must be made real*: the returns to manufacturing and processing in these models assume the output can be sold, and at national scale much of it cannot — which is precisely why the AfCFTA, by assembling a continental market, is the enabling condition for the whole agenda rather than one policy among many [27, 28]. *Third, delivery must be selective and sequenced*: the composition result means that scattering resources thinly across all eight families wastes them, while concentrating on the processing-and-productivity core, in the right order, compounds. The economies that have moved — Mauritius decades ago, Morocco and Tunisia into European value chains, Ethiopia and Rwanda more recently, Côte d'Ivoire and Ghana into cocoa grinding — did

so by picking a small number of linked levers and executing them consistently. The analysis in this report is, in the end, an argument for doing that deliberately and at continental scale.

7.2 A sequencing roadmap

The composition result — that levers reinforce one another — implies a sequence rather than a single choice. A practical ordering, consistent with the simulations, runs as follows. *First*, the enabling foundations: reliable, low-cost **power** and **digital** infrastructure (the two infrastructure components that are GDP-positive) and the **skills** (TVET) that processing and tradable services require — these raise the return on everything that follows and address the forward-linkage bottlenecks of Part two. *Second*, the output engines: **agro-processing** and **livestock processing** for the agrarian and pastoral economies, **mineral beneficiation** for the resource exporters, and **industrial parks, SME credit and productivity upgrading** everywhere, anchored where possible in special-economic-zone and processing-zone vehicles. *Third*, the market: implementation of the **AfCFTA**, which converts national industrial bases into suppliers to a continental market and is the single policy with the largest estimated payoff. *Throughout*, the welfare levers — trade-and-transport facilitation, financial inclusion — to ensure the gains reach households even where they do not flatter GDP. The same sequence, re-weighted by archetype, applies across the continent: foundations, then processing, then market.

7.3 Limitations and caveats

Three caveats frame the results. *First*, the structural diagnostics are a 2015 snapshot from EXIOBASE; they capture the architecture of each economy but not subsequent shocks (COVID-19, the commodity and debt cycles of the 2020s, the Sahelian security crisis), and the EXIOBASE sectoring, while consistent across countries, is necessarily coarser than a national input–output table. *Second*, the simulations are partial in the policy sense: they quantify the *economic* return to each lever under the model's structure, but they do not price the fiscal cost, the political-economy feasibility or the time-to-implement of the interventions — a high-return lever that is fiscally or institutionally out of reach is not, in practice, low-hanging fruit, which is why Part four reads the model against country diagnostics. *Third*, the 2040 horizon understates the slow-acting levers: education and health, and some infrastructure, deliver much of their return beyond 2040, so their modest GDP numbers here are a lower bound on their true long-run value. None of these caveats disturbs the central, robust finding — the dominance of manufacturing and processing for output and of infrastructure and services for welfare — which holds across all forty-nine economies and all seven regions.

References

[1] McMillan, M. & Rodrik, D. (2011). *Globalization, Structural Change and Productivity Growth*. NBER WP 17143; McMillan, Rodrik & Verduzco-Gallo (2014), *World Development* 63.

[2] Diao, X., McMillan, M. & Rodrik, D. (2019). *The Recent Growth Boom in Developing Economies: A Structural-Change Perspective*. Palgrave Handbook of Development Economics.

[3] Brookings Institution (2023). *Africa's new economic transformation: more than manufacturing.* https://www.brookings.edu/articles/africas-new-economic-transformation-more-than-manufacturing/

[4] World Bank (2023–24). *Drivers of Structural Transformation*; *Africa's Pulse*. https://www.worldbank.org/en/region/afr/publication/africa-economic-update

[5] World Bank (2023). *Industrialization in Africa must compete, connect and create value.* https://blogs.worldbank.org/en/africacan/industrialization-in-africa-must-compete-connect-and-create-value

[6] African Development Bank (2024). *Scaling up financing is key to accelerating Africa's structural transformation.* https://www.afdb.org/en/news-and-events/scaling-financing-key-accelerating-africas-structural-transformation-73244

[7] ISS African Futures. *Africa Manufacturing Forecast.* https://futures.issafrica.org/thematic/07-manufacturing/

[8] Christiaensen, L. & Demery, L. (2018). *Agriculture in Africa: Telling Myths from Facts.* World Bank.

[9] African Development Bank (2016). *Feed Africa: Strategy for Agricultural Transformation in Africa 2016–2025.* https://www.afdb.org/en/the-high-5/feed-africa

[10] African Development Bank. *Special Agro-Industrial Processing Zones (SAPZ)*; *Agribusiness: Africa's New Investment Frontier.* https://www.afdb.org/en/agribusiness

[11] FAO / World Bank; AfDB. *Africa's food import bill* (≈$48.5bn 2016, >$110bn by 2025). https://www.fao.org/agrifood-economics/

[12] Newfarmer, R., Page, J. & Tarp, F., eds. (2018). *Industries without Smokestacks: Industrialization in Africa Reconsidered.* UNU-WIDER / Oxford University Press.

[13] Hirschman, A.O. (1958). *The Strategy of Economic Development.* Yale University Press.

[14] Koopman, R., Wang, Z. & Wei, S.-J. (2014). *Tracing Value-Added and Double Counting in Gross Exports. American Economic Review* 104(2).

[15] Leontief, W. (1986). *Input–Output Economics.* Oxford University Press.

[16] Hausmann, R., Rodrik, D. & Velasco, A. (2008). *Growth Diagnostics.* In *The Washington Consensus Reconsidered.*

[17] Hanushek, E. & Woessmann, L. (2012). *Do Better Schools Lead to More Growth?. Journal of Economic Growth* 17(4).

[18] Weil, D.N. (2007). *Accounting for the Effect of Health on Economic Growth. Quarterly Journal of Economics* 122(3).

[19] International Growth Centre (various). *Country growth and structural-change studies.* LSE/Oxford.

[20] Young, A. (2012). *The African Growth Miracle. Journal of Political Economy* 120(4).

[21] Easterly, W. (2001). *The Lost Decades. Journal of Economic Growth* 6(2).

[22] IMF *Regional Economic Outlook: Sub-Saharan Africa*; Afreximbank, *State of Play of Debt Burden in Africa 2024.* https://www.imf.org/en/Countries/Regions/Sub-Saharan-Africa

[23] World Bank *Africa's Pulse*; Mastercard Foundation, *Africa Youth Employment Outlook.* https://blogs.worldbank.org/en/africacan/a-ladder-of-opportunity-unlocking-jobs-for-todays-african-youth

[24] AUDA-NEPAD / AfDB. *Programme for Infrastructure Development in Africa (PIDA).* https://www.au-pida.org/

[25] IEA / World Economic Forum (2025–26). *Africa's critical minerals and value addition.* https://www.weforum.org/stories/2026/04/africa-critical-minerals-energy-transition/

[26] G20 *Critical Minerals Framework* (2025–26); "local beneficiation at source." Zimbabwe raw-lithium export ban; Namibia 2025 ban on unprocessed critical minerals.

[27] World Bank (2020). *The African Continental Free Trade Area: Economic and Distributional Effects.* https://www.worldbank.org/en/news/press-release/2020/07/27/african-continental-free-trade-area

[28] World Bank (2022) / WEF. *AfCFTA: deeper integration* — income up to +9%/$571bn; 50m from extreme poverty; intra-African exports +109%, led by manufactures. https://www.worldbank.org/en/news/press-release/2022/06/30/free-trade-pact-could-help-lift-up-to-50-million-africans-from-extreme-poverty

[29] Stadler, K. et al. (2018). *EXIOBASE 3. Journal of Industrial Ecology* 22(3).

[30] *CDCGE: A Country-Disaggregated Computable General Equilibrium Model — Model Report.* Specification of the recursive-dynamic CGE engine (nested-CES production, LES demand, bilateral Armington/CET trade, square MCP) calibrated on EXIOBASE 3rx and used for the country studies.

[31] van der Mensbrugghe, D. (2019). *The Environmental Impact and Sustainability Applied General Equilibrium (ENVISAGE) Model, Version 10.01.* Center for Global Trade Analysis, Purdue University.

[32] Dirkse, S.P. & Ferris, M.C. (1995). *The PATH Solver: A Non-Monotone Stabilization Scheme for Mixed Complementarity Problems. Optimization Methods and Software* 5(2).

A Full simulation results — GDP gains

Table 12 reports the complete set of GDP outcomes: the percentage gain by 2040 relative to baseline for every one of the forty-nine countries under each of the eight scenario families. It is the numerical counterpart of the maps in Part three. Reading across a row gives a country's growth menu; reading down a column gives a lever's continental reach. Manufacturing is the largest entry in all but two rows, and infrastructure the smallest in nearly every row.

Table 12: Full results: GDP gain by 2040 (% vs baseline), all 49 countries × 8 scenario families.

Country	Crops	Lives	Minin	Manuf	Infra	Educa	Healt	Servi
Algeria	+1.7	+2.9	+1.2	+5.7	-2.4	+0.3	+0.5	-0.7
Angola	+0.4	+3.3	+2.3	+8.0	-1.0	+0.1	+0.4	+0.9
Benin	+3.6	+3.3	+0.4	+5.9	-2.0	+0.0	+0.4	-1.2
Botswana	+1.0	+3.7	+1.7	+9.4	-1.3	+0.3	+0.2	+0.2
Burkina Faso	+4.7	+3.8	+0.1	+6.4	-3.1	+0.3	+0.2	-3.5
Burundi	+3.9	+4.0	-0.3	+6.2	-3.6	+0.2	+0.2	-2.4
Côte d'Ivoire	+5.1	+3.2	+1.1	+6.8	-0.9	+0.4	+0.5	-1.7
Cameroon	+2.6	+3.4	+0.5	+6.6	-2.7	+0.2	+0.6	-0.6
Central African Rep.	+3.8	+3.7	-0.6	+5.2	-4.0	+0.3	+0.6	-1.4
Chad	+2.7	+4.5	+1.4	+7.5	-0.5	+1.4	+1.0	+3.5
Congo (Rep.)	+0.5	+2.7	+2.4	+6.5	-1.2	-0.3	+0.6	-0.2
DR Congo	+1.4	+3.5	+1.6	+8.0	-2.6	+0.2	+0.3	-1.5
Djibouti	+1.5	+2.6	+1.0	+4.9	-2.4	+1.2	+1.2	-1.5
Egypt	+3.0	+4.2	+0.8	+8.4	-2.9	+0.3	+0.4	-2.2
Eq. Guinea	+0.2	+2.9	+3.1	+8.1	-0.0	+0.1	+0.3	+0.8
Eritrea	+2.1	+4.0	+0.1	+6.4	-2.3	+0.8	+0.5	-0.4
Eswatini	+0.9	+3.0	+1.3	+6.9	-4.6	+0.3	+0.4	-1.7
Ethiopia	+4.2	+3.7	-0.5	+5.4	-4.1	+0.4	+0.4	-3.1
Gabon	+0.6	+2.7	+1.5	+5.8	-1.3	+0.4	+0.9	+1.9
Ghana	+3.9	+2.9	+0.7	+5.9	-1.3	+0.2	+0.4	-0.3
Guinea	+2.7	+3.1	-0.1	+5.0	-3.4	+0.4	+0.5	-1.4
Guinea-Bissau	+7.1	+3.5	-0.4	+5.0	-2.1	+0.2	+0.3	-1.6
Kenya	+3.8	+3.8	+0.6	+7.0	-2.6	+0.4	+0.5	-1.8
Lesotho	+1.4	+2.8	+0.4	+6.5	-2.2	-0.9	+0.7	-1.8
Liberia	+0.9	+2.5	-1.3	+3.9	-4.8	-0.7	+0.2	-1.6
Libya	-0.9	+2.5	+2.1	+6.0	-0.6	-0.8	+0.5	+0.2
Madagascar	+2.8	+3.4	+0.6	+6.4	-3.0	+0.1	+0.8	+0.1
Malawi	+5.4	+3.8	+0.3	+6.4	-2.2	+0.1	+0.5	-3.1
Mali	+4.3	+3.6	+0.1	+5.8	-2.3	-0.1	+0.3	+0.1
Mauritania	+2.2	+3.6	+2.7	+8.3	-1.4	+0.9	+0.5	-0.6
Mauritius	+0.6	+2.4	+0.3	+5.3	-2.2	+0.3	+0.8	+1.6
Morocco	+2.4	+3.4	+1.1	+7.1	-2.4	+0.4	+0.6	-1.0
Mozambique	+3.7	+2.9	+0.6	+5.8	-1.9	+0.4	+0.5	-1.5
Namibia	+1.9	+3.0	+1.1	+5.8	-2.1	+0.3	+0.6	-0.9
Niger	+4.6	+4.1	+0.3	+6.2	-2.8	+0.3	+0.4	-2.3
Nigeria	+3.1	+4.3	+1.1	+7.9	-1.5	+0.2	+0.5	+0.7
Rwanda	+4.0	+4.3	+0.4	+7.1	-3.1	+0.4	+0.4	-2.6
Senegal	+2.8	+3.6	+1.3	+7.4	-1.9	+0.8	+1.2	+0.6
Sierra Leone	+2.1	+2.9	+0.9	+7.0	-1.2	-0.4	-1.0	+0.7
Somalia	+13.7	+6.1	-0.8	+3.4	-3.5	+0.5	+0.2	-4.9
South Africa	+0.8	+4.2	+1.5	+11.2	-0.1	+0.3	+0.9	+2.2
São Tomé & P.	+1.7	+2.9	-0.2	+4.8	-3.2	+0.4	+0.8	-0.1

continued

Table 12 – continued

Country	Crops	Lives	Minin	Manuf	Infra	Educa	Healt	Servi
Tanzania	+4.1	+4.3	+0.6	+7.4	-2.9	+0.4	+0.4	-2.3
The Gambia	+2.9	+3.7	+0.1	+5.8	-2.8	+0.4	+0.4	-0.9
Togo	+3.6	+2.8	+0.8	+4.4	-1.9	-0.1	+0.2	-2.0
Tunisia	+1.4	+3.3	+1.3	+7.7	-1.6	+0.5	+0.8	-0.1
Uganda	+3.0	+4.1	+0.5	+7.3	-3.1	+0.4	+0.4	-1.9
Zambia	+0.8	+3.2	+1.7	+8.0	-1.1	+0.0	+0.1	-1.0
Zimbabwe	+2.7	+3.3	+1.1	+7.2	-2.2	+0.3	+0.4	-2.0

B Full simulation results — welfare gains

Table 13 reports the same matrix for welfare (equivalent variation). The contrast with the GDP matrix is the report's central empirical point: the columns that are weakest on GDP — infrastructure and services — are among the strongest on welfare, while manufacturing, dominant on GDP, is more modest on welfare. The two tables together are the basis for the recommendation to evaluate productive levers on output and enabling levers on living standards.

Table 13: Full results: welfare (equivalent-variation) gain by 2040 (% vs baseline), all 49 countries × 8 scenario families.

Country	Crops	Lives	Minin	Manuf	Infra	Educa	Healt	Servi
Algeria	+3.8	+2.9	-1.1	+7.6	+10.0	+0.0	+1.2	+16.2
Angola	+2.3	+3.1	-1.3	+9.3	+10.9	-0.1	+1.4	+19.3
Benin	+4.3	+3.4	-1.2	+8.8	+11.1	-0.0	+1.2	+15.3
Botswana	+0.6	+2.2	-1.4	+8.3	+10.8	-0.1	+1.5	+20.1
Burkina Faso	+8.0	+4.3	-2.0	+7.9	+10.4	+0.1	+1.2	+14.8
Burundi	+8.1	+4.6	-2.0	+7.9	+10.3	+0.0	+1.1	+14.2
Côte d'Ivoire	+5.0	+3.3	-1.1	+8.1	+11.2	-0.0	+1.1	+15.3
Cameroon	+5.1	+3.7	-1.3	+8.5	+10.2	+0.0	+1.1	+14.8
Central African Rep.	+7.8	+5.0	-1.7	+8.8	+9.7	+0.1	+1.1	+12.8
Chad	+6.0	+4.3	-1.1	+9.1	+10.4	+0.3	+1.2	+14.9
Congo (Rep.)	+2.5	+3.4	+0.6	+11.6	+11.1	-0.1	+1.0	+13.1
DR Congo	+5.2	+3.8	-0.6	+9.5	+10.5	+0.0	+0.9	+13.0
Djibouti	+1.7	+2.1	-0.7	+7.7	+11.3	+0.5	+1.7	+16.6
Egypt	+3.1	+3.4	-1.1	+8.0	+10.1	-0.0	+1.2	+15.8
Eq. Guinea	+0.3	+4.1	+1.6	+16.6	+12.3	+0.3	+1.0	+12.3
Eritrea	+4.2	+3.5	-1.9	+7.9	+11.1	+0.2	+1.5	+18.2
Eswatini	+1.3	+2.6	-0.5	+9.3	+9.2	-0.1	+1.0	+14.8
Ethiopia	+8.0	+4.2	-1.9	+7.7	+9.7	+0.0	+1.0	+13.5
Gabon	+2.1	+2.3	-1.3	+6.8	+10.4	-0.0	+1.4	+18.8
Ghana	+4.2	+3.1	-1.2	+8.3	+11.9	+0.0	+1.3	+16.9
Guinea	+4.9	+3.5	-0.9	+8.9	+9.8	+0.1	+1.0	+12.7
Guinea-Bissau	+8.9	+4.8	-1.9	+8.1	+10.8	+0.0	+1.1	+13.8
Kenya	+6.0	+3.9	-1.5	+8.3	+10.6	+0.1	+1.2	+15.1
Lesotho	+1.8	+2.3	-0.8	+8.9	+10.9	-0.5	+1.1	+15.3
Liberia	+8.7	+4.5	-1.5	+7.7	+9.8	-0.4	+0.5	+10.7
Libya	+0.8	+2.6	+0.0	+10.3	+11.8	-0.3	+1.3	+16.2
Madagascar	+5.5	+3.6	-1.3	+8.3	+10.9	+0.0	+1.3	+15.4
Malawi	+6.3	+3.5	-1.4	+8.1	+10.5	-0.1	+1.1	+14.1
Mali	+7.6	+4.8	-1.6	+9.0	+10.5	-0.0	+1.0	+14.0

continued

Table 13 – continued

Country	Crops	Lives	Minin	Manuf	Infra	Educa	Healt	Servi
Mauritania	+5.5	+3.7	-0.1	+9.6	+10.9	+0.2	+0.8	+13.1
Mauritius	+1.1	+2.0	-0.9	+8.0	+10.8	+0.0	+1.3	+17.1
Morocco	+3.8	+3.2	-1.0	+8.5	+10.1	-0.0	+1.1	+15.4
Mozambique	+5.3	+3.1	-1.0	+8.2	+11.3	+0.1	+1.2	+15.0
Namibia	+1.4	+2.3	-1.0	+7.8	+10.5	-0.1	+1.3	+17.1
Niger	+8.2	+4.5	-1.5	+8.5	+10.5	+0.1	+1.1	+13.5
Nigeria	+4.9	+3.8	-2.0	+7.9	+11.0	+0.0	+1.5	+18.5
Rwanda	+6.4	+4.1	-1.8	+8.1	+10.4	+0.0	+1.2	+15.5
Senegal	+4.1	+3.4	-1.1	+8.7	+11.0	+0.2	+1.4	+16.4
Sierra Leone	+7.8	+4.1	-2.0	+8.4	+12.4	-0.1	+1.0	+17.4
Somalia	+9.7	+5.7	-2.3	+8.3	+9.5	+0.1	+1.2	+13.7
South Africa	+1.3	+2.9	-2.3	+9.5	+12.9	-0.1	+1.8	+24.0
São Tomé & P.	+4.6	+3.1	-1.8	+7.1	+11.0	+0.1	+1.4	+17.1
Tanzania	+6.7	+4.2	-1.7	+8.4	+10.4	+0.0	+1.2	+14.9
The Gambia	+4.7	+3.4	-1.6	+8.0	+10.8	+0.2	+1.3	+16.2
Togo	+7.9	+4.1	-0.9	+8.4	+10.9	-0.1	+0.7	+11.5
Tunisia	+2.6	+3.0	-0.8	+9.1	+11.0	-0.0	+1.1	+16.2
Uganda	+5.8	+3.8	-1.7	+8.1	+10.2	+0.0	+1.2	+15.2
Zambia	+3.0	+1.9	-1.6	+5.8	+10.5	+0.1	+1.5	+17.8
Zimbabwe	+3.8	+3.0	-0.8	+9.0	+10.9	+0.1	+1.2	+14.9

C Full structural indicators

Table 14 reports the complete 2015 structural cross-section underlying Part two: the broad value-added shares, mineral export share, import penetration, the intermediate-input intensity of A, the mean output multiplier from L, the number of key sectors, and the domestic-value-added share of exports, for all forty-nine economies. It is the evidentiary base for the structural archetypes used throughout the report.

Table 14: Full structural indicators, 2015 (EXIOBASE 3rx). VA shares and DVA in %, import penetration (Imp.pen) in % of absorption, A-int = mean column sum of A, L-mult = mean output multiplier, Key = number of key sectors.

Country	Ag.VA	Mfg.VA	Serv.VA	Min.exp	Imp.pen	A-int	L-mult	Key	DVA
Algeria	8	14	49	44	11	0.24	1.31	39	87
Angola	4	13	45	68	9	0.34	1.52	87	87
Benin	21	18	52	0	15	0.28	1.38	54	78
Botswana	3	19	60	7	13	0.22	1.28	40	77
Burkina Faso	23	19	45	2	9	0.26	1.36	40	87
Burundi	26	22	44	1	11	0.27	1.39	46	81
Côte d'Ivoire	23	19	49	7	17	0.26	1.35	44	74
Cameroon	17	22	48	7	16	0.25	1.33	41	80
Central African Rep.	26	25	41	0	13	0.26	1.37	43	82
Chad	16	22	45	6	13	0.23	1.31	47	85
Congo (Rep.)	4	14	30	80	17	0.29	1.39	86	75
DR Congo	16	20	40	69	26	0.24	1.32	52	77
Djibouti	3	10	70	0	12	0.20	1.25	34	69
Egypt	12	21	49	10	12	0.24	1.31	37	82
Eq. Guinea	2	10	13	80	12	0.29	1.50	79	79

continued

Table 14 – continued

Country	Ag.VA	Mfg.VA	Serv.VA	Min.exp	Imp.pen	A-int	L-mult	Key	DVA
Eritrea	12	13	58	4	7	0.27	1.38	50	88
Eswatini	6	35	49	5	28	0.16	1.21	28	63
Ethiopia	26	18	43	1	9	0.24	1.32	34	87
Gabon	3	15	48	45	13	0.22	1.29	51	88
Ghana	19	13	49	6	15	0.29	1.43	49	75
Guinea	15	20	44	10	18	0.21	1.27	32	79
Guinea-Bissau	33	20	42	0	10	0.30	1.43	42	97
Kenya	21	18	52	4	13	0.28	1.38	47	74
Lesotho	8	18	60	14	23	0.15	1.18	31	47
Liberia	36	22	35	0	16	0.23	1.30	40	71
Libya	2	11	48	57	11	0.27	1.38	77	75
Madagascar	20	19	56	0	14	0.26	1.36	50	76
Malawi	22	19	52	0	13	0.20	1.27	36	66
Mali	24	20	44	0	13	0.27	1.36	41	84
Mauritania	15	13	35	77	35	0.27	1.37	50	76
Mauritius	3	21	69	0	26	0.19	1.25	48	68
Morocco	11	21	56	5	19	0.22	1.29	38	66
Mozambique	19	17	54	7	17	0.20	1.26	42	66
Namibia	6	22	58	15	20	0.18	1.23	29	67
Niger	23	20	45	0	13	0.25	1.34	45	82
Nigeria	15	20	53	17	7	0.30	1.44	44	93
Rwanda	23	18	49	2	11	0.29	1.38	41	78
Senegal	13	20	57	5	17	0.27	1.36	51	73
Sierra Leone	31	19	39	4	11	0.31	1.44	48	79
Somalia	29	22	40	0	1	0.30	1.42	37	100
South Africa	3	16	59	12	14	0.26	1.42	42	78
São Tomé & P.	14	15	64	0	12	0.31	1.44	45	73
Tanzania	23	15	45	10	10	0.29	1.39	44	82
The Gambia	15	16	59	1	10	0.27	1.37	43	84
Togo	30	19	40	0	13	0.22	1.28	42	73
Tunisia	8	19	62	3	21	0.23	1.31	47	60
Uganda	19	20	49	1	12	0.24	1.32	42	80
Zambia	8	15	53	32	15	0.23	1.32	34	74
Zimbabwe	11	21	56	8	15	0.21	1.26	50	68