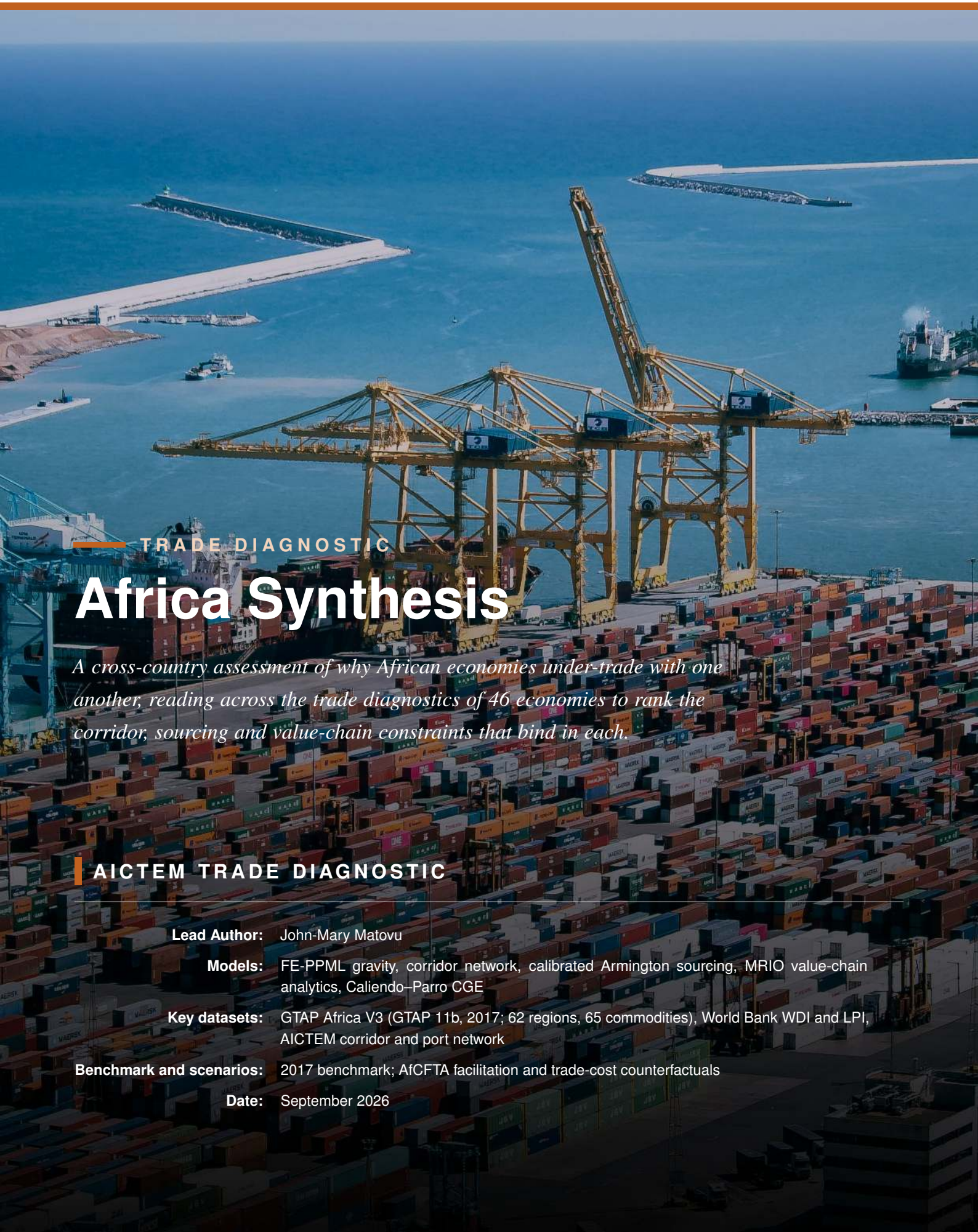
AFRICAN INSTITUTE FOR CLIMATE,
TRADE AND ECONOMIC MODELLING



TRADE DIAGNOSTIC

Africa Synthesis

A cross-country assessment of why African economies under-trade with one another, reading across the trade diagnostics of 46 economies to rank the corridor, sourcing and value-chain constraints that bind in each.

AICTEM TRADE DIAGNOSTIC

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Models: FE-PPML gravity, corridor network, calibrated Armington sourcing, MRIO value-chain analytics, Caliendo–Parro CGE

Key datasets: GTAP Africa V3 (GTAP 11b, 2017; 62 regions, 65 commodities), World Bank WDI and LPI, AICTEM corridor and port network

Benchmark and scenarios: 2017 benchmark; AfCFTA facilitation and trade-cost counterfactuals

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Executive Summary

This report reads across the trade diagnostics of **46 African economies** to find the patterns only the continent reveals. Each is built from one pipeline on the GTAP Africa V3 input–output cube, through the five model families set out in Section 1. Every statistic here is stacked from those models' own outputs, so this document and the 46 country reports rest on the same numbers.

Africa's economies are open to the world and barely open to each other. Together they export **US$594 bn**, of which only **US$71 bn** moves between them. Against a frictionless gravity benchmark of **US$570 bn** the average economy realises a **fill ratio of 0.14** (median 0.12), leaving **US$499 bn** unrealised each year; Mozambique realises most of its potential (0.45) and the Central African Republic least (0.03). In levels the gap sits with the large economies, South Africa (US$133 bn), Egypt (US$62 bn), Nigeria (US$55 bn), Tunisia (US$34 bn) and Morocco (US$31 bn) carrying more than three-fifths of it; in proportion it sits with the small, landlocked and high-cost economies whose realistic market is the neighbourhood they reach least.

The binding margin is the cost of moving goods rather than the tariff schedule. Delivered cost to an African market averages **18.2% of cargo value** and reaches 30% for Libya, while the applied tariff is estimated at **near zero with a 95% interval from -5.4% to $+9.7\%$**, a weak estimate rather than a demonstration that tariffs do not matter. The full facilitation package raises modelled intra-African exports by **74.7%** at continental level and **88%** on the mean economy, with non-tariff and standards reform carrying two-thirds of it alone (**+51.1%**), ahead of ports (+15.1%), corridor upgrading (+9.4%), rail (+7.9%) and one-stop border posts (+4.8%). Non-tariff reform, port efficiency and the package beat tariff removal at conventional confidence; the other three are larger in expectation but their intervals overlap it.

Complementary trade is thin even where it is cheap. The average economy meets **72.7%** of its intermediate demand at home and **22.8%** from outside Africa, leaving **4.6%** from African partners, and Western Europe or East Asia is the largest import source for 38 of the 46. Domestic value added averages **72%** of gross exports, a commodity signature rather than industrial depth. Under the full package regional sourcing rises by **1.7 percentage points**, from 10.3% to 12.0%, in every economy. The most systemic chokepoint is **petroleum and coal products** (bottleneck index 0.47), which leads in 16 economies and whose broad group binds in **17 of the 46**. Where the general-equilibrium model runs, a 20% trade-cost cut raises welfare by **1.7% across 17 economies**, reaching 5.9% in Zambia.

Combining the four gap domains into one index splits the continent into **13 economies bound by corridors and facilitation**, **17 by regional sourcing and value chains**, **14 by bottleneck commodities and diversification**, and two in which the three bind about equally. It is ranked over the **35 economies with a region of their own in the cube**, widest in Tunisia and narrowest in Tanzania, with the eleven spliced from a composite shown alongside and marked. Non-tariff barriers and standards come first everywhere; the lead instrument then follows the class, with tariff liberalisation as the legal foundation. These are screening results, not project appraisals.

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1. Introduction: Africa's Trade System

1.1 Why Africa under-trades with itself

Africa's economies are at once highly open and barely integrated with one another. The 46 economies assessed here record about **$594 bn** of gross exports between them, of which only **$71.3 bn** crosses an African border. Pooling the evidence of the 46 country diagnostics, this report asks why, with whom the unrealised trade lies, through which corridors and sectors it would flow, and which interventions would release it (UNCTAD, 2021; UNECA, 2021).

On this evidence the answer is about structure and friction rather than tariffs, and three findings recur in every country report. African economies are **structurally similar and lightly industrialised**: they export raw or lightly processed primary products and import the machinery, chemicals and processed goods they do not make, so neighbours are more often competitors in third markets than customers for one another. The **cost of moving goods is first order**: delivered transport costs average **18.2% of cargo value** and exceed 20% for the most isolated economies, so even where a regional supplier exists it is frequently undercut by an overseas one landed at a coastal port. And the **realised share of regional potential is low and uneven**, a mean fill ratio of **0.14** that falls to 0.03 in the most fragmented economy and clears 0.30 in only two.

1.2 Five models, one frame

The evidence base is five model families applied identically to every economy for which the underlying data exist. A *fixed-effects Poisson gravity model* estimates what each pair would trade without friction, and therefore what is missing (Section 4). A *corridor and port network model* routes that trade over 17 calibrated corridors, 32 ports and 33 border crossings and prices the delivered cost, transit time and border waiting of every ordered pair (Section 3). A *calibrated Armington sourcing model* asks how far input purchases shift towards African suppliers as those frictions fall, and *multi-region input–output analytics* decompose exports into domestic and foreign value added and score every commodity for how much of the production network depends on it (Section 5). A *Caliendo–Parro general-equilibrium model* traces a trade-cost reduction through prices, wages and real consumption for the 17 economies it solves (Section 6). Section 7 draws the gap domains into a typology and Section 8 states the priorities that follow.

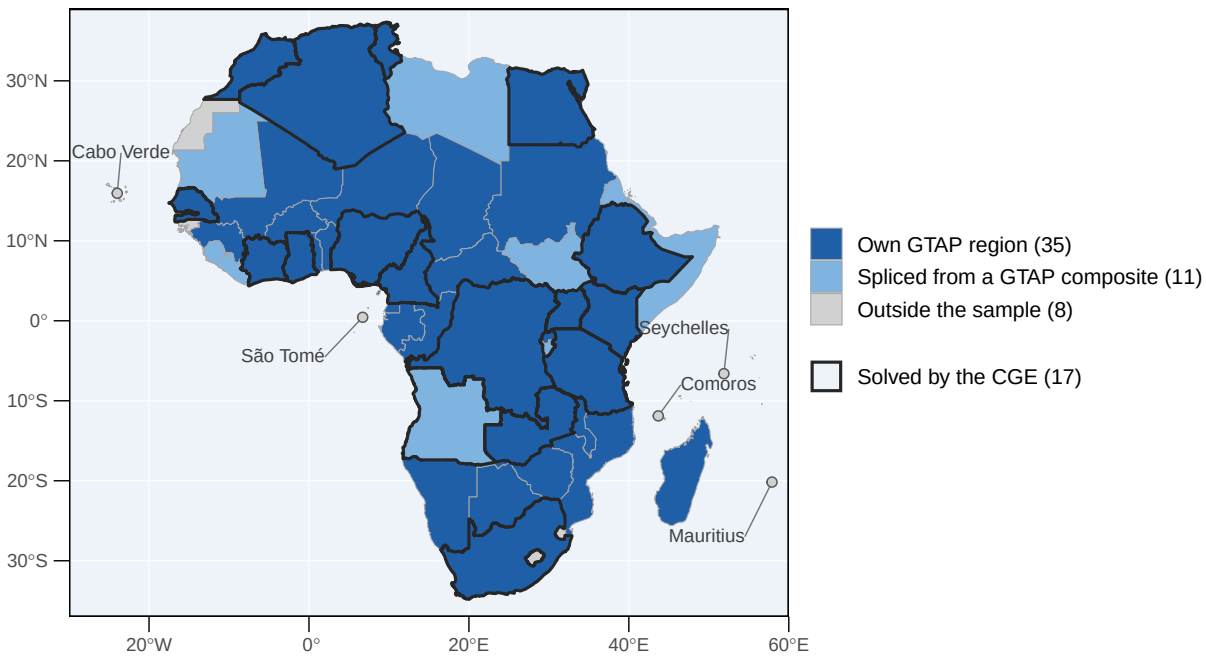
1.3 Coverage and data basis

Every number rests on the **GTAP Africa V3** cube, built on GTAP 11b and benchmarked to 2017, with 62 regions and 65 commodities (Aguiar et al., 2022). Of the 46 African economies it resolves, **35 carry their own GTAP region** and **11 are spliced out of a composite**: Burundi, Djibouti, Eritrea, South Sudan and Somalia out of the rest-of-East-Africa aggregate, The Gambia, Liberia, Mauritania and Sierra Leone out of rest-of-West-Africa, Angola out of rest-of-Central-Africa and Libya out of rest-of-North-Africa. Composites contribute within-composite shares only; levels come from GTAP and the residual is zero by construction. Section 7 tests whether the spliced economies score differently on

the composite index, and reports that they do.

Figure 1 maps the coverage. **Eight of the 54 African states are outside the sample** (Cabo Verde, the Comoros, Guinea-Bissau, Lesotho, Mauritius, São Tomé and Príncipe, Eswatini and the Seychelles), because the corridor and port network has no node for them rather than because the cube lacks them. The omission is measurable: **9.6% of intra-African trade on the cube involves a partner outside the 46**, so every continental total here is a total over the 46. Uganda is inside the sample and inside every figure and table; its own country document is a bespoke assessment written before the current template, which is why it reads differently from the other 45. The general-equilibrium model solves 17 economies, outlined on the map, and the other 29 enter its results only through the rest-of-world aggregates.

Figure 1: Coverage and data basis of the 46-economy panel



Notes: Fill shows how each of the 46 economies enters the GTAP Africa V3 cube: with a region of its own, or spliced from one of four composite regions. The outline marks the 17 economies the Caliendo–Parro CGE solves. Grey marks the eight African states outside the sample, for which the corridor and port network has no node; Western Sahara is drawn in the same grey and is not one of the eight. Small island states are drawn at true scale and are therefore faint.

1.4 The continent at a glance

Table 1 collects the headline quantities the five models produce for the whole sample, each on its own basis. Figure 2 maps the number that organises the rest of the report, the *fill ratio*, realised intra-African exports divided by frictionless potential. A band of very low realisation runs across North

Africa and the Sahel, Libya at 0.04, South Sudan 0.04, Tunisia 0.06, Mali 0.07 and Niger 0.09, against a Southern African core where Mozambique, Botswana, the DR Congo, Zimbabwe and Zambia all clear 0.22. The pattern is not random: the lowest fill ratios sit with the highest delivered costs and the thinnest regional supplier networks, which is the relationship Sections 3 and 4 quantify.

Table 1: The African trade system at a glance

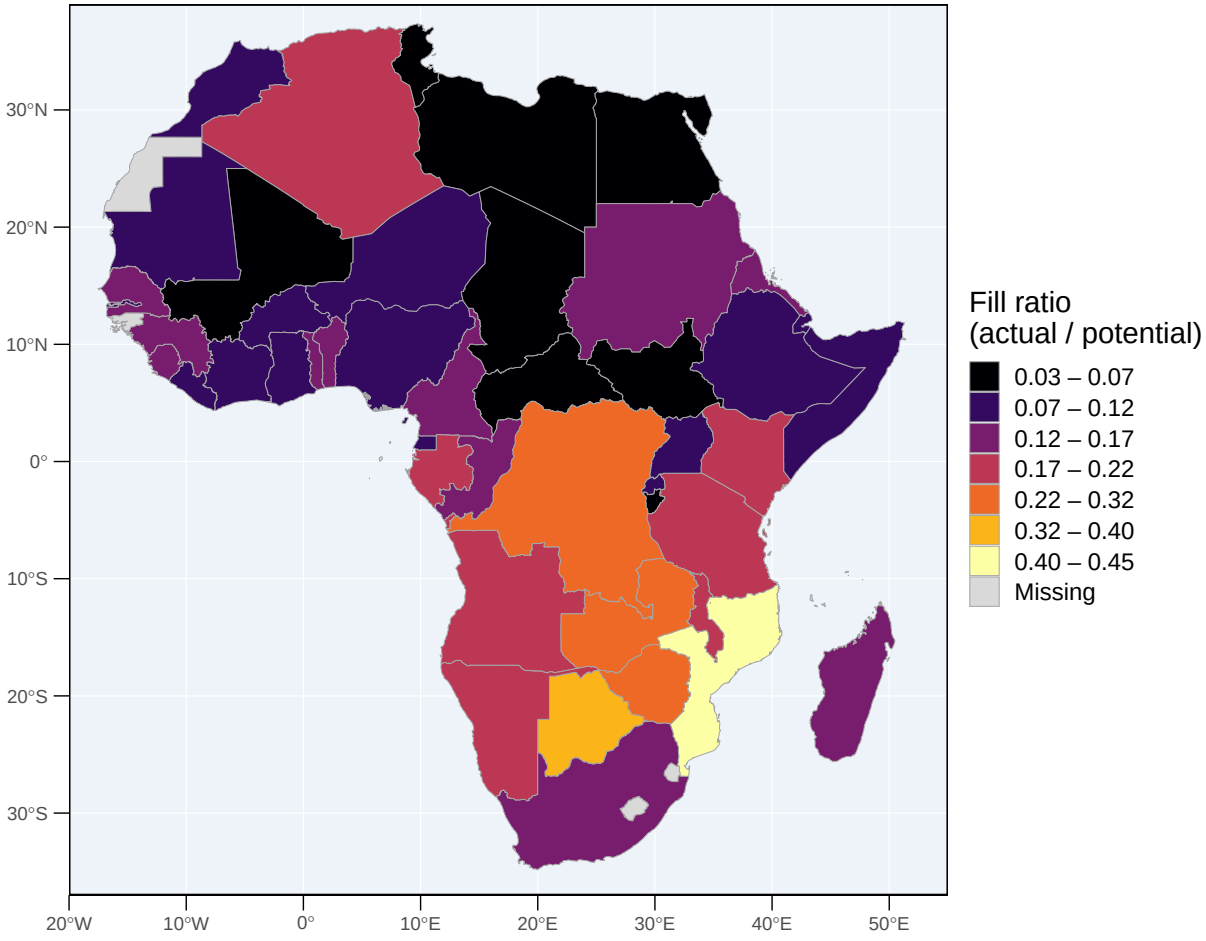
Coverage and data basis	
Economies analysed	46
of which with their own GTAP region	35
of which landlocked	14
African states outside the sample	8
Intra-African trade with a partner outside the sample (%)	9.6
Intra-African trade and the realisation gap	
Realised intra-African exports (US$ bn)	71.3
Frictionless gravity potential (US$ bn)	570.4
Missing intra-African trade (US$ bn)	499.0
Median fill ratio (actual / potential)	0.12
Largest single intra-African market, share of the total (%)	13.9
Logistics friction	
Mean delivered transport cost (% of cargo value)	18.21
Mean transit time to an African market (hours)	356
Mean border crossings on the modelled route	1.32
Modelled corridors / ports / border crossings	17 / 32 / 33
Intra-African trade routed over the top three corridors (%)	69.6
Structure and value chains	
Combined gross exports (US$ bn)	593.7
Mean import dependence (% of intermediate absorption)	19.5
Mean domestic value added in exports (%)	72.2
Mean economy's inputs: domestic / African / rest of world (%)	72.7 / 4.6 / 22.8
Highest value-chain bottleneck index (petroleum and coal products)	0.47
Policy response	
Full facilitation package, continental (%)	74.7
Full facilitation package, mean economy (%)	88.1
Regional input sourcing under the package (pp)	1.70
CGE welfare gain, −20% trade-cost cut, 17 economies (%)	1.72

Notes: Continental aggregates over the 46 economies of the panel, computed by stacking the pipeline's own model outputs. Each row keeps its native basis and its own denominator: the trade quantities are GTAP gross flows benchmarked to 2017, which are larger than official merchandise statistics; delivered cost, transit time and crossings are means over all 2,070 ordered economy pairs; import dependence and the input mix are unweighted means across economies; the general-equilibrium row covers the 17 economies the CGE solves and not the other 29. "Outside the sample" is the share of intra-African trade on the cube whose partner is one of the eight African states the network model does not reach. The bottleneck index is the continental Value-Chain Bottleneck Index of Section 5.

1.5 What the models cannot say

Four limits bound everything below and are repeated where the numbers they bound appear; Section 8 states them again at the end. The gravity model **cannot identify a tariff elasticity**, because a single 2017 cross-section with exporter and importer fixed effects leaves no exogenous tariff variation. It

Figure 2: Intra-African export realisation, by economy



Notes: The fill ratio is realised intra-African exports divided by the frictionless gravity potential of Section 4; darker shading marks economies that realise less of it. This is the one mapped quantity in the report whose high end is the good end, so its colour ramp is inverted relative to the other choropleths and dark marks the worse end here as everywhere else. All 46 economies of the panel are shown. Grey marks the eight African states outside the sample.

cannot separate **distance from delivered cost**, because delivered cost is largely built from distance. It can say **nothing country-level**, because the fixed effects absorb logistics performance, landlockedness and institutions exactly, so every country-level logistics statement here comes from the network model rather than from the estimates. And it cannot **rank the facilitation levers** against each other, because their confidence bands overlap. Where a lever returns zero this report says whether the zero is an estimate or a structural absence: the sourcing model has no tariff channel at all, so its nil response to tariff removal is a blind spot rather than evidence.

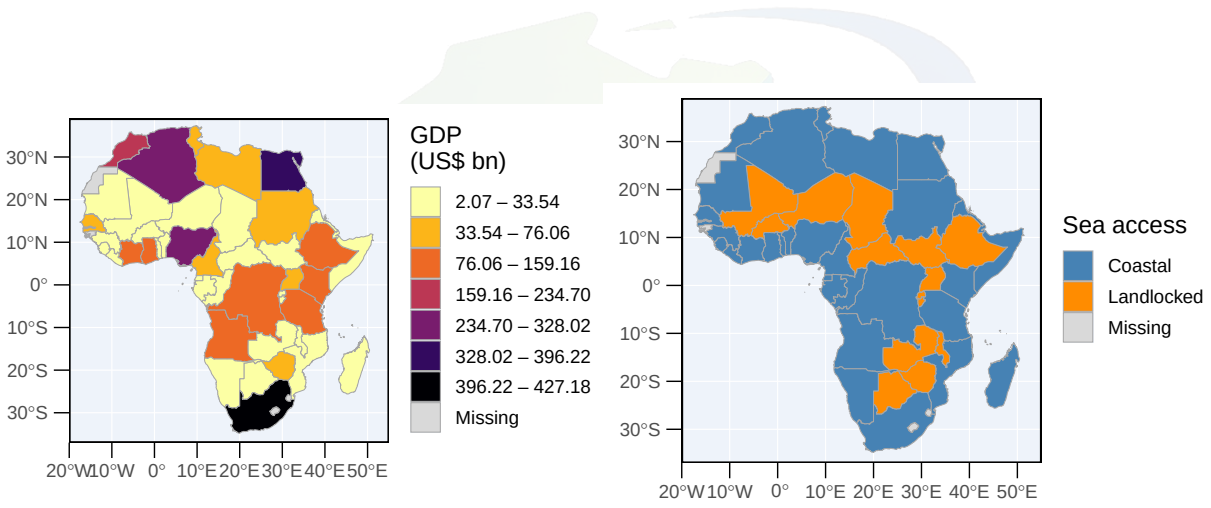
2. Structure and Trade Profile

The panel spans two orders of magnitude in size, from South Africa at $427 bn and Egypt at $365 bn down to micro-states, but shares a structural signature the rest of this report turns on. The median economy is small, undiversified and logistics-constrained. **Fourteen of the 46 are landlocked**, dependent on a neighbour's corridor and port for every tonne they trade, and for them the relevant lever is not their own tariff schedule but the cost and reliability of a corridor they do not control. The Logistics

Performance Index runs from 1.9 in Libya to 3.7 in South Africa with most economies between 2.0 and 2.6; South Sudan is the one African country for which the World Bank publishes none at all, which is itself a statement about its trade institutions.

Economic mass concentrates in a few poles, Egypt and the Maghreb in the north, Nigeria in the west and the Southern African core around South Africa, with a long tail of small economies whose domestic markets cannot support an efficient manufacturing base alone. That distribution is itself an argument for integration: no single small economy reaches the scale industrialisation requires, but a corridor of them can. Figure 3 maps both facts the paragraph rests on, the concentration of economic mass and the fourteen economies with no coast of their own.

Figure 3: Economic mass and sea access



Notes: Left: gross domestic product in current US dollars, all 46 economies, in seven Fisher classes. Right: the fourteen landlocked economies, which depend on a neighbour's corridor and port for every tonne they trade and are the set Section 8 sequences first on corridors. Grey marks the eight African states outside the sample.

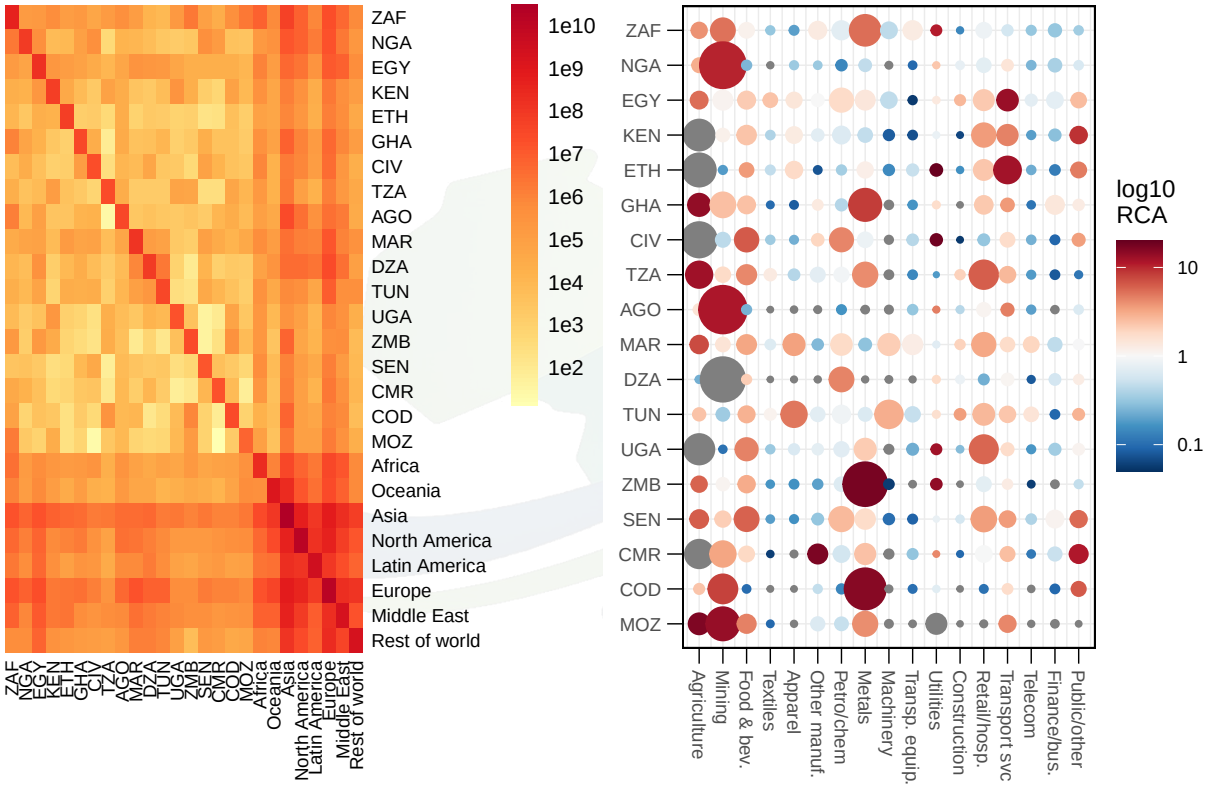
2.1 Production structure and comparative advantage

Beneath the size differences, African production recipes are thin and similar. Figure 4 shows the intermediate-input flow matrix between the 18 economies the multi-region accounts resolve individually and the eight GTAP world regions, summed over all 65 commodities. The bright diagonal says that each economy's largest supplier is itself; the bright right-hand columns say that its next-largest suppliers are Asia, Europe and the Middle East. The cells that would link African economies to *each other* are pale by two to four orders of magnitude, which is the same fact the sourcing analysis reaches from the other direction: 4.6% of intermediate demand is met from African partners.

Where economies do specialise, they specialise narrowly and similarly. The companion panel scores

revealed comparative advantage (Balassa, 1965) across the 17 broad groups, and it concentrates in agriculture, mining and the resource-based manufactures, metals for Zambia and the DR Congo, mining for Nigeria and Angola, agriculture for Kenya, Ethiopia and Côte d'Ivoire, while machinery, transport equipment and electronics are almost uniformly blue. Because so many economies hold advantage in the same primary groups they are natural competitors in world commodity markets rather than complementary suppliers to one another, which is a first-order reason intra-African trade is thin and the reason the value-addition agenda of Section 5 matters more here than a tariff schedule does.

Figure 4: Continental production structure and comparative advantage



Notes: Left: intermediate-input flows between the 18 focus economies and the eight GTAP world regions, summed over all 65 commodities, on a log colour scale because the matrix spans nine orders of magnitude; rows are suppliers and columns users. Right: revealed comparative advantage for the same 18 economies, with the 65 commodities aggregated for display into 17 broad groups weighted by the underlying levels; bubble area is the group's share of that economy's exports and colour is the export-weighted index.

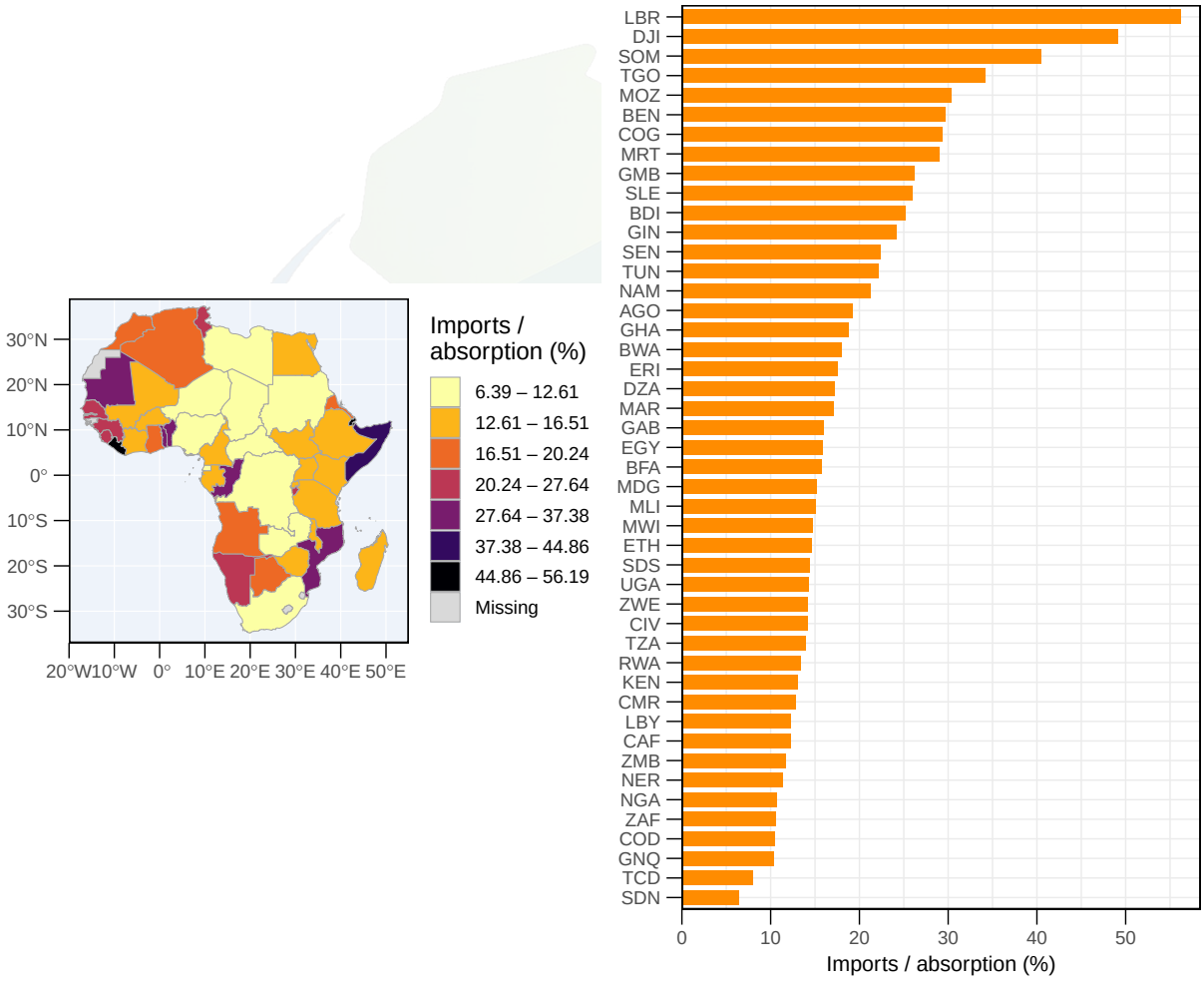
2.2 Imports, and where the dependence sits

Imports are the mirror image: machinery, chemicals, refined fuels and processed manufactures, the capital and intermediate goods a thin-manufacturing continent does not make for itself. Figure 5 maps import dependence, the imported share of intermediate-input absorption, and ranks the economies by it. Dependence is extreme in **Liberia (56%)**, **Djibouti (49%)** and **Somalia (41%)** and high in Togo (34%), Mozambique (30%) and Benin (30%), where domestic supplier networks are thinnest or where an entrepôt economy re-exports what it lands. Low dependence is not the compliment it appears: Sudan at 6% and Chad at 8% are among the least dependent in the panel, not because their supplier

networks are deep but because their measured absorption is dominated by a narrow domestic primary base. For the entrepôt economies regional sourcing is a substitution opportunity; for the resource economies low dependence is a symptom of a shallow industrial base rather than a sign of resilience.

By commodity the dependence is deepest where regional value-chain development could substitute most: **petroleum and coal products** lead at 39% of intermediate use imported, ahead of computer, electronic and optical products (27%), water transport (24%) and metals nec (23%). Those are the fuels, capital goods and shipping services whose local or regional production is the operational content of industrialisation, and they reappear in Section 5 as the commodities on which the widest part of the production network depends.

Figure 5: Import dependence, mapped and ranked



Notes: Left: import dependence, the imported share of intermediate-input absorption, for all 46 economies. Right: the same economies ranked by it; the most dependent are the entrepôt and post-conflict economies rather than simply the smallest. Grey marks the eight African states outside the sample.

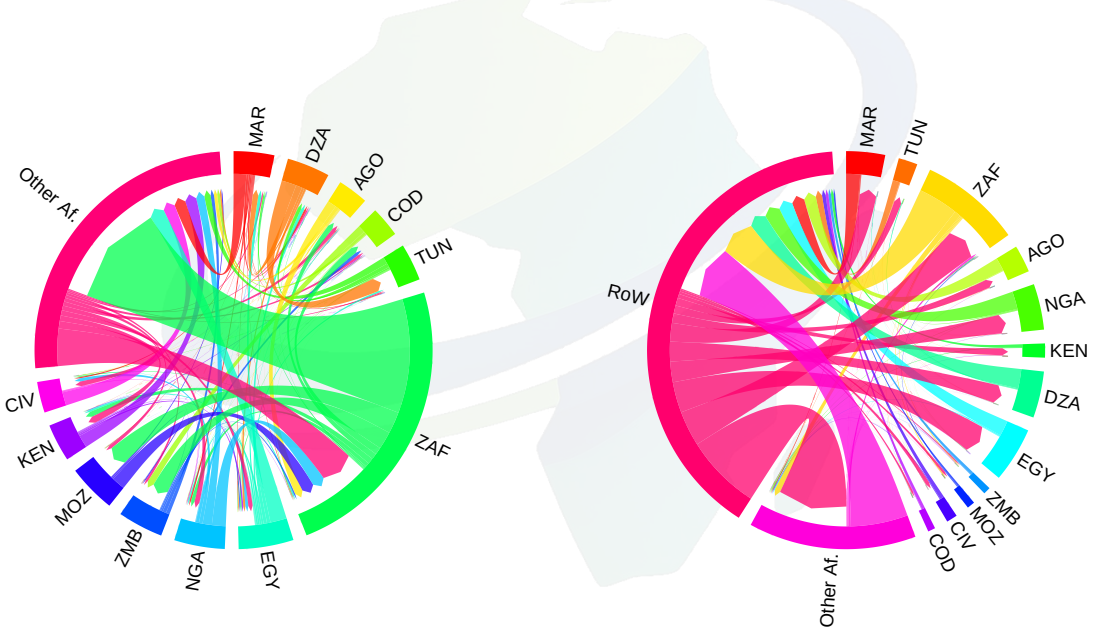
2.3 Intra-African trade against the rest of the world

What intra-African trade exists is concentrated on a few anchor economies. Figure 6 renders the matrix as a chord diagram: thick chords run to and from a small set of hubs, South Africa above all,

which absorbs **13.9%** of all modelled intra-African exports and is the largest African market for **ten** of the 46, while most pairs trade with each other barely at all. This hub-and-spoke core is the realised part of African integration and the thin chords are the opportunity. Its companion panel adds the rest-of-world nodes and dwarfs every intra-African chord at a stroke, which is the quantitative meaning of the continent's outward tilt.

The tilt is also a concentration risk. Figure 7 maps each economy's largest single import source: **Western Europe leads for 23 of the 46 economies and East Asia for a further 15**, between them 38 of 46. Only two African economies lead any neighbour's import table at all: South Africa, for five of its Southern African neighbours, and Uganda, for South Sudan. One caveat belongs with the map: the cube resolves partners outside the African set as *world regions* rather than countries, so "Western Europe" and "East Asia" are aggregates and the map cannot say which economy within them leads.

Figure 6: Intra-African and rest-of-world trade as chord diagrams

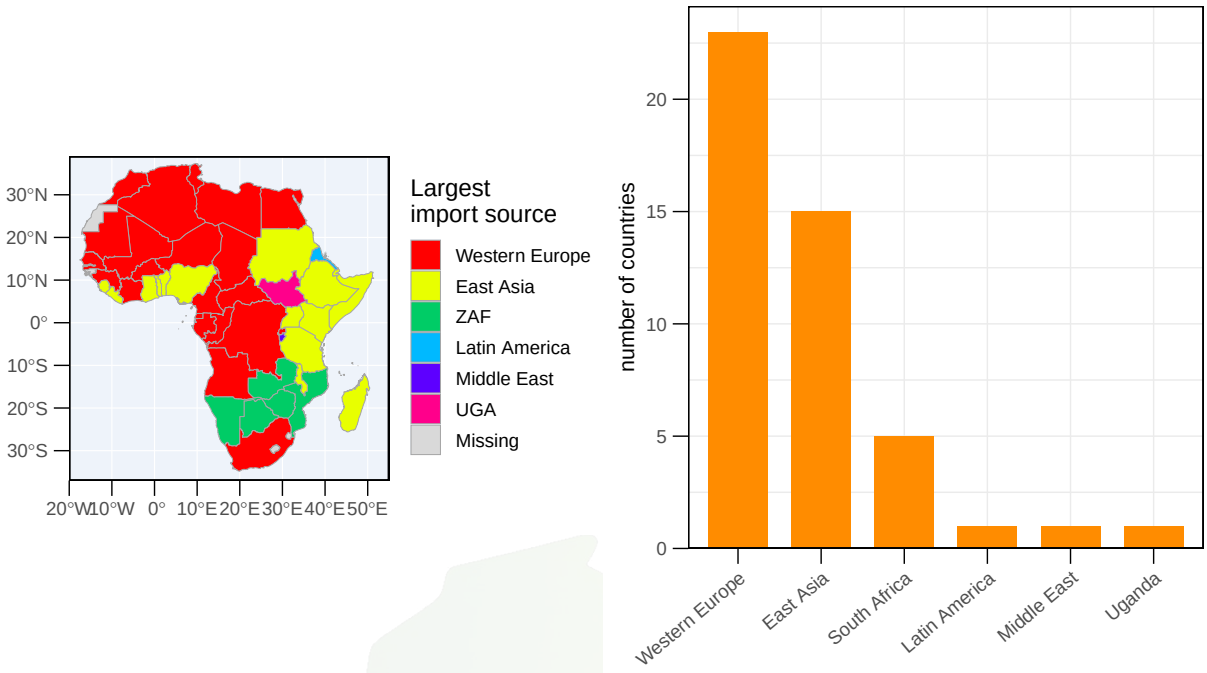


Notes: Chord width is proportional to the flow. The ring carries no scale, because its largest node is three hundred times its smallest and a common tick spacing labels only the largest: the left panel draws $70.1 bn of the $71.3 bn continental total and the right $1,232 bn. The twelve largest African traders keep their own node and every other African economy is pooled as "Other Af."; the $1.3 bn the left panel does not draw is trade between two economies inside that pooled node, which a chord cannot show. Left: intra-African trade, concentrated on South Africa and the Southern African core. Right: the same matrix with the rest of the world added, which dwarfs every intra-African chord.

2.4 Domestic value added, and why it is high

Gross exports overstate the income African economies earn from trade, so the profile has to be read in value-added terms too. Figure 8 maps the domestic value-added share of exports and decomposes the 18 largest exporters' gross exports. The continental mean is **72%** domestic, and the highest shares belong to the hydrocarbon and mineral economies, Nigeria at 96%, Niger 90%, Tanzania 89% and Chad 87%, not because they have built deep export industries but because raw commodities

Figure 7: Largest import-source partner, mapped and ranked by frequency



Notes: Left: largest single import-source partner, all 46 economies. Right: how often each partner leads. Partners outside the African set are GTAP world-region aggregates rather than individual countries, so the map cannot identify which economy within an aggregate leads. Grey marks the eight African states outside the sample.

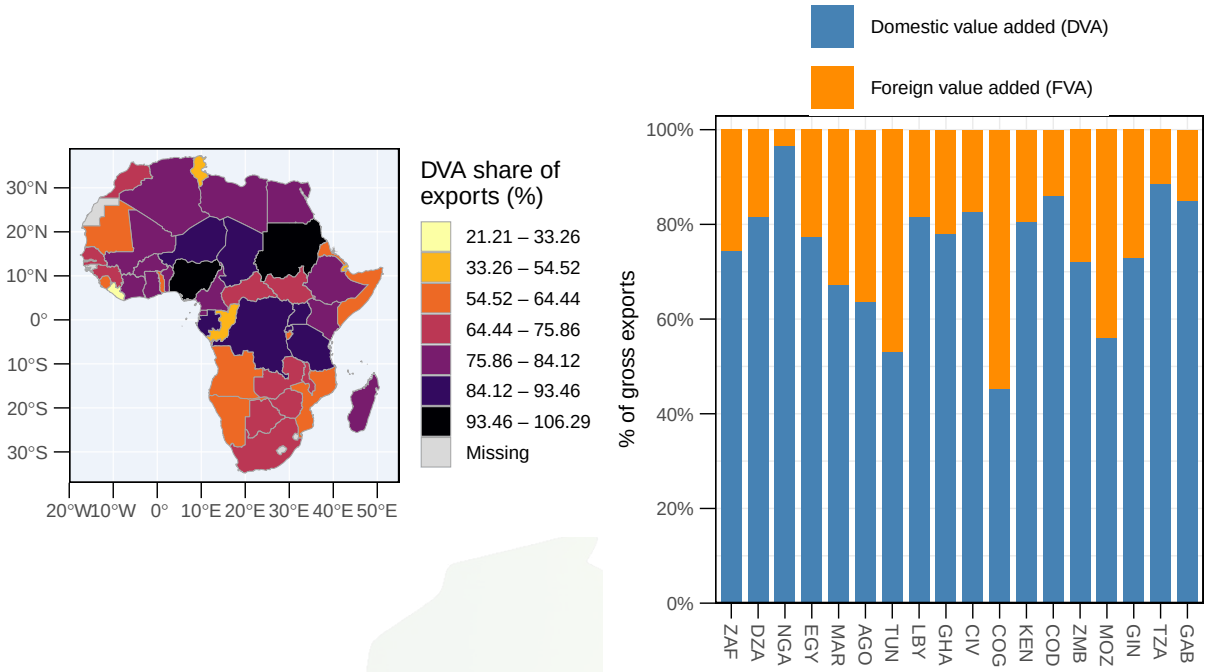
embody almost no imported input. The lowest, Liberia 21%, Congo 45%, Djibouti 52% and Tunisia 53%, mix re-export activity with, in Tunisia's case, genuine assembly for European chains. A high domestic-content ratio is a commodity signature rather than a sign of strength, and the objective the country reports converge on is to raise the level and sophistication of exports rather than to defend the ratio.

One value exceeds its theoretical ceiling. Sudan returns a domestic value-added share of **106%**, an artefact of the cube's treatment of a small, heavily re-exporting economy whose measured imported input content is close to zero. It is reported as it stands rather than trimmed, no argument here rests on it, and for the same reason the composite index of Section 7 uses the foreign value-added share and never the domestic one.

2.5 The Regional Economic Communities

Integration is organised through overlapping Regional Economic Communities, and the continental picture masks sharp differences between them. Assigning each economy to a single primary bloc by a fixed priority order, Figure 9 maps the groupings and compares them and Table 2 sets out the indicators. **Southern Africa is the outlier on realisation**: its members record a median fill ratio of **0.22**, **1.8 times the continental median** and more than twice North Africa's 0.08, and the bloc carries the largest absolute missing-trade gap at **$170 bn**, because it is where most realised regional trade already happens and where the potential is correspondingly large. **North Africa is close to the mirror**

Figure 8: Domestic value added in exports, mapped and decomposed

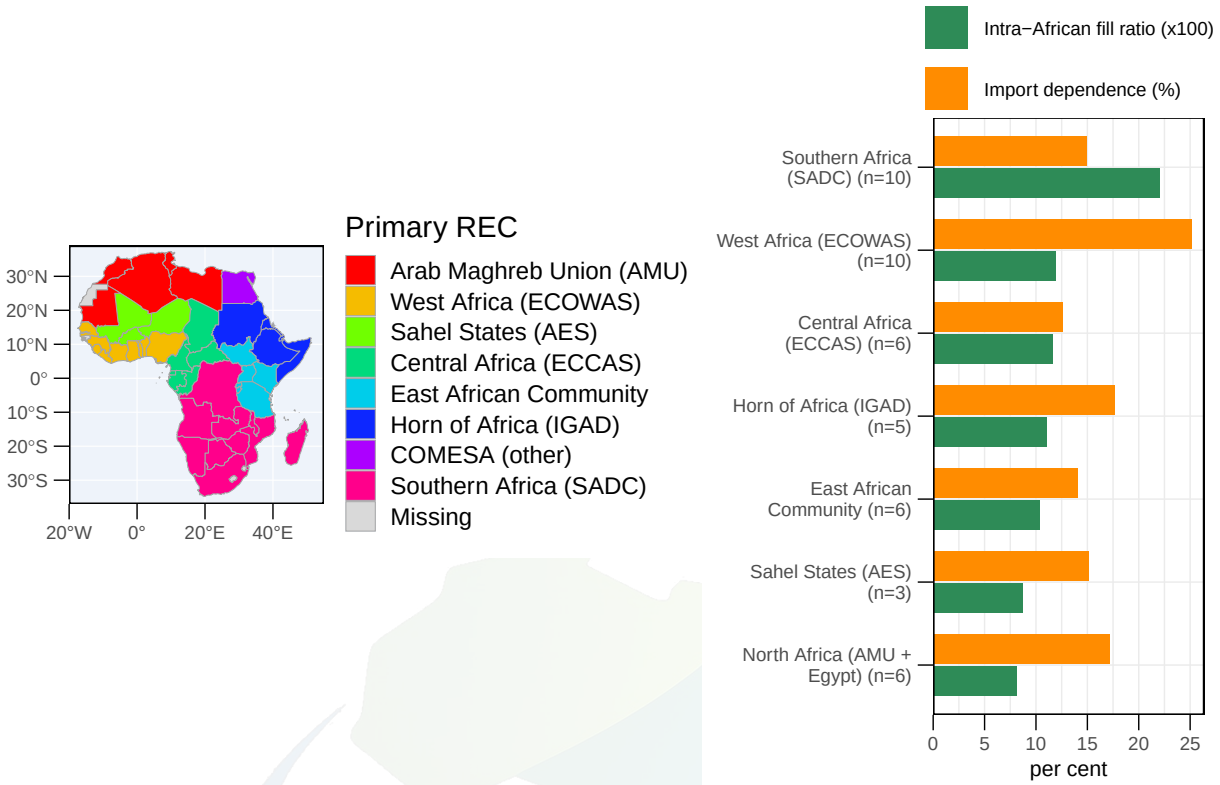


Notes: Left: domestic value-added share of gross exports, all 46 economies; Sudan's 106% exceeds the theoretical ceiling and is an artefact rather than a finding. Right: the 18 largest exporters by gross exports, a different set from the 18 the multi-region accounts resolve individually, split into domestic and foreign value added; the foreign share is the backward participation rate. Grey marks the eight African states outside the sample.

image, with the second-highest delivered costs of any bloc at a median 20.3%, a hair behind the Sahel States, and the lowest realisation of any bloc, below even the Sahel States. **The Sahel States**, counted here as the Alliance of Sahel States following the 2024 withdrawal of Mali, Burkina Faso and Niger from ECOWAS and its formal effect in 2025, record a median fill ratio of 0.09 and a modelled uplift of **+94%**, behind Central Africa's +107%.

These differences are not decorative, because common membership is one of the four friction terms the gravity model identifies, and the largest of them. Across the 2,070 ordered pairs, those sharing a bloc carry an average delivered cost of **14.6%** against **19.5%** for the rest and realise a mean fill ratio of **0.23** against **0.06**. They do not, however, cross fewer borders: bloc pairs average 1.58 crossings against 1.23, because bloc partners are typically overland neighbours while the cheapest non-bloc routings are often maritime. The premium is a cost-and-realisation premium rather than a border-count one, and the reading is that the African Continental Free Trade Area (AfCFTA) should be built on the blocs rather than around them: they are the existing machinery, and the differentiated priorities of Section 8 map closely onto them (UNECA, 2021).

Figure 9: Regional Economic Communities: membership and comparative indicators



Notes: Left: primary Regional Economic Community, one bloc per economy by a fixed priority order, all 46 economies. Right: the same seven blocs compared on median intra-African fill ratio, multiplied by 100, and median import dependence, drawn from the same rows and on the same statistic as Table 2; n is the number of members assigned to each. Grey marks the eight African states outside the sample.

Table 2: Structural and integration indicators by primary Regional Economic Community

Primary bloc	n	Fill ratio	Imp. dep. (%)	DVA (%)	Uplift (%)	Cost (%)	Missing ($bn)
North Africa (AMU + Egypt)	6	0.08	17	72	82	20.3	155
West Africa (ECOWAS)	10	0.12	25	70	91	16.6	107
Sahel States (AES)	3	0.09	15	79	94	20.3	16
Central Africa (ECCAS)	6	0.12	13	81	107	16.8	10
East African Community	6	0.10	14	83	80	19.1	31
Horn of Africa (IGAD)	5	0.11	18	63	105	17.0	10
Southern Africa (SADC)	10	0.22	15	70	59	16.8	170

Notes: Medians across the member economies assigned to each bloc, except missing trade, which is summed. Each economy is assigned to one primary bloc by the fixed priority order AMU, ECOWAS, AES, EAC, IGAD, SADC, ECCAS, COMESA, so the member counts are not the blocs' own and no economy is counted twice. Mali, Burkina Faso and Niger are counted under the Alliance of Sahel States following their withdrawal from ECOWAS. Egypt's membership string records COMESA alone, so the priority order leaves it in a bloc of one; it is reported inside a North Africa row of six rather than as a bloc, because a single economy cannot carry a bloc-level statement and on current data it would be the row with the largest uplift. "Cost" is the average delivered transport cost to African markets. Model output; see Annex A.

3. Connectivity, Corridors and Logistics Friction

If structure explains what Africa trades, geography and friction explain how little of it crosses an African border. The external evidence agrees that this is the binding margin. Direct estimates of the ad-valorem equivalent of non-tariff measures put them well above applied duties across developing-country trade (Kee et al., 2009), and African landlocked economies have long faced transport prices several times those of developed countries (Teravaninthorn and Raballand, 2009; Limão and Venables, 2001). This report's own scenario engine reaches the same conclusion from inside the model: non-tariff and standards reform is worth **+51%** of intra-African exports against **+1%** for tariff removal (Section 6).

3.1 The corridor and port network

The network mapped in Figure 10 is the skeleton of African trade, and its sparseness is its defining feature. Seventeen calibrated corridors, 32 ports and 33 border crossings carry the whole of the continent's modelled overland regional trade, and the load is as concentrated as the network is thin. Of the **$40.5 bn** routed over corridors, the **North–South Corridor** alone carries $13.2 bn, the Trans-Kalahari $9.6 bn and the Trans-Maghreb $5.3 bn, 69.6% between them, while the Douala, Lagos–Niamey and Tema–Ouagadougou corridors each carry under $0.35 bn and the Maputo Corridor carries nothing at all. Line widths are drawn in proportion to that load, so the three routes that carry the traffic are visible as such and the rest of the network as the thin thing it is.

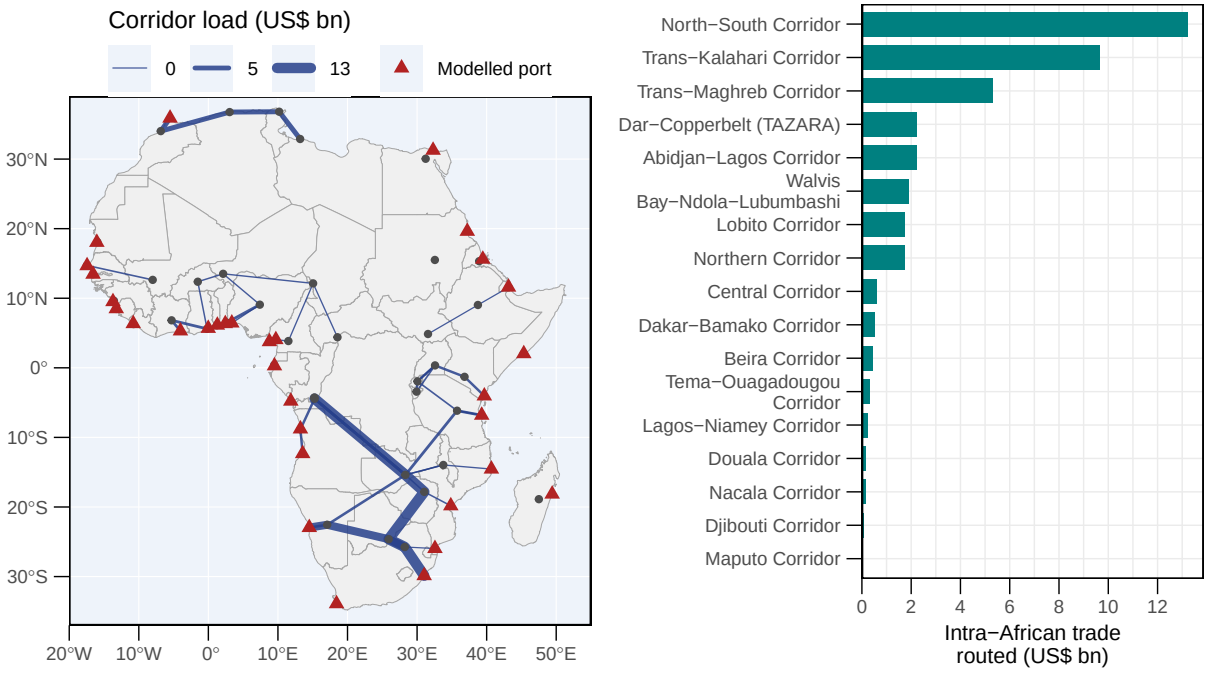
Thinness is itself a constraint, in two ways. Each loaded corridor is a single point of failure for the landlocked economies that depend on it, with no substitute at comparable cost; and where reliability is low the *effective* cost of trade rises well above the headline freight rate, because traders hold buffer stocks and price in delay. The spatial structure of African production is therefore both the map of its integration opportunity and the map of its vulnerability.

3.2 Delivered cost, time and crossings

Figure 11 translates the network into the number that decides competitiveness, the average delivered ad-valorem cost of reaching an African market. The continental mean is **18.2% of cargo value**, already high by world standards, and the tail is punishing: **Libya 29.6%**, Tunisia 26.3%, the Central African Republic 25.9%, South Sudan 22.7% and Algeria 22.6%, against 14.7% to 15.7% for the cheapest origins, Ghana, Togo, Benin, Angola and Equatorial Guinea. At the top of that range transport cost alone exceeds any plausible tariff and frequently exceeds the producer's own margin, which is the mechanism behind the import dependence of Section 2.

The companion panel sets delivered cost against the fill ratio, and the negative relationship is the empirical core of this report: *Africa under-trades with itself roughly in proportion to what it costs to move goods across it*. All five of the worst-realising economies are among the seven most expensive, and delivered cost and the fill ratio correlate at -0.42 across the 46. Figure 12 takes the same question to two other resolutions. At commodity level, petroleum and coal products, machinery and equipment,

Figure 10: The African trade-corridor and port network

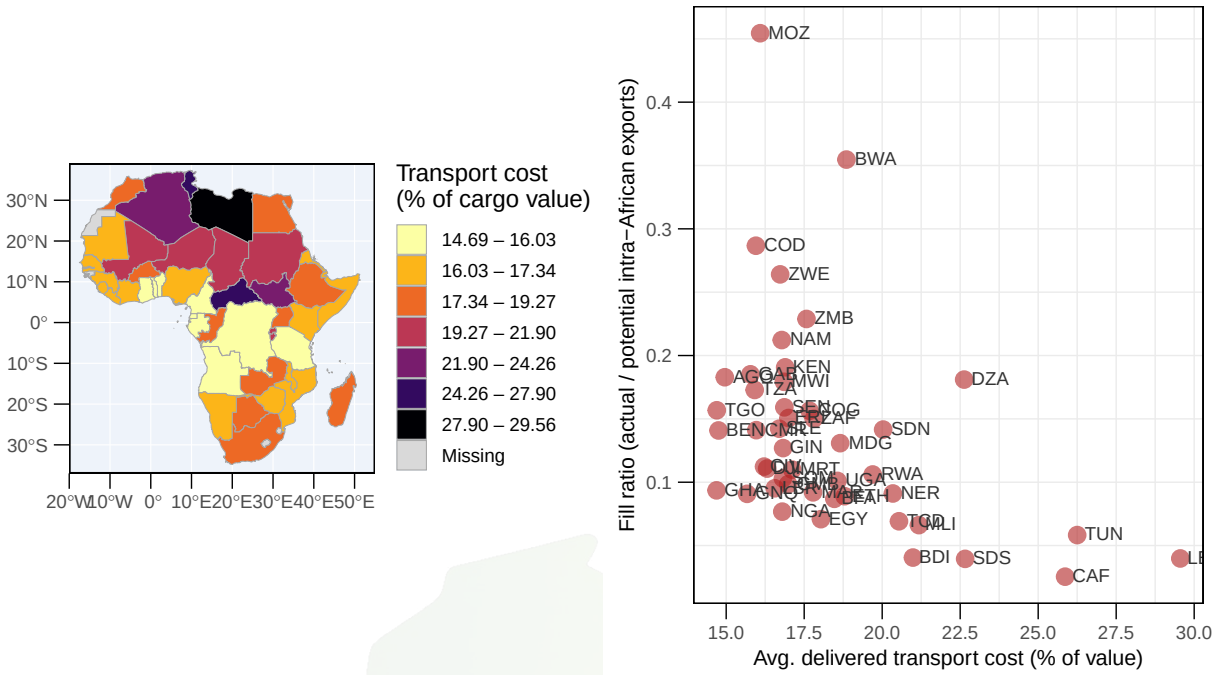


Notes: Left: the 17 calibrated corridors drawn through their node sequences, with line width proportional to the intra-African trade the network model routes over each, and the 32 modelled ports. The Maputo Corridor carries nothing and is drawn at the minimum width rather than dropped. Right: all 17 corridors ranked by that load; the three Southern and North African routes carry more than the other fourteen combined.

motor vehicles and parts and chemical products are the four largest extra-African input leakages, and they are no dearer than the average commodity to move regionally: their trade-weighted frictions are **9.4% to 11.8%** against a median of 11.4% across the 64 commodities with intra-African trade. Freight is therefore not what distinguishes them, which points at supplier capability instead (Daudin et al., 2011). At economy level, cost and time move together: **Libya at 492 hours**, Tunisia 455, South Sudan 440, Mali 422 and Algeria 420 sit far out on both, while the Southern African economies cluster low and cheap.

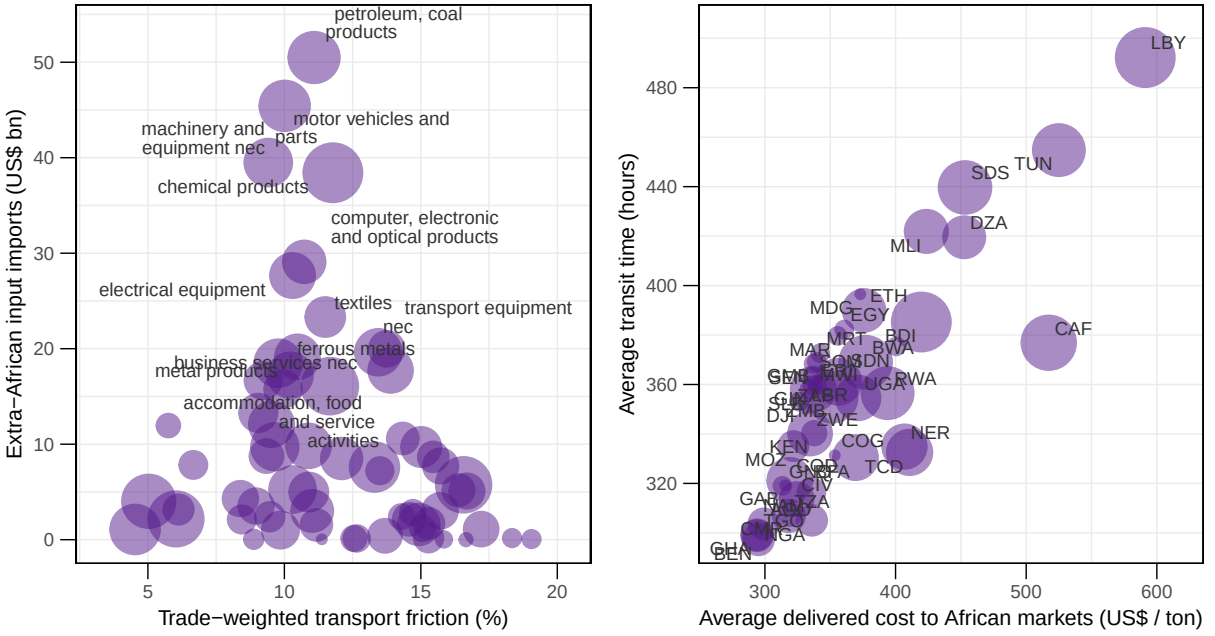
Two facts about the routing are worth recording, because the previous edition of this series could state neither. **No pair returns a zero delivered cost**: all 46 capitals are reachable across all 2,070 ordered pairs, where an earlier network left nine economies unroutable and therefore frictionless by accident. And the average route crosses **1.32 borders**, 672 pairs being reached without a land crossing at all and 590 in exactly one. Those are the coastal and maritime pairs, and they behave differently from the rest. Overland routes run cheap and fast at short range and deteriorate steeply with distance and border count; maritime routes start dearer and flatten with distance. That is why far-apart coastal pairs are reached by sea and the interior is not reached cheaply at all.

Figure 11: Delivered transport cost, mapped and against the fill ratio



Notes: Left: average delivered transport cost of reaching African markets, per cent of cargo value, all 46 economies. Right: intra-African fill ratio against that cost; the negative relationship is the empirical core of this report. Grey marks the eight African states outside the sample.

Figure 12: Commodity friction and economy-level accessibility



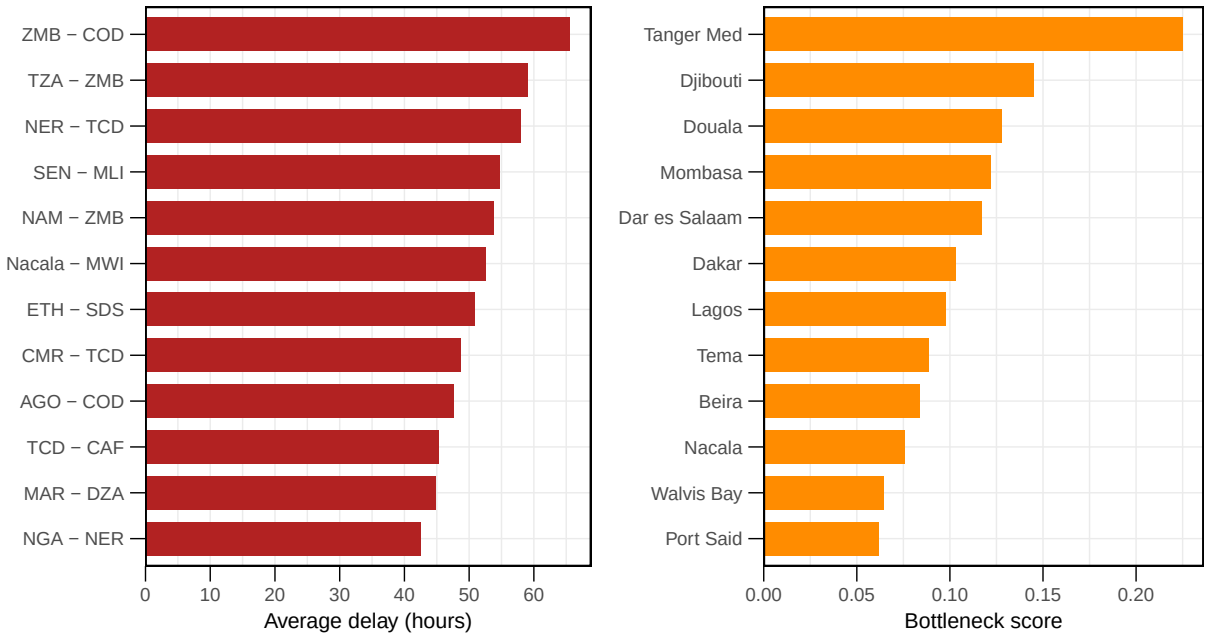
Notes: Left: 64 of the 65 GTAP commodities by trade-weighted transport friction against extra-African input imports, the twelve largest leakages labelled and bubble area the commodity's intra-African trade; one commodity has no intra-African trade and therefore no weighted friction. Right: all 46 economies by average delivered cost per tonne against average transit time, bubble area the number of border crossings on the modelled route.

3.3 Critical nodes and border delays

Beyond economies, specific gateways are the critical nodes of the network, and the flip side of their centrality is exposure to their failure. Of the 78 modelled nodes, the ones that matter most are those

that both carry a large share of transit and impose a long delay, because improving them pays twice. Figure 13 ranks the gateways two ways, and the two lists barely overlap. On delay the ranking is dominated by the Southern and Central African interior: the **Zambia–DR Congo** crossing imposes an average **65.5 hours**, Tanzania–Zambia 59.1, Niger–Chad 58.1, Mali–Senegal 54.7 and Namibia–Zambia 53.8, nearly three days at a single border on exactly the corridors that carry the most trade. On systemic importance the list is different, because it weights a gateway by how much of the network depends on it rather than by how slow it is: Tanger Med scores highest at 0.22, ahead of Djibouti (0.15), Douala (0.13), Mombasa (0.12) and Dar es Salaam (0.12). That the slowest gateway and the most load-bearing one are usually not the same place is the point: a programme that chases delay statistics alone will not buy resilience. Both readings argue for the same investments at the high-betweenness nodes, where a one-stop border post or a digitised customs gateway benefits every corridor passing through rather than one bilateral pair (Freeman, 1977).

Figure 13: Critical gateways: delay imposed and systemic importance



Notes: Left: the twelve slowest of the 33 modelled border crossings, by average delay in hours. Delay is symmetric in the network model, so each crossing is counted once rather than once per direction. Right: the twelve highest-scoring of the 32 modelled ports on the composite bottleneck score; the 46 inland city nodes are excluded.

4. The Realisation Gap: Gravity and Missing Trade

4.1 The gravity model and what it identifies

The gravity model turns the structural and spatial diagnostics into a counterfactual: how much each economy *would* trade regionally without friction, and therefore how much is missing. Estimated on the cube's bilateral flows in the tradition begun by Tinbergen (1962) and formalised by Anderson and van Wincoop (2003) and Head and Mayer (2014), with a fixed-effects Poisson estimator robust to the many zero flows (Santos Silva and Tenreyro, 2006; Novy, 2013), it isolates the part of low intra-African trade

that distance and economic size cannot explain.

Figure 14 shows the fit on the 2,038 of 2,070 ordered pairs carrying positive trade and reports the estimated coefficients. Four of the five terms carry the argument. Shared bloc membership is the largest positive term at **+0.91** in semi-elasticity ($p = 0.003$), shared language the next at **+0.66** ($p = 0.003$), delivered ad-valorem cost the expected negative at -0.089 per percentage point ($p = 0.006$), and the border-crossing count -0.276 ($p = 0.035$). Those four are the terms distinguishable from zero once standard errors are clustered two ways on origin and destination, and the facilitation scenarios of Section 6 rest on the third of them.

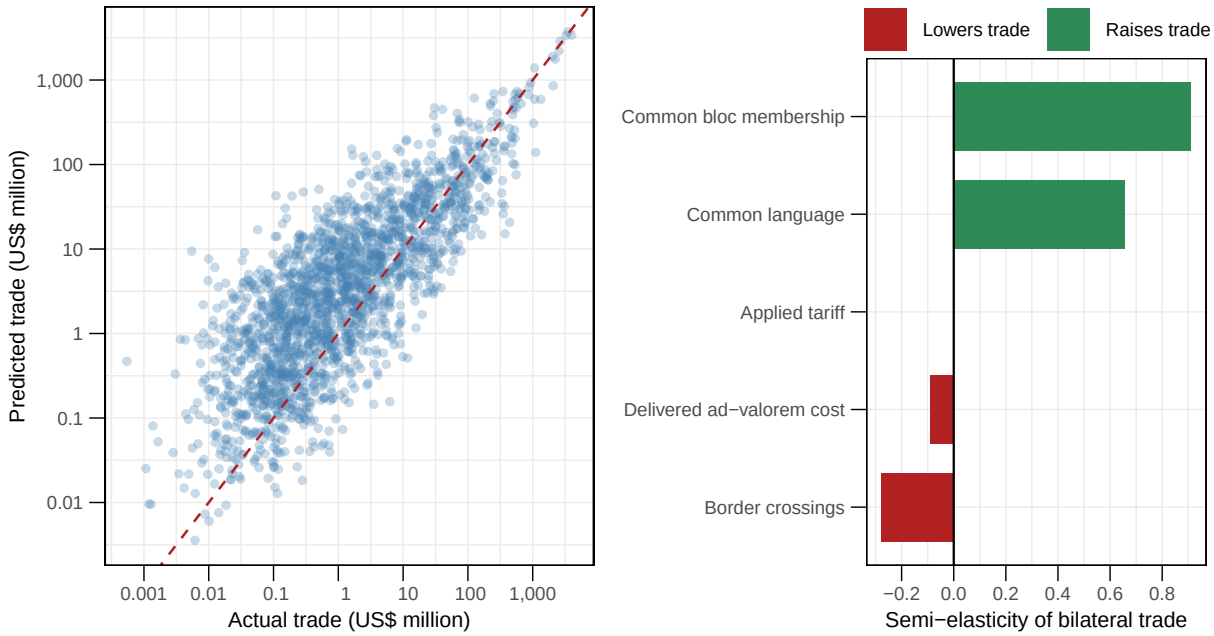
The remaining terms bound what can be claimed. **The applied-tariff coefficient is identified and is estimated at -0.0035** ($p = 0.79$, 95% interval -0.029 to $+0.022$). That is a change of kind rather than of value: in earlier rounds the tariff variable was constructed as a constant multiple of one minus the common-bloc dummy, so it was perfectly collinear with a regressor beside it, the estimator dropped it, and the zero that was published was a pivot artefact rather than an estimate. Duties are now taken from the cube's own duty-paid-against-CIF identity, and the result is a weak estimate, near zero but with an interval wide enough to contain a substantial gain. The border-crossing coefficient is **-0.276** and correctly signed, where an earlier round reported $+0.035$, a wrong sign that traced to port dwell time being left out of delivered cost, which understated the cost of precisely the low-crossing maritime routes. Pricing the second of a maritime movement's two port calls finished that correction and had a second effect: it raises cost on the low-crossing routes without touching the crossing count, so the correlation between the two regressors falls to 0.51 and the count is separately identified for the first time. It is not, however, "the border effect": delivered cost already prices border waiting at the value of time and carries about 60% of the standalone penalty, leaving the count to measure the residue, which is now significant on its own ($p = 0.035$) and jointly with delivered cost (Wald $p = 0.013$). Log distance is estimated at -0.350 and is insignificant ($p = 0.16$) once delivered cost is in the specification, which is unsurprising given that delivered cost is largely built from distance; it is not in the chart's source file and is therefore not drawn. Average logistics performance is not reported at all, because the fixed effects span it exactly and it was never identified.

4.2 Missing trade, and the two ways to read it

The summed shortfall is **$499.0 bn a year** against realised intra-African exports of **$71.3 bn**: on this accounting the continent trades internally at about an eighth of its frictionless potential. That is a far larger gap, and a far smaller realised base, than this series reported before, and the change is a data correction rather than a deterioration: the cube moved to GTAP Africa V3 and port dwell time was priced into delivered cost. Annex A sets out both.

Figure 15 shows the 20 largest absolute gaps and maps the gap across the continent. **South Africa ($133.0 bn), Egypt ($61.6 bn), Nigeria ($55.1 bn), Tunisia ($33.5 bn) and Morocco ($31.3 bn)** carry more than three-fifths of the continental total between them, followed by Ghana ($20.2 bn) and Côte d'Ivoire ($17.9 bn).

Figure 14: The gravity model: fit and estimated friction coefficients



Notes: Left: the fixed-effects Poisson fit on the 2,038 of 2,070 ordered African pairs carrying positive trade; both axes are logarithmic, so the zero-trade pairs cannot be drawn, and the dashed line is the 45-degree line. Right: the five estimated friction terms the chart's source file carries. Every term is correctly signed; shared language, shared bloc membership, delivered ad-valorem cost and the border-crossing count are distinguishable from zero on two-way clustered standard errors. Log distance is estimated at −0.350 but is not in the file; average logistics performance is not identified because the fixed effects absorb it exactly.

The two readings of that gap point at different policies, and this report keeps them apart deliberately. In *levels* it is a large-economy phenomenon, because a large economy has a large frictionless potential: four of the five above are among the six largest exporters and all five are among the ten largest. In *proportion* it is a small, fragmented and landlocked phenomenon: the Central African Republic realises 3% of its potential, South Sudan 4%, Libya 4%, Burundi 4% and Tunisia 6%. A programme that maximises recovered trade will work on the South African, Egyptian and Nigerian corridors; a programme that maximises the effect on an economy will work on the Sahel and the interior, where the same instruments move a much larger share of a much smaller base. The modelled facilitation uplifts of Section 6 follow the proportional reading almost exactly.

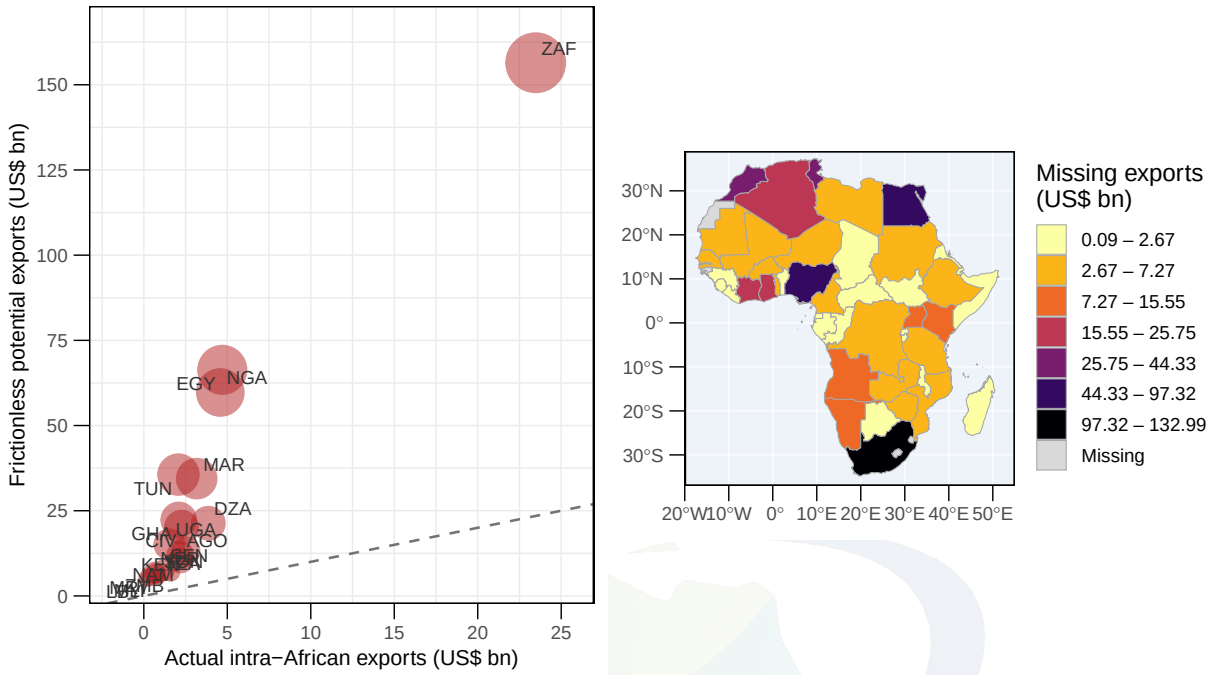
5. Value Chains, Sourcing and Bottlenecks

The multi-region input–output account opens the production side: where African economies buy their inputs, how deep their domestic chains run, how much of their export value is genuinely theirs, and which commodities most constrain the rest.

5.1 Input sourcing and value-chain participation

Figure 16 places each of the 46 economies on its regional integration in *input* terms, summing all 65 commodity rows so that nothing is dropped. The finding common to almost every economy is how little

Figure 15: Missing intra-African trade, by economy and mapped



Notes: Left: the 20 largest absolute gaps of the 46 economies, actual against frictionless-potential intra-African exports, bubble area the gap itself and the dashed line parity. Right: the same gap mapped across all 46. Grey marks the eight African states outside the sample.

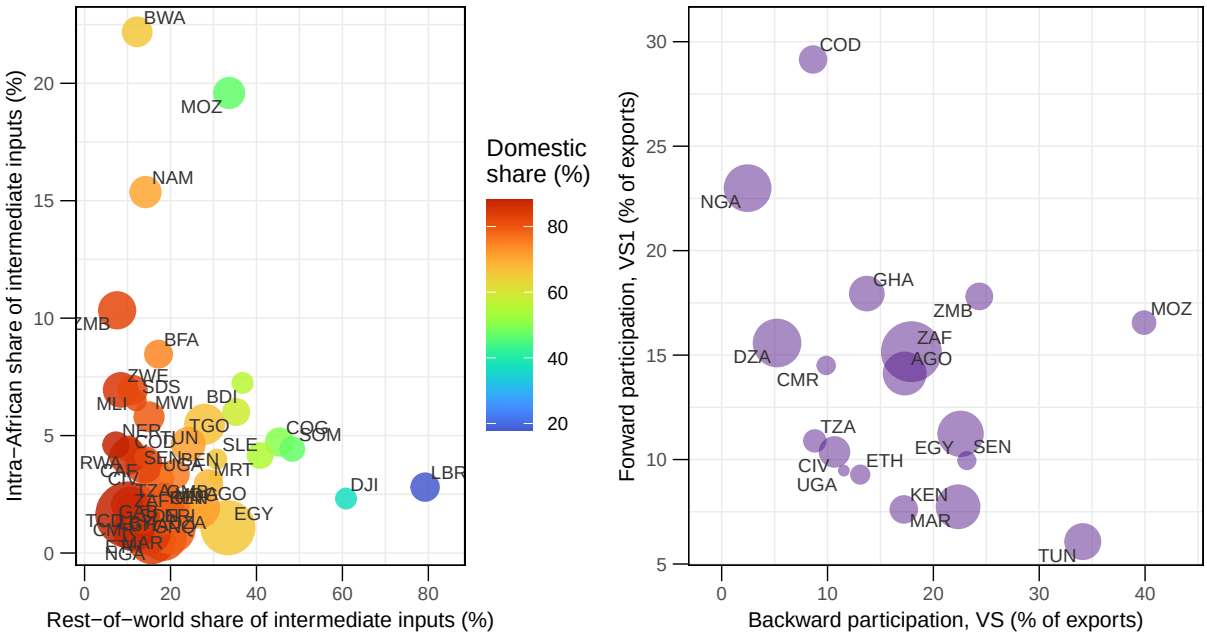
is sourced regionally: the average economy meets **72.7%** of its intermediate demand domestically and **22.8%** from outside Africa, leaving an intra-African share of 4.6%, and the best-integrated economy, Botswana, reaches only 22%. African economies do not yet buy from each other at scale, which is both the symptom of shallow regional value chains and the opportunity the AfCFTA is meant to capture (Foster-McGregor et al., 2015).

The companion panel shows value-chain participation for the 18 economies the accounts resolve individually, the foreign value added embodied in exports against the domestic value re-exported onward by partners, on the Koopman–Wang–Wei decomposition (Koopman et al., 2014; Wang et al., 2013). The average over those 18 is **17% backward** and **14% forward**. Mozambique (40%) and Tunisia (34%) draw the most foreign value into their own exports, both because they assemble; the DR Congo (29%) and Nigeria (23%) supply the most value onward, both because they ship ores and crude that others process.

5.2 Backward and forward linkages

Figure 17 sets backward and forward participation side by side for the same 18 economies and adds export-weighted upstreamness. That the backward mean sits at 17%, and that most economies cluster below it, is a direct measure of how shallow the production webs behind African exports are (Hirschman, 1958; Eaton and Kortum, 2002). Upstreamness measures how many production stages an economy sits from final demand, and Angola (3.9), the DR Congo (3.4), Nigeria (3.3), Zambia (3.3)

Figure 16: Input sourcing and value-chain participation



Notes: Left: input sourcing for all 46 economies, intra-African share against rest-of-world share, each economy's 65 commodity rows summed; bubble area is total intermediate demand and colour the domestic share, which is the residual to 100%. Right: value-chain participation for the 18 economies the multi-region accounts resolve individually, backward against forward, bubble area gross exports; economies above the diagonal supply more value into others' chains than they draw into their own.

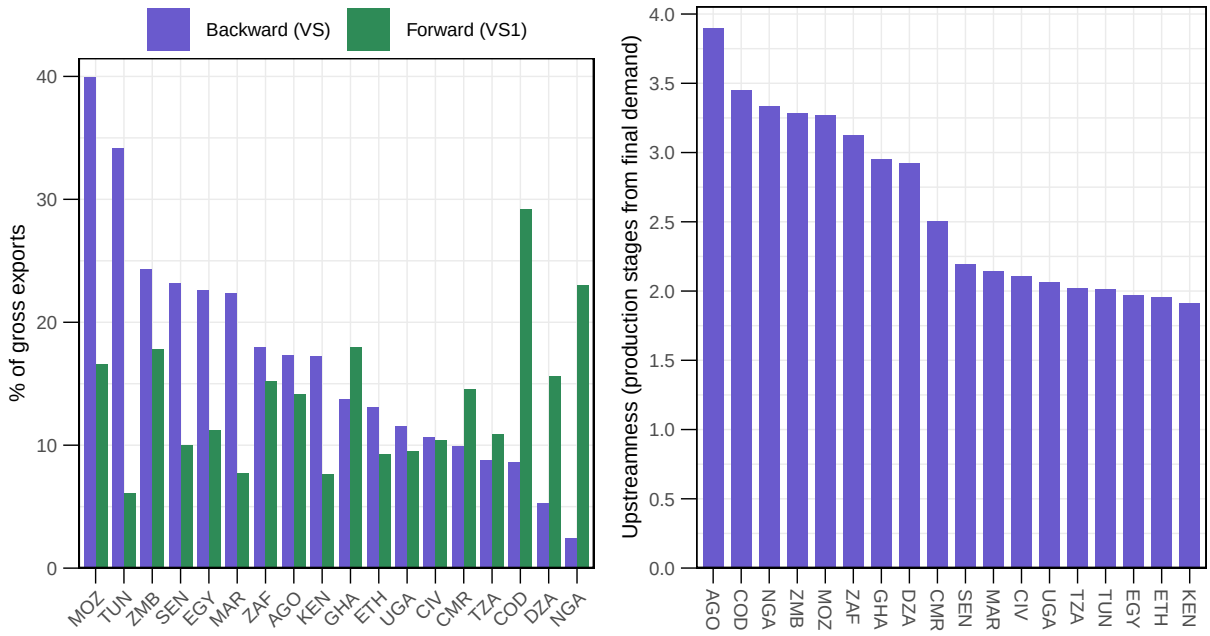
and Mozambique (3.3) are furthest upstream, which is precisely the oil, copper and cobalt profile: they supply the early stages of global value chains and import the downstream, higher-value stages back (Antràs et al., 2012). Moving downstream is the structural-transformation agenda the profile makes visible, and it is the one the development literature identifies as Africa's most realistic industrialisation path, built on agro-processing, mineral beneficiation and resource-based manufacturing rather than on assembly for export (Newfarmer et al., 2018; McMillan et al., 2014). Those priorities are complementary across economies, because one country's processed output is another's input, so pursuing them regionally is what turns comparative advantage into intra-African trade.

5.3 The sourcing response to the facilitation package

Figure 18 reports the regional-sourcing model, and both what it reports and what it *can* report have changed. Sourcing was previously a least-cost linear programme; it is now an Armington constant-elasticity expenditure share on the cube's own import-source substitution elasticities, against a rest-of-world backstop priced per destination, so the outside option responds to the same levers as the regional one. Both margins are calibrated cell by cell to the observed 2017 pattern, and that calibration has a consequence worth stating before any number is quoted: **the model's baseline equals observed sourcing by construction, so there is no "regionalisation gap" to report.** What it still produces, and what the figure plots, is the *response*.

The response is real but modest. Under the full facilitation package continental regional sourcing rises

Figure 17: Value-chain participation and export-weighted upstreamness



Notes: Left: backward and forward value-chain participation for the 18 economies the multi-region accounts resolve individually, as a share of gross exports, aggregated over all 65 commodities. Right: export-weighted upstreamness for the same 18; higher values place an economy further from final demand, supplying raw and intermediate stages rather than finished goods.

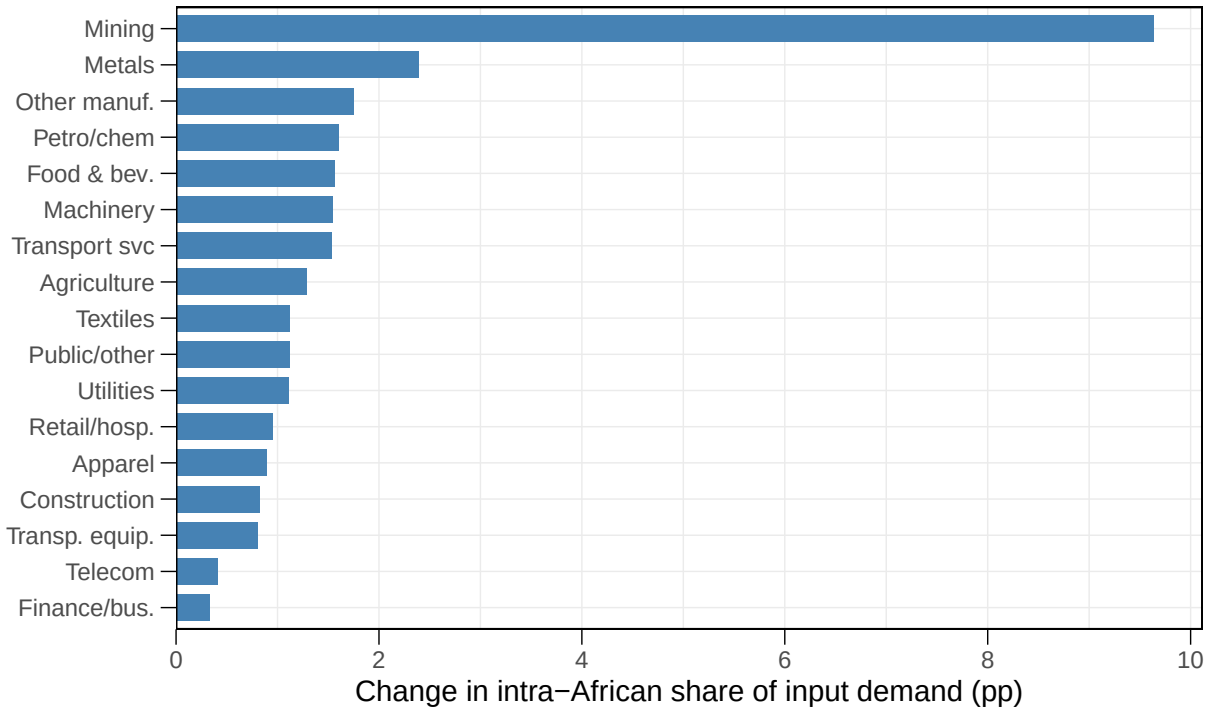
from **10.32% to 12.02%** of imported input demand, **+1.70 percentage points and +16.5% in relative terms**, with non-tariff and standards reform alone carrying all of it: the package's port component pushes the regional share down by as much as its border and corridor components lift it, so in this model, unlike in the gravity component, the package does not dominate its own parts. All 46 economies rise, from +0.49 pp in Eritrea to +5.26 pp in South Sudan, median +1.90 pp, the largest gains going to the landlocked and interior economies. By commodity group the movement is largest in mining (+9.6 pp from a 50% base), metals (+2.4 pp) and other manufacturing (+1.7 pp). The allocation no longer corners anywhere: none of the 2,914 rows with positive demand sits at a bound, against 71% under the linear programme, and supplier totals reproduce the benchmark exactly, so a sourcing result can now be read as a level rather than as an artefact of a normalisation (Costinot and Rodríguez-Clare, 2014).

One mechanism deserves its own sentence because it looks like a contradiction and is not. Port efficiency *raises* intra-African trade volumes by 15.1% in the gravity model and *lowers* the regional sourcing share by 2.0% in the Armington model, because better ports help overseas suppliers at least as much as regional ones. Both results are right; they answer different questions.

5.4 Bottleneck commodities

The Value-Chain Bottleneck Index scores each commodity on how much of the wider production network depends on it, combining forward linkage, network betweenness, supplier concentration and import dependence into one number (Freeman, 1977; Antràs et al., 2012). Figure 19 ranks the twelve

Figure 18: Response of regional input sourcing to the full facilitation package

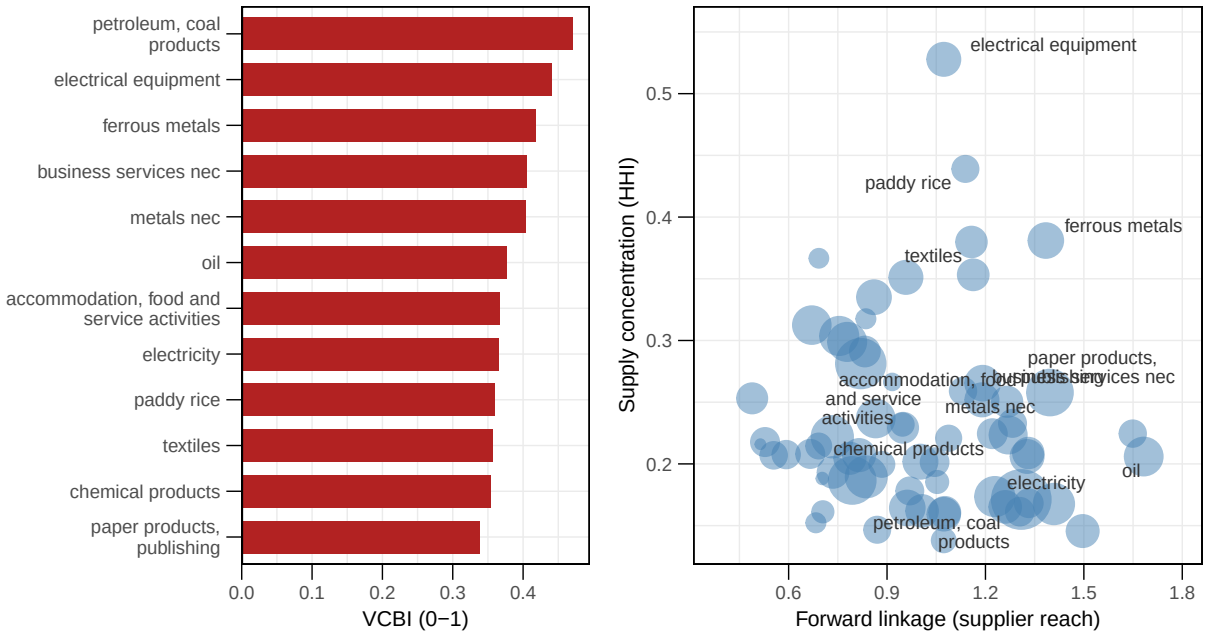


Notes: The 65 GTAP commodities are aggregated for display into 17 broad groups weighted by the underlying levels. Sourcing is an Armington constant-elasticity share on the cube's own import-source substitution elasticities, calibrated cell by cell on both margins to the observed 2017 pattern, so the baseline reproduces observed sourcing exactly and there is no optimum-against-actual gap to plot; what is plotted is each group's modelled response to the full facilitation package. The sourcing model's friction matrix is transport cost only and carries no tariff channel, so tariff removal produces no response here, which is a limit of the model and not a finding about tariffs.

highest of the 65 and plots all 65 on the two drivers. **Petroleum and coal products** leads at **0.47**, followed by electrical equipment (0.44), ferrous metals (0.42), business services (0.41) and metals nec (0.41), and the top-ranked commodities separate on both drivers at once: they reach far into the network *and* come from few suppliers.

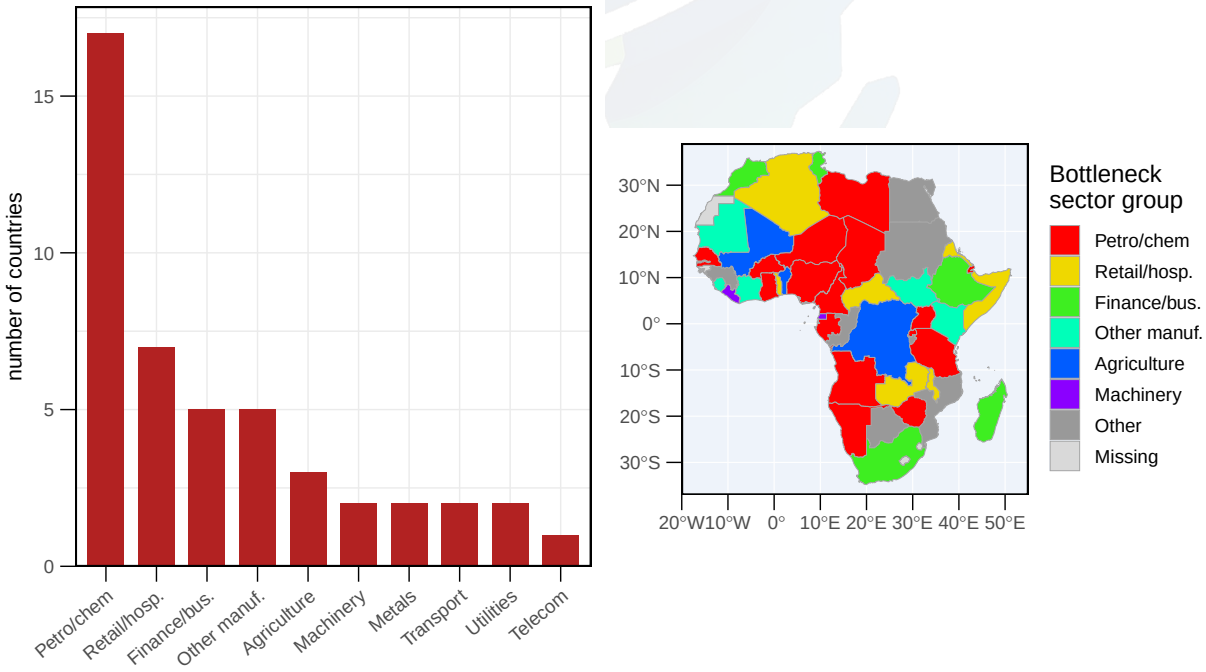
Figure 20 counts how often each broad group is the *top* bottleneck across the panel and maps the result. **Petro-chemicals leads in 17 of the 46 economies**, retail and hospitality in seven, other manufacturing and business services in five each, agriculture in three, transport, utilities, metals and machinery in two each, and telecommunications in one, Mozambique. The map reveals a geography: a petro-chemical belt through the hydrocarbon producers and the Sahel, service-sector chokepoints in the smallest and most fragmented economies, and agricultural bottlenecks in the DR Congo, Mali and Benin, where the binding input constraint is the food system itself. Structural path analysis of that food chain makes the same point from the supply side: the strongest path into food processing runs from trade and distribution (0.077 per unit of final demand) ahead of vegetables, fruit and nuts (0.064), so an upstream constraint in trade margins, cold chain or business services propagates into food processing just as a crop failure does (Defourny and Thorbecke, 1984). Those two are the strongest of the thirty paths the decomposition retains and carry 27% of the retained total between them; no other single path carries more than 7%. These are the import-exposed, concentrated pivots on which continental resilience most depends, and they are the natural targets of the regional-value-chain agenda.

Figure 19: The continental Value-Chain Bottleneck Index



Notes: Left: the twelve highest-scoring of the 65 GTAP commodities; the full commodity table is in the country annexes. Right: all 65 plotted on the two drivers, forward linkage against supplier concentration, with the top twelve labelled and bubble area proportional to import dependence.

Figure 20: Most systemic bottleneck group, ranked and mapped



Notes: Left: how often each broad group is an economy's most systemic bottleneck, across all 46 economies; petrochemicals leads in 17. Right: the same dominant group mapped. Commodities outside the 17-group display scheme are pooled and labelled as such. Grey marks the eight African states outside the sample.

6. Scenarios and Economy-Wide Gains

The scenario engine prices the policy menu directly, simulating how intra-African trade responds to the components of the AfCFTA, applied one at a time and as a full package. Every uplift below is a percentage change in modelled intra-African exports against the estimated baseline.

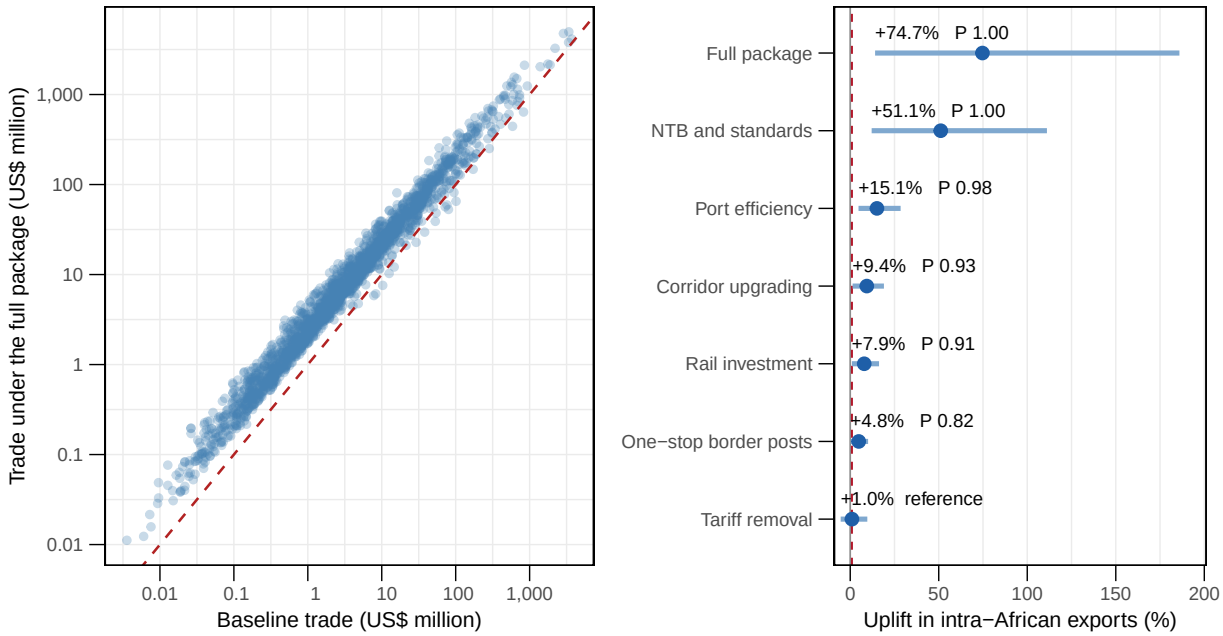
6.1 The facilitation package and its components

Figure 21 plots the bilateral response, all 2,070 ordered pairs at baseline against their value under the full package, and decomposes the package into its components with the 95% interval of each. The full package raises modelled intra-African exports by **+74.7%** at continental level. **Non-tariff and standards reform is the largest single lever at +51.1%**, about two-thirds of the package on its own, ahead of port efficiency (+15.1%), corridor upgrading (+9.4%), rail investment (+7.9%) and one-stop border posts (+4.8%). Tariff removal adds +1.0%.

Two levers have changed character rather than merely size. **Port efficiency** previously returned exactly zero, because the lever scaled port dwell time, which entered transit time only, while the model routes and prices on delivered cost; dwell is now monetised at the value of time on both of a maritime movement's port calls, as border waiting already was on the land legs, and the lever is the second largest of the six. **Tariff removal** previously returned exactly zero because the tariff variable was perfectly collinear with the common-bloc dummy and the estimator dropped it. Neither zero was a finding about the world, and neither should be quoted as one.

The intervals are the reason this figure replaces a bar chart. Drawn from the clustered variance-covariance matrix, they run from -5.4% to $+9.7\%$ for tariff removal, from $+0.2\%$ to $+10.1\%$ for one-stop border posts, and from $+14.1\%$ to $+185.9\%$ for the package. Tested on the interval of the *difference* against tariff removal, **non-tariff and standards reform ($P = 0.997$), port efficiency ($P = 0.98$) and the full package ($P = 0.997$) are larger than tariff removal at conventional confidence**; corridor upgrading (0.93), rail (0.91) and one-stop border posts (0.82) are larger in expectation but their intervals overlap it, and all three have moved further from that threshold rather than closer, so facilitation has not strengthened as a bloc: its port component has and its land-corridor components have not, which is what doubling the price of a port call should do. The defensible claim is therefore narrower than a ranking: non-tariff and standards reform is the largest single lever and is measurably larger than tariff liberalisation, port efficiency is the second largest and now separates from it too, the corridor, rail and border-post levers are larger in expectation but the data cannot separate them from it, and the tariff effect itself is estimated near zero with an interval wide enough to include a substantial gain. The independent ground for treating non-tariff measures as first order is the direct estimation of their ad-valorem equivalents in the trade-restrictiveness literature, where they routinely exceed applied duties (Kee et al., 2009).

Figure 21: The facilitation package: bilateral response and lever decomposition



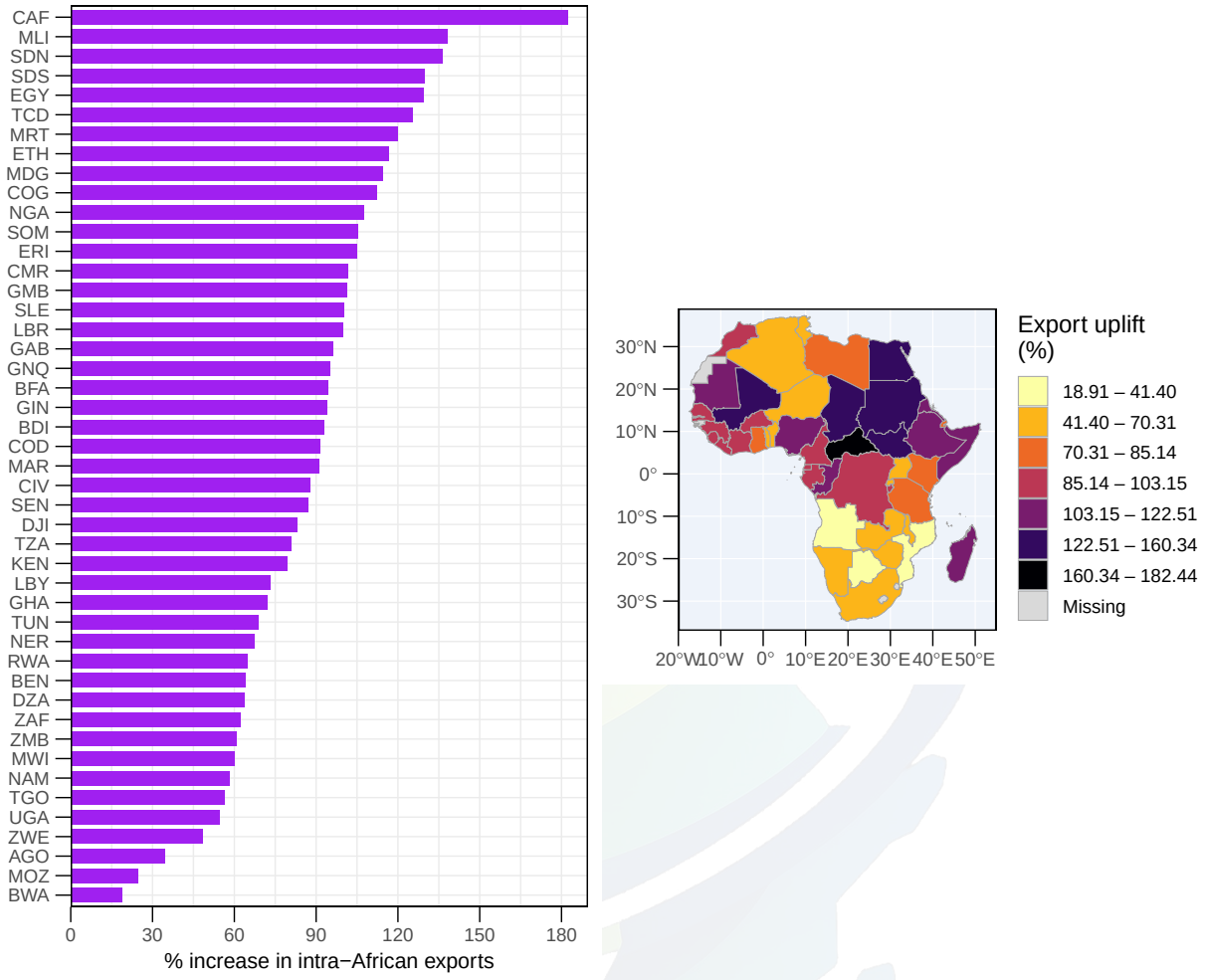
Notes: Left: all 2,070 ordered economy pairs, baseline bilateral trade against trade under the full facilitation package, on logarithmic axes with the dashed line at parity. Right: the package decomposed by component, with the point estimate, the 95% interval from 8,000 draws of the clustered variance-covariance matrix, and the probability that each lever exceeds tariff removal; the intervals and probabilities are recomputed on the current fit and carried in the synthesis data layer. The red dashed line marks tariff removal, the reference lever.

6.2 Who gains most

Across the panel the full package raises intra-African exports by **88% on the mean economy** and **91% on the median**. Figure 22 ranks the uplift and maps it, and the progressivity is striking: the Central African Republic (≈182%), Mali (≈138%), Sudan (≈136%), South Sudan (≈130%) and Egypt (≈129%) gain most, which is close to the landlocked, high-friction, low-realisation set of Sections 3 and 4; Egypt joins it not for want of a coast but because it realises 0.07 of its own regional potential on above-median delivered cost. The gains thin towards the better-connected coasts, where realisation is already highest and there is less to recover: Botswana gains 19% and Mozambique 25%.

Two cautions belong with the ranking. These are large percentages on small bases, and the Central African Republic's 182% is an uplift on $27 m of realised regional exports, so it transforms that economy's trade profile and changes the continental total hardly at all. And three of the 322 economy-by-lever cells are negative, all three for Angola, where one-stop border posts return −18.6%, corridor upgrading −16.0% and rail −20.4%: four of Angola's routes switch from sea to land once the second port call is charged and pick up four border crossings each, and the gravity equation prices crossings as well as delivered cost while the router minimises delivered cost alone. Angola's own diagnostic carries the full disclosure. Nothing else in the 322 is negative.

Figure 22: Facilitation uplift in intra-African exports, ranked and mapped



Notes: Left: uplift in intra-African exports under the full facilitation package, ranked, all 46 economies. The largest gains accrue to the most constrained economies and are large percentages on small bases. Right: the same uplift mapped. Grey marks the eight African states outside the sample.

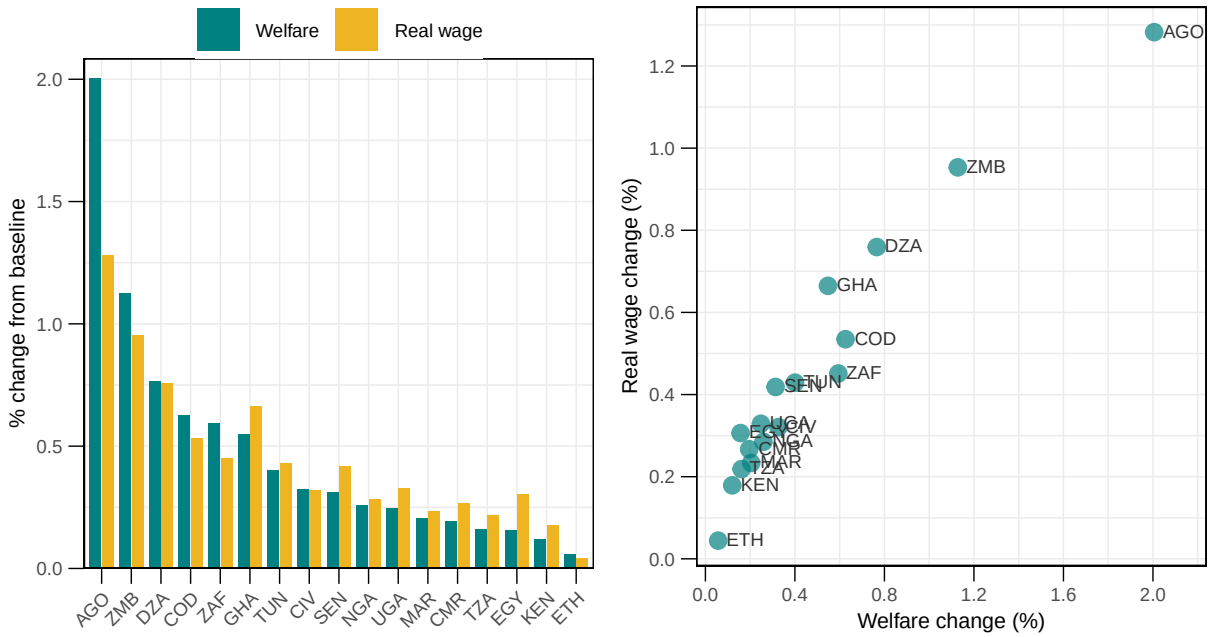
6.3 General-equilibrium welfare, where it is modelled

Trade responses are a means rather than an end, and the welfare question is what the reforms do to real incomes. The Caliendo–Parro general-equilibrium model, calibrated to the same benchmark, answers it by tracing a trade-cost reduction through prices, wages and real consumption (Caliendo and Parro, 2015; Dekle et al., 2008). It solves **17 of the 46 economies**; the other 29 are outside its focus set and enter only through the rest-of-world aggregates, so they are *absent* from the averages rather than scored at zero.

Figure 24 ranks and maps the welfare effect of a 20% cut in intra-African trade costs, the deeper cut the country reports quote. **Zambia (5.9%)**, **Angola (3.6%)**, Tunisia (2.8%), the DR Congo (2.4%) and Ghana (1.9%) gain most, averaging 1.7% across the 17. That ordering is not the facilitation ordering and should not be read as one: across the 17 the welfare gain correlates $+0.46$ with the fill ratio and -0.62 with the facilitation uplift, because welfare follows the volume of regional trade an economy already carries while the uplift follows how far it sits from its own frictionless benchmark. Nigeria,

Egypt and Ethiopia sit at the foot of this ranking and above the continental median on the other. At the shallower 5% cut (Figure 23) the average welfare gain is 0.48% and the average real-wage gain 0.45%; the two move together and every one of the 17 is positive on both, which is the distributionally progressive channel, since wages are the income source of the poor. The two readings support the same programme for different reasons. Trade-cost reduction raises real income in every economy the model solves, and it raises regional trade more where the frictions are higher, though only loosely: the facilitation uplift correlates $+0.27$ with delivered cost across all 46. A corridor and facilitation agenda is therefore defensible on the efficiency argument and on the distributional one, and the two arguments point at different economies. External assessments of the AfCFTA point the same way on a wider margin. The World Bank projects a 7% continental real-income gain by 2035 (Maliszewska and Ruta, 2020) and the IMF reaches comparable conclusions on a different model (Abrego et al., 2019). This model isolates the trade channel, which is the proximate mechanism behind those income gains.

Figure 23: Welfare and real wages under a 5% trade-cost cut

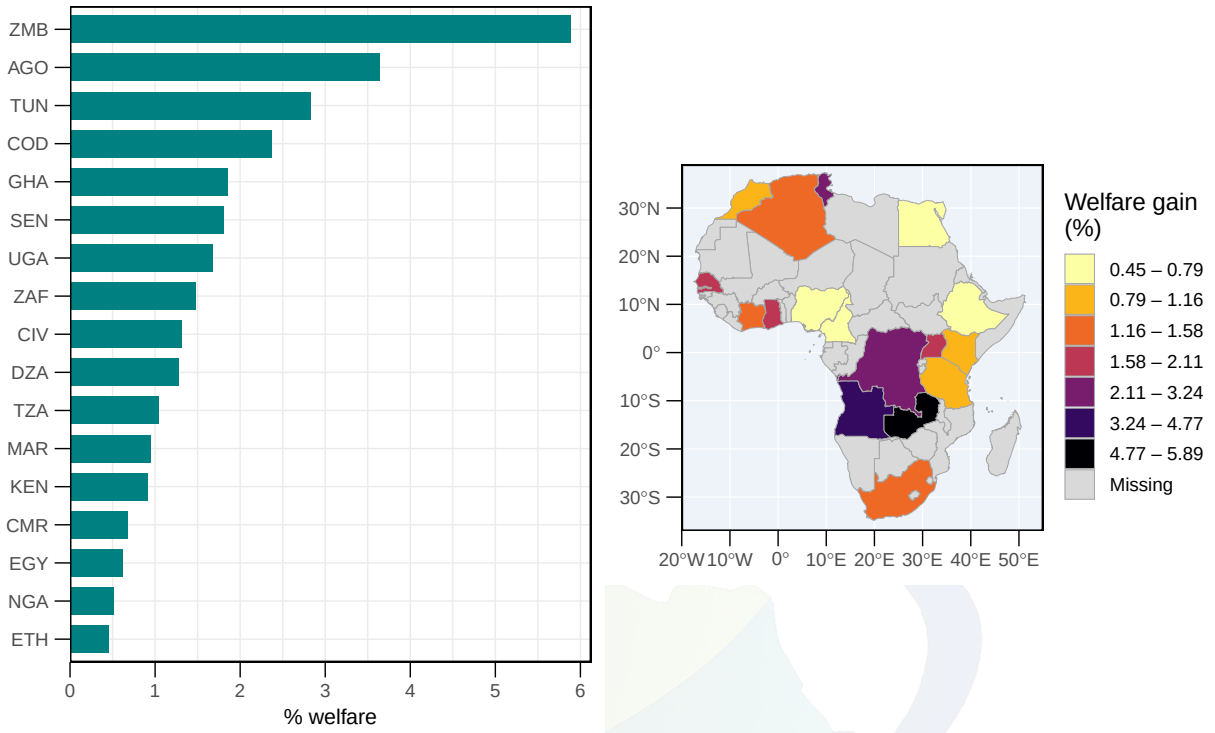


Notes: Left: welfare and real-wage change under a 5% cut in intra-African trade costs, for the 17 economies the Caliendo–Parro model solves; the other 29 of the 46 are outside its focus set rather than scored at zero. Right: the same 17 economies on the two axes at once. All 17 are positive on both, and the two gains are close to proportional, which is what makes the channel distributionally progressive: the real wage is the income source of the poor. The deeper 20% cut of Figure 24 raises the same gains about three and a half times over.

7. Synthesis: A Typology of Binding Constraints

Two questions organise the continent once the diagnostics are laid side by side: *which* constraint binds in each economy, and *whether* the constraints coincide in the same places. To answer the first, each of eight indicators is converted to a within-sample percentile oriented so that higher always means a worse gap, the percentiles are averaged within four domains, and the domains are ranked

Figure 24: Welfare gain from a 20% trade-cost cut, ranked and mapped



Notes: Left: welfare gain from a 20% cut in intra-African trade costs, ranked, for the 17 African economies the Caliendo–Parro model solves. Right: the same gains mapped; the other 29 of the 46 are shaded as missing, which is an absence of a modelled value and not a zero. Grey marks the eight African states outside the sample.

against one another for every economy. The *realisation gap* is the outcome being explained, from the fill ratio. The three constraint domains are *logistics friction* (delivered cost, transit time, border crossings), *structural dependence* (import dependence, rest-of-world input share, foreign value added in exports) and *bottleneck exposure*, the Value-Chain Bottleneck Index of the economy's most systemic commodity, which is itself built from forward linkage, network betweenness, supplier concentration and import dependence. The composite index is the mean of the four domains, scaled to 0–100.

Three exclusions are deliberate. The domestic value-added share never enters, because it is a commodity signature rather than a gap and because Sudan's 106% breaks any monotone orientation; the foreign share carries the value-added channel inside the dependence domain instead. Logistics performance never enters either, because the gravity model's fixed effects absorb everything country-level exactly, so it has no standing in an index built on those estimates, and it is unavailable for South Sudan. And the fourth domain carries the bottleneck index alone. It used to average that index with two concentration measures that share no signal with it or with each other, one of which it already contains (Section 7 sets out the correlations). Dropping them leaves eight indicators and moves twelve of the 46 between classes. Landlockedness is reported as a column and never used as a rule. That is a deliberate departure from the earlier classifier in this series, which made "landlocked *or* cost above the 60th percentile" a disjunction. The disjunction placed coastal South Africa in the corridor group on a margin of a third of a percentage point, alongside Burundi and the Central African Republic.

7.1 Regional patterns

Regional medians on the five United Nations macro-regions (Table 3) show the coarse structure, and they are the cut that makes this synthesis comparable with the infrastructure diagnostic for the same continent. Northern Africa realises least of its regional potential (median fill 0.08) and pays most to move goods (21.3%); Southern Africa realises most (0.21) and needs the facilitation package least (+58%); Western Africa carries the highest import dependence (23%) and Central Africa the lowest (13%). Annex C sets the two regional cuts against each other for readers who need to move between them.

Table 3: Structural and integration indicators by United Nations macro-region

Macro-region	n	Fill ratio	Imp. dep. (%)	DVA (%)	Uplift (%)	Cost (%)	Missing ($bn)
Northern Africa	6	0.08	16	80	82	21.3	154
Western Africa	14	0.10	23	75	94	16.8	129
Eastern Africa	15	0.13	15	67	81	17.0	49
Central Africa	8	0.15	13	81	99	16.0	24
Southern Africa	3	0.21	18	73	58	17.8	143

Notes: Medians across the economies in each of the five United Nations M49 macro-regions, except missing trade, which is summed; M49's "Middle Africa" is labelled Central Africa here. South Sudan is placed in Eastern Africa rather than the Northern Africa its M49 code implies, following the practice of the companion infrastructure diagnostic. "Cost" is the average delivered transport cost to African markets. The eight African states outside the sample are not counted in any row, which is why Southern Africa has three members.

7.2 A composite index and a binding constraint

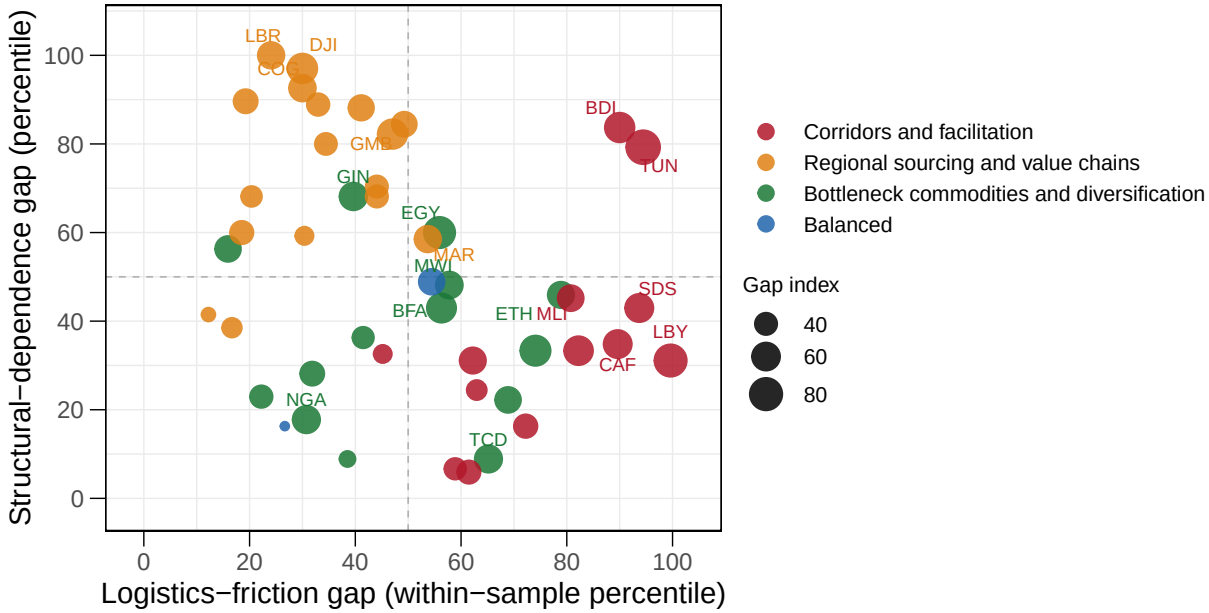
Figure 25 places each economy in the space of its logistics-friction and structural-dependence gaps, sized by the composite index and coloured by which of the three constraint domains binds hardest. The corners are informative. The upper left holds the economies whose problem is what they buy rather than how far it travels: Liberia, Djibouti, Congo, Somalia, The Gambia and Mauritania combine very high dependence with middling or low friction. The lower right holds the mirror image, the high-friction interior and North African economies, Libya, Algeria, Chad, Niger, Rwanda and South Sudan among them, whose supplier structure is unremarkable but whose goods cannot move. Burundi and Tunisia sit in the upper right with both, Egypt and Morocco more marginally, and Tunisia carries the widest composite gap on the continent.

Aggregating the domains gives an ordering, and Figure 26 draws it for all 46. The headline is read off the **35 economies that carry their own GTAP region**, because an index computed on a composite's coarser structure is not comparable with one computed on a dedicated region; the other eleven are drawn hollow in the same ranking and are reported but not ranked against it. On that comparable core **Tunisia (87.3), Egypt (74.5), Ethiopia (69.6), Burkina Faso (65.4) and Mali (63.6)** sit highest and **Tanzania (20.7), Gabon (23.4), the DR Congo (26.3), Zimbabwe (30.0) and Namibia (30.2)** lowest. Of the eleven spliced economies, Libya (79.4), Djibouti (67.3) and Burundi (66.8) would stand second, fifth and sixth were they ranked with the rest. The classification splits the continent into

13 economies bound by corridors and facilitation, 17 by regional sourcing and value chains, 14 by bottleneck commodities and diversification, and two, Madagascar and Tanzania, in which the three domains fall within twelve points of each other and no single constraint leads (Table 4).

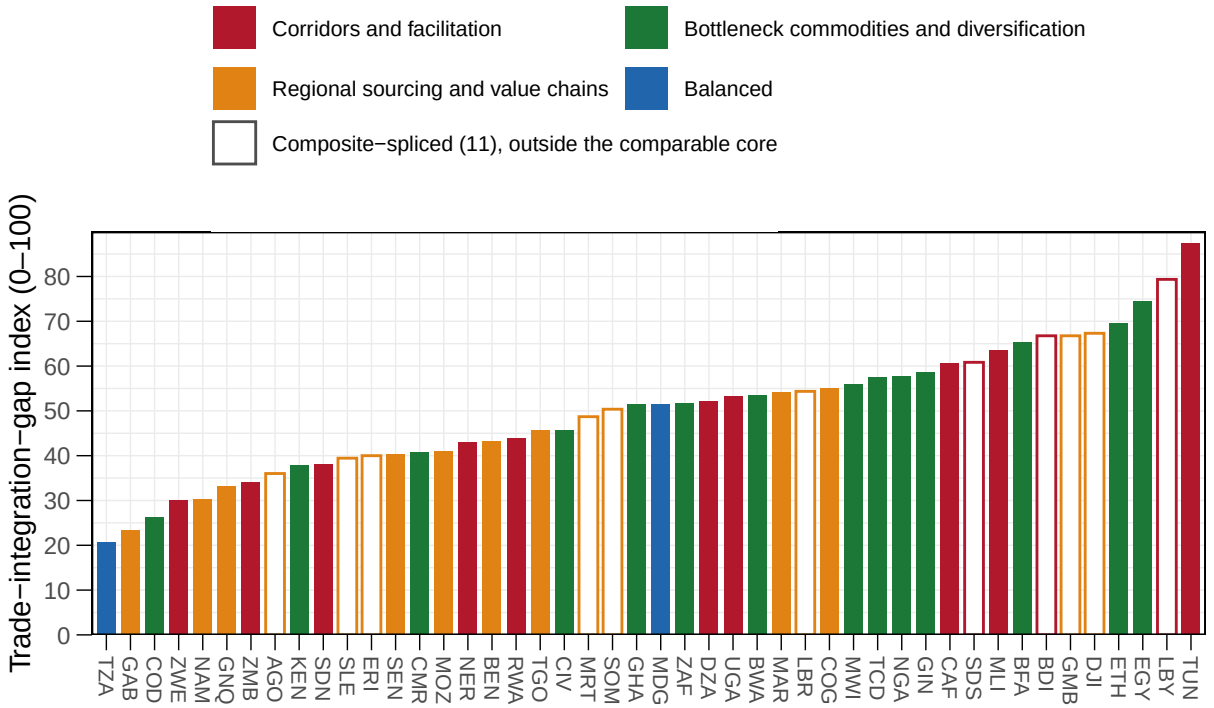
Three diagnostics belong with the classification rather than in a footnote. It recovers geography without being told any: **nine of the 14 landlocked economies fall in the corridors class** although landlockedness is never a rule, and the other five, Botswana, Burkina Faso, Chad, Ethiopia and Malawi, fall in the bottleneck class, so **no landlocked economy is classified as a supplier-network problem**. It agrees with the earlier four-class classifier in this series on **58.7%** of the panel where the two share a class. The disagreements are informative: of the 22 economies the earlier rule sent to "corridors and facilitation" on its landlocked-or-expensive disjunction, 13 stay there and seven move to the bottleneck class. The two classes that rested on a hard 0.85 cut-off in the domestic value-added share distribute across the new classes, as that share has no monotone claim to make. And the basis test that the earlier specification failed, this one passes: **the eleven economies spliced from a GTAP composite no longer score differently** from the 35 with their own region, a median index of 54.4 against 51.4 with a rank-sum p of 0.20, where the four-indicator fourth domain put them at 56.1 against 46.9 with $p = 0.016$. Two of the indicators that domain has dropped were export and supplier concentration, which a small, thinly resolved economy scores high on close to by construction, so part of what read as a basis effect was one. A null result on eleven observations is weak evidence of comparability rather than proof of it, which is why the headline ranking is still read off the 35.

Figure 25: Typology of binding constraints



Notes: All 46 economies, each in the space of its logistics-friction gap and its structural-dependence gap, both within-sample percentiles from 0 to 100, sized by the composite index and coloured by which of the three constraint domains binds hardest. The third domain, bottleneck exposure, is on neither axis, which is why some economies far from the upper right carry its colour. Dashed lines mark the sample midpoints; labels are the widest gaps and the axis extremes.

Figure 26: Composite trade-integration-gap index, all 46 economies



Notes: The composite trade-integration-gap index, the mean of the four domain-gap percentiles scaled to 0–100, for all 46 economies, ranked from narrowest on the left to widest on the right and coloured by binding constraint. Solid bars are the 35 economies with their own GTAP region, the comparable core the highest and lowest statements in the text are read off; hollow bars are the eleven spliced from a composite region, in the same ranking and their own class colour but outside that core. Percentiles are taken over all 46, so the heights are on one scale; what is not comparable between a hollow bar and a solid one is the structure the score is computed from. The index is a relative screening measure within this sample and not an absolute standard. Against the earlier four-class rule in this series, its 22 “corridors and facilitation” economies split 13 / 1 / 7 / 1 across the four classes here, its 16 “regional sourcing” economies 0 / 14 / 2 / 0, its four “beneficiation” economies 0 / 1 / 2 / 1 and its four “diversification” economies 0 / 1 / 3 / 0.

Table 4: The twenty widest composite gaps and their binding constraint

Economy	Region	Index	Real.	Fric.	Dep.	Bott.	Binding constraint
Tunisia	Northern	87.3	91	94	79	84	Corridors
Libya †	Northern	79.4	96	100	31	91	Corridors
Egypt	Northern	74.5	84	56	60	98	Bottlenecks
Ethiopia	Eastern	69.6	78	74	33	93	Bottlenecks
Djibouti †	Eastern	67.3	53	30	97	89	Sourcing
Burundi †	Eastern	66.8	93	90	84	0	Corridors
Gambia †	Western	66.8	64	47	82	73	Sourcing
Burkina Faso	Western	65.4	80	56	43	82	Bottlenecks
Mali	Western	63.6	89	82	33	50	Corridors
South Sudan †	Eastern	60.8	98	94	43	9	Corridors
Central African Rep.	Central	60.6	100	90	35	18	Corridors
Guinea	Western	58.6	49	40	68	78	Bottlenecks
Nigeria	Western	57.7	82	31	18	100	Bottlenecks
Chad	Central	57.4	87	65	9	69	Bottlenecks
Malawi	Eastern	55.9	22	58	48	96	Bottlenecks
Congo	Central	55.1	31	30	93	67	Sourcing
Liberia †	Western	54.4	67	24	100	27	Sourcing
Morocco	Northern	54.2	71	54	59	33	Sourcing
Botswana	Southern	53.4	2	79	46	87	Bottlenecks
Uganda	Eastern	53.3	62	62	31	58	Corridors

Notes: The 20 economies with the widest composite trade-integration gap, of 46. “Real.”, “Fric.”, “Dep.” and “Bott.” are the within-sample percentiles from 0 to 100 of the realisation, logistics-friction, structural-dependence and bottleneck-exposure gaps. The binding constraint is the highest of the three constraint domains; the realisation gap is the outcome being explained and is not a candidate. “Balanced” means the three constraint domains fall within twelve percentile points of each other. A dagger marks an economy spliced from a GTAP composite region: its index is on the same scale but is computed from a coarser structure, so it is outside the comparable core of 35 the highest and lowest statements in the text are read off. Region is the United Nations macro-region. The full 46-economy table is Annex B.

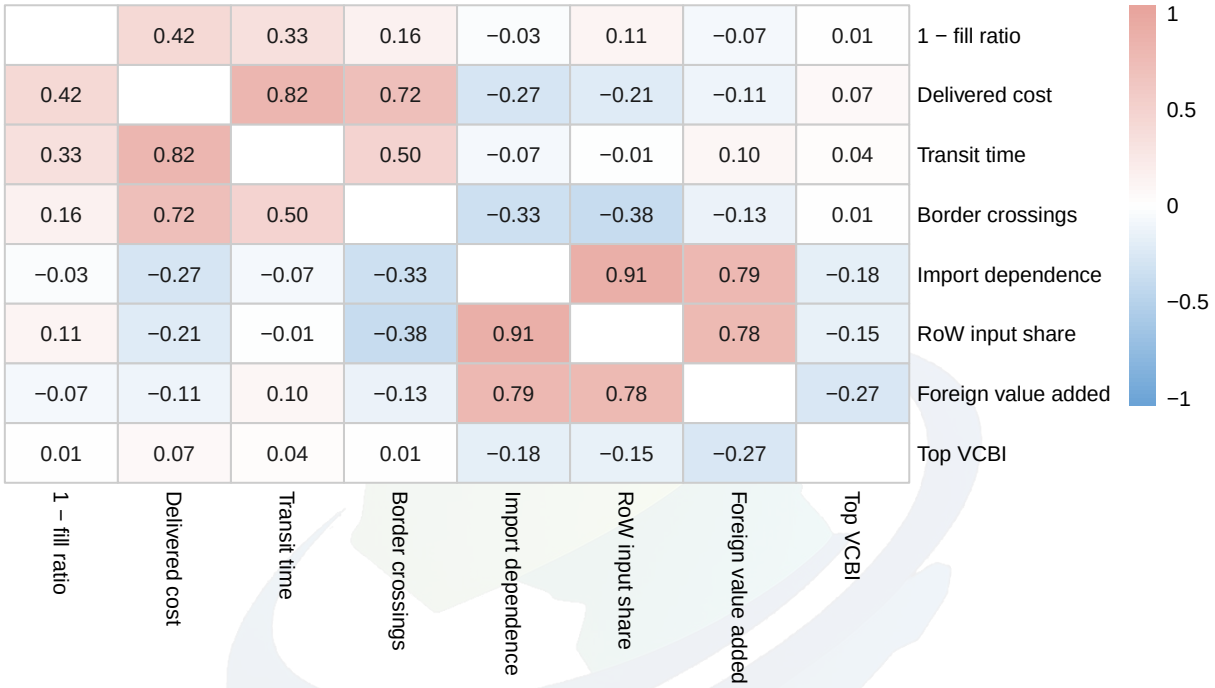
7.3 Do the gaps coincide?

Partly, and the pattern is policy-relevant (Figure 27). The two domains that average three indicators are internally coherent: delivered cost, transit time and border crossings move together at correlations of 0.50 to 0.82, and import dependence, the rest-of-world input share and foreign value added at 0.78 to 0.91. Each measures one thing, which is what licenses averaging its indicators. The other two domains carry one indicator each and need no such licence, and that is why the fourth is built the way it is. Its former companions, the supplier concentration of the leading bottleneck commodity and the economy’s export concentration, correlate with the bottleneck index at -0.12 and -0.08 and with each other at $+0.06$. Averaged, the three produced a domain score that meant “exposed on at least one of three unrelated counts” and decided a class for ten economies on it.

Across domains the useful findings are the signs. The realisation gap correlates **+0.45** with logistics friction, which is the same relationship Figure 11 draws at economy level and the empirical core of this report. It is essentially uncorrelated with structural dependence (-0.04). Logistics friction is *negatively* correlated with structural dependence (-0.25): the economies that pay most to move goods are not the ones that buy most from abroad, because high friction suppresses imports as effectively as it suppresses exports. And bottleneck exposure is close to orthogonal to all three ($+0.08$, $+0.14$ and

−0.17), which is exactly what a fourth domain has to be to be worth having. That orthogonality is exactly why the typology is worth having. An economy can be expensive to reach and self-supplying, or cheap to reach and wholly dependent, and the instrument that helps is not the same one.

Figure 27: Do the trade-integration gaps coincide?



Notes: Cross-economy correlations among the eight underlying indicators, over all 46 economies, oriented so that higher always means a worse gap; red is positive and blue negative, and the diagonal is left blank. The friction indicators and the dependence indicators each co-move strongly, which licenses averaging each trio into a domain. The realisation gap and bottleneck exposure carry one indicator each and are not averages. The top bottleneck index is close to orthogonal to everything else here, which is why it earns a domain rather than a column.

8. Policy Priorities and Conclusion

This diagnostic ranks where the returns to attention are highest, and in which instrument, across 46 economies measured the same way. It does not prescribe projects.

8.1 Five priorities

1. **Dismantle non-tariff barriers and harmonise standards first.** It is the largest single lever at +51%, about two-thirds of the full package on its own, and one of only two single instruments this model can show to be larger than tariff removal at conventional confidence, the other being port efficiency. It is also the cheapest in capital terms, because standards, sanitary and phytosanitary procedures, licensing and rules of origin are administrative rather than civil-engineering problems, and it binds on every one of the 46 economies regardless of which domain leads its typology: the non-tariff lever is positive in all 46, from +12% in Botswana to +105% in the Central African Republic.

2. **Sequence the rest by the binding constraint, not uniformly by instrument.** The typology assigns each economy a first-order domain. Corridors and gateways lead for the 13 friction-bound economies, nine of them landlocked, whose delivered cost has a median of 21.0% of cargo value against a continental 17.0% and runs to 29.6%, and whose facilitation uplift has a median of 69% and runs to 182%. Regional supplier development leads for the 17 dependence-bound economies, where the median economy imports 26% of its intermediate absorption against a continental 16% and the range runs to 56%, and not one of which is landlocked. Bottleneck commodities lead for the 14 exposure-bound economies, whose leading commodity scores 0.47 to 0.65 on the bottleneck index against a panel median of 0.47, so their exposure runs through input lines that are both widely depended on and thinly supplied. A continental programme that treats every economy as a corridor problem misallocates against this map.

3. **Fix the gateways that carry the load as well as the ones that are slow.** The two rankings in Figure 13 barely overlap. The Zambia–DR Congo, Tanzania–Zambia and Niger–Chad crossings impose two to three days each and sit on the corridors that carry the most trade, so one-stop border posts and digital customs there buy time directly. Tanger Med, Djibouti, Douala, Mombasa and Dar es Salaam carry the network rather than the delay, so capacity and redundancy there buy resilience. Three corridors route 70% of all modelled corridor trade, a concentration no continental network should accept.

4. **Build the regional supplier base around the bottleneck commodities.** Petroleum and coal products, machinery and equipment, motor vehicles and parts and chemical products are the four largest extra-African input leakages, and they are no dearer than the average commodity to move regionally, at trade-weighted frictions of 9.4% to 11.8% against a median of 11.4% across the commodities that trade within Africa at all. Freight is therefore not what separates them from the inputs Africa does supply itself, which points the constraint at supplier capability, and they are the most direct lever on the 4.6% of intermediate demand currently met from African partners. Under the full package that share moves by only 1.7 percentage points, which is the measure of how much of this agenda facilitation alone will not deliver.

5. **Treat tariff liberalisation as the legal foundation rather than the growth lever.** The estimated tariff effect is near zero with a 95% interval from -5.4% to $+9.7\%$, which on a single 2017 cross-section with exporter and importer fixed effects is as much as the data can say, and this report reads it neither as a demonstration nor as a dismissal. What it does provide is the legal framework within which the other four priorities are negotiated, scheduled and enforced, and without which they have no vehicle.

8.2 Sequencing

The four instruments compose, and the order in which they arrive changes what each is worth. In the first years the binding constraints are administrative and can be moved administratively: the non-tariff and standards agenda, one-stop border posts and digital customs at the slowest crossings, and the

payments and trade-finance infrastructure without which a regional supplier cannot be reached or paid, alongside the scheduled tariff liberalisation that gives all of it a legal frame. In the middle years the capital programme follows the load: the corridors and gateway ports that carry 70% of modelled corridor trade, climate-proofed and given redundant routing, and the processing and supplier capacity around the bottleneck commodities, anchored by reliable power. Later the two converge, as regional value chains consolidate across borders and African production moves downstream. The principle holds for every group: facilitation enables value chains, and value chains justify facilitation.

8.3 Caveats and appropriate use

These are screening results, not project appraisals, and four limits bound them. **The tariff elasticity is identified but weak.** Measured from the cube's own duty records it estimates -0.0035 with a 95% interval of -0.029 to $+0.022$, so the claim that facilitation dominates tariff removal holds at conventional confidence for non-tariff and standards reform, for port efficiency and for the combined package; for the corridor, rail and border-post levers it rests on the external literature. A single 2017 cross-section with exporter and importer fixed effects leaves no exogenous tariff variation, and no re-estimation will change that. **The sourcing model is calibrated**, so it has nothing to say about the right level of regional sourcing: its baseline equals the observed share by construction and it answers only how far that share moves when frictions fall. It also has **no tariff channel at all**, its friction matrix being transport cost only, so its zero response to tariff removal is a structural blind spot and not evidence about tariffs. **The general-equilibrium model covers 17 of the 46 economies**, so its averages describe that subset. And **the panel covers 46 of the 54 African states**, with 9.6% of intra-African trade on the cube running to a partner outside it.

The value of the exercise is comparative, and the country diagnostics should be consulted before any of these priorities is turned into a plan.

A. Data, Models and Reproducibility

Models and data. On the coverage stated in Section 1, the assessment is built on the **GTAP Africa V3** multi-region input–output cube (Aguiar et al., 2022), 62 regions by 65 commodities benchmarked to 2017, a calibrated African trade-corridor and port network of 17 corridors, 32 ports, 33 border crossings and 78 nodes, and World Bank development and logistics indicators (World Bank, 2024; Arvis et al., 2023). The five model families are applied identically to every economy, so the country diagnostics are methodologically comparable and aggregate consistently to the continent. Of the 46 economies, 35 carry their own GTAP region and 11 are spliced out of one of four composites; the composites contribute within-composite shares only, levels come from GTAP, and the residual is zero by construction.

A change of data basis, and a re-specification. Earlier editions of this series were computed on a global multi-region supply-and-use table described in those documents as a hybrid account, and are now computed on GTAP Africa V3 itself. That change is material and is not a refinement: measured

intra-African trade falls from roughly $240 bn to about $71 bn, Sudan's share of intra-African exports falls from 23% to **1.1%**, and South Africa becomes the largest African market for ten economies. A second, narrower re-specification in September 2026 moved every friction-dependent number here. Port dwell time is now priced into delivered cost at the value of time, as border waiting already was, and on both port calls of a maritime movement rather than one, which raised the mean delivered cost from 10.9% to **18.2%**, raised the frictionless benchmark with it, and lowered every fill ratio: the highest is now 0.45 rather than 0.55 and the median 0.12 rather than 0.16. The same fix corrected the sign of the border-crossing coefficient, made it significant for the first time, and turned port efficiency from a structural zero into the second-largest single lever, and the sourcing component was rebuilt from a least-cost linear programme into a calibrated Armington share. Where an earlier report's prose rested on the superseded numbers, that prose has been rewritten against the current model rather than carried forward.

Known limitations. Four are load-bearing and are stated wherever they matter. The gravity tariff elasticity is identified but statistically indistinguishable from zero on a single cross-section, so tariff scenarios carry a wide interval and should be read neither as a demonstration nor as a dismissal. The sourcing model is calibrated to the 2017 benchmark, so it reports the response of regional sourcing to lower frictions rather than a level, and its friction matrix is transport cost only, so it has no tariff channel and returns no response to tariff removal for structural reasons. The general-equilibrium model solves 17 of the 46 economies. And the composite index of Section 7 is reported for the 35 economies with their own GTAP region, with the eleven spliced from a composite shown alongside and marked. The two groups no longer score differently ($p = 0.20$, against $p = 0.016$ for the specification this edition replaces), but eleven observations cannot establish comparability. One data value exceeds its theoretical ceiling, Sudan's 106% domestic value-added share, and is reported as it stands rather than trimmed.

Reproducibility. The continental data layer regenerates from the model result files in one chain, and this report's panels, tables and new figures regenerate from that layer in a second, single-command chain. The panel is reconciled against the 46 country diagnostics on nine headline scalars each before anything is drawn: fill ratio, missing trade, delivered cost, facilitation uplift, sourcing response, general-equilibrium welfare, top bottleneck commodity, import dependence and domestic value added. Structural diagnostics are deterministic functions of the data. The gravity estimates are fixed-effects Poisson pseudo-maximum-likelihood fits with standard errors clustered two ways on origin and destination, and the general-equilibrium deviations are reported against the model's own baseline, reproducible to solver tolerance. Monetary values are GTAP gross flows, which are larger than official merchandise statistics. Macroeconomic indicators are approximate; every model-derived result is an exact output of the pipeline.

B. Intra-African Trade and Structural Indicators by Economy

Table 5 consolidates the headline indicators for all 46 economies: the fill ratio and missing trade from the gravity model, delivered transport cost from the network model, import dependence and the

most systemic bottleneck group from the value-chain analytics, the domestic value-added share of exports, the facilitation uplift from the scenario engine, the general-equilibrium welfare gain from a 20% intra-African trade-cost cut, and the composite gap index and binding constraint of Section 7. It is the cross-country evidence base from which this synthesis is drawn, and on the seven quantities both documents report it agrees with each economy's own country diagnostic in every case.

Table 5: Intra-African trade and structural indicators, by economy

Economy	Fill ratio	Missing ($bn)	Cost (%)	Imp. dep. (%)	DVA (%)	Bottleneck group	Uplift (%)	CGE (%)	Gap index	Binding constraint
Algeria	0.18	17.5	22.6	17	82	Retail/hosp.	64	1.28	52.0	Corridors
Angola †	0.18	9.8	15.0	19	64	Petro/chem	35	3.64	36.0	Sourcing
Benin	0.14	1.6	14.8	30	81	Agriculture	64	–	43.2	Sourcing
Botswana	0.35	1.4	18.9	18	73	Transport	19	–	53.4	Bottlenecks
Burkina Faso	0.09	4.3	18.5	16	79	Petro/chem	94	–	65.4	Bottlenecks
Burundi †	0.04	0.6	21.0	25	58	Transport	93	–	66.8	Corridors
Cameroon	0.14	3.6	16.0	13	83	Petro/chem	101	0.68	40.7	Bottlenecks
Central African Rep.	0.03	1.0	25.9	12	72	Retail/hosp.	182	–	60.6	Corridors
Chad	0.07	0.7	20.5	8	87	Petro/chem	125	–	57.4	Bottlenecks
Congo	0.16	2.4	17.7	29	45	Utilities	112	–	55.1	Sourcing
Côte d'Ivoire	0.11	17.9	16.2	14	83	Other manuf.	88	1.31	45.6	Bottlenecks
DR Congo	0.29	4.2	16.0	10	86	Agriculture	91	2.37	26.3	Bottlenecks
Djibouti †	0.11	0.5	16.3	49	52	Petro/chem	83	–	67.3	Sourcing
Egypt	0.07	61.6	18.0	16	77	Metals	129	0.62	74.5	Bottlenecks
Eq. Guinea	0.09	1.4	15.7	10	78	Machinery	95	–	33.2	Sourcing
Eritrea †	0.15	0.1	17.0	18	58	Retail/hosp.	105	–	40.0	Sourcing
Ethiopia	0.09	4.2	18.8	15	82	Finance/bus.	117	0.45	69.6	Bottlenecks
Gabon	0.19	1.0	15.8	16	85	Petro/chem	96	–	23.4	Sourcing
Gambia †	0.10	0.2	17.0	26	57	Petro/chem	101	–	66.8	Sourcing
Ghana	0.09	20.2	14.7	19	78	Petro/chem	72	1.85	51.4	Bottlenecks
Guinea	0.13	0.6	16.8	24	73	Utilities	94	–	58.6	Bottlenecks
Kenya	0.19	10.7	16.9	13	81	Other manuf.	79	0.91	37.8	Bottlenecks
Liberia †	0.10	2.2	16.6	56	21	Machinery	100	–	54.4	Sourcing
Libya †	0.04	5.0	29.6	12	82	Petro/chem	73	–	79.4	Corridors
Madagascar	0.13	1.0	18.7	15	78	Finance/bus.	115	–	51.4	Balanced
Malawi	0.18	1.0	16.9	15	67	Retail/hosp.	60	–	55.9	Bottlenecks
Mali	0.07	5.2	21.2	15	78	Agriculture	138	–	63.6	Corridors
Mauritania †	0.11	5.9	17.1	29	60	Other manuf.	120	–	48.7	Sourcing
Morocco	0.09	31.3	17.8	17	67	Finance/bus.	91	0.95	54.2	Sourcing
Mozambique	0.45	2.9	16.1	30	56	Telecom	25	–	41.0	Sourcing
Namibia	0.21	8.2	16.8	21	62	Petro/chem	58	–	30.2	Sourcing
Niger	0.09	6.2	20.3	11	90	Petro/chem	67	–	43.0	Corridors
Nigeria	0.08	55.1	16.8	11	96	Petro/chem	107	0.51	57.7	Bottlenecks
Rwanda	0.11	1.2	19.7	13	86	Petro/chem	65	–	43.8	Corridors
Senegal	0.16	6.3	16.9	22	67	Petro/chem	87	1.80	40.3	Sourcing
Sierra Leone †	0.14	0.3	16.7	26	60	Other manuf.	100	–	39.4	Sourcing
Somalia †	0.10	0.2	16.8	41	63	Retail/hosp.	105	–	50.4	Sourcing
South Africa	0.15	133.0	17.8	11	74	Finance/bus.	62	1.48	51.7	Bottlenecks
South Sudan †	0.04	0.4	22.7	14	65	Other manuf.	130	–	60.8	Corridors
Sudan	0.14	4.9	20.0	6	106	Metals	136	–	38.1	Corridors
Tanzania	0.17	4.4	15.9	14	89	Petro/chem	81	1.05	20.7	Balanced
Togo	0.16	3.0	14.7	34	57	Retail/hosp.	56	–	45.6	Sourcing
Tunisia	0.06	33.5	26.3	22	53	Finance/bus.	69	2.83	87.3	Corridors
Uganda	0.10	13.6	18.6	14	86	Petro/chem	55	1.68	53.3	Corridors
Zambia	0.23	5.4	17.6	12	72	Retail/hosp.	61	5.89	34.1	Corridors
Zimbabwe	0.26	3.1	16.7	14	67	Petro/chem	48	–	30.0	Corridors

Notes: All 46 economies of the panel. Fill ratio and missing trade from the gravity model; delivered cost from the network model, as a percentage of cargo value averaged over the economy's 45 African destinations; import dependence, bottleneck group and the value-added shares from the multi-region input–output analytics; uplift from the scenario engine under the full facilitation package; welfare from the Caliendo–Parro general-equilibrium model under a 20% intra-African trade-cost cut, where a dash means the economy is outside the model's focus set rather than that it gains nothing. The bottleneck group is the broad group of the economy's highest-scoring commodity on

the Value-Chain Bottleneck Index. “Gap index” is the composite of Section 7, scaled 0–100, and “Binding constraint” the highest of its three constraint domains: Corridors, Sourcing, Bottlenecks, or Balanced when the three fall within twelve points of each other. Sudan’s domestic value-added share of 106% exceeds the theoretical ceiling and is an artefact of the cube’s treatment of a small re-exporting economy, reported as it stands. A dagger marks the eleven economies spliced from a GTAP composite region rather than carrying one of their own; they are reported here in full and are outside the comparable core of 35 that Section 7 ranks.

C. Regional Economic Communities and United Nations Macro-Regions

This report uses two regional cuts. The primary one is the Regional Economic Community, because common membership is an estimated friction term in the gravity model and because the AfCFTA’s implementation runs through the blocs. The secondary one is the five United Nations macro-regions, which makes this document comparable with the companion infrastructure diagnostic for the same continent. Table 6 sets them against each other.

Table 6: Primary Regional Economic Community against United Nations macro-region

Primary bloc	North.	West.	East.	Cent.	South.	Total
North Africa (AMU + Egypt)	5	1	0	0	0	6
West Africa (ECOWAS)	0	10	0	0	0	10
Sahel States (AES)	0	3	0	0	0	3
Central Africa (ECCAS)	0	0	0	6	0	6
East African Community	0	0	6	0	0	6
Horn of Africa (IGAD)	1	0	4	0	0	5
Southern Africa (SADC)	0	0	5	2	3	10
Total	6	14	15	8	3	46

Notes: Counts of the 46 economies. Each economy is assigned one primary bloc by the fixed priority order AMU, ECOWAS, AES, EAC, IGAD, SADC, ECCAS, COMESA, and Egypt is reported inside the North Africa row for the reason given with Table 2. Macro-regions are the United Nations M49 classification with “Middle Africa” labelled Central Africa and South Sudan placed in Eastern Africa. The two cuts cross in three places worth noting: Mauritania sits in the Maghreb bloc and in Western Africa, Sudan in the Horn bloc and in Northern Africa, and the Southern African bloc spans three macro-regions.

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