



TRADE DIAGNOSTIC

South Sudan

An assessment of South Sudan's trade structure, competitiveness and AfCFTA integration opportunities using multi-region input–output accounting and CGE simulation.

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

Scenarios: 2017 benchmark; AfCFTA facilitation and trade-cost counterfactuals

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Executive Summary

South Sudan is a landlocked African economy with a GDP of about \$12.0 bn; it is the one African country for which the World Bank publishes no Logistics Performance Index, which is itself a statement about the state of its trade institutions. It is a member of EAC and IGAD and a signatory of the African Continental Free Trade Area (AfCFTA). This assessment applies an integrated spatial–gravity–MRIO–network pipeline — the same used at continental level — to diagnose why South Sudan under-trades, with whom, through which corridors and sectors, and what to do about it (Maliszewska and Ruta, 2020; UNECA, 2021).

- **Intra-African trade is realised only partly.** Actual intra-African exports of about \$16 m fall short of an estimated frictionless potential of \$395 m — a missing-trade gap of \$379 m, a fill ratio of 0.04, among the lowest on the continent.
- **Its largest regional markets** are Uganda (\$9 m), South Africa, Angola and Nigeria (under \$1 m each). Uganda is also where the largest unrealised potential lies, a \$146 m gap — more than a third of the country's entire missing trade — with Algeria (\$40 m) and South Africa (\$35 m) next.
- **Non-tariff and standards reform and port efficiency are the two levers measurably larger than tariff removal.** South Sudan's average delivered transport cost to African markets is about 22.7% of cargo value, one of the highest in this series. Removing tariffs alone is estimated to raise intra-African exports by about 1.3% — a small effect, but measured with a confidence band wide enough to include a substantial gain — while the full AfCFTA facilitation package raises South Sudan's intra-African exports by about 129.6% (NTB/standards 77.9%; port efficiency 17.5%; corridor upgrading 16.1%; rail 12.0%; one-stop border posts 10.8%).
- **Import dependence is concentrated** in oil, accommodation, food and service activities, trade, human health and social work activities, where South Sudan sources inputs from outside Africa even where regional suppliers exist.
- **Regional sourcing is already unusually African, and it is the export side that is undiversified.** The Armington CES sourcing model, calibrated so that its baseline reproduces the observed pattern, puts **44.86%** of South Sudan's imported input demand with African suppliers today — among the highest baselines on the continent — rising to **50.12%** under the full AfCFTA package. That is **+5.26 pp**, the largest movement in percentage points anywhere in this series, but only **+11.7%** in relative terms, below the continental average of +16.5%, because there is less room above a base this high. South Sudan's diversification problem is not where it buys its inputs; it is what it sells.

Recommended reforms, in priority order: (1) dismantle non-tariff barriers and harmonise standards/SPS; (2) complete one-stop border posts and digital customs; (3) upgrade and climate-proof

the priority corridors (Djibouti Corridor) and build corridor redundancy; (4) build value-chain and energy capacity; and (5) implement AfCFTA tariff liberalisation as the enabling foundation.

1. Introduction

South Sudan's trade is shaped by its geography and economic structure. As a landlocked economy dependent on transit corridors and foreign gateway ports over which it has no direct control and a member of EAC, IGAD, its realistic market is its African neighbourhood — yet, like most of the continent, it trades far less regionally than its economic size implies (UNCTAD, 2021). Intra-African trade remains a small share of African economies' total, and the gap is not merely statistical: it means producers forgo nearby markets and fail to build the supplier networks that underpin industrialisation.

The candidate explanations are well known but rarely quantified together: geography and distance; thin, port-oriented infrastructure; border and customs frictions; non-tariff barriers and divergent standards; weak and similar productive structures; and missing regional value chains (Limão and Venables, 2001; World Bank, 2020). This assessment runs all of them on one database, so that South Sudan's constraints can be measured and ranked rather than asserted.

The central question is therefore *why South Sudan under-trades with its neighbours, with whom, through which corridors and sectors, and which interventions deliver the largest gains*. The report answers it through structural diagnostics (Sections 2–9) and forward-looking simulation (Sections 10–11), then ranks the reforms (Sections 12–14). A note on data: monetary values are GTAP gross flows (larger than official merchandise statistics); macroeconomic figures (Section 2) are approximate (World Bank WDI; IMF; national sources); all model-derived results are exact outputs of the pipeline and reproduced in the annex tables.

South Sudan's regional-integration agenda runs through the AfCFTA and its RECs (EAC, IGAD). The AfCFTA — the largest free-trade area by membership in the world — is projected to raise intra-African trade substantially, but the evidence is consistent that the gains come overwhelmingly from trade facilitation and the removal of non-tariff measures rather than from tariff liberalisation, which is already largely accomplished within South Sudan's RECs (Maliszewska and Ruta, 2020; UNECA, 2021). This assessment quantifies, for South Sudan specifically, where those facilitation gains would accrue and how large they could be.

South Sudan is the world's youngest sovereign state, and its trade economy carries every mark of that youth. Independence in July 2011, after decades of war and a referendum in which the overwhelming majority of southerners voted to secede from Sudan, created a country with almost no inherited industrial base, a skeletal road network, and a single overwhelming source of foreign exchange: crude oil. At separation South Sudan took roughly three-quarters of the unified country's oil production but none of the export infrastructure — the pipelines, the refinery at Khartoum, and the terminal at Port Sudan all remained on the northern side of a new international border. From its first day, therefore, the country's defining economic fact was a structural one: it pumps oil it cannot move to market except through the territory of the state it had just left. That dependence is not a detail of the

trade profile; it is the trade profile, and it conditions the diversification-and-stability challenge that this assessment treats as central.

The fiscal arithmetic of independence was brutally simple and remains so. Oil has accounted for the great majority of government revenue and the near-totality of merchandise exports in most years since 2011, leaving the budget hostage to two variables over which Juba has little control — the world oil price and the willingness of Khartoum to keep the pipeline open. This is the textbook configuration of the resource curse compounded by landlocked transit dependence, and South Sudan has experienced it in its most acute form. A 2012 dispute over transit fees led Juba to shut down its own production for more than a year, an extraordinary act of self-denial that demonstrated how little fiscal cushion the new state possessed. The episode foreshadowed a recurring pattern in which the country's single export artery is exposed to bargaining, blockade and, more recently, the spillover of someone else's war.

The civil war that erupted in December 2013 turned a fragile new state into a humanitarian emergency. The conflict, rooted in a political rupture within the ruling movement and quickly mapped onto ethnic and regional fault lines, killed an estimated several hundred thousand people, displaced millions internally and into neighbouring countries, and devastated what little productive capacity had been built. Oil installations in the producing states were damaged and partly shut in; agriculture in conflict zones collapsed; and the economy became, to a degree unusual even by post-conflict standards, an economy of humanitarian transfers and imported relief. The Revitalised Agreement on the Resolution of the Conflict in South Sudan (R-ARCSS), signed in 2018, brought a fragile and repeatedly delayed peace, the formation of a transitional unity government, and a still-incomplete process of integrating armed forces and preparing for elections. Peace, even imperfect, is the precondition for any of the trade gains this report quantifies; sub-national violence, flooding and localised displacement continue to interrupt the corridors and markets on which trade depends.

The pipeline's vulnerability moved from theory to crisis with Sudan's own war. When fighting broke out in Sudan in April 2023 between the army and the Rapid Support Forces, the conflict engulfed the very territory South Sudan's crude must cross. Damage and insecurity along the export pipeline and at the loading facilities repeatedly throttled or halted South Sudanese exports, cutting the government's principal revenue stream at a stroke and exposing, in the most concrete way imaginable, the danger of a single foreign-dependent export route. The episode is the empirical proof of this assessment's resilience argument: a country whose entire export economy passes through one neighbour's pipeline has no redundancy, and a shock to that route is a shock to the state itself.

Alongside oil sits an economy that survives on imports. South Sudan manufactures very little and grows far less food than its fertile land could yield; its towns are supplied by truck convoys of food, fuel, cement, medicines and consumer goods arriving overwhelmingly from Uganda and Kenya. The humanitarian system — UN agencies and NGOs feeding millions — is itself a large importer, and the line between commercial trade, aid logistics and informal cross-border commerce is blurred. The South Sudanese pound has lost most of its value against the dollar, parallel exchange rates have at times diverged sharply from the official one, and inflation has periodically run at levels that erode wages and

savings, all of which makes imported goods dearer and the import-dependent population poorer.

Against this backdrop, South Sudan's accession to the East African Community in 2016 is its most consequential trade-policy decision. EAC membership formalises an integration that already existed in fact — most of the country's imports come from EAC partners, and its natural market is its East African neighbourhood — and offers a framework for the customs harmonisation, corridor cooperation and standards alignment that the model identifies as the binding levers. South Sudan is also an IGAD member and an AfCFTA signatory. The central trade challenge, then, is twofold and inseparable: diversification away from a single transit-dependent commodity toward agriculture, livestock and regional value chains; and stability — political, monetary and physical — without which no diversification strategy can take root. Everything that follows should be read against that twin imperative.

2. Country Economic Structure

2.1 Macroeconomic Profile

Table 1: South Sudan: Macroeconomic profile

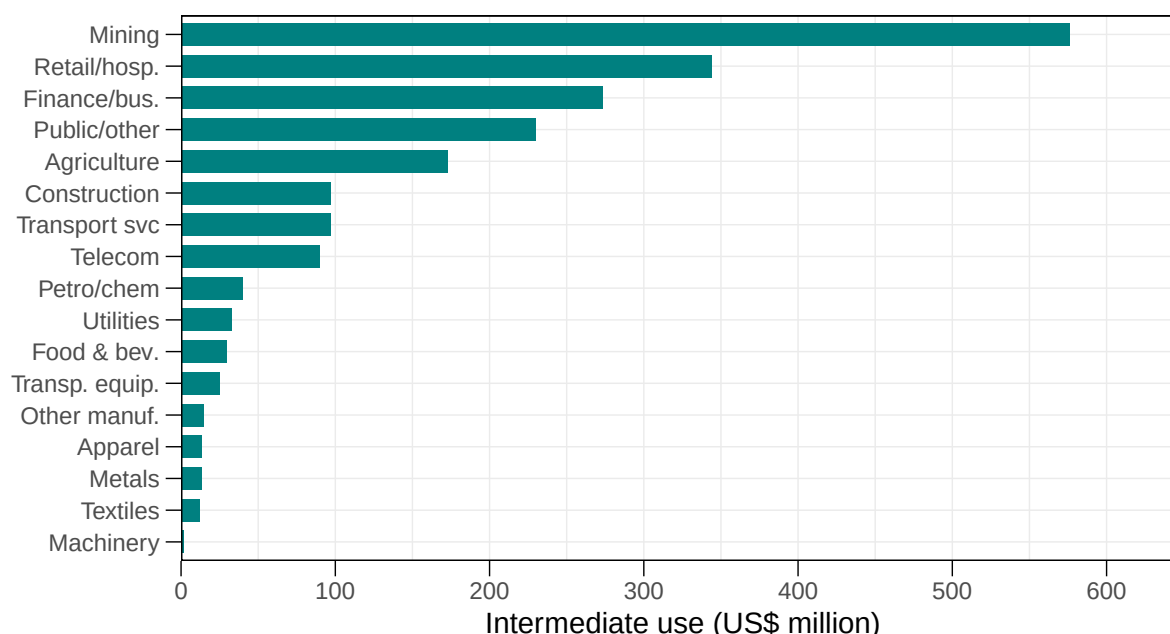
Indicator	Value
Capital	Juba
GDP (approx.)	\$12.0 bn
Population	12.2 million
GDP per capita	\$1080
Logistics Performance Index	— / 5
Landlocked	Yes
REC memberships	EAC, IGAD

Notes: GDP, population and per-capita figures are approximate external estimates (World Bank WDI, IMF and national sources), not model output.

Two structural facts frame everything that follows. First, the delivered cost of moving goods to African markets — 22.7% of cargo value on this model's own accounting, across an average of 2.6 border crossings — makes logistics a first-order constraint, not a footnote; the World Bank publishes no Logistics Performance Index for South Sudan, so the table records a dash rather than a score. Second, its landlocked position means its external trade has no domestic outlet and depends on transit through neighbours and their ports — a dependence the spatial model quantifies in Section 4.

2.2 Sectoral Structure

South Sudan's industrial structure is best read through intermediate input use, which ranks sectors by how much they buy from other industries rather than by value added. Figure 1 sets it out.

Figure 1: South Sudan: sectors ranked by intermediate input use

Notes: The 65 GTAP commodities are aggregated for display into 17 broad groups, weighted by the underlying levels, so no commodity is dropped; the commodity-level table is in Annex C. US\$ million. Intermediate input use is a proxy for activity scale; primary agriculture reads small on this metric because it generates a high share of its value with little purchased input.

Mining tops the chart, and the commodity behind it is crude oil, at \$551 m of purchased inputs (Table 6) — more than twice the next commodity — financial services at \$213 m, the trade margin at \$197 m, human health and social work at \$137 m, construction at \$97 m and telecommunications at \$89 m. The whole economy's intermediate demand is smaller than a single mid-sized sector in most of the countries in this series, which is the first thing to register: South Sudan's input-output structure is an oil enclave attached to a services-and-administration economy, with almost no manufacturing to buy from anyone. Agriculture reads small on this metric, as it does everywhere, because it generates most of its value with little purchased input — but in South Sudan that reflects an unmechanised, largely subsistence sector rather than an efficient one. The sectors at the top of this chart are the ones whose growth would pull hardest on suppliers, and Section 6.2 shows how much of that pull leaves the continent.

2.3 Production Geography

South Sudan's economic geography is organised around its commercial-and-industrial core (the capital region and main cities), its agricultural belts, and the border gateways through which its regional trade physically passes — notably the Djibouti Corridor. As a landlocked economy it is also a transit node: goods bound for its interior neighbours pass through it, making its corridors and borders regionally significant. This geography — a producing core feeding goods outward through a ring of border gateways, while drawing imports inward along the main corridors — is the spatial structure the rest of the report analyses.

3. Trade Profile

South Sudan's economic geography is the geography of the Nile, the oilfields, and the southern border with Uganda and Kenya. Juba, the capital, sits on the west bank of the White Nile in the country's far south, close enough to the Ugandan border to be supplied by road from Kampala and Mombasa rather than from anywhere in its own vast interior. This is a telling fact: the seat of government and the largest concentrated market in the country are oriented southward toward East Africa, not toward the oil-producing north or the Sudanese border through which its exports flow. Juba is the commercial and administrative core, the destination of the import convoys, the hub of the humanitarian operation, and the node from which the country's thin road network radiates. It is also, by regional standards, a small and infrastructure-poor capital, with intermittent power, limited paved streets, and a port-of-entry function for goods rather than a manufacturing base.

The oil wealth lies far to the north, in Unity and Upper Nile states. The producing fields cluster around the Paloich/Palouge area of Upper Nile and the older fields of Unity (around Bentiu), regions that are physically and politically distant from Juba and that bore much of the heaviest fighting of the civil war. Crude gathered here is fed into the export pipeline that runs north across the international border to the Sudanese network and ultimately to the marine terminal at Port Sudan on the Red Sea. The spatial logic is stark: the country's only significant export earner originates in its most conflict-exposed region and exits through a foreign country, while the population and the demand for imports concentrate hundreds of kilometres to the south. No domestic infrastructure links the two economies of oil and consumption into a coherent national market.

Between these poles lies a country defined by water, grass and cattle. The White Nile and its tributaries, and the immense seasonal wetland of the Sudd — one of the largest swamps in the world — dominate the centre of the country, fragmenting the terrain, flooding huge areas in the rainy season, and making year-round road transport across much of the interior impossible. The central and eastern plains are cattle country, home to pastoralist communities for whom livestock is wealth, social currency and livelihood; the national cattle herd is large, but it is an asset held largely outside the formal market, moved on the hoof and rarely processed or exported through formal channels. Cattle-related competition over pasture and water is itself a recurrent source of the local insecurity that disrupts trade.

The agricultural promise of South Sudan is concentrated in the Equatorias. The three Equatoria states in the south — the green, higher-rainfall belt along the Ugandan and Congolese borders — are the country's breadbasket in potential if not in fact, capable of producing maize, sorghum, cassava, groundnuts, fruit and, historically, cash crops. This is the land that makes the import-substitution case so compelling: a country that imports staple food from Uganda sits next to some of the most fertile farmland in East Africa, underused because of insecurity, displacement, the absence of feeder roads, and the collapse of input and output markets during the war. The Equatorias are also where the cross-border trade with Uganda is densest, because the same fertile zone that could feed the country is the zone closest to its main supplier.

The border towns are where the trade economy is most visible. Nimule, on the Uganda border astride the Juba road, is the country's principal commercial gateway — the point through which the great majority of imported goods enter, the site of the main customs post, and the chokepoint whose efficiency or congestion sets the pace of national supply. Kaya, further west on the Uganda–DR Congo frontier, is a second crossing handling its own stream of goods. To the southeast, the route toward Kenya runs to the frontier at Nadapal, the crossing on the road toward Lokichoggio and the Kenyan interior, offering an alternative line to Mombasa that does not pass through Uganda. These towns — Nimule above all — are not minor border posts; they are the physical valves of an import-dependent economy, and their handful of kilometres of road, bridge and customs shed carry a weight out of all proportion to their size. The country's trade geography, in short, is a long thin axis from the southern border crossings up to Juba, a separate oil enclave in the far north, and a vast, watery, lightly governed interior in between.

3.1 Export Structure

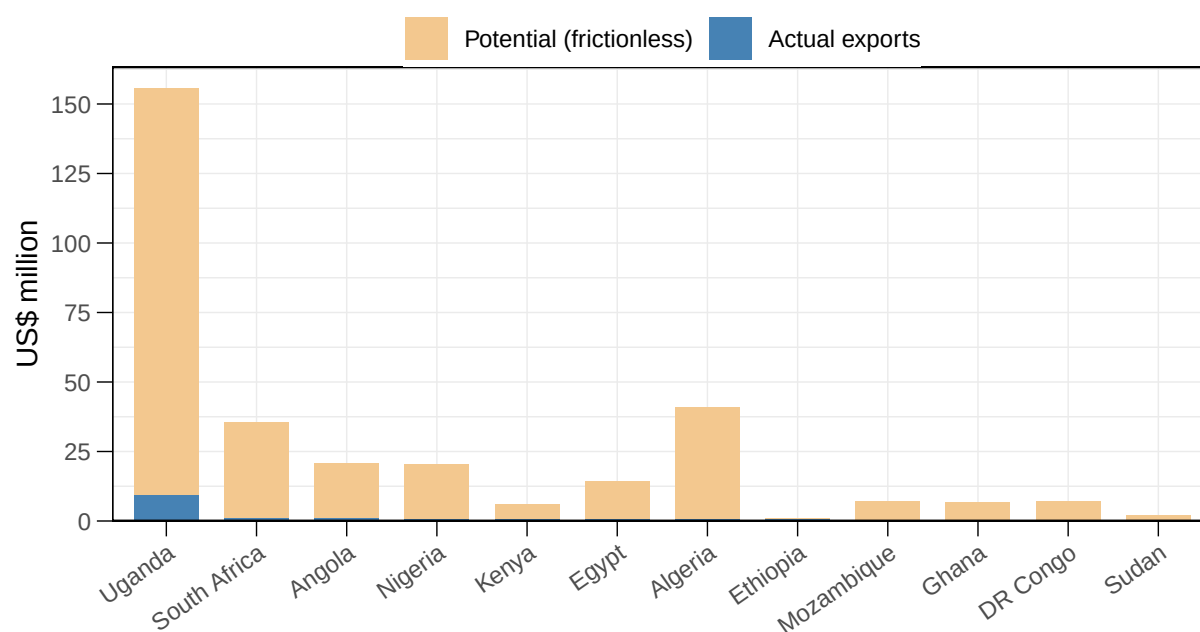
South Sudan's exports combine its primary-commodity and agricultural base with a growing range of regional manufactures and processed goods. In the MRIO gross accounts its productive export base — the part with the clearest regional growth potential — is concentrated in the sectors where it holds comparative advantage (Section 7); its single largest African market is Uganda. The orientation of the export base, between its African neighbourhood and the rest of the world, is discussed in Section 3.4 below.

3.2 Import Structure

South Sudan's imports are dominated by goods it does not yet produce at scale — refined fuels, machinery and electrical equipment, vehicles, pharmaceuticals, chemicals and fertilisers, iron and steel, and (for many economies) staple foods. By origin these come overwhelmingly from outside Africa — China, India, the Gulf and Europe — plus a few regional partners. This import structure is the source of the import-leakage that the MRIO analysis (Section 6.2) identifies as a regional-sourcing opportunity, and it ties South Sudan's production costs to extra-African supply chains and shipping margins, so that cheaper logistics act like an economy-wide productivity gain.

3.3 Intra-African Trade

South Sudan's regional exports concentrate in a handful of neighbouring markets. Figure 2 sets out, for each, the gap between actual exports and the frictionless gravity potential.

Figure 2: South Sudan: largest intra-African export markets

Notes: Actual exports (blue) against frictionless gravity potential (orange), US\$ million. The orange extension is unrealised potential.

Uganda is the largest single market at \$9 m actual against a potential of \$156 m — a \$146 m gap that is more than a third of South Sudan's entire \$379 m of missing trade — and no other partner reaches \$2 m of actual exports. The next-largest gaps are Algeria (\$40 m) and South Africa (\$35 m), neither of which South Sudan trades with in any meaningful way today. Ethiopia is the instructive exception: at 4.0% ad-valorem it is by far the cheapest market South Sudan can reach, and the only one with which it trades anywhere near the model's benchmark, but the volumes involved are under \$2 m. Because South Sudan's regional trade is this concentrated on a single neighbour, a facilitation effort targeted on the Juba–Nimule–Kampala axis, rather than broad and undirected liberalisation, is what would move the country's continental trade aggregate.

The ranked partners and the size of each gap are:

Table 2: South Sudan: Intra-African export partners: actual, gravity potential and missing trade

Partner	Actual	Potential	Missing	Ad-valorem cost
Uganda	\$9 m	\$156 m	\$146 m	22.5%
South Africa	\$1 m	\$36 m	\$35 m	23.0%
Angola	\$1 m	\$21 m	\$20 m	20.7%
Nigeria	\$1 m	\$20 m	\$20 m	23.7%
Kenya	\$1 m	\$6 m	\$5 m	20.1%
Egypt	\$1 m	\$14 m	\$14 m	20.0%
Algeria	\$1 m	\$41 m	\$40 m	28.7%
Ethiopia	\$1 m	\$1 m	\$0 m	4.0%

Notes: Gravity potential is the frictionless benchmark; missing trade is the difference. Ad-valorem cost is delivered transport cost as a share of cargo value. Values are GTAP gross flows and exceed official merchandise statistics.

South Sudan's export structure is among the least diversified in the world, and the assessment's framework must be read with that reality in the foreground. In any honest accounting of the country's foreign sales, crude oil is not merely the largest item — it is very nearly the only item. Petroleum has typically represented the overwhelming majority of merchandise exports and the bulk of government revenue, so that the country's terms of trade, its fiscal space and its currency all move with the oil price and with the operability of the single northern pipeline. The model's gross MRIO accounts and its gravity estimates necessarily abstract toward a more diversified African export profile than South Sudan actually possesses; the figures should therefore be read as describing the structural potential and the friction landscape rather than the current, oil-dominated reality. The honest summary of South Sudan's exports is one commodity, one route, one buyer-of-last-resort in the international oil market, and almost nothing else moving through formal channels.

Beyond oil, the country's tradable production is real but largely informal and unmeasured. South Sudan has a genuine, if modest, base of non-oil exportables that rarely appear in official statistics. Gum arabic — the hardened sap of acacia trees, a commodity in which Sudan and South Sudan together form a significant share of world supply — is tapped across the country's drylands and has historically moved north into the Sudanese trading networks; it is a natural, climate-resilient export with established global demand in the food and pharmaceutical industries. Livestock leaves the country on the hoof, particularly toward Sudan and across the eastern borders, in flows that are large in head count but almost entirely informal and undocumented. Timber and forest products, including teak plantations established in the Equatorias in the colonial era, represent a further export with real value but also real governance and sustainability risks. None of these has been developed into a formal, traceable, quality-assured export chain, and that gap — between latent comparative advantage and realised, recorded trade — is the diversification opportunity the country's strategy must seize.

The import structure is the mirror image: comprehensive, vital and concentrated on two neighbours. South Sudan imports virtually everything its towns consume. Refined fuels are imported even though the country exports crude, because it has no functioning refinery of meaningful scale — a paradox that captures the absence of domestic value addition as sharply as any statistic could. Food is imported in large quantities, including staples that the Equatorias could grow, because conflict, flooding and the collapse of rural markets have left domestic production far below potential. Cement, construction materials, machinery, vehicles, medicines, processed foods, beverages and the full range of manufactured consumer goods all arrive from outside. The annex sourcing tables show the pattern at sector level — heavy rest-of-world shares in metals, electrical equipment, mining inputs and agriculture — but the lived reality is even more concentrated than those continental averages suggest.

By origin, South Sudan's import economy runs through Uganda and Kenya above all others. Uganda is the dominant supplier, exporting food, beverages, cement, construction materials and manufactures southward into Juba and the border markets; for Ugandan exporters, South Sudan has at times been one of their most important regional markets, a relationship visible in the dense truck traffic on the Kampala–Nimule–Juba road. Kenya supplies fuel, manufactured goods and services routed up the Northern Corridor from Mombasa. Beyond East Africa, the country draws machinery,

vehicles and equipment from China, India and the Gulf, and it remains tied to Sudan through the historical trading links of the north and the gum and livestock flows. The intra-African import annex, which ranks Nigeria, Ethiopia and others highly in the model's gross accounts, should again be read as the structural friction map rather than the bilateral reality, which is overwhelmingly Ugandan and Kenyan.

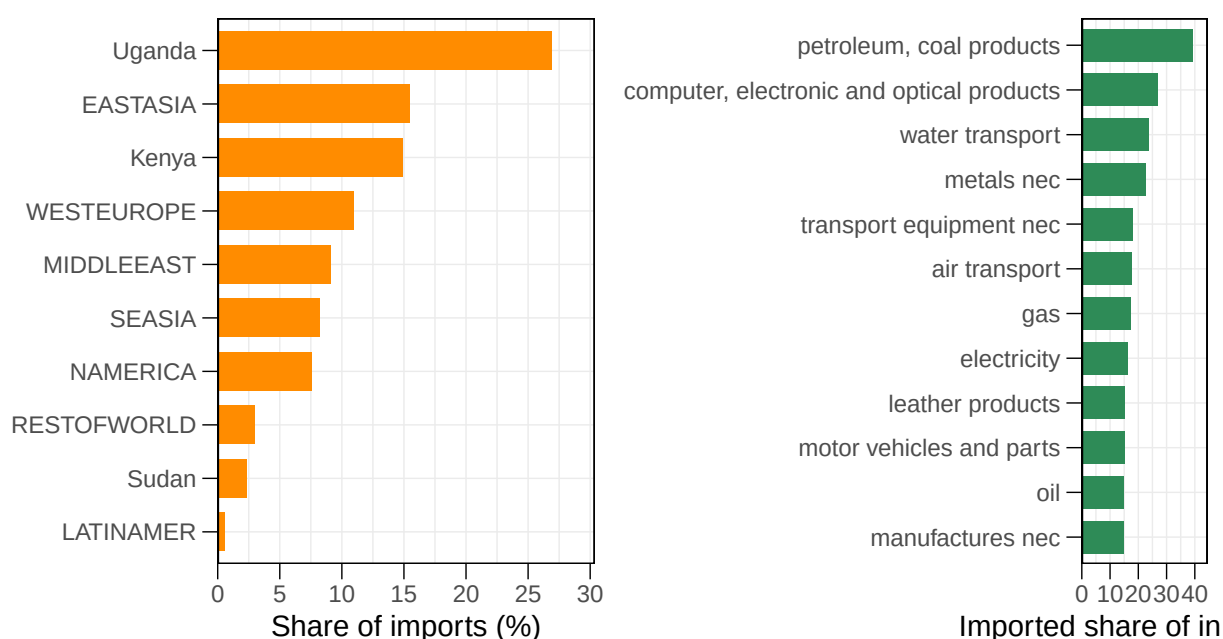
The result is an import-dependent economy whose external balance is precarious by construction. When oil flows, export earnings finance the import bill, though much of the revenue is absorbed by government and debt-service obligations rather than productive investment; when the pipeline is disrupted, as during Sudan's 2023 war, the foreign exchange that pays for imported food and fuel evaporates, the pound weakens, prices spike, and a population already among the most food-insecure in the world is squeezed further. This is why the report treats diversification not as an aspiration but as a necessity. Every formalised export chain — gum arabic graded and certified, livestock traded through quarantine and market infrastructure, Equatorial maize sold into the regional market rather than displaced by Ugandan imports — would simultaneously earn foreign exchange, reduce the import bill, and loosen the country's dependence on a single commodity moving through a single foreign pipe.

3.4 Extra-African Dependence

South Sudan is not in the 18-economy GVC-resolution set, so a full world-region export decomposition is not computed here; its extra-African orientation is captured instead by the import-dependence and value-added diagnostics immediately below and the accessibility analysis of Section 4.

3.5 Trade Dependency Analysis

The bespoke account above described an economy supplied by truck from Kampala and Mombasa. Figure 3 is the model's version of the same picture, by partner and by sector.

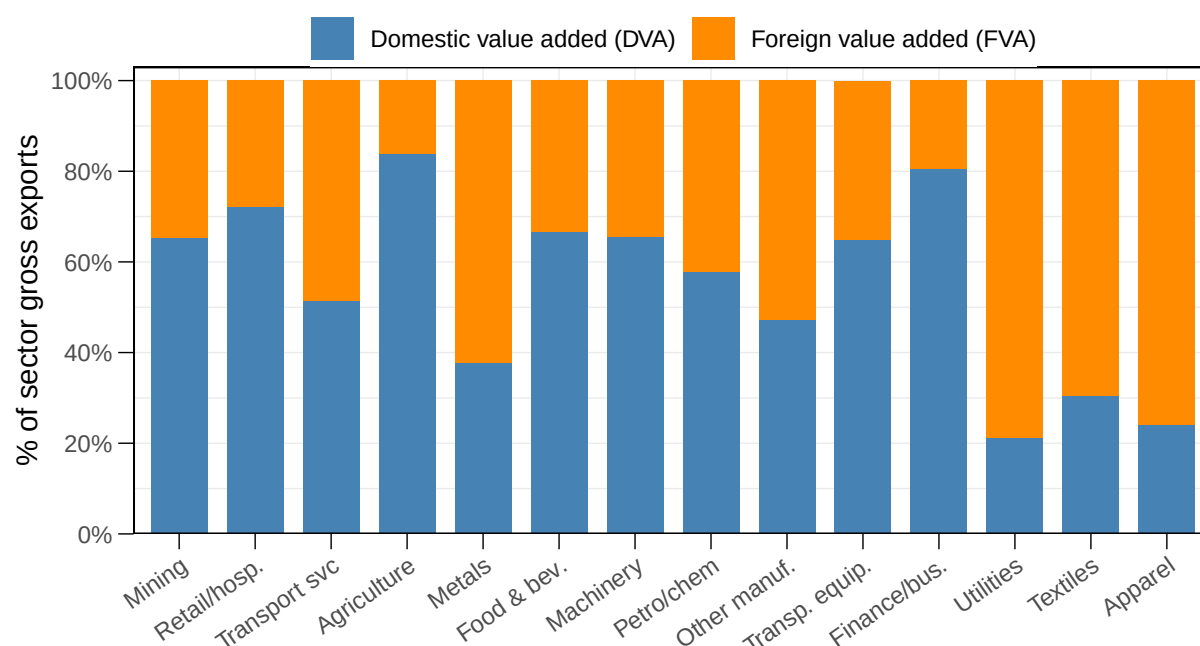
Figure 3: South Sudan: import dependence by partner and by sector

Notes: Left: the ten largest import-source partners as a share of total imports. Right: the twelve GTAP commodities of the 65 with the highest imported share of intermediate inputs.

The model agrees with the road. Uganda alone supplies 26.9% of South Sudan's imports and Kenya 14.9%, so that two East African neighbours account for more than two-fifths of the bill — a concentration on African suppliers that almost no other country in this series shows. East Asia (15.5%), Western Europe (10.9%), the Middle East (9.1%) and South-East Asia (8.2%) make up most of the rest, and Sudan, the historic trading partner, is down at about 2%. The sector panel is where the constraint shows: refined petroleum and coal products draw close to 40% of their intermediate inputs from abroad, computers and electronics 26%, and water transport and metals a little over 20%. A country that exports crude and imports the fuel refined from it is the clearest possible illustration of value captured elsewhere.

3.6 Value-Added Decomposition of Exports

How much of the value in what South Sudan sells is made in South Sudan is answered in Figure 4.

Figure 4: South Sudan: domestic and foreign value added in gross exports

Notes: The 65 GTAP commodities are aggregated for display into 17 broad groups, weighted by the underlying levels, so no commodity is dropped; the commodity-level table is in Annex C. Domestic value added (DVA, blue) and foreign value added (FVA, orange) by broad sector. The foreign share is the sector's backward GVC-participation rate.

South Sudan keeps less of its export value than most economies in this series. Agriculture, at 84% domestic, and financial and business services, at 80%, are the exceptions; mining — the oil sector that is very nearly the whole export basket — retains 65%, and utilities (21%), apparel (24%), textiles (30%) and metals (37%) are majority foreign content. The 35% foreign share in mining is the substantive number here: it is the imported equipment, services and expertise of an upstream run by foreign consortia, value that leaves the country alongside the crude rather than with it. This is the same finding the value-chain discussion of Section 7 reaches from the other direction — an economy that exports its resources in their rawest form captures the resource rent and very little else.

4. Spatial Connectivity and Market Access

4.1 Domestic Transport Network

South Sudan's freight moves predominantly by road; rail is typically thin and only partly operational, and modal options such as inland-water and air carry niche flows. The quality of the trunk network to the border gateways, and of the feeder roads that connect production to those trunks, is the first-mile determinant of its regional competitiveness (Teravaninthorn and Raballand, 2009).

4.2 Regional Corridors

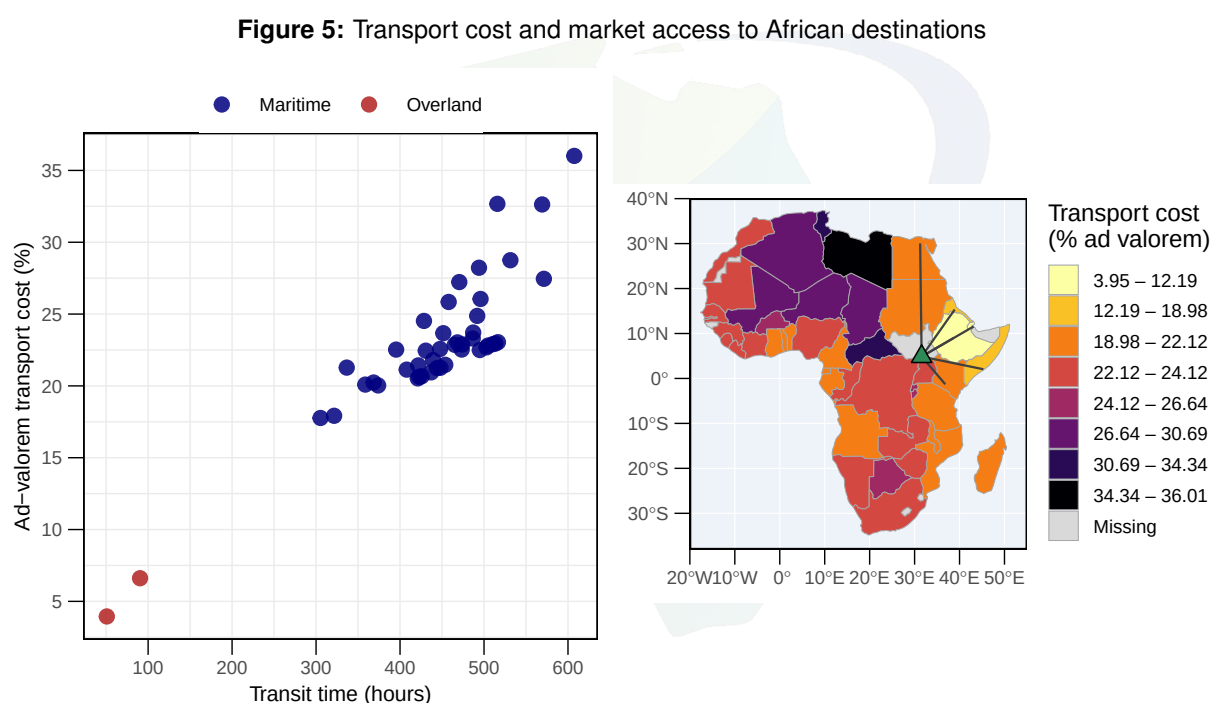
South Sudan's external trade moves on the Djibouti Corridor, linking it to gateway ports and to its interior neighbours. Because it is landlocked, the reliability of these corridors and the efficiency of the borders they cross are, geographically, the binding determinants of its trade costs.

4.3 Travel Time and Logistics Costs

The spatial model computes, for South Sudan, an average delivered transport cost of about 22.7% of cargo value, an average transit time of about 440 hours, and an average of 2.6 border crossings to reach an African destination. These continental averages conceal a wide range — cheap, fast links to immediate neighbours and expensive, multi-day links to distant markets — which Figure 5 makes explicit.

4.4 Market Access

South Sudan's access to African markets splits sharply by distance and mode. Figure 5 plots delivered cost against transit time for every destination and maps the same cost surface geographically.



Notes: Left: delivered transport cost against transit time to each African market, overland and maritime routing. Right: the same delivered cost drawn spatially. Cost is ad-valorem, as a share of cargo value.

Destinations reachable overland cluster at short transit times and single-digit ad-valorem cost; a tail of markets reachable only through a maritime leg runs to 20–35% and more of cargo value. For a country with no port of its own, that split means South Sudan's realistic market for bulky, lower-value goods is its immediate neighbourhood, while distant African markets are only worth pursuing for high-value, low-bulk exports such as gum arabic.

South Sudan's corridor problem is unusually stark even by the standards of landlocked African economies, because its two principal external links serve entirely different functions and face entirely different risks. Its import lifeline runs south to the sea through East Africa; its export lifeline runs north to the sea through Sudan; and the two share neither route, nor port, nor governing partner. The country is, in effect, balanced between two single points of failure, and the assessment's resilience

and redundancy arguments apply to it with exceptional force. It is worth noting that the model's calibrated network represents South Sudan's access through the Djibouti Corridor (Djibouti–Ethiopia–South Sudan), and the accessibility tables accordingly show Ethiopia and Djibouti as the cheapest reachable markets; in the country's actual commercial geography, the dominant import corridor is the southern road to Mombasa, and the Ethiopian route, though real and strategically valuable, carries far less traffic today.

The Juba–Nimule–Uganda corridor is the artery on which daily life depends. Goods bound for South Sudan's towns are landed at Mombasa, hauled up the Northern Corridor across Kenya into Uganda, consolidated around Kampala, and trucked north to the border at Nimule and on to Juba. This single road — paved over much of its length but heavily trafficked, accident-prone and exposed — carries the food, fuel, cement and manufactures that keep Juba and the southern markets supplied. Its efficiency is therefore a national-economic variable: congestion at Nimule, insecurity on the Juba road, delays at the Kenya–Uganda and Uganda–South Sudan border posts, or a shock anywhere along the Northern Corridor propagate directly into South Sudanese prices and shortages. The corridor is also the country's connection to a functioning regional logistics system; deepening South Sudan's integration into the Northern Corridor institutions — joint border management, harmonised transit, cargo tracking — is among the highest-value facilitation moves available to it.

The oil pipeline to Port Sudan is the export corridor, and its fragility has become a chronic national risk. Crude from Upper Nile and Unity is pipelined north across the border into the Sudanese network and to the Red Sea terminal at Port Sudan. The corridor has been a source of vulnerability since independence: subject to transit-fee disputes, to the 2012 production shutdown, and now to the direct physical danger of Sudan's civil war, which has at times damaged the line and the export facilities and curtailed flows. Port Sudan appears in the network's betweenness ranking as a chokepoint precisely because so much depends on it. For South Sudan there is no near-term alternative export route for crude at scale, which is exactly why the economy is so exposed; the only durable hedges are diversification away from a single commodity and, over the long term, an alternative outlet to the sea.

That alternative outlet is the route to Kenya, anchored on Nadapal and the prospective LAPSSSET link. A southeastern road runs from the South Sudanese interior to the Kenyan frontier at Nadapal, toward Lokichoggio and down into northern Kenya, offering a second line to Mombasa that bypasses Uganda. More ambitiously, the Lamu Port–South Sudan–Ethiopia Transport (LAPSSSET) corridor is designed to give South Sudan a direct rail, road and pipeline connection to a new deep-water port at Lamu on the Kenyan coast — including, in its most consequential component, a crude pipeline that could one day let South Sudan export oil without crossing Sudan at all. LAPSSSET would, if realised, transform the country's corridor position from one-route dependence to genuine redundancy. But it is a long-horizon, capital-intensive, multi-government undertaking whose progress has been slow and uneven, and the country cannot plan its next decade around it.

Across all of these corridors, the binding constraints are insecurity, infrastructure and borders rather than tariffs. Sub-national conflict, cattle-raiding, banditry and the displacement of populations make stretches of road unsafe and seasonal flooding makes others impassable; convoy travel, escorts

and informal payments raise costs and times far above what distance alone would imply. Physical infrastructure is thin: few paved trunk roads, almost no rail, and feeder roads that disappear in the wet season, severing producing areas from the corridors entirely. Border posts at Nimule and elsewhere lack the one-stop facilities, single windows and electronic customs that would speed clearance. The scenario results' emphasis on facilitation, border modernisation and corridor upgrading — not tariff cuts — is therefore exactly the right diagnosis for South Sudan, with the crucial addition that for this country, basic security and basic all-weather connectivity must come even before the sophisticated facilitation measures that a more stable economy could prioritise.

5. Gravity Model Analysis

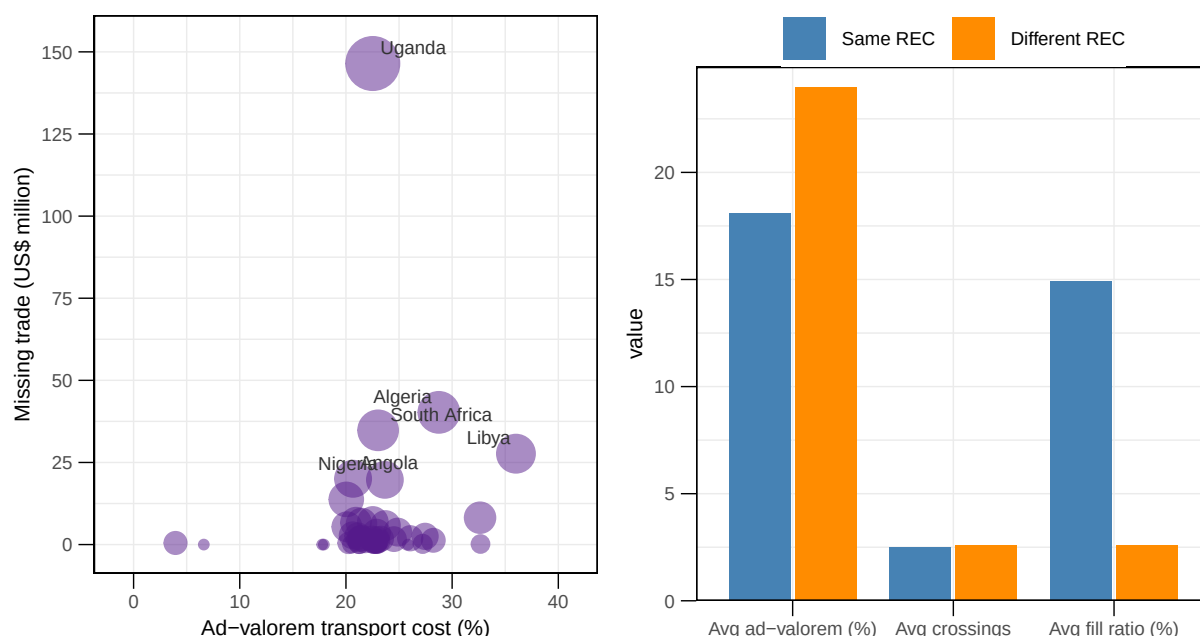
The gravity model estimates how much South Sudan *should* trade with each African partner given size and frictions, by fixed-effects Poisson pseudo-maximum-likelihood — the best-practice specification that absorbs size and multilateral resistance and identifies the friction effects from bilateral variation (Anderson and van Wincoop, 2003; Santos Silva and Tenreyro, 2006; Head and Mayer, 2014).

5.1 Actual vs Potential Trade

Aggregated across partners, South Sudan's actual intra-African exports of \$16 m fall short of a frictionless potential of \$395 m — a missing-trade gap of \$379 m, a fill ratio of 0.04. The gap is concentrated on its largest, highest-friction partners (Figure 6).

5.2 Missing Trade

The missing-trade gap is not spread evenly across partners: it concentrates where the largest markets meet the highest friction. Figure 6 plots each partner's missing trade against its transport friction, and breaks out the same frictions by REC membership.

Figure 6: Missing trade and the frictions behind it

Notes: Left: missing trade by partner (US\$ million) against the transport friction to that partner; bubble area is gravity potential. Right: average transport cost, border crossings and fill ratio for partners inside and outside the same Regional Economic Community.

Uganda carries the largest bubble in the scatter — \$146 m of missing trade at 22.5% ad-valorem cost and three border crossings, more than a third of the national gap on its own — followed by Algeria (\$40 m at 28.7%), South Africa (\$35 m at 23.0%) and Nigeria (\$20 m at 23.7%). The pattern is the textbook one for this country: every partner of any size sits at double-digit delivered cost, because South Sudan cannot reach a single African market without at least one border crossing and most of them without two or three. Uganda is where a facilitation programme should start, not because the friction there is worst but because it is the only relationship with enough potential volume for a friction cut to matter.

5.3 Drivers of Under-Trade

The right-hand panel of Figure 6 breaks the same frictions out by REC membership, and for South Sudan the premium is large on two of the three measures. Its EAC and IGAD partners — Uganda, Kenya, Tanzania, Ethiopia, Rwanda — are reached at a markedly lower average delivered cost than non-members, and they realise a far higher share of their modelled potential. Border crossings are the exception: at about 2.5 on average they are identical inside and outside the bloc, because South Sudan's geography imposes them regardless of who signed what. Shared bloc membership bundles lower friction — mutual recognition, simpler procedures, proximity — into more realised trade, and the ordering of drivers is transport and logistics cost first, border frictions second, non-tariff barriers third; the bilateral tariff term, on duties already low within South Sudan's RECs, is measured near zero but imprecisely. The REC premium visible here is why extending South Sudan's facilitation commitments to its non-bloc partners is among the cheapest ways to raise realised trade.

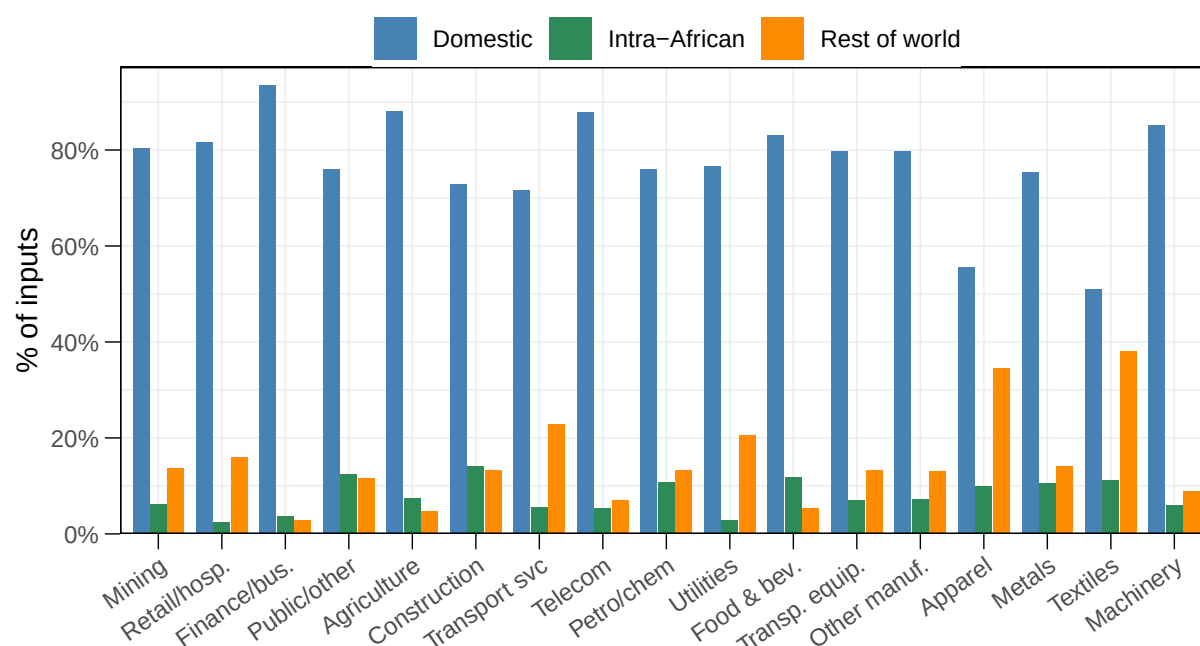
Taken together, the gravity results identify South Sudan's missing trade as predominantly a logistics-

and-non-tariff problem. All six friction terms are now correctly signed — distance and delivered cost negative, common language and common REC positive, border crossings negative at -0.2764 where the published table had reported them positive, and a bilateral tariff term identified for the first time from observed duties rather than from a proxy collinear with REC membership. Four of the six are statistically significant: common language, common REC, the ad-valorem delivered cost and, for the first time, border crossings, which pricing both of a maritime movement's port calls finally separated from the cost term. Distance and tariffs are not separately distinguishable from zero on 2,070 ordered pairs with two-way clustered standard errors. That the crossings term is now identified matters here more than in most of this series, because South Sudan's binding friction is border crossings: the term is correctly signed and economically large, though the delivered-cost term already prices border waiting at the value of time and carries roughly 60% of it, and taken jointly the two are significant (Wald $p = 0.013$). These coefficients are the empirical engine behind the counterfactual scenarios of Section 10, which hold South Sudan's economic structure fixed and ask what its trade would be under different frictions (Anderson and van Wincoop, 2003; Head and Mayer, 2014). The policy reading is half-supported rather than unambiguous: facilitation and infrastructure carry the largest expected effects, but only non-tariff and standards reform and port efficiency are measurably larger than tariff removal at conventional confidence — the other levers are bigger in expectation without being statistically separable from it.

6. MRIO Value Chain Analysis

6.1 Domestic and Regional Linkages

South Sudan's sectors source most of their intermediate inputs domestically or from outside Africa; the intra-African share stays under 15% in every broad sector, and under 19% in every one of the 65 commodities in the annex sourcing table (Table 6). Economy-wide the split is 81.5% domestic, 12.0% rest-of-world and 6.5% intra-African — a regional share roughly double the 3.4% median across the 46 modelled countries, and a direct consequence of the Ugandan and Kenyan supply lines. Figure 7 sets out the full split by sector.

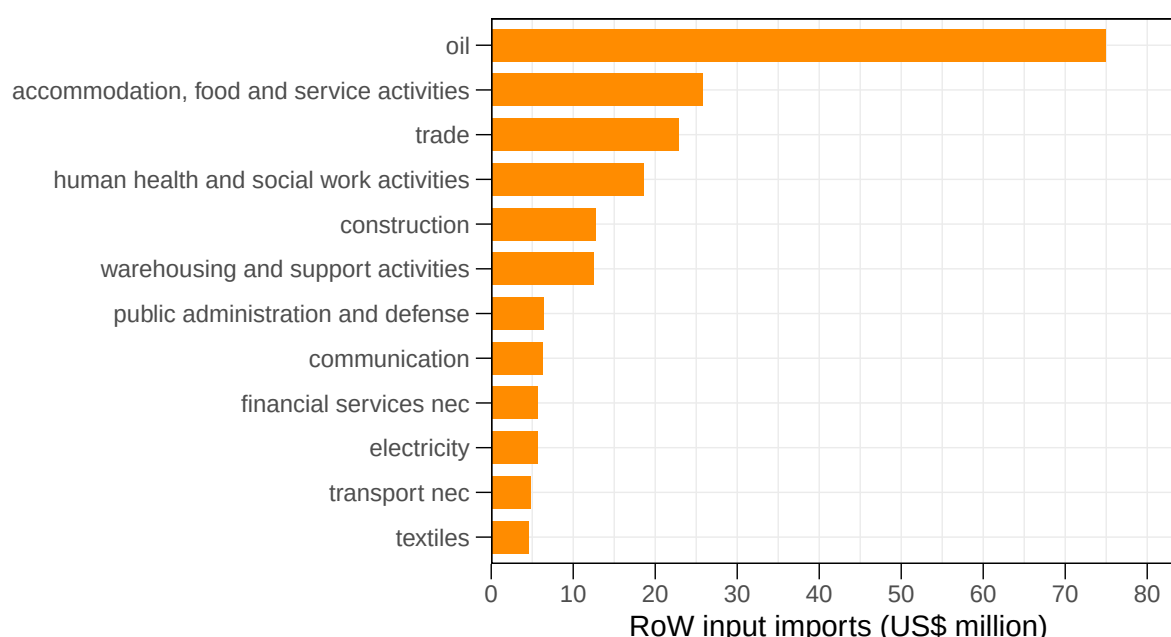
Figure 7: South Sudan: input sourcing by sector

Notes: The 65 GTAP commodities are aggregated for display into 17 broad groups, weighted by the underlying levels, so no commodity is dropped; the commodity-level table is in Annex C. Domestic (blue), intra-African (green) and rest-of-world (orange) shares of intermediate input use.

Where domestic sourcing is thin, the shortfall is filled mainly from outside Africa: textiles buy 38% of their inputs from the rest of the world, apparel 34%, transport services 23% and utilities 21%, against intra-African shares of 11%, 10%, 5% and 3%. Financial and business services, at 94% domestic, sit at the other extreme. That rest-of-world share is the import leakage that Section 6.2 below quantifies sector by sector — demand a regional-sourcing policy could, in principle, redirect toward African suppliers.

6.2 Import Leakage

The addressable leakage — extra-African input spend, in dollar terms — is concentrated in a few sectors. Figure 8 ranks them.

Figure 8: South Sudan: extra-African input imports by sector

Notes: The twelve largest of the 65 GTAP commodities are shown, ranked on the plotted quantity; the full 65-commodity table is in Annex C. US\$ million. This is the addressable regional-sourcing opportunity: demand currently met from outside Africa that a regional supplier could in principle capture.

Crude oil tops the ranking at \$75 m of extra-African input purchases — nearly a third of the country's entire \$247 m extra-African input bill — ahead of accommodation and food services at \$26 m, the trade margin at \$23 m, human health and social work at \$19 m, and construction and warehousing at \$13 m each. The absolute sums are small, which is the point: South Sudan's leakage problem is not that it buys a great deal from outside Africa but that it buys very little of anything, and what leakage there is sits in the oil enclave, whose imported drilling equipment and specialist services have no African supplier at any price. The addressable part is the rest — construction materials, food service inputs, warehousing — where Ugandan and Kenyan suppliers already compete and mostly already win.

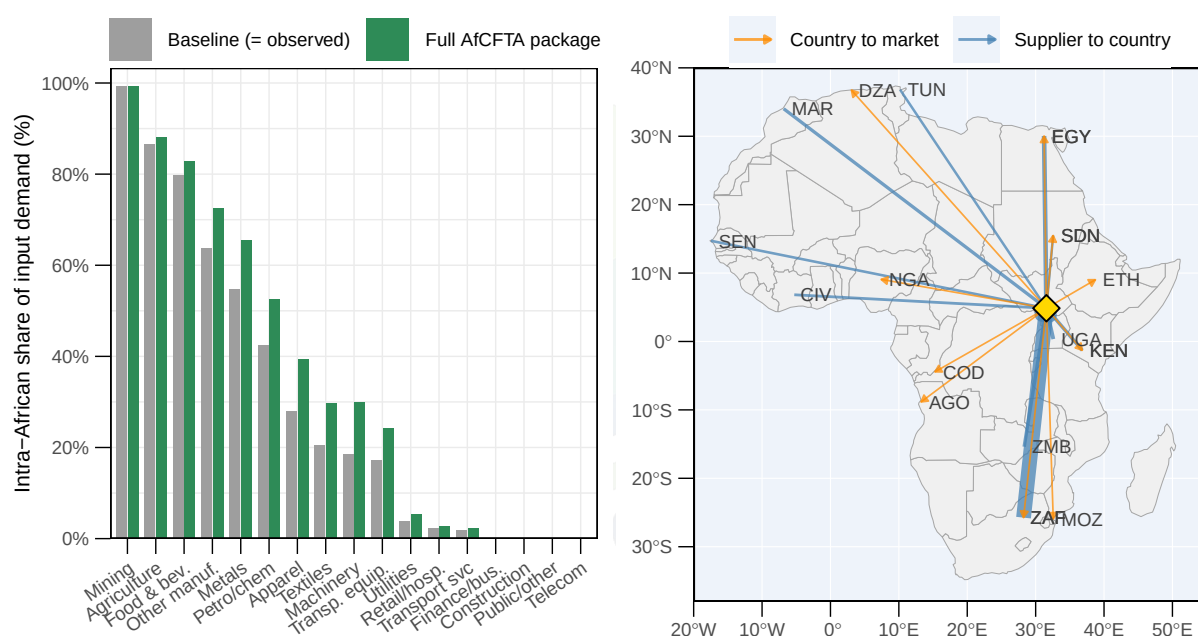
6.3 Regional Sourcing and its Response to Facilitation

The `optimize.jl` sourcing layer asks how much of South Sudan's imported input demand African suppliers would meet if regional frictions fell. For each of the 65 commodities it splits that demand between **African suppliers** — priced at the corridor friction of Section 4 — and a **rest-of-world backstop**, using an **Armington CES expenditure share** on GTAP's own import-source substitution elasticity (ESUBM) for the commodity concerned. The backstop is not a flat sea-freight constant: it is priced per destination from GTAP's observed international transport margin plus dwell time at the gateway plus the inland haul from the port of entry to Juba, so for a landlocked economy it responds to the same corridor, border and port levers as the regional option does. Both margins are calibrated cell by cell to the observed 2017 pattern.

Because that calibration makes the model's baseline equal South Sudan's observed sourcing by construction, there is no "optimal versus actual" distance to report and no corner to disclose: the

allocation is smooth, nothing sits at a bound, and every supplier to which the CES gives a finite weight keeps a positive share. What the model produces is the *response*, and for South Sudan it must be read on both of its scales at once. African suppliers meet **44.86%** of the country's imported input demand in the baseline — among the highest shares on the continent, and a direct consequence of the Ugandan and Kenyan supply lines — rising to **50.12%** under the full AfCFTA package. In percentage points that movement, **+5.26 pp**, is the largest in this series. In relative terms it is **+11.7%**, below the continental average of +16.5%, and the two readings are not in tension: a share already approaching half has less headroom above it than one in single digits, so the same friction cut buys proportionally less. Figure 9 sets out the sector detail on the left and the supplier and market links on the right.

Figure 9: South Sudan: regional sourcing and its response to AfCFTA



Notes: Left: baseline (grey, equal to observed) against the full AfCFTA package (green), intra-African share of input demand by sector. Right: the supplier and market links the same allocation implies.

The policy reading that follows is different from the one this section used to carry. South Sudan does not have a regional-sourcing problem. It already buys a larger share of its imported inputs from African suppliers than almost any economy in this corpus, it would buy more under facilitation, and what it does not buy regionally sits overwhelmingly in the oil enclave, whose imported drilling equipment and specialist services have no African supplier at any price (Section 6.2). What South Sudan has is an *export* problem: one commodity, one pipeline, and a fill ratio of 0.04 against the gravity benchmark. A regional-sourcing agenda would refine an input structure that is already the right shape; the diversification that matters has to happen on the selling side, in the gum, livestock, food and timber chains that could give the country something other than crude to send across a border.

Where that sourcing goes has changed with the model. The earlier linear programme concentrated South Sudan's regional sourcing and supply on Ethiopia, its lowest-friction neighbour by the accessibility surface of Section 4, and that locality was read as a finding. It was largely an artefact of cornering:

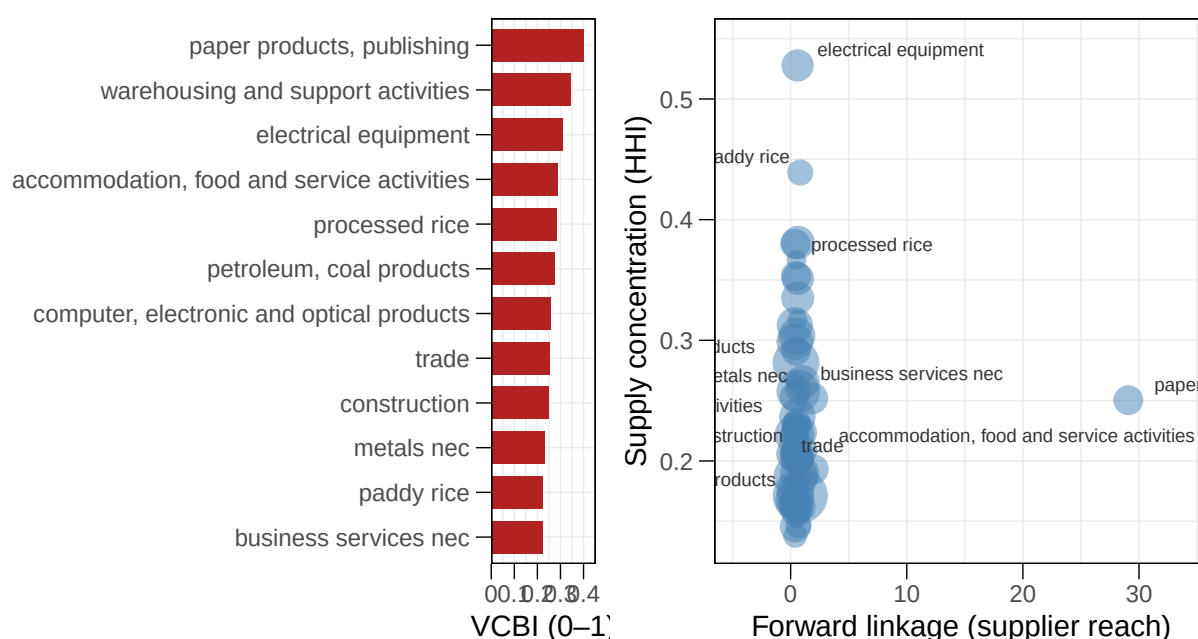
a rule that picks the single cheapest delivered supplier on each row will always look local, because proximity is what makes a supplier cheapest. With curvature in the allocation the right-hand panel is continental as well as local — Uganda, Kenya and Ethiopia carry the bulk of it, as the corridor geography demands, but the continent's large industrial producers hold weight in the manufactures and equipment they alone make.

One thing this panel cannot show. The sourcing model's friction matrix is built from delivered *transport* cost alone; tariffs enter the gravity model next door and have no channel here at all. AfCFTA tariff removal therefore registers no movement in this figure, and that zero is a structural blind spot in the sourcing model, not evidence that tariffs are irrelevant to where South Sudan buys its inputs.

A second point is worth stating plainly, because this figure and the scenario table appear to disagree about ports. Port-efficiency reform raises intra-African export volumes in the gravity model — 17.5% for South Sudan (Section 10) — while, continentally, slightly *lowering* the regional share of input sourcing in this one, by about 2.0%. Both results are correct and they are not in conflict: every import passes a port once, so faster handling at Mombasa or Djibouti helps an overseas supplier at least as much as a regional one, whereas intra-African trade is substantially overland and gains proportionally less; the gravity model, which contains no rest-of-world alternative, sees only the volume effect. For a country whose regional sourcing share is already high, that distinction is worth keeping in view: port reform is worth pursuing for the trade volume it unlocks, not for the sourcing share it shifts.

6.4 Value-Chain Bottleneck Index

The bottleneck index asks which commodities combine wide reach into the rest of the economy, concentrated supply and heavy import reliance — the three properties that turn one disruption into many. Figure 10 ranks South Sudan's.

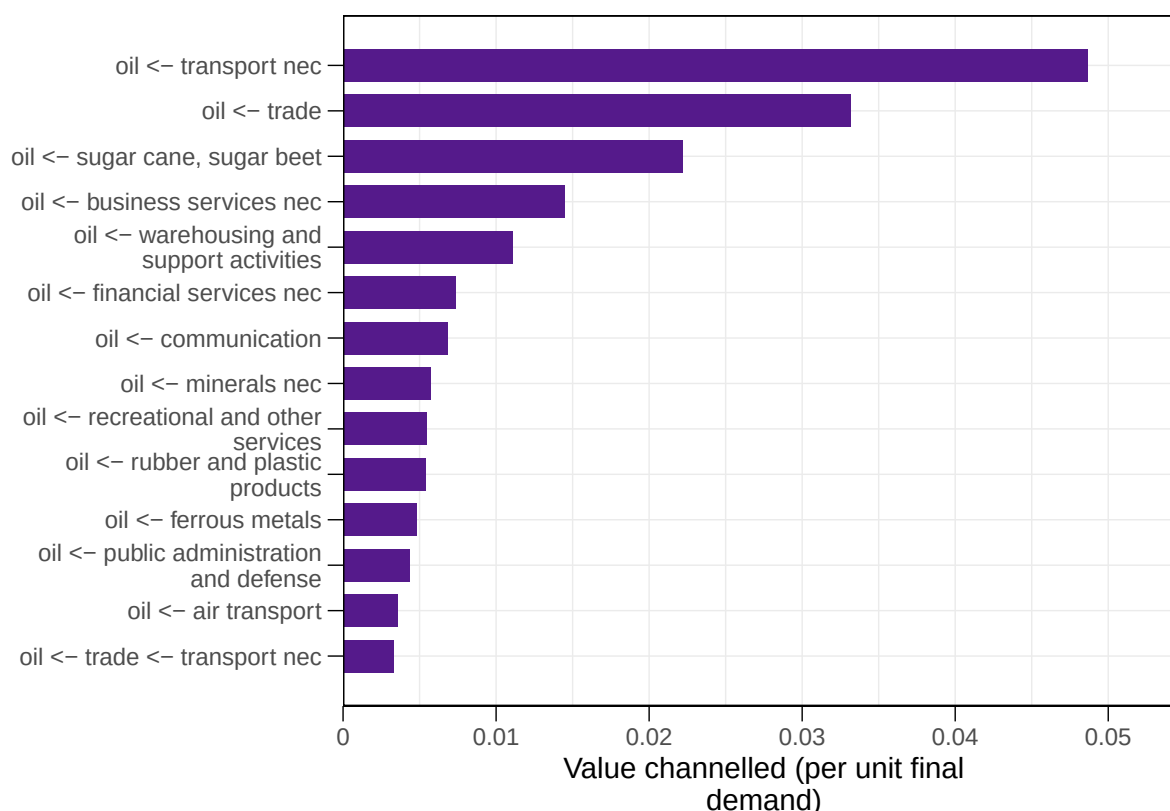
Figure 10: South Sudan: the Value-Chain Bottleneck Index

Notes: Left: the twelve GTAP commodities with the highest Value-Chain Bottleneck Index (VCBI) of the 65. Right: the underlying drivers for all 65 — forward linkage (supplier reach) against supply concentration (HHI), with bubble area proportional to import dependence.

Paper products and publishing score highest at 0.40, ahead of warehousing and support activities (0.34), electrical equipment (0.31), accommodation and food services (0.29) and processed rice and refined petroleum (0.28 each). The right-hand panel shows that the paper score is driven almost entirely by one extreme forward-linkage value, a ratio computed on a commodity that barely produces in South Sudan and therefore not worth acting on; the same caution applies wherever a linkage measure is normalised on a near-zero base. The scores that carry policy content are warehousing and electrical equipment, both of which combine concentrated supply with genuine reach — and both of which point back at the same constraint, that everything South Sudan handles or powers arrives through one road corridor.

6.5 Structural Path Analysis

Structural path analysis traces the supply routes feeding one sector, ranked by the value each channels per unit of final demand. The model selects crude oil, the sector that is very nearly the entire export economy; Figure 11 shows what feeds it.

Figure 11: South Sudan: structural path analysis of the leading sector

Notes: The dominant supply paths delivering inputs into the sector, ranked by the value each channels per unit of final demand. Each step “A ← B” reads “A draws inputs from B”.

The dominant path into oil runs from transport services, ahead of the trade margin, sugar cane, business services and warehousing. Read as a list of what the oil sector actually buys, it is striking for what it does not contain: no machinery, no metals of consequence, no chemicals, no engineering. The oil enclave’s domestic purchases are logistics, trade and administration — the services of getting things to and from a wellhead — while every physical input of substance is imported, which is exactly the \$75 m of extra-African leakage Section 6.2 identifies. This is the input-output signature of an extractive enclave, and it is why oil revenue has bought so little industrialisation.

7. Priority Value Chains

Across the portfolio, South Sudan’s priority value chains are its **agro-processing and food** chains (where regional demand and comparative advantage are strongest), its **construction-materials and basic-manufacturing** chains (large regional demand, import-substitutable inputs), and the **enabling services** (transport, logistics, ICT, finance) whose friction raises the cost of trading everything else. For each, the binding constraints recur — standards and SPS, border and corridor friction, energy cost, finance and scale — which is why the cross-cutting reforms of Sections 10 and 12 benefit the whole portfolio rather than any single chain.

South Sudan’s value-chain portfolio is best understood as one dominant chain that captures little value, surrounded by several latent chains with extraordinary potential and severe

constraints. The honest starting point is that the country today has very little processing of anything; its comparative advantages in oil, livestock, land and forests are exported — when they are exported at all — in their rawest form, and most of the value addition happens abroad. The opportunity, and the diversification imperative, lies precisely in moving up these chains.

The oil chain is the dominant one, and its defining feature is the absence of refining. South Sudan extracts crude in Upper Nile and Unity, pipes it unprocessed across the border, and sells it on the international market, importing back the refined fuels its own economy burns. There is no significant domestic refinery, no petrochemical industry, no fertiliser production from associated gas, and no meaningful local content in the upstream operations, which are run by foreign consortia. The value the country captures is the export price of crude minus transit fees, and almost nothing more. Even modest domestic refining to cover the country's own fuel demand would reduce import dependence and capture margin, though the security, scale, financing and governance obstacles are formidable; the chain's larger lesson is how completely a resource economy can fail to industrialise around its resource.

The agriculture-and-food chain is the country's single largest import-substitution opportunity. South Sudan imports staple food while sitting on some of East Africa's most fertile land in the Equatorias. A revived food chain — maize, sorghum, cassava, groundnuts, rice, horticulture — would substitute directly for Ugandan and Kenyan imports, earn income for the rural majority, and rebuild the domestic market the war destroyed. The constraints are equally large: insecurity and displacement that empty farming areas, the near-total absence of feeder roads and storage, collapsed input markets for seed and tools, no agro-processing or cold chain, and competition from cheaper, better-organised imports. The annex optimisation showing food and agriculture as overwhelmingly substitutable by regional sourcing understates a deeper point — much of this demand could ultimately be met domestically, not merely regionally, if production were restored.

The livestock chain is vast in scale and minimal in formal value capture. South Sudan holds one of the larger cattle herds in Africa, alongside goats and sheep, yet exports almost no processed meat, hides or dairy through formal channels. Animals move on the hoof, informally, with no quarantine infrastructure, no abattoirs of export standard, no disease-control regime that would satisfy regional or Gulf market requirements, and no traceability. A livestock chain built on animal-health services, market yards, slaughter and chilling capacity, and access to the meat-deficit markets of the region and the Middle East is a genuine long-term prospect, but it runs straight into the pastoral conflict and weak veterinary governance that currently keep the herd outside the formal economy.

Gum arabic is the most readily formalisable export chain. The acacia drylands yield a globally demanded, low-weight, high-value, climate-resilient commodity that requires no irrigation and that smallholders already harvest. With grading, cleaning, certification, aggregation and a traceable route to the international food and pharmaceutical buyers, gum arabic could become a flagship non-oil export with relatively modest investment. Its constraints are organisational and logistical rather than agronomic — the resource is already there — which is what makes it an attractive early win for a diversification strategy.

Timber and forest products form a chain of real value and real risk. The Equatorias hold natural forests and colonial-era teak plantations whose hardwood commands high prices regionally. Developed sustainably and legally, with replanting and traceability, this could be a meaningful export; pursued extractively, it risks deforestation, conflict over land, and the governance pathologies that afflict resource exports in fragile states. The chain's promise is inseparable from the strength of the institutions that would have to govern it.

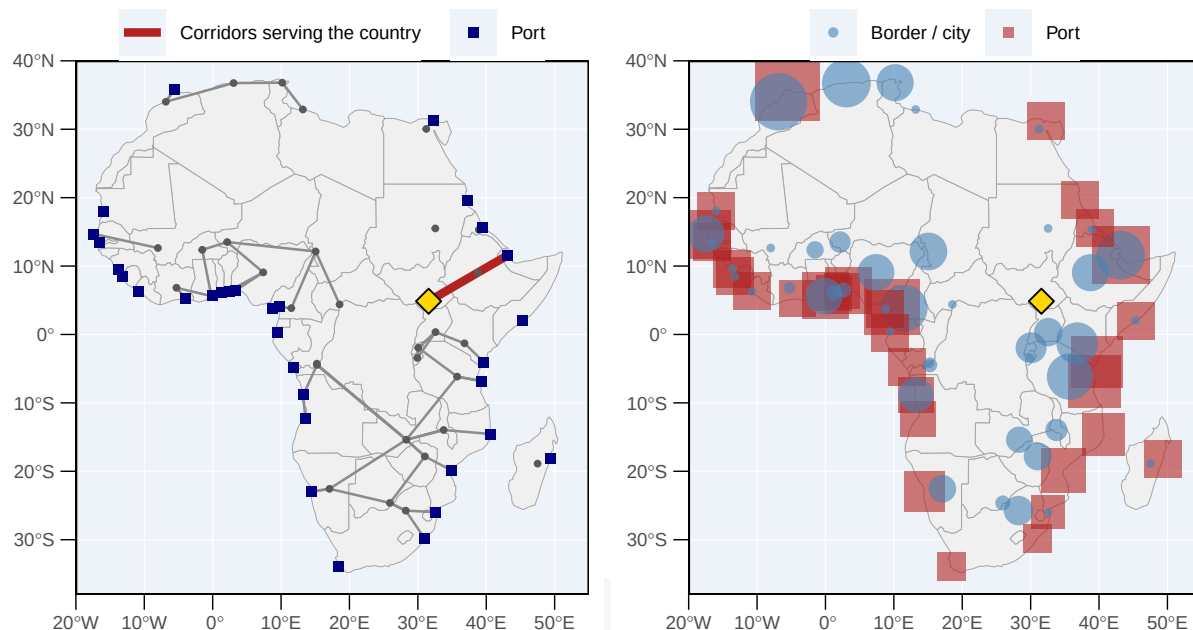
Finally, cross-border trade with Uganda and Kenya is itself a value chain — the most active one the country has. The dense commercial traffic through Nimule and Kaya, the wholesale and retail networks of Juba supplied from Kampala and Mombasa, the informal traders, transporters and money-changers who move goods and value across the southern border, constitute a living regional-trade ecosystem. Today it runs overwhelmingly one way, importing finished goods; the strategic prize is to turn it bilateral, so that the same corridors and the same trading relationships carry South Sudanese food, livestock, gum and timber outward as readily as they carry Ugandan and Kenyan goods inward. Each of these chains is constrained today by the same cluster of binding factors — insecurity, missing infrastructure, absent finance, thin skills and weak institutions — which is why the cross-cutting reforms benefit the whole portfolio at once.

8. Trade Network Position

The corridor-plus-maritime network is assembled by `build_network`; country-to-country reach is computed by the spatial-access function `accessibility` (least-cost Dijkstra routing); and centrality is assessed by `betweenness` on the same network (Freeman, 1977).

8.1 Country as Trade Node

South Sudan's position in the continental corridor-and-maritime network is best seen geographically. Figure 12 draws the network with South Sudan's own corridor links highlighted, and shows the betweenness centrality of the same nodes.

Figure 12: Position in the African trade-corridor network

Notes: Left: the corridor network drawn geographically, with this country's corridors highlighted and its capital starred. Right: betweenness centrality of ports and border gateways; marker area is proportional to betweenness.

The wider network is radial and port-oriented, running from coastal gateways inward to capitals with few links between interiors, and South Sudan sits deep inside it: its external trade runs entirely through corridors that cross foreign territory to reach the sea. Corridor reliability and border efficiency on those foreign links are therefore the binding determinants of its trade costs, and the highlighted corridors are the first call on any infrastructure-and-facilitation budget.

8.2 Accessibility and Reach

The same cost surface, mapped by destination, is Figure 5 in Section 4: a dark inner ring of neighbours reachable cheaply overland, and a bright outer tier reachable only by an expensive sea leg. Geographically as well as numerically, South Sudan's realistic market is that dark inner ring; deepening trade with the low-cost neighbourhood, not chasing the bright periphery, is the efficient strategy.

8.3 Centrality and Critical Nodes

The right-hand panel of Figure 12 shows where betweenness concentrates: at the gateway ports through which landlocked trade must funnel, and for South Sudan specifically at the Djibouti and East African gateways that carry its imports and exports. A node's betweenness is both its leverage — an efficiency gain there propagates to every route that uses it — and its fragility, since a disruption there fragments those same routes; South Sudan's own experience with the 2023 disruption to the Port Sudan export route is exactly this fragility realised. The high-betweenness gateways serving South Sudan are simultaneously its greatest source of leverage and its greatest single-point-of-failure risk, the case for both efficiency and redundancy investment.

8.4 Vulnerability

South Sudan's network exhibits the vulnerabilities the model is designed to expose: a dependence on a small number of foreign corridors and gateway ports (single points of failure), with limited redundant routing, and exposure to climate and security shocks on those corridors. The resilience implication is to invest in redundancy and climate-proofing alongside efficiency, because the same fragile logistics that constrain trade can, under a shock, surrender years of integration gains (Maliszewska and Ruta, 2020).

9. Bottleneck Diagnostics

9.1 Physical

Transit dependence on foreign corridors and ports; road condition and feeder-road gaps; thin and poorly interconnected rail; congested border infrastructure; and, for many sectors, the cost and reliability of power.

9.2 Policy

Non-tariff barriers and divergent standards are the single largest constraint in the model (the largest scenario lever, Section 10); customs procedures, documentation and rules of origin add cost; tariffs, already low within South Sudan's RECs, register a small and imprecisely estimated effect rather than a demonstrated irrelevance (Kee et al., 2009; UNCTAD, 2021).

9.3 Productive capacity

Energy cost and reliability; limited access to affordable finance; a shallow technical-skills base; small firm size; and dependence on imported inputs (Section 6.2) that raises costs and exposes producers to supply shocks.

9.4 Institutional

Agency coordination at borders; incomplete one-stop-border-post and single-window coverage; partial electronic customs and cargo tracking; and the capacity of standards bodies and mutual-recognition arrangements.

South Sudan's bottlenecks are not the ordinary frictions of a developing trade economy; they are the bottlenecks of fragility, and they must be named honestly. The standard diagnostic categories — physical, policy, productive, institutional — all apply, but in South Sudan they sit beneath a more fundamental constraint that conditions everything else: the country is emerging from civil war into a fragile and incomplete peace, and the absence of basic security and stable governance is the binding bottleneck from which the others descend. No facilitation reform, no corridor upgrade, no value-chain programme can deliver its modelled returns in areas where roads are unsafe, populations are displaced, and the writ of the state is contested. This must be stated plainly: for South Sudan,

stability is prior to trade policy.

Insecurity and fragility are therefore the first bottleneck. The R-ARCSS peace has held imperfectly since 2018, but sub-national violence, intercommunal and cattle-related conflict, banditry on the corridors, and recurrent displacement continue to interrupt production, sever supply routes and deter investment. The slow pace of security-sector integration and the repeatedly postponed transition leave a persistent uncertainty that raises every economic actor's discount rate. Traders build the cost of escorts, detours and risk into their prices; farmers in conflict-exposed areas cannot plant; investors will not commit capital to fixed assets they cannot protect. Fragility is not a backdrop to the trade problem — it is the largest single component of the trade problem.

The near-total absence of infrastructure is the second. South Sudan has among the lowest road densities in the world, a tiny fraction of it paved; effectively no functioning railway; a power system so limited that most economic activity relies on diesel generation; and feeder roads that vanish in the rainy season, isolating much of the interior for months. The Sudd wetland and seasonal flooding physically fragment the country. There is little modern storage, no cold chain, minimal port-of-entry capacity, and weak telecommunications outside the main towns. This is not a matter of upgrading an existing network but of building one almost from nothing, which makes the corridor and connectivity investments in the policy hierarchy unusually foundational and unusually expensive for this country.

The pipeline dependence on Sudan is the third and most distinctive bottleneck. South Sudan's entire export economy rests on a single pipeline crossing the territory of a neighbour that is itself at war. This concentrates an extraordinary risk in one asset over which Juba has no control: a transit dispute, a deliberate closure, or — as since 2023 — the physical damage and insecurity of someone else's conflict can sever the country's principal source of foreign exchange overnight. The 2012 shutdown and the 2023 disruptions are not anomalies but realisations of a structural vulnerability that will persist until either the commodity base diversifies or an alternative export route exists. No other bottleneck in this assessment carries the same potential to collapse state revenue at a stroke.

Currency collapse and macroeconomic instability form the fourth. The South Sudanese pound has depreciated dramatically, official and parallel exchange rates have diverged, foreign-exchange shortages are chronic, and inflation has at times reached levels that destroy real incomes. For an import-dependent economy this is doubly damaging: a weak and unstable currency raises the local price of the imported food and fuel on which the population depends, while exchange-rate uncertainty and FX rationing make it nearly impossible for the private sector to plan, import inputs reliably, or finance trade. Monetary and fiscal stabilisation is thus not separable from trade reform; it is part of it.

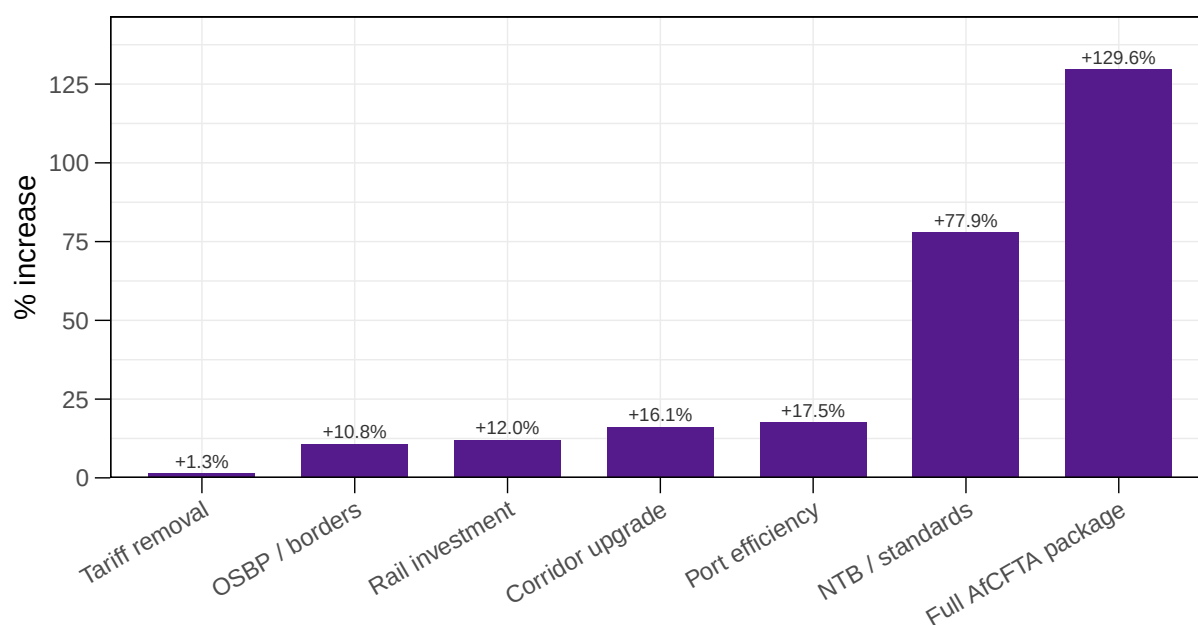
Import dependence is the fifth bottleneck — both a symptom and a self-reinforcing constraint. Because the country produces so little, it must import nearly everything, which drains foreign exchange, exposes consumers to corridor and currency shocks, and crowds the market with goods that compete against the very domestic production that would reduce the dependence. The annex sourcing tables capture the sectoral leakage, but the deeper bottleneck is the hollowing of domestic productive capacity during the war, which left even basic food and construction materials to be supplied from abroad. Breaking this cycle requires restoring production faster than imports can capture the market.

Institutions are the sixth and most cross-cutting bottleneck. South Sudan is building a customs service, a standards regime, a statistics system, a central bank and the machinery of trade governance largely from scratch, in a fragile-state environment with thin human capacity, limited revenue beyond oil, and competing demands on every institution. Border management at Nimule and elsewhere lacks one-stop posts, single windows and electronic systems; standards and SPS bodies that would let South Sudanese livestock and food meet regional requirements are nascent; oil-revenue management institutions are still consolidating transparency and accountability. These institutional gaps determine whether any of the other reforms can be implemented at all, which is why capacity-building threads through every tier of the policy agenda.

10. Scenario Analysis

The scenario menu ranks South Sudan's policy levers by their effect on intra-African exports. Figure 13 sets them out; Table 3 gives the same figures.

Figure 13: South Sudan: projected uplift in intra-African exports by policy scenario



Notes: Percentage increase against the calibrated baseline. Each scenario is a counterfactual on the estimated gravity frictions, holding economic structure fixed.

Non-tariff and standards reform is by far the largest single lever at 77.9% — on its own it would raise South Sudan's intra-African exports by more than three-quarters — well ahead of port efficiency (17.5%), corridor upgrading (16.1%), rail investment (12.0%) and one-stop border posts (10.8%), with tariff removal smallest at 1.3%. The one-stop border post number is high by the standards of this corpus, which follows directly from the 2.6 border crossings the average South Sudanese consignment must make. Port efficiency is the figure that has changed most: it previously registered nothing at all, because port dwell entered the model only as transit time, which the gravity equation does not observe. Dwell is now priced at the value of the time it consumes, and a landlocked economy that reaches the

sea through Mombasa or Djibouti records a double-digit uplift from faster handling at gateways it does not own. The tariff figure deserves the opposite caution: the term is now identified from observed bilateral duties rather than from a proxy collinear with REC membership, and it is measured near zero — but imprecisely enough that the band around it includes a substantial gain, and only non-tariff and standards reform and port efficiency separate from it at conventional confidence. The prize for South Sudan is in standards reform and infrastructure investment pursued together; the tariff schedule is the legal floor they stand on rather than the constraint they relieve (Maliszewska and Ruta, 2020; UNECA, 2021).

Table 3: South Sudan: Projected uplift in intra-African exports by policy scenario

Scenario	Uplift
Full AfCFTA package	129.6%
NTB / standards harmonisation	77.9%
Port efficiency	17.5%
Corridor upgrading	16.1%
Rail investment	12.0%
One-stop border posts	10.8%
AfCFTA tariff removal	1.3%

Notes: Each scenario is a counterfactual on the estimated gravity frictions, holding economic structure fixed. The combined package is sub-additive because the levers overlap. The tariff lever now scales a measured bilateral applied rate rather than a proxy; its estimated effect is small and imprecise, so a low figure here is a weak estimate rather than a demonstrated irrelevance.

The sub-additivity of the combined package — its uplift is less than the naïve sum of the individual levers — reflects the fact that the levers overlap: once South Sudan's borders are fast and its non-tariff barriers gone, part of the corridor-upgrade gain is already banked. But the package still substantially exceeds the largest single lever in the gravity model, which shows that the reforms are complementary and that South Sudan should pursue facilitation, standards harmonisation and infrastructure investment together, not sequentially. Conversely, the same machinery implies that a climate or security shock to South Sudan's corridors would *cut* its regional trade by a comparable double-digit margin — the resilience cost of fragile logistics, and the case for building redundancy and climate-proofing into the corridor agenda.

11. Economic Impact Assessment

South Sudan falls outside the CGE focus set, but by the same general-equilibrium logic — and consistent with the AfCFTA welfare assessments — intra-African trade-cost reductions would raise its welfare through cheaper imported inputs and improved market access, with the largest proportional gains for the more isolated, high-friction economies (Maliszewska and Ruta, 2020; Costinot and

Rodríguez-Clare, 2014). The directional trade responses are quantified in Section 10.

Through the model's structure and the trade responses of Section 10, a serious facilitation programme would raise South Sudan's exports (led by its competitive value chains), lower input costs, expand output and employment in the labour-intensive tradable sectors, and — through the real-wage channel — reduce poverty, while a modal shift to rail and corridor efficiency would lower freight-emissions intensity.

12. Policy Prioritisation

Ranking reforms by **impact** × **feasibility** × **cost-efficiency** × **time** sorts South Sudan's options into tiers:

- **Quick wins (0–2 years):** non-tariff-barrier removal and standards/SPS harmonisation (the largest lever, $\approx 77.9\%$, institutional and fast); dwell-time reduction at the gateway ports it depends on ($\approx 17.5\%$), an operational reform rather than a capital programme, though one it can only pursue with Kenya, Djibouti and Ethiopia; and one-stop border posts and digital customs ($\approx 10.8\%$), which matter more here than almost anywhere because of the crossings South Sudan's geography imposes.
- **Medium-term (2–5 years):** regional-sourcing and local-content coordination; standards-body and customs modernisation; trade-finance and payments integration.
- **Strategic infrastructure (5–15 years):** corridor upgrading ($\approx 16.1\%$) and regional rail ($\approx 12.0\%$), with corridor redundancy and climate-proofing a priority for a landlocked economy.
- **Industrial policy:** energy-cost reduction, serviced industrial land, and capacity-building in the priority value chains (Section 7).
- **Enabling:** AfCFTA tariff liberalisation — necessary as the legal floor, and measured at $\approx 1.3\%$ on its own, though with a wide enough band around that estimate that it should not be dismissed.

Two cautions apply throughout: trade-cost-reducing measures raise welfare even where they lower measured GDP and must not be discarded on a GDP test; and financing matters as much as design, since an intervention's growth case can be undone by how it is paid for.

13. Implementation Roadmap

South Sudan's trade-policy agenda is inseparable from its peace-and-transition agenda, and any honest prioritisation must begin there. The implementation of the R-ARCSS peace agreement — completing security-sector integration, consolidating the transitional government, and moving credibly toward elections and a permanent constitution — is the foundation on which every economic reform rests. The model's facilitation and corridor scenarios assume a functioning state able to police its

roads, staff its borders and enforce its standards; delivering that state is the first item of trade policy in all but name. Donors and regional partners should therefore see investments in stabilisation, the rule of law and basic state capacity not as separate from the trade-and-integration agenda but as its precondition. For South Sudan, peace is industrial policy.

Oil-revenue management is the second pillar, and the lever with the most immediate fiscal consequence. Because oil dominates revenue, how that revenue is captured, saved, stabilised and invested largely determines whether the country can finance diversification. The priorities are transparency and accountability in the oil sector; mechanisms to buffer the budget against price and pipeline shocks, including stabilisation and savings arrangements; the orderly management of oil-backed debt; and, critically, the channelling of oil revenue into the infrastructure, agriculture and human capital that would build a non-oil economy. The recurrent revenue crises triggered by pipeline disruption make the case for a stabilisation buffer concrete rather than theoretical. Used well, oil revenue is the only domestic financing source large enough to fund the country's escape from oil dependence; used poorly, it entrenches the dependence it could end.

EAC integration is the central regional-policy track, and it aligns precisely with the model's diagnosis. South Sudan's accession to the East African Community in 2016 gives it the framework within which the binding facilitation levers — customs harmonisation, the EAC Customs Union and Common Market commitments, mutual recognition of standards, joint border management, and integration into the Northern Corridor institutions — can be implemented. The gravity results' strong common-REC premium is, for South Sudan, the EAC premium: deepening genuine integration with Uganda, Kenya, Tanzania and the other partners it already trades with is the cheapest, highest-return regional move available. The road and connectivity dimension is equally central — improving the Juba–Nimule corridor and the country's links into the Northern Corridor, and advancing, over the long horizon, the LAPSSET connection to Lamu that would give South Sudan an alternative outlet to the sea and the redundancy its export economy so badly lacks. EAC membership also brings obligations — meeting common-market standards, building customs capacity, harmonising procedures — that will stretch the country's nascent institutions, making technical assistance and phased implementation essential.

AfCFTA participation is the enabling legal floor, consistent with the assessment's finding that the measurable gains lie elsewhere. As a signatory of the African Continental Free Trade Area, South Sudan gains preferential access to the continental market, but the report's scenario results put tariff liberalisation on its own at about 1.3% — a small and imprecisely measured effect — while the gains that the model can separate from it come from facilitation, standards and corridor investment. AfCFTA's value to South Sudan is therefore less the tariff schedule than the framework it provides for trade facilitation, rules of origin that could let South Sudanese gum, livestock and food qualify for continental markets, and the political momentum it lends to the institution-building the country must undertake regardless. South Sudan should ratify and operationalise its AfCFTA commitments as the legal foundation, while concentrating its scarce implementation capacity on the facilitation and standards measures that actually move trade.

The priorities, sequenced for a fragile state, depart in emphasis from the standard continental ordering. For a stable economy the report's hierarchy — lead with non-tariff and standards reform, then borders, then corridors and rail — is correct. For South Sudan the sequence must be prefixed by the foundational layer that other countries take for granted: consolidate peace and basic security on the trade corridors; stabilise the currency and the fiscal position so that import-dependent markets can function; and build the most basic all-weather connectivity and border infrastructure, beginning with the Nimule gateway and the Juba corridor. On that foundation the conventional facilitation agenda becomes viable — one-stop border posts and digital customs at Nimule; standards and SPS systems that let livestock, gum arabic and food reach regional markets; and the deeper EAC harmonisation that lowers friction with the country's natural partners. The strategic, capital-intensive investments — corridor upgrading, the Kenyan route and LAPSSET, and any move toward domestic refining or export diversification — sit behind these, financed where possible from well-managed oil revenue and concessional partners. The through-line of the entire agenda is the country's twin imperative: diversify away from a single transit-dependent commodity, and build the stability — political, monetary and physical — without which no diversification can hold.

14. Conclusions and Recommendations

South Sudan trades below its potential with its region — a fill ratio of 0.04 — for reasons this assessment has measured and ranked: **non-tariff barriers and divergent standards** (the largest lever), **transport and border frictions** on the corridors and gateways that connect it to its neighbours, and **productive-capacity gaps**. Its regional *sourcing*, unusually for this series, is not among them: at 44.86% of imported input demand it is already one of the most African-supplied input structures on the continent, and the country's undiversified side is what it sells, not what it buys. **Non-tariff and standards reform and port efficiency are the two levers the model can separate from tariff removal at conventional confidence**; the tariff effect itself is measured near zero but with a band wide enough to include a substantial gain, so it is a weak estimate rather than a demonstrated irrelevance. Its best opportunities lie in deepening trade with its natural neighbouring markets (Uganda, South Africa, Angola, Nigeria) and scaling its competitive value chains into that market. Its priority reforms, in sequence, are: dismantle non-tariff barriers and harmonise standards; complete one-stop border posts and digital customs; upgrade and de-risk the corridors and build redundancy; lower energy costs and build value-chain capacity; and implement AfCFTA tariff liberalisation as the enabling floor. Done together and built resiliently, these reforms could raise South Sudan's intra-African exports by about 129.6%, lift the African share of its imported input demand from 44.86% to 50.12%, and deliver broad-based, progressive welfare gains (Maliszewska and Ruta, 2020; UNECA, 2021).

A. Data Sources and Reproducibility

Built on the GTAP MRIO database and World Bank indicators with the TradeAnalytics, TradeFuture and KITEAnalytics Julia packages. Gravity flows (`missing_trade`, `missing_pairs`) are in US dollars; MRIO sourcing and GTAP bilateral values in thousands; all converted to US\$ million for display. GTAP records gross flows, so magnitudes exceed official merchandise statistics. Macroeconomic figures (Section 2) are approximate external sources (World Bank WDI; IMF; national statistics). All figures are reproducible from `country_figures.jl`, `country_optimize_all.jl` and `country_report_gen.jl`; every model result is also written as a CSV under `output/`.

B. Intra-African trade partners

Table 4: South Sudan: top 15 intra-African export partners

Partner	Actual (\$m)	Potential (\$m)	Missing (\$m)	Ad-val %	Crossings	Same REC
Uganda	9	156	146	22.5	3	Yes
South Africa	1	36	35	23.0	3	
Angola	1	21	20	20.7	2	
Nigeria	1	20	20	23.7	2	
Kenya	1	6	5	20.1	2	Yes
Egypt	1	14	14	20.0	2	
Algeria	1	41	40	28.7	3	
Ethiopia	1	1	0	4.0	1	Yes
Mozambique	0	7	7	20.9	2	
Ghana	0	7	6	21.5	2	
DR Congo	0	7	7	22.5	3	
Sudan	0	2	2	21.3	2	Yes
Libya	0	28	28	36.0	5	
Gabon	0	3	3	20.6	2	
Cote d'Ivoire	0	4	4	22.9	2	

Notes: Ranked by value. Values are GTAP gross flows and exceed official merchandise statistics. The full partner list is in the model output under `assets/data/`.

Table 5: South Sudan: top 15 intra-African import partners

Partner (origin)	Actual (\$m)	Potential (\$m)	Missing (\$m)	Ad-val %	Crossings	Same REC
Uganda	336	5711	5375	22.5	3	Yes
Kenya	186	1989	1803	20.1	2	Yes
Sudan	29	336	307	21.3	2	Yes
Rwanda	2	63	60	24.5	4	Yes
Ethiopia	2	4	2	4.0	1	Yes
South Africa	2	72	71	23.0	3	
Morocco	1	31	30	23.3	2	
Tanzania	1	8	7	20.2	2	Yes
DR Congo	0	17	17	22.5	3	
Angola	0	7	7	20.7	2	
Egypt	0	5	5	20.0	2	
Central African Republic	0	21	21	32.7	4	
Algeria	0	10	10	28.7	3	
Ghana	0	3	3	21.5	2	
Nigeria	0	4	4	23.7	2	

Notes: Ranked by value. Values are GTAP gross flows and exceed official merchandise statistics. The full partner list is in the model output under `assets/data/`.

C. Sector diagnostics

Table 6: South Sudan: input sourcing, its response to AfCFTA and value-chain indicators by sector

Sector	Domestic	Intra-Af.	RoW	AfCFTA Δ
Oil	442	34	75	+0.0 pp
Accommodation, food...	13	2	26	+0.0 pp
Trade	171	3	23	+0.6 pp
Human health and...	102	17	19	+0.0 pp
Construction	70	14	13	+0.0 pp
Warehousing and...	35	2	13	+1.5 pp
Public administration...	53	9	6	+0.0 pp
Communication	79	5	6	+0.0 pp
Financial services nec	200	7	6	+0.0 pp
Electricity	17	1	6	+1.6 pp
Transport nec	25	2	5	+0.0 pp
Textiles	6	1	5	+9.3 pp
Wearing apparel	6	1	4	+13.0 pp
Recreational and...	40	3	4	+0.0 pp
Air transport	3	1	3	+0.1 pp
Mineral products nec	19	3	3	+8.1 pp
Transport equipment...	18	2	3	+8.1 pp
Minerals nec	19	1	3	+0.0 pp
Real estate activities	56	1	2	+0.5 pp
Business services nec	34	2	1	+0.0 pp
Forestry	22	1	1	+1.5 pp
Ferrous metals	7	1	1	+8.0 pp
Education	12	3	1	+0.0 pp
Sugar cane, sugar beet	44	1	1	+9.2 pp
Water transport	6	0	1	+0.0 pp
Chemical products	6	1	1	+11.5 pp
Water	8	0	1	+0.0 pp
Manufactures nec	5	1	1	+13.9 pp
Bovine cattle, sheep...	19	3	1	+5.8 pp
Animal products nec	22	5	1	+3.2 pp
Raw milk	14	2	1	+6.8 pp

continued on the next page

Table 7 (continued)

Sector	Domestic	Intra-Af.	RoW	AfCFTA Δ
Food products nec	9	2	1	+4.2 pp
Vegetables, fruit...	24	0	1	+3.3 pp
Wood products	6	0	1	+9.0 pp
Rubber and plastic...	4	0	1	+11.0 pp
Insurance	22	1	1	+0.0 pp
Fishing	3	0	1	+0.3 pp
Leather products	1	0	0	+6.7 pp
Motor vehicles and...	2	0	0	+6.5 pp
Oil seeds	1	0	0	+0.3 pp
Dwellings	8	0	0	+0.0 pp
Metal products	1	0	0	+13.6 pp
Metals nec	2	0	0	+2.8 pp
Crops nec	0	0	0	+5.5 pp
Beverages and tobacco...	1	0	0	+0.7 pp
Cereal grains nec	1	0	0	+1.1 pp
Coal	1	0	0	+0.0 pp
Basic pharmaceutical...	1	0	0	+10.7 pp
Sugar	4	0	0	+0.3 pp
Plant-based fibers	1	0	0	+0.1 pp
Processed rice	6	0	0	+6.3 pp
Paddy rice	1	0	0	+17.2 pp
Vegetable oils and...	2	0	0	+3.6 pp
Dairy products	1	0	0	+11.3 pp
Gas	0	0	0	+62.0 pp
Petroleum, coal...	0	0	0	+0.9 pp
Wheat	0	0	0	+0.3 pp
Machinery and...	0	0	0	+11.1 pp
Computer, electronic...	1	0	0	+12.5 pp
Bovine meat products	1	0	0	+3.7 pp
Electrical equipment	0	0	0	+11.6 pp
Meat products nec	1	0	0	+6.7 pp
Paper products...	0	0	0	+3.3 pp
Gas manufacture...	0	0	0	+0.0 pp
Wool, silk-worm...	0	0	0	+0.1 pp

Notes: Sourcing values are US\$ million of intermediate input use. Regional sourcing is modelled as an Armington CES on GTAP's own import-source substitution elasticities, calibrated cell by cell to the observed 2017 pattern, so the model's baseline reproduces observed sourcing exactly and there is no "optimal versus actual" gap to report. The AfCFTA Δ column is the modelled response instead: the change, in percentage points, in the share of the commodity's imported input demand met from African suppliers under the full AfCFTA package. That denominator is the model's import demand for the commodity and is not the denominator of the three value columns beside it, so the two should not be reconciled against each other. Economy-wide the same measure moves from 44.86% to 50.12%, +5.26 pp. The sourcing model's friction matrix is transport cost only and carries no tariff channel, so tariff removal produces no response in this column – a limit of the model, not a finding about tariffs. Forward GVC participation, reported in Section 6, is normalised by each commodity's own gross exports, so it exceeds 100% for commodities that barely export; those values are not interpretable as shares.

D. Corridors and network

Table 8: South Sudan: regional transport corridors

Corridor	Mode	Reliability	Serves South Sudan	Route
Northern Corridor	road/rail	0.60		Mombasa → KEN → UGA → RWA → BDI
Central Corridor	road	0.55		Dar es Salaam → TZA → RWA → UGA → BDI
North-South Corridor	road	0.65		Durban → ZAF → BWA → ZWE → ZMB → COD
Dar-Copperbelt (TAZARA)	rail/road	0.50		Dar es Salaam → TZA → ZMB → COD
Maputo Corridor	road/rail	0.70		Maputo → ZAF
Beira Corridor	road/rail	0.55		Beira → ZWE → ZMB → MWI
Nacala Corridor	rail	0.50		Nacala → MWI → ZMB
Trans-Kalahari Corridor	road	0.75		Walvis Bay → NAM → BWA → ZAF
Walvis Bay-Ndola-Lubumbashi	road	0.60		Walvis Bay → NAM → ZMB → COD
Lobito Corridor	rail	0.50		Lobito → AGO → COD → ZMB
Abidjan-Lagos Corridor	road	0.60		Abidjan → CIV → GHA → TGO → BEN → NGA
Dakar-Bamako Corridor	road/rail	0.55		Dakar → SEN → MLI
Tema-Ouagadougou Corridor	road	0.60		Tema → GHA → BFA → NER
Lagos-Niamey Corridor	road	0.50		Lagos → NGA → NER → TCD
Djibouti Corridor	road/rail	0.65	Yes	Djibouti → DJI → ETH → SDS
Douala Corridor	road	0.50		Douala → CMR → TCD → CAF
Trans-Maghreb Corridor	road	0.70		Tanger Med → MAR → DZA → TUN → LBY

Notes: Delivered cost is ad-valorem, as a share of cargo value.

Table 9: South Sudan: trade-network nodes by betweenness centrality (top 10)

Rank	Node	Type	Country	Betweenness	Avg delay (h)	Score
1	Tanger Med	port	Morocco	0.10	348	0.22
2	Djibouti	port	Djibouti	0.08	320	0.15
3	Douala	port	Cameroon	0.07	273	0.13
4	Mombasa	port	Kenya	0.06	306	0.12
5	Dar es Salaam	port	Tanzania	0.06	297	0.12
6	Dakar	port	Senegal	0.05	323	0.10
7	Lagos	port	Nigeria	0.05	277	0.10
8	Morocco	city	Morocco	0.08	19	0.09
9	Tema	port	Ghana	0.05	279	0.09
10	Beira	port	Mozambique	0.04	313	0.08

Notes: Betweenness centrality counts the shortest paths through each node; the highest-centrality gateways are the chokepoints where facilitation is most leveraged. The full ranking is in the model output under `assets/data/`.

References

- Anderson, J. E. and van Wincoop, E. (2003). Gravity with Gravitas: A Solution to the Border Puzzle. *American Economic Review*, 93(1):170–192.
- Costinot, A. and Rodríguez-Clare, A. (2014). Trade Theory with Numbers: Quantifying the Consequences of Globalization. In *Handbook of International Economics*, volume 4, pages 197–261. Elsevier.
- Freeman, L. C. (1977). A Set of Measures of Centrality Based on Betweenness. *Sociometry*, 40(1):35–41.
- Head, K. and Mayer, T. (2014). Gravity Equations: Workhorse, Toolkit, and Cookbook. In *Handbook of International Economics*, volume 4, pages 131–195. Elsevier.
- Kee, H. L., Nicita, A., and Olarreaga, M. (2009). Estimating Trade Restrictiveness Indices. *The Economic Journal*, 119(534):172–199.
- Limão, N. and Venables, A. J. (2001). Infrastructure, Geographical Disadvantage, Transport Costs, and Trade. *World Bank Economic Review*, 15(3):451–479.
- Maliszewska, M. and Ruta, M. (2020). *The African Continental Free Trade Area: Economic and Distributional Effects*. World Bank, Washington, DC.
- Santos Silva, J. M. C. and Tenreyro, S. (2006). The Log of Gravity. *Review of Economics and Statistics*, 88(4):641–658.
- Teravaninthorn, S. and Raballand, G. (2009). *Transport Prices and Costs in Africa: A Review of the International Corridors*. World Bank, Washington, DC.
- UNCTAD (2021). Economic Development in Africa Report 2021: Reaping the Potential Benefits of the AfCFTA for Inclusive Growth. Technical report, United Nations Conference on Trade and Development. <https://unctad.org>.
- UNECA (2021). Assessing Regional Integration in Africa (ARIA X): Towards Achieving the AfCFTA Objectives. Technical report, United Nations Economic Commission for Africa. <https://www.uneca.org>.
- World Bank (2020). World Development Report 2020: Trading for Development in the Age of Global Value Chains. Technical report, World Bank, Washington, DC.