African Journal of Procurement, Logistics & Supply Chain Management
AJPLSCM 2026, Volume 9, Issue 02, Page 01-13
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Journal Impact Factor (JIF): 6.782
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Internal Standard Serial Number (ISSN): 2676-2730
DOI: https://dx.doi.org/10.4314/ajplscm.v9i2.1
Web: https://damaacademia.com/index.php/ajplscm/

Uneven Recovery in Transport Services Following COVID-19 Global Value Chain Evidence from 2018 to 2024

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Abstract

Post-COVID-19 recovery in the transport sector may follow divergent trajectories when measured by gross trade values versus participation in international production networks. This study analyses four transport-related activities using Asian Development Bank (ADB) data spanning 2018–2024 and validates three comparable activities against OECD Trade in Value Added (TiVA) indicators through 2022. The empirical dataset comprises 43 sector–source–year observations and integrates nominal recovery indices, participation-share measures, symmetric decomposition, and sensitivity checks using alternative baseline years. In 2020, ADB air transport records a 46.51% decline in global value chain (GVC) trade value, while its participation share increases by 2.40 percentage points, indicating that contraction in levels can coincide with relative gains in participation.

By 2024, all four activities surpass their 2019 GVC trade values; however, water transport and transport-supporting activities display reduced participation shares, implying that scale effects in gross trade can offset weakening participation. Comparisons with TiVA corroborate the initial contraction's magnitude while refining inferences about recovery timing and the evolution of participation shares. Moreover, baseline selection materially affects inferred "return" dates, underscoring the importance of methodological transparency. The results motivate paired reporting of recovery in both monetary terms (trade values) and structural terms (participation measures). The analysis also indicates that global aggregates alone cannot identify COVID-19's distinct causal contribution or infer operational resilience, and that additional, context-specific evidence is needed to inform African sourcing decisions.

Keywords: *COVID-19, Transport Services, Global Value Chains, Recovery*

Citation: *Oppong, B. P. (2026), "Uneven Recovery in Transport Services Following COVID-19 Global Value Chain Evidence from 2018 to 2024", African Journal of Procurement, Logistics & Supply Chain Management. 2026, 9(2): pp.01-13. DOI: https://dx.doi.org/10.4314/ajplscm.v9i2.1*

Submitted: 10 October 2026 | Accepted: 26 October 2026 | Published: 30 October 2026

1.0 INTRODUCTION

Recovery in transport services is often operationalised as a return to the activity volume observed before the COVID-19 pandemic (Gudmundsson et al., 2021). Although this benchmark is informative, it does not address a related question: whether the sector has re-established its pre-pandemic function within international production networks. Notably, transport services may exhibit higher export revenues even if a smaller share of those exports is embodied in global value chains (GVCs). Conversely, the sector's GVC participation rate may increase while the absolute value of associated exports declines. These alternative configurations have distinct implications for procurement strategies and logistics planning. Accordingly, neither an increase in export value nor an increase in participation rates, considered in isolation, is sufficient to substantiate recovery across the multiple dimensions relevant to transport services integration in global production.

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The COVID-19 pandemic provides an instructive empirical context for examining this distinction. According to the International Civil Aviation Organisation (ICAO, 2020), scheduled passenger volumes declined by 60.1% in 2020 relative to 2019. Similarly, the United Nations Conference on Trade and Development (UNCTAD, 2021) documents a 3.8% contraction in global maritime trade volume over the same period. Taken together, these indicators capture complementary, yet analytically distinct, dimensions of the transport-sector disruption associated with the pandemic.

Prior research has analysed the shock's international transmission, adaptive responses by shipping and port operators, and heterogeneity in air-cargo recovery (Bonadio et al., 2021; Findlay et al., 2021; Notteboom et al., 2021). Another methodological issue concerns how to represent "recovery" when the object of analysis is transport services embedded in internationally fragmented production. Specifically, a rebound in nominal global value chain (GVC) trade values does not necessarily coincide with a restoration of the share of sectoral trade attributable to GVC-related production linkages. Separating these dimensions enables a more accurate interpretation of evidence commonly used in sourcing and logistics assessments.

This study compares inland transport, water transport, air transport, and a broader category of supporting activities over 2018–2024. The primary time series are drawn from the Asian Development Bank multiregional input–output dataset (ADB MRIO). We use Trade in Value Added (TiVA) statistics from the Organisation for Economic Co-operation and Development (OECD) as an external benchmark for three transport activities through 2022. The analysis addresses three questions: (i) whether nominal GVC trade values and GVC participation shares exhibit congruent recovery trajectories; (ii) how changes in gross-trade scale and participation shares jointly account for observed movements in GVC trade values; and (iii) whether the main inferences are robust to alternative baselines and data sources.

This contribution empirically assesses divergence between two dimensions of transport-sector recovery. Using annual indices, an exact accounting decomposition, and explicit baseline-sensitivity checks, it delineates which results are robust and which depend on the comparator used. The COVID-19 pandemic serves as the relevant disruption context; however, the analysis does not seek to identify its distinct causal effect. The underlying observations pertain to global transport-sector estimates; consequently, their implications for African procurement and logistics derive from interpreting international evidence rather than from direct estimates of performance at the level of African countries.

2.0 MATERIALS AND METHODS

2.1 Transport Disruption and International Production

Transport services both interlink geographically dispersed production sites and constitute a service category traded internationally. Consequently, transport sector disruptions can impede the distribution of goods produced by other industries and, at the same time, alter the export composition and intermediate-input structure of transport service providers. Bonadio et al. (2021) develop a framework to quantify how pandemic-induced labour-supply shocks propagate through international production networks. Ivanov (2020) employs simulation methods to assess how the sequencing and duration of disruption and recovery across supply-chain stages influence overall supply-chain performance. Collectively, these studies elucidate mechanisms through which disruptions transmit between transport systems and international production networks.

Maritime-sector evidence likewise indicates substantial heterogeneity within what may appear to be a uniform disruption. Notteboom et al. (2021) analyse shipping services, terminal operations, port activity, and network connectivity, and show that market structure and adaptive responses materially mediated the operational impacts of COVID-19. Their findings caution against interpreting changes in aggregate trade flows as a sufficient characterisation of disruptions to transport operations. UNCTAD (2021) similarly contextualises trade-volume trends with concurrent developments in shipping markets and port performance. Accordingly, the monetary value of exported transport services is not informationally equivalent to operational indicators such as vessel calls, cargo tonnage, or service reliability.

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Air transport warrants an explicit distinction between passenger and freight activities. Using high-frequency data, Findlay et al. (2021) analyse air-cargo connectivity and exposure to global value chains (GVCs), documenting cross-market heterogeneity in both demand conditions and the pace of recovery. Similarly, Gudmundsson et al. (2021) generate separate recovery forecasts for passenger and freight demand. Collectively, this evidence motivates an analytical focus on differential recovery trajectories; however, the traffic-based indicators employed in these studies are not directly comparable to a GVC trade-value series that aggregates transport activities at the sectoral level. Moreover, the dataset used here does not allow separating passenger services from freight.

2.2 Participation Shares and Recovery in Value

Global value chain (GVC) accounting identifies trade flows associated with production processes that cross more than one international border (Oppong & Tweneboah, 2023; Oppong, 2025a; Oppong, 2025b). Within this framework, the World Integrated Trade Solution (WITS) decomposition attributes such trade to the exporting sector and distinguishes among pure backward, pure forward, and two-sided linkages (Borin & Mancini, 2023; World Bank, 2025). For a given transport sector, the GVC participation share is defined as the value of GVC-related trade divided by the sector's gross trade. This indicator captures the sector's involvement in cross-border production arrangements as recorded in trade statistics; it is not a physical measure of border crossings by aircraft or vessels, nor does it represent the share of global merchandise shipments carried by a particular transport mode.

Borin et al. (2026) distinguish trade-based participation from output-based participation; this study uses the trade-based measure throughout. This distinction matters because international production linkages may be mediated through domestic input–output relationships, and because the denominator choice shapes the interpretation of participation statements. Mechanically, a sector's participation share may rise when GVC-related trade declines less rapidly than the rest of gross trade, and it may fall even when GVC-related trade rises if gross trade expands faster. Hence, changes in trade values and changes in participation shares may diverge in sign.

Accordingly, a two-dimensional assessment is employed, reporting (i) a GVC trade-value index and (ii) the change in the participation share. Index values above the reference year indicate a nominal recovery in recorded GVC-related trade. In contrast, a positive change in the share indicates that GVC-related trade has gained relative weight within the sector. Discordance arises when these two comparisons point in opposite directions. An index that rises above the reference level reflects a threshold crossing; however, sustained recovery depends on subsequent observations.

2.3 Recovery and Resilience

Supply-chain resilience is the capability to anticipate disruptions, respond effectively, and recover operational performance while maintaining or restoring core functions (Ponomarov & Holcomb, 2009). This construct extends beyond a mere rebound in aggregate monetary indicators. The Organisation for Economic Co-operation and Development (OECD, 2025) highlights adaptability and the active management of interdependencies as central dimensions in assessing resilient supply chains. Consequently, neither participation shares nor trade-value indices directly measure these underlying organisational capabilities. Moreover, the post-2020 period encompasses structural and exogenous developments that cannot be attributed solely to the initial COVID-19 shock. For example, UNCTAD (2024) documents intensifying geopolitical and climate-related stresses affecting maritime chokepoints. These contemporaneous pressures underscore the need to distinguish descriptive recovery patterns from causal inference about COVID-19's effects. Accordingly, the present study examines sectoral trajectories and accounting-based contributions while avoiding attributing all subsequent changes exclusively to the pandemic.

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3.0 METHODOLOGY

3.1 Data and Sector Selection

The dataset comprises global (world-level) GVC trade estimates disseminated via WITS, with sector definitions and decomposition variables specified in the relevant World Bank documentation (World Bank, 2020, 2025). The primary extract includes 28 ADB sector–year observations covering four activities over 2018–2024. The TiVA comparison extract includes 15 observations for three activities over 2018–2022. All 43 selected observations designate WLD as both exporter and importer; accordingly, they represent alternative world–sector estimates rather than observations at the level of individual countries, firms, or shipments.

ADB sector 26 aggregates supporting and auxiliary transport activities with travel-agency activities. It is therefore retained only as a broad supporting activities category and is not interpreted as a standalone measure of warehousing. TiVA's "warehousing and support" category is excluded from the matched comparison because the WITS sector concordance does not provide evidence of equivalent sectoral coverage. The comparison is consequently restricted to inland (land) transport, water transport, and air transport. Despite similar sector labels, underlying classification schemes, country coverage, and database construction may differ across sources.

The selected numerical trade variables contain neither missing nor negative values, and all selected gross-trade denominators are strictly positive. The exporter–importer–sector–year–source key is unique. Four accounting identities were evaluated, including (i) gross trade equals the sum of traditional trade and GVC trade, and (ii) GVC trade equals the sum of its three linkage components. The maximum absolute residual across these checks is below 0.000000004 million US dollars. Such arithmetic coherence, however, does not constitute independent validation of the underlying input–output estimates.

3.2 Measures and Reference Periods

For each source, activity and year, G denotes GVC trade value, T gross trade and p the participation percentage. The participation measure is:

$$p_t = \frac{100G_t}{T_t}$$

Values are in millions of current US dollars. The GVC trade-value index equals 100 times the year's GVC value divided by its 2019 value. Share changes subtract the 2019 participation percentage from the later percentage and are expressed in percentage points. We calculate these measures separately for each activity and source. No observations are pooled as independent replications, and no source history is joined to another.

The principal reference is 2019, the final full year before the 2020 disruption. The 2018 observations provide a baseline sensitivity check. They matter because several activities had lower nominal GVC trade in 2019 than in 2018. The analysis reports the 2019–2020 contraction, the common endpoint in 2022 and the ADB endpoint in 2024. The first observed recovery year is the earliest annual observation from 2020 onward at or above the selected baseline value. It is a threshold crossing in the available series, not an estimate of the month of recovery or evidence that recovery subsequently persisted.

The selected WITS decomposition series ends in 2022 for TiVA and in 2024 for ADB (World Bank, 2025). Comparisons between sources therefore end in 2022, while the later trajectory uses ADB alone. All calculations use observed source-year values without interpolation or extrapolation.

3.4 Decomposing Nominal GVC Trade Changes

Because G equals T multiplied by p divided by 100, a change in G can be decomposed into gross-trade scale and participation-share contributions. Using the average of the two endpoint values gives an exact symmetric decomposition, consistent with the treatment of alternative polar decompositions discussed by Dietzenbacher and Los (1998):

$$\Delta G = C_T + C_p$$

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$$C_T = \frac{p_1 + p_0}{200}(T_1 - T_0)$$
$$C_p = \frac{T_1 + T_0}{200}(p_1 - p_0)$$

Subscripts 0 and 1 denote the earlier and later observations. The scale contribution evaluates the change in gross trade at the average participation share. The participation contribution measures the change in the participation share at average gross trade. Their sum equals the observed GVC trade-value change before rounding. Divide each contribution by the initial GVC trade value and multiply by 100 to express it as percentage points of nominal GVC value growth.

The decomposition contrasts the 2019–2020 disturbance with the 2019–2024 endpoint reported in the ADB series. The scale component captures both valuation effects and changes in the level and composition of trade. The participation component may likewise embed price movements, shifts in the passenger–freight mix, and other within-sector compositional adjustments. Neither component separately identifies demand-side conditions, technological change, or COVID-19 as distinct causal mechanisms.

The results rely on observed differences and accounting identities rather than an explicit structural model. Given the limited time-series support—seven annual ADB observations per activity and five TiVA observations—the empirical design is insufficient to underpin a credible causal interruption framework or to construct an untreated counterfactual. Accordingly, the constructed world aggregates are not accompanied by statistical significance testing or sampling-based confidence intervals. Robustness is evaluated via comparisons across data sources and alternative baselines within the bounds of available coverage.

4.0 RESULTS AND DISCUSSIONS

4.1 The 2020 Contraction Differs From The Participation Response

Across the four ADB transport-related activities, nominal GVC trade is lower in 2020 relative to 2019. Air transport shows the largest contraction (−46.51%), compared with declines of −19.64% for inland transport, −15.45% for water transport, and −14.07% for supporting activities. Participation shares change heterogeneously: inland and water transport decrease by 1.08 and 1.30 percentage points, respectively, while air transport and supporting activities increase by 2.40 and 1.82 percentage points. Table 1 summarises the shock magnitude and the most recent endpoint observation, while Figure 1 presents the full time-path trajectories.

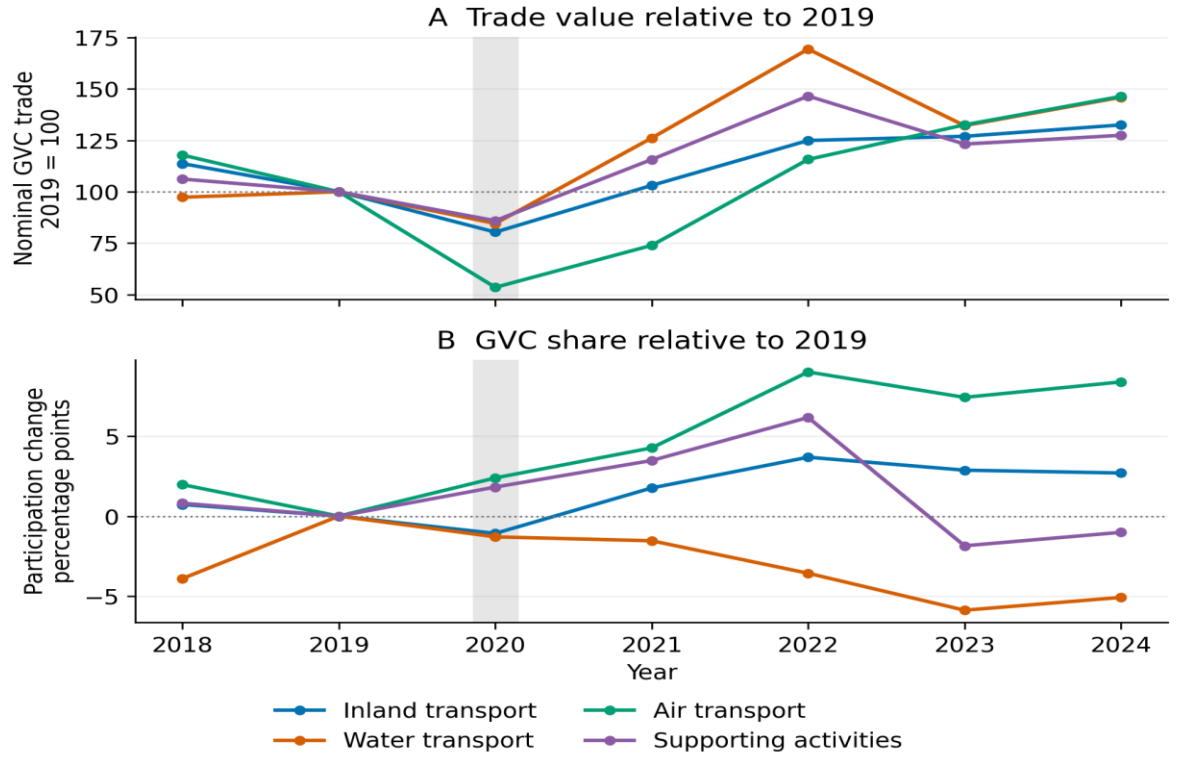
Table 1: *ADB changes from the 2019 baseline*

Activity	2020 value (%)	2020 share (pp)	2024 value (%)	2024 share (pp)
Inland transport	-19.64	-1.08	+32.51	+2.70
Water transport	-15.45	-1.30	+45.96	-5.10
Air transport	-46.51	+2.40	+46.38	+8.41
Supporting activities	-14.07	+1.82	+27.46	-1.02

Note. The value is nominal GVC trade growth relative to 2019. Share is the change in GVC trade as a percentage of sector gross trade. pp = percentage points. The supporting-activities category includes travel agencies.

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Figure 1: *Different paths for trade value and participation in ADB*



Note. Panel A uses nominal GVC trade with 2019 = 100. Panel B subtracts the 2019 participation share. The grey band marks 2020—source: Authors' calculations from WITS.

The air transport results show that relying on the participation ratio alone can yield a misleading assessment of the magnitude of disruption in trade value. In the ADB database, the sector's share increases from 41.74% to 44.13%, even though its nominal GVC-related trade value declines by nearly one half. Moreover, gross air-transport trade contracts more rapidly than its GVC component. Consequently, the observed rise in the participation ratio should not be interpreted as evidence that the shock did not affect international production activity. The supporting-activities category provides a less pronounced example of the same pattern.

These comparisons pertain to monetary measures of GVC trade and the corresponding denominator used to compute the ratio. They do not capture reductions in passenger volumes or freight tonnage documented in transport statistics. In addition, the air-transport category aggregates activities with heterogeneous exposure to travel restrictions and to shifts in goods demand. As a result, sector-level aggregates cannot disentangle how much changes in the share reflect compositional shifts between passenger and cargo services.

4.2 Nominal Recovery Precedes or Follows Share Recovery

ADB inland, water and supporting activities first exceed their 2019 nominal GVC trade values in 2021. Air transport first does so in 2022. Their participation paths differ. Air and supporting activities already exceed their 2019 shares in 2020, inland transport does so in 2021, and water transport remains below its 2019 share throughout 2020–2024.

By 2024, all four activities have higher nominal GVC trade than in 2019. Air transport gains 46.38%, water transport 45.96%, inland transport 32.51% and supporting activities 27.46%. However, water transport's share is 5.10 percentage points below 2019, and supporting activities' share is 1.02 points below. Inland and air transport retain gains of 2.70 and 8.41 points, respectively. Monetary recovery therefore coexists with a lower relative GVC role in two

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of the four activities. The paths are also uneven after 2022. Water transport's GVC trade-value index falls from 169.40 in 2022 to 145.96 in 2024, and the index for supporting activities falls from 146.55 to 127.46. Both remain above 2019 in value, but their participation shares also decline over those two years. Air transport's index rises from 115.72 to 146.38 while its share eases from 50.78% to 50.15%. This last comparison shows that a growing monetary value can accompany a slightly lower participation share even within an activity whose longer-term share remains above the baseline.

4.3 What the matched TiVA comparison confirms

The TiVA database corroborates the substantial decline in nominal air-transport GVC trade in 2020, estimating a 44.92% contraction, close to the ADB estimate of 46.51%. TiVA likewise documents nominal contractions in inland and maritime transport. Accordingly, the overarching conclusion of widespread disruption across all three transport activities is consistent across the sources considered. However, estimated responses in sectoral shares are less uniform, as Table 2 shows.

Table 2: *Matched source comparisons relative to 2019*

Activity	Source	2020 value (%)	2020 share (pp)	2022 value (%)	2022 share (pp)
Inland transport	ADB	-19.64	-1.08	+24.93	+3.69
Inland transport	TiVA	-17.72	+1.10	+26.71	+4.42
Water transport	ADB	-15.45	-1.30	+69.40	-3.58
Water transport	TiVA	-16.59	+0.59	+31.70	+2.13
Air transport	ADB	-46.51	+2.40	+15.72	+9.04
Air transport	TiVA	-44.92	+0.16	-1.76	+5.83

Note. All endpoints preserve the same source. The comparison covers three activities with similar labels. Differences in source construction and detailed coverage remain. TiVA observations after 2022 are unavailable in this extract.

In air transport, TiVA indicates only a 0.16 percentage-point increase in the participation share in 2020, substantially smaller than the corresponding increase reported by ADB. Relative to 2019, both sources nonetheless show the same qualitative pattern—an increasing participation share alongside a decline in trade value—although the magnitude of the TiVA share change is minimal. For inland and water transport, TiVA reports rising participation shares, whereas ADB reports declines, indicating that the immediate participation response differs both by activity and by statistical source.

By 2022, both datasets place inland and water transport GVC trade values above their respective 2019 baselines. For air transport, however, the assessment of value recovery remains source-contingent: TiVA still reports a level 1.76% below 2019, while ADB reports a level 15.72% above 2019. Despite this divergence, both sources indicate higher air-transport participation shares over 2019–2022, with increases of 5.83 and 9.04 percentage points, respectively. Collectively, these results strengthen the inference that participation shares and monetary values need not recover synchronously, and they imply that the timing of air-transport value recovery depends on the underlying data source.

Water transport similarly shows source-dependent participation dynamics: over 2019–2022, participation in TiVA increases by 2.13 percentage points, while participation in ADB decreases by 3.58 percentage points. A decline in 2024 is observed only in ADB, as the selected TiVA series terminates in 2022.

4.4 Scale and Participation Make Different Contributions

This decomposition clarifies the arithmetic basis for the divergent trajectories. For the 2020 contraction in air transport, the gross-trade scale component accounts for −50.83 percentage points of GVC value growth. In contrast, the participation component contributes +4.32

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percentage points, jointly reproducing the observed decline of −46.51%. A similar pattern is observed for supporting activities, where a negative scale effect is partially offset by a positive participation effect. By contrast, inland and water transport exhibit negative contributions from both the scale and participation components. Table 3 presents the full set of decomposition results for the shock year and the most recent endpoint.

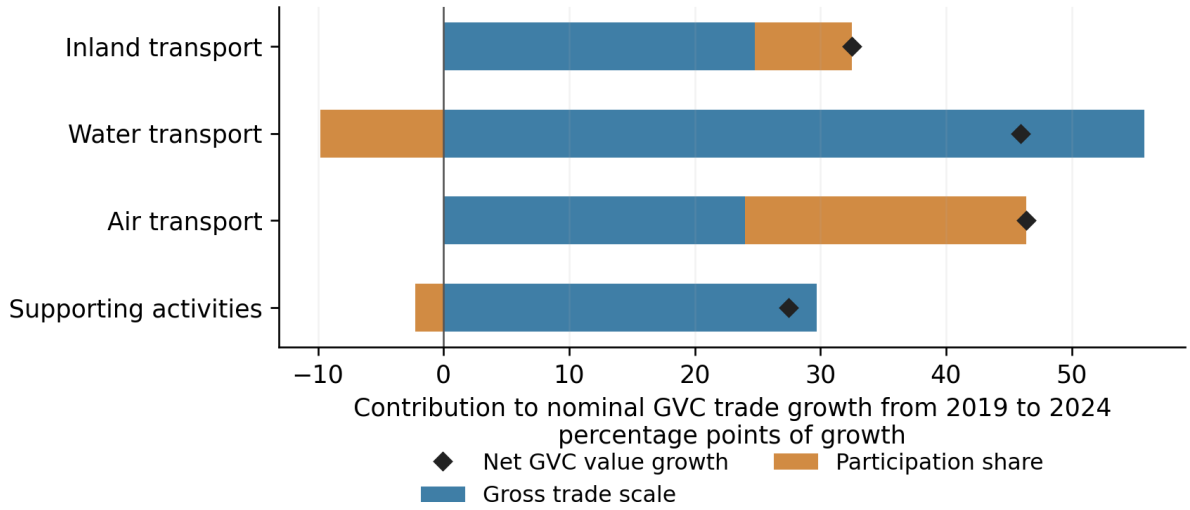
Table 3: *Decomposition of ADB nominal GVC trade growth*

Activity	Interval	Trade scale	Participation	Total growth
Inland transport	2019–2020	-17.11	-2.53	-19.64
Inland transport	2019–2024	+24.77	+7.74	+32.51
Water transport	2019–2020	-13.64	-1.81	-15.45
Water transport	2019–2024	+55.78	-9.82	+45.96
Air transport	2019–2020	-50.83	+4.32	-46.51
Air transport	2019–2024	+24.02	+22.36	+46.38
Supporting activities	2019–2020	-17.25	+3.18	-14.07
Supporting activities	2019–2024	+29.68	-2.22	+27.46

Note. Components are percentage points of nominal GVC value growth, not percentage-point changes in participation shares. Each equals its monetary contribution divided by initial GVC trade and multiplied by 100. Components sum exactly before rounding and do not identify causal mechanisms.

During 2019–2024, in the water transport sector, the gross trade scale effect contributes +55.78 percentage points, while the participation effect offsets 9.82 percentage points, yielding a nominal GVC growth rate of 45.96%. For supporting activities, the scale effect contributes +29.68 percentage points, while the participation effect contributes −2.22 percentage points. These results indicate that increases in trade value within these activities are primarily driven by expansion in overall trade scale rather than by an increased share of GVC participation. Figure 2 reports the end-point decomposition contributions.

Figure 2: *Scale and participation contributions to ADB growth from 2019 to 2024*



Note. Bars show separate accounting contributions. Diamonds show their net sum. Negative participation contributions offset positive scale contributions—source: Authors' calculations from WITS.

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The decomposition of air transport growth over 2019–2024 exhibits a distinct contribution structure. The scale component contributes +24.02 percentage points and the participation component +22.36 percentage points, jointly accounting for a 46.38% increase. For inland transport, the scale component contributes +24.77 percentage points, while participation contributes +7.74 percentage points. These accounting contributions reflect growth measured in current dollars and therefore capture the combined effects of valuation changes, shifts in trade composition, and variations in underlying activity.

4.5 The Baseline Changes the Apparent Recovery Date

The 2018 sensitivity analysis corroborates the qualitative findings of the 2024 ADB comparison: all four activities exhibit higher nominal GVC trade. In addition, air and inland transport show higher participation shares, while water transport and supporting activities show lower shares. However, the estimated magnitudes and the first observed return dates differ, as reported in Table 4.

Table 4 *ADB baseline sensitivity and first observed nominal recovery*

Activity	**Return to 2019**	**Return to 2018**	**2024 value vs 2018 (%)**	**2024 share vs 2018 (pp)**
Inland transport	2021	2022	+16.55	+1.97
Water transport	2021	2021	+49.97	-1.18
Air transport	2022	2023	+24.21	+6.44
Supporting activities	2021	2021	+20.05	-1.83

Note. Return years are the first annual observations from 2020 onward at or above the chosen nominal GVC trade baseline. They do not establish sustained recovery or the month of return. All activities remain above both value baselines in 2024.

Air transport retains its 2018 global value chain (GVC) trade value in 2023, occurring one year after it returns to the 2019 level. In contrast, inland transport returns to baseline in 2022 rather than 2021. Water transport and supporting activities exceed both nominal reference levels in 2021. For air transport, the 2024 increase amounts to 24.21% relative to 2018, compared with 46.38% relative to 2019. These results indicate that both the inferred recovery timing and the estimated growth magnitude depend on the reference year.

Baseline sensitivity also affects how we interpret the initial response in TiVA-based air participation. Specifically, air participation in 2020 is marginally higher than in 2019 but remains below the 2018 level, implying that the sign of the initial change depends on the selected baseline. Notably, the pronounced decline in nominal air GVC trade is robust to baseline selection, whereas participation metrics alone do not fully capture the extent of the nominal contraction.

5.0 CONCLUSIONS

5.1 Discussions

The findings differentiate between (i) the recovery of the recorded value of international production linkages and (ii) the recovery of their relative importance within transport-related trade. These two dimensions are not required to converge temporally. Divergence is evident during the initial contraction phase, when participation shares may rise despite a sharp decline in trade value, and during the subsequent expansion phase, when trade values may surpass pre-shock baselines. At the same time, participation shares remain below baseline levels. This paired, two-dimensional assessment extends the discussion of heterogeneous transport recovery beyond reliance on a single indicator (e.g., traffic volumes or revenues) by applying an analogous evaluative framework across transport activities.

The results also complement the operational research literature on transport disruption. Notteboom et al. (2021) analyse behavioural and operational responses by carriers, terminals, and ports, whereas Findlay et al. (2021) examine air cargo market dynamics and exposure to

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DOI: https://dx.doi.org/10.4314/ajplscm.v9i2.1
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global value chains (GVCs). In contrast, the present estimates characterise the association between sectoral GVC trade values and participation shares. Gudmundsson et al. (2021) instead investigate the recovery in passenger and freight demand, underscoring the multiple empirical dimensions relevant to transport recovery.

For procurement managers, global participation trends offer interpretive context for sourcing assessments when considered jointly with supplier capacity and inventory requirements. An increasing share of participation during an overall contraction may indicate that non-focal trade categories are declining more rapidly, rather than signalling an absolute expansion in available capacity. Similarly, higher nominal trade values may reflect valuation effects and compositional shifts in addition to changes in real activity. Accordingly, aggregate world-sector indicators should be complemented by operational evidence, including contractual exposure, available capacity, lead times, and delivery performance. Such operational measures are not captured in the world-sector datasets.

For logistics analysts, a dashboard that combines a value index with a participation-change metric renders two distinct dimensions of recovery observable. Consistent sources and reference years are necessary to distinguish genuine temporal change from artefacts arising from differences in database construction. Moreover, a single annual return above a baseline should be analytically distinguished from sustained improvement over time. The observed differences in air-transport recovery timing and maritime participation across ADB and TiVA show that inference depends on the underlying statistical source and its methodological choices.

These findings inform African supply-chain analysis by distinguishing recovery in nominal global value chain trade from changes in participation shares. UN Trade and Development (2024) documents how maritime chokepoint disruptions increase transport costs and expose vulnerable trading economies to supply risks. Rerouting around the Cape of Good Hope has lengthened voyages and increased shipping costs (Bacrot & Faure, 2024). Key et al. (2024) model climate-related chokepoint disruptions and identify potential reductions in agricultural imports and economic output in sub-Saharan Africa. These studies provide context for interpreting global transport indicators, while the world-sector estimates examined here contain no separate observations for African countries or specific trade routes.

Applying the paired assessment to regional investment and sourcing decisions therefore requires country- or corridor-level trade records linked to operational transport measures. Customs and port records can support corridor benchmarking (Raballand et al., 2008), while freight performance frameworks provide measures of throughput, costs and modal use (Havenga & de Bod, 2016). Corridor trip monitoring systems can complement these records by tracking truck movements and supporting corridor performance monitoring (Chibomba, 2022).

Finally, the distinction between monetary recovery and organisational resilience is central to interpretation. Ponomarov and Holcomb (2009) and the OECD (2025) conceptualise resilience as a capability encompassing response and adaptation. A return to a monetary baseline provides evidence regarding one observed outcome, but it does not, by itself, demonstrate preparedness for future disruptions. Monetary recovery and resilience should therefore be treated as analytically distinct constructs.

5.2 Limitations and Future Research

The study employs a descriptive design based on a limited set of constructed annual world–sector observations. The framework does not incorporate an untreated comparison group, explicit pandemic-policy covariates, or a counterfactual structure; consequently, COVID-19-related impacts cannot be causally disentangled from contemporaneous demand reallocation, price movements, energy-cost shocks, or subsequent supply-chain disruptions. The analysis should therefore be interpreted as a pandemic-era chronology rather than an estimate of attributable welfare or output losses. Monetary values are reported in current US dollars; accordingly, nominal recovery indices and associated decompositions do not identify underlying physical volumes or real-income effects. Sectoral groupings are internally heterogeneous (e.g., “supporting activities” includes travel agencies). The underlying data do not distinguish passenger from cargo operations, capture firm-level capabilities, or measure service-quality

African Journal of Procurement, Logistics & Supply Chain Management
AJPLSCM 2026, Volume 9, Issue 02, Page 01-13
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Journal Impact Factor (JIF): 6.782
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Internal Standard Serial Number (ISSN): 2676-2730
DOI: https://dx.doi.org/10.4314/ajplscm.v9i2.1
Web: https://damaacademia.com/index.php/ajplscm/

dimensions such as delivery reliability; moreover, aggregating to the global level obscures cross-country and route-specific heterogeneity.

The TiVA benchmark comparison is available only through 2022 and excludes the supporting-activities category. In addition, sector definitions, country coverage, and database construction differ across sources even after calendar-year alignment, and subsequent data vintages may revise the reported estimates. Future research could integrate harmonised bilateral services-trade statistics with traffic volumes, freight-rate measures, and route-performance indicators, and employ a longer panel with quantified exposure to restrictions to facilitate causal identification.

5.3 Conclusion

Transport-sector recovery following the 2020 disruption varies by activity and measurement approach. In 2020, air transport in the ADB sample declines by 46.51% in nominal GVC-related trade, while its GVC participation share rises by 2.40 percentage points. By 2024, all four transport-related activities surpass their respective 2019 GVC trade levels; however, water transport and transport-supporting activities display lower participation shares than in 2019.

A decomposition shows that, for these two activities, expansion in gross trade compensates for weaker participation intensity. TiVA-based evidence corroborates the pronounced initial contraction in air-transport value added. It reinforces the empirical distinction between recovery in nominal magnitudes and recovery in participation shares, while also refining the inferred recovery timing and the trajectory of water transport's participation share. Sensitivity checks using a 2018 baseline further shift the estimated return dates, underscoring recovery assessment's dependence on the reference year.

For procurement and logistics applications, jointly reporting value-based and participation-based indicators provides a more informative characterisation of aggregate recovery, provided the data source and benchmark year are consistent. Nonetheless, operational metrics remain necessary for decisions involving specific sourcing relationships. Overall, the study documents recent patterns in global transport participation around the COVID-19 period while avoiding interpreting temporal sequencing or nominal rebounds as evidence of causal effects or operational resilience.

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AJPLSCM 2026, Volume 9, Issue 02, Page 01-13
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Journal Impact Factor (JIF): 6.782
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DOI: https://dx.doi.org/10.4314/ajplscm.v9i2.1
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African Journal of Procurement, Logistics & Supply Chain Management
AJPLSCM 2026, Volume 9, Issue 02, Page 01-13
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Journal Impact Factor (JIF): 6.782
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Internal Standard Serial Number (ISSN): 2676-2730
DOI: https://dx.doi.org/10.4314/ajplscm.v9i2.1
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