

Strengthening G20 Value Chains: Leveraging Technology and Collaboration

Thematic Area: Trade, Investment, and Resilient Supply Chains

Introduction

Global trade in 2023 expanded to USD 30.5 trillion with USD 24 trillion of merchandise trade and USD 6.5 trillion of services trade. World merchandise trade, however, declined by 4.9% in value terms compared to the previous year, due to unfavorable trends in exchange rates and lower prices for primary commodities¹. According to the World Economic Forum, region-wise trade presented a mixed picture in 2023 as trade in advanced economies declined sharply; however, it increased in emerging markets such as China. In contrast, Latin America, Middle East, North Africa, and Sub-Saharan Africa experienced a contraction in trade.

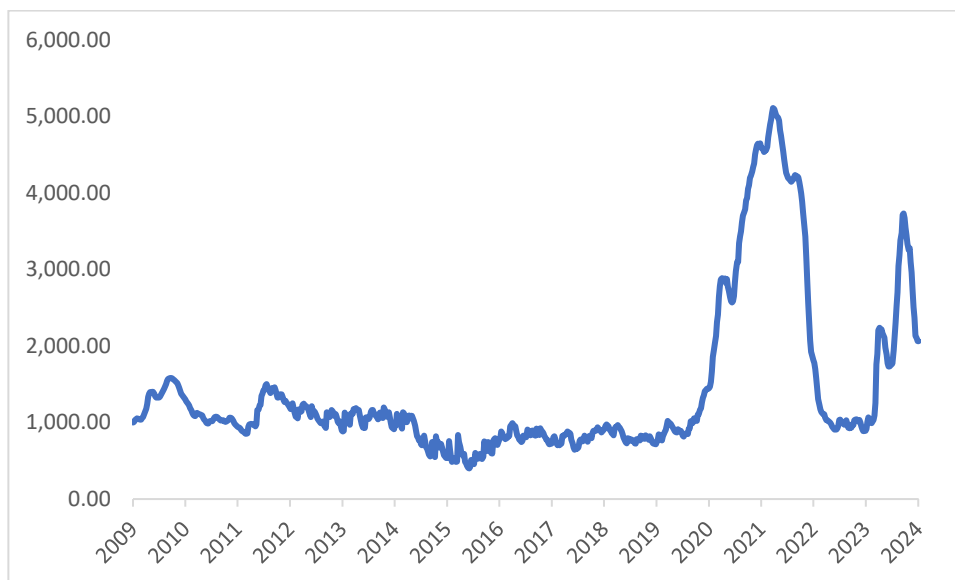
Global trade is experiencing significant challenges such as geopolitical conflicts, dysfunctional appellate body of dispute settlement mechanisms of the World Trade Organisation (WTO), upcoming non-tariff measures such as the Carbon Border Adjustment Mechanism (CBAM), deforestation regulations, and others. Furthermore, health restrictions posed during the COVID19 pandemic, increasing trade protectionism, and geo-economic fragmentation driven by geopolitical conflicts led to an increase in shipping costs. With almost 90% of trade moving

¹https://www.wto.org/english/res_e/statis_e/statistics2023_e.htm#:~:text=In%202023%2C%20world%20trade%20in,trajectory%2C%20increasing%20by%209%25.

along maritime routes², increase in shipping costs had a significant impact on consumer prices across the globe. This relationship is also evident from an IMF study which postulates that the doubling of freight rates increases inflation by 0.7%³.

Freight rates via ships have been on a rising trend since the pandemic and further exacerbated this year with conflict in the Middle East and security issues for ships passing through the Red Sea. The following figure depicts the global shipping costs from October 2009 to October 2024, indicating not only the rising trend in the cost of transportation but also the lingering impact of the pandemic and geopolitical developments on international trade.

Trend in Global Shipping Costs: Comprehensive Index of the Shanghai Containerized Freight Index, October 2009–October 2024



Source: UN Trade and Development (UNCTAD), based on data provided by Clarksons Shipping Intelligence Network, 20 October 2024⁴

Over the decades, as transport costs declined, companies diversified their production across multiple countries, aiming to benefit from lower costs of inputs and labour in different economies. This led to the development of increasingly complex Global Value Chains (GVCs). According to the World Development Report 2020⁵, GVCs allow countries and firms to specialize at multiple stages of production leading to diverse participation from the developed world and from Least Developing Countries (LDCs). It is in this context that connectivity, lower transport

² <https://www.nautilusshipping.com/the-worlds-major-maritime-trade-routes-connecting-the-globe>

³ <https://www.imf.org/en/Blogs/Articles/2022/03/28/how-soaring-shipping-costs-raise-prices-around-the-world>

⁴ <https://unctad.org/news/high-freight-rates-strain-global-supply-chains-threaten-vulnerable-economies>

⁵ <https://openknowledge.worldbank.org/bitstream/handle/10986/32437/9781464814570.pdf>

costs, and robust supply chains are pivotal as managing these costs can facilitate enhanced recovery in merchandise trade over the coming years.

G20 and GVCs: Trends and Challenges

GVCs promote growth and participation by increasing inter-linkages among firms and developing a seamless taxonomy of production processes for multiple products. This framework of GVCs was strengthened with the idea of “A G20 Framework for Mapping GVCs” which was proposed during the G20 Summit 2023. The framework aims to mitigate vulnerabilities by identifying parameters such as concentration of suppliers, volatility of trade volume, upstreaming of an industry or product, down streaming of an industry or product, critical nature of industry and product, product attributes, and connectivity.

Global Value Chains depend on trade in Intermediate Goods (IG) which can act as an indicator to measure the supply chain dynamics as they are used as inputs in production of final goods. Data suggests that trade in IG for G20 increased significantly from USD 956 billion in 1995 to USD 3903 billion in 2020 with exports increasing from USD 467 billion to USD 1871 billion and imports also increasing significantly from USD 489 billion to USD 2031 billion. Such an exponential increase in IG not only reflects enhanced exchange of parts and components between nations but also contributes to increase in urban energy efficiency through technology transfers and development of energy efficiency in local cities⁶.

Trends in Gross Exports, Imports, and Total Trade in Intermediate Goods (IG) of G20 Members from 1995-2020 (USD Billion)



⁶ Xiang Y, Zheng J, Tu X. The Impact of Intermediate Goods Imports on Energy Efficiency: Empirical Evidence from Chinese Cities. *Int J Environ Res Public Health*. 2022 Oct 11;19(20):13007. doi: 10.3390/ijerph192013007. PMID: 36293600; PMCID: PMC9603057.

Source: Trade in Value Added Database (TIVA), 2023⁷; Accessed on 13 December 2024

Trends in the above figure also present the impact of shocks in the global economy on GVCs. Trade in IG fell sharply due to the Global Financial Crisis in 2008-09 and in 2016 due to persistent weakness in the global economy and low commodity prices resulting in sluggish import demand⁸. Evidence of this trend can be seen in the 18% contraction in IG's exports in 2009 compared to 2008, and the subsequent decline in exports at a Compound Annual Growth Rate (CAGR) of 7.57% from 2014 to 2016. Furthermore, due to the lasting impact of the pandemic and the geopolitical conflicts, decline in world exports of IG continued in 2023 leading to an annual contraction of 5%⁹.

To build resilience in supply chains, there is a need to examine GVC participation amongst the G20 member states. Contribution to GVCs can be calculated by combining backward and forward linkages. According to the World Trade Organization, global supply chains link the supplier of raw materials in one country to the marketing and distribution firm in another. Backward linkages, in this context, refer to the use of foreign inputs in production of goods and services that are further exported. In contrast, forward linkages reflect the domestic value added in inputs exported to third economies for further production.

Based on OECD Trade in Value Added (TIVA) 2023 guidelines, backward linkages can be determined by the share of foreign value added in gross exports and forward linkages can be computed by the domestic value added embodied in foreign exports as a share of gross exports.

Conceptual Framework for Global Value Chain (GVC) Participation



⁷ [https://data-explorer.oecd.org/vis?pg=0&bp=true&snb=14&tm=TIVA&vw=tb&df\[ds\]=dsDisseminateFinalCloud&df\[id\]=DSD_TIVA_MAINLV%40DF_MAINLV&df\[ag\]=OECD.STI.PIE&df\[vs\]=1.0&dq=IMGR_INT%2BEXGR_INT.G20.T.W..A&pd=1995%2C2020&to\[TIME_PERIOD\]=false&ly\[cl\]=TIME_PERIOD&ly\[rw\]=MEASURE](https://data-explorer.oecd.org/vis?pg=0&bp=true&snb=14&tm=TIVA&vw=tb&df[ds]=dsDisseminateFinalCloud&df[id]=DSD_TIVA_MAINLV%40DF_MAINLV&df[ag]=OECD.STI.PIE&df[vs]=1.0&dq=IMGR_INT%2BEXGR_INT.G20.T.W..A&pd=1995%2C2020&to[TIME_PERIOD]=false&ly[cl]=TIME_PERIOD&ly[rw]=MEASURE)

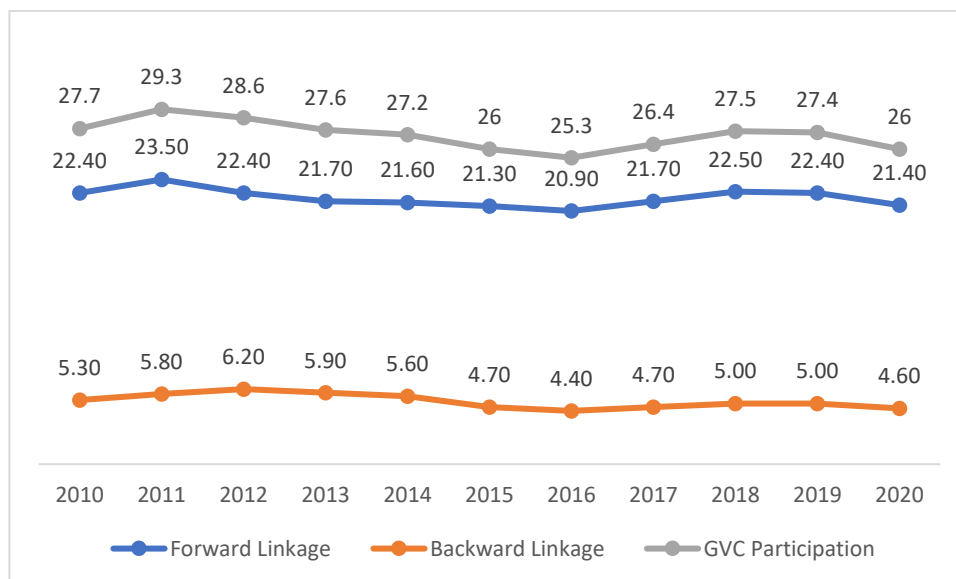
⁸ https://www.wto.org/english/res_e/statis_e/wts2017_e/wto_chapter_03_e.pdf

⁹ https://www.wto.org/english/res_e/statis_e/miwi_e/info_note_2023q4_e.pdf

Source: Guide to OECD Trade in Value Added (TiVA) Indicators, 2023 edition

The following figure highlights the forward and backward linkages for G20 countries as per the latest data from Trade in Value Added (TiVA) database 2023 edition. The data suggests that there has been a gradual de-globalization as GVC participation from G20 countries declined marginally from 27.70% to 26.00% during the last decade from 2010 to 2020. The same trend, naturally, can be noticed in forward and backward participation for G20 member states.

Backward Linkage, Forward Linkage, and GVC Participation for G20 (% of Gross Exports)



Source: Trade in Value Added Database (TiVA), 2023¹⁰; Accessed on 13 December 2024

GVC participation from emerging economies such as India and China have been significant as of 2020, suggesting that economic shocks in emerging markets will not only impact their import demand but also lead to disruptions in global supply chains. A study by IMF indicates that shocks in G20 emerging markets can explain as much as 5% variation in output after 3 years in advanced economies and 10% in other emerging economies¹¹. This also suggests that developed countries have greater supply chain resilience when compared with developing countries. It also implies the need for greater South-South trade and cooperation to insulate the Global South from disruptions in developed markets.

¹⁰ [https://data-explorer.oecd.org/vis?pg=0&bp=true&snb=14&tm=TIVA&vw=tb&df\[ds\]=dsDisseminateFinalCloud&df\[id\]=DSD_TIVA_MAINSH%40DF_MAINSH&df\[ag\]=OECD.STI.PIE&df\[vs\]=1.0&dq=EXGR_FVA%2BFEXGR_DVA.G20_.T.W..A&pd=2020%2C&to\[TIME_PERIOD\]=false](https://data-explorer.oecd.org/vis?pg=0&bp=true&snb=14&tm=TIVA&vw=tb&df[ds]=dsDisseminateFinalCloud&df[id]=DSD_TIVA_MAINSH%40DF_MAINSH&df[ag]=OECD.STI.PIE&df[vs]=1.0&dq=EXGR_FVA%2BFEXGR_DVA.G20_.T.W..A&pd=2020%2C&to[TIME_PERIOD]=false)

¹¹ <https://www.elibrary.imf.org/downloadpdf/display/book/9798400255892/CH004.pdf>

This is also evident from the following table as the GVC participation in high-income countries such as United States, Korea, Russia, France, and Germany exceeds that of upper middle income and lower middle-income countries.

GVC Participation (% of Gross Exports) for G20 Member States (2020)*

Sno	Country	Backward Linkages	Forward Linkages	Global Value Chains (GVCs)
High Income Countries				
1	Australia	9.40	25.60	35.00
2	Canada	22.80	13.30	36.10
3	France	21.80	21.70	43.50
4	Germany	21.40	22.50	43.90
5	Italy	20.70	20.10	40.80
6	Japan	13.30	26.40	39.70
7	United Kingdom	14.30	24.80	39.10
8	United States	7.50	27.00	34.50
9	Russia	9.50	35.20	44.70
10	Saudi Arabia	4.40	33.90	38.30
11	European Union	15.80	13.80	29.60
12	Korea	29.70	21.70	51.40
Upper Middle-Income Countries				
13	Argentina	9.50	15.90	25.40
14	Brazil	13.90	19.40	33.30
15	China	15.80	18.10	33.90
16	South Africa	20.30	19.00	39.30
17	Mexico	35.00	9.00	44.00
18	Türkiye	21.60	17.10	38.70
19	Indonesia	11.20	21.00	32.20

Lower Middle-Income Countries				
20	India	17.20	17.70	34.90
G20		4.60	21.40	26.00

Source: Trade in Value Added Database (TIVA), 2023; Accessed on 10 December 2024¹²;

* Based on World Bank country classifications by income level for 2024-2025¹³

Leveraging Technology and Fostering Collaboration

There is a need to boost GVC participation for emerging economies by integrating digital technology (Industry 5.0), human capital, and sustainability in supply chain dynamics. Factors such as changing economic conditions, realignment of supply chains, climate change initiatives, and region based geopolitical conflicts are expected to play a significant role in enhancing resilience in inter-country supply chains. It is the combination of advanced technology, sustainability, and collaboration amongst the Global South driven by technology transfer that can increase GVC participation in emerging markets.

Advanced technology within the framework of industry 5.0 such as Internet of Things, Artificial Intelligence, and Big Data can lead to better inventory and time management, it can enable efficient demand forecasting leading to optimal production of output which then can be distributed across the region with efficient logistical coordination. As 90% of goods are transported through the shipping routes, integration of AI in the shipping industry can streamline regulatory procedures, improving overall supply chain management. For example, AI driven analysis with data from navigation equipment can offer insights to reduce the possibility of human error in avoiding potential collisions, accidents, and other safety-related incidents¹⁴.

Smart factories coupled with industrial technologies can also bolster sustainability in supply chain management by reducing wastage, fostering optimal resource

¹² [https://data-explorer.oecd.org/vis?pg=0&bp=true&snb=14&tm=TIVA&vw=tb&df\[ds\]=dsDisseminateFinalCloud&df\[id\]=DSD_TIVA_MAINSH%40DF_MAINSH&df\[ag\]=OECD.STI.PIE&df\[vs\]=1.0&dq=EXGR_FVA%2BFEXGR_DVA.TUR%2BEU27_2020%2BMEX%2BG20%2BZAF%2BRUS%2BSAU%2BIDN%2BIND%2BCHN%2BBRA%2BARG%2BUS%2BGBR%2BKOR%2BJPN%2BITA%2BFRA%2BDEU%2BCAN%2BAUS..T.W..A&pd=2020%2C&to\[TIME_PERIOD\]=false](https://data-explorer.oecd.org/vis?pg=0&bp=true&snb=14&tm=TIVA&vw=tb&df[ds]=dsDisseminateFinalCloud&df[id]=DSD_TIVA_MAINSH%40DF_MAINSH&df[ag]=OECD.STI.PIE&df[vs]=1.0&dq=EXGR_FVA%2BFEXGR_DVA.TUR%2BEU27_2020%2BMEX%2BG20%2BZAF%2BRUS%2BSAU%2BIDN%2BIND%2BCHN%2BBRA%2BARG%2BUS%2BGBR%2BKOR%2BJPN%2BITA%2BFRA%2BDEU%2BCAN%2BAUS..T.W..A&pd=2020%2C&to[TIME_PERIOD]=false)

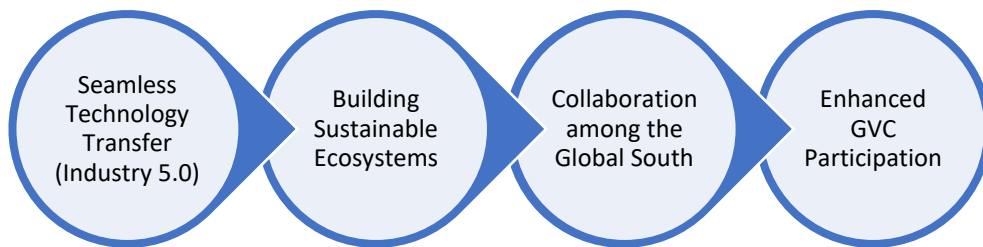
¹³ <https://blogs.worldbank.org/en/opendata/world-bank-country-classifications-by-income-level-for-2024-2025>

¹⁴ <https://britanniapandi.com/2024/02/the-use-of-artificial-intelligence-in-shipping/>

utilization, and adhering to environmental regulations while also promoting transparency and tracking through blockchain technology¹⁵.

Furthermore, UN Trade and Development (UNCTAD) recommends that developing countries should mitigate vulnerabilities by augmenting their domestic industrial setup with a balanced focus between manufacturing and services to boost productivity and generate employment. UNCTAD also recommends that optimal domestic policies coupled with international trade agreements can increase access to global financial markets.

Recommended Steps to Enhance GVC Participation for G20 Emerging Markets



To sum up, technology, sustainability, and greater South-South collaboration can enhance GVC participation, helping to lower transaction costs and insulating emerging markets from rising geopolitical and economic risks.

¹⁵ <https://www.eelet.org.uk/index.php/journal/article/download/843/732>