FONDATION POUR LES ÉTUDES ET RECHERCHES SUR LE DÉVELOPPEMENT INTERNATIONAL

Working Paper 304 April 2022 Development Policies

Update August 2025

Patterns and Correlates of Supply Chain Trade in Sub-Saharan Africa and Middle East and North Africa*

Jaime de Melo / Jean-Marc Solleder

Jaime de Melo, Emeritus, University of Geneva, FERDI and CEPR.
E-mail: jaime.demelo@unige.ch

Jean-Marc Solleder, University of Geneva.
E-mail: jean-marc.solleder@unige.ch

Abstract

Strong participation in Global Supply Chains (GSCs) indicates the structural transformation at the heart of the 'Africa we want' described in African Union's Agenda 2063 project. We report new input-output based measures at several levels: across countries, regions, and sectors over the period 1995-2022, explore correlates of their participation, seeking to detect differences in patterns between Sub-Saharan Africa (SSA) and Middle East and North Africa (MENA), two regions often treated separately.

JEL Classification Numbers: F2: International Economics / International Factor Movements and International Business; F1: International Economics / Trade; F6: International Economics / Economic Impacts of Globalization
Keywords: trade policy; global value chains; digitalization; servicification; trade costs; national data infrastructure; Sub-Saharan Africa, Middle East and North Africa

*This paper is a revised and extended version of Melo and Solleder (2023). Thanks to Joël Cariolle for giving us access to his data set on submarine cables, and to Joël Cariolle, Céline Carrère and Olga Solleder for comments. Thanks to the ERF and the French National Research Agency under program ANR-16-IDEX-0001 for funding. Melo and Solleder remain responsible for any errors and opinions.

.../... On average, for both SSA and MENA, exports have a low content of imported intermediates. Exports undergo further transformation in destination countries before reaching consumers. Compared with other regions, SSA and MENA mostly engage in supply chain trade with countries outside their respective regions. In sum, despite regional trade agreements focusing on reducing trade barriers to intra-regional trade, regional value chains have failed to develop in both regions, a significant pattern in a world of increasing reshoring in a world of rising geopolitical tensions.

For both regionas, higher mobile subscriptions and higher scores on political stability are associated with higher GVC participation rates. Higher trade costs are associated with lower backward participation and lower overall GVC participation. The dampening effect of high trade costs on imports is greater for SSA countries compared to those in the MENA group. For MENA, a 1% increase in trade costs reduces the import content of exports by 2.6% and by 3.3% for SSA

1 Introduction

All countries participate in Global Value Chains (GVCs) in some form. The importance of supply chain trade in the process of structural transformation cannot be over-emphasized since countries that participate in a supply chain can enter in niches along the chain without having to build the whole product through vertical specialization as was the case previously. An increasing content of imported intermediates in exports (backward participation in GVC terminology) and of exports undergoing further elaboration in destination countries before reaching the consumer (forward participation in GVC terminology) are indicators of participation in GVCs. Participation in GVCs is also an indicator of structural transformation which is at the heart of the 'Africa we want' described in African Union's Agenda 2063. Notably, drawing on a taxonomy of GVCs classifying manufacturing on a ladder from concentration on commodities to concentration on innovation activities, the World Bank's World Development Report (WDR 2020) shows that GDP per capita grows more rapidly when countries move away from commodities into limited manufacturing GVCs or beyond, to innovative activities. Thus, participation in GVCs is also associated with higher growth.

In this paper, we report on measures of GVCs across countries, regions, and sectors to detect any particularities in MENA and SSA. We also explore the role of two drivers of GVC trade: the availability of hard infrastructure, like access to trade partners through a dense network of telecom links such as submarine cables (SMCs), and the reduction in trade costs through improvements in soft infrastructure/governance proxied by political stability, a component of the World Governance Indicators.

Participation in GVCs requires digitalization. In Melo and Solleder (2022), we suggested that MENA and SSA face different challenges. For SSA where the size of the digital economy is small, digital-readiness is low, the cost of capital is high, the challenge is that automation presents a threat for employment. With SSA on the way to account for half of the growth in the global labour force over the first half of the 21st. century, the arrival of digitalization could rob SSA from its demographic dividend opportunity offered by rising wages in China. For SSA, participation in low-tech labor-intensive manufacturing production networks could be the road to a successful transformation.

In many MENA countries manufacturing has failed to take off. Here, the digital transformation where 'value creation shifts from capital to knowledge' (Baldwin and Forslid, 2020) presents an opportunity for structural transformation. Successful digitalization would then allow MENA countries to achieve a service-sector-led high-productivity growth structural transformation. For MENA, the challenge is improving across-the-board low indicators of competitiveness for their per capita-income level. A high import content of high-tech services exports would be an indication of successful digital transformation.

Except for the econometric estimates in section 4, regional-level comparisons of GVC participation rates for MENA and SSA are restricted to countries in the Africa and South Asia region, both more comparable as regions than the other regions dubbed 'factory comparators' (North America, Europe & Central Asia) which are still included in the tables only for the sake of completeness.

Section 2 briefly discusses the development of GVCs. Section 3 gives evidence of participation by MENA and SSA countries in GVCs over the period 1995-2022 from the EORA-UNCTAD data, the only database covering most countries in the MENA and SSA regions. Using a tripartite decomposition introduced by Borin et al. (2021), GVC indicators show that both regions are less engaged in supply chain trade than other regions. Their participation is more downstream (exports that undergo further processing in the importing countries) than upstream (a high import content in gross exports). Section 3 also documents the weak performance in SSA and MENA on services, a sector that has become an engine of structural transformation across most regions. Section 4 explores linkages between indicators of bilateral GVC trade, bilateral trade costs, and measures of hard and soft infrastructure quality in origin and destination countries. Section 5 concludes.

2. Developments of Supply Chains

In the early 1960s, trade in intermediates started growing faster than trade in final goods. The importance of GVCs took a first turn from the 1980s onwards when Information and Communication Technology (ICT) transformed the competitive landscape by creating a high-tech, low-wage combination (skills in the headquarter firms, production in low-wage countries). As documented by Baldwin (2016), this allowed a handful of countries in East Asia and Central Europe to establish/join 'factory Asia' and 'factory Europe'. This allowed firms to unbundle manufacturing processes, intensifying further trade in intermediates. This first phase corresponded to the period when national policies and multilateralism moved together.

A second turn started with the financial crisis of 2008-09 and was prolonged by the global pandemic starting in 2020. Already, between 2009 and 2015, growth in overall trade was weak and GVC trade contracted (WDR, 2020, figure 2). During the 2009 crisis, world trade fell more sharply than GDP and investments needed to fuel GVCs dried up (WDR, 2020). A tally of trade measures applied by countries shows that discriminatory measures have been growing more rapidly than liberalizing measures since the crisis and that these measures

have impacted trade.[1] Trade uncertainty, as measured by perceptions in the press, also increased during 2009-22.[2]

Two other factors, covered in a companion paper (Melo and Solleder, 2022), also contributed to the recent slowdown in GVC activity. One is the increased risk of a globalized economy in a world of increasing political tensions. Another is the growth of artificial intelligence, automation and robotics, machine learning and big data analytics, the Internet of Things (IoT), autonomous vehicles, and 3D printing, all driving structural transformation of economies. In other words, digitalization might be a threat to GVC activity. The continued growth of economies like China and India where the stages of supply chain are increasingly carried in the domestic economy also contributed to a slowing down of cross-border supply chain trade.[3]

3. EORA-based estimates of backward and forward participation trends: 1990-2022

Borin et al. (2021) provide a quantitative assessment of trade crossing at least two borders considering industries that are suppliers of GVC-oriented industries without being directly engaged in exporting (called two-sided and noted GVC2sd in equation (1) below). Incorporating industries in the middle of the supply chain leads to the following tripartite decomposition of GVC-related trade between countries s and r:

$$GVC_{sr} = GVCpf_{sr} + GVCpb_{sr} + GVC2sd_{sr} \qquad (1)$$

This decomposition of global value chain (GVC) participation includes three components.[4] The first, pure forward participation ($GVCpf_{sr}$), refers to the export of value added generated entirely within domestic sectors (such as mining). It is measured as the difference between the total domestic value added that is exported and the portion that is absorbed by the importer.

The next two terms together represent the import content of exports, a concept introduced by Hummels et al. (2001) to quantify vertical specialization. The pure backward participation term ($GVCpb_{sr}$) captures the share of imported inputs that are further processed and then

[1] See https://www.globaltradealert.org/ for the count of trade measures and Evenett and Fritz (2015) on how these measures discriminated most against LDCs.
[2] See Ahir, Bloom, and Furceri (2019).
[3] Using the TiVA database, Miroudot and Nordstrom (2020) show that supply chains have become more domestic rather than more regional in that sample. They estimate that since 2012, the average length of supply chains has shrunk by 50 km per year.
[4] The presentation follows Melo and Solleder (2025). In the literature, forward GVC, also known as IVA (Indirect Value Added) is domestic value-added contained in inputs sent to third countries for further processing. Higher values indicate that the firm is far from the final consumer. Backward GVC or FVA (Foreign Value-Added) is an indicator of backward integration. Higher values indicate that the firm is closer to the final consumer.

re-exported, either as final goods or intermediate products. The two-sided participation component ($GVC2sd_{sr}$) accounts for imported inputs embedded in a country's exports, which are subsequently re-exported by the bilateral trade partner.

This tripartite decomposition applies to both intra- and extra-regional trade linkages and can be expressed either in absolute terms or as a share of total exports.[5]

Summed at the industry or country level, the three measures in (1) give an estimate of the share of trade in value-added in gross exports for an industry or country. Also note the conundrum posed by high forward ($GVCpf$) and high backward ($GVCpb$) shares. On the one hand, high values suggest that a country/region/sector is benefiting from the efficiency gains (technological transfer, flow of ideas, learning by doing) associated with outsourcing and the fragmentation of production. On the other hand, high values are an indication of vulnerability to supply shocks via high backward shares and to demand shocks via high forward shares.

The measures presented here are based on the EORA database. Only available at an aggregated sectoral level (26 sectors in the EORA data base used here), these measures do not capture the growing fractionalisation of tasks along supply chains, nor the fact that a growing share of trade in services do not cross borders and hence are not recorded in customs data. These limitations and the fact that the EORA database does not draw on a single country IO table for any country in SSA and MENA are discussed in Annex A1 of the discussion paper version (Melo and Solleder, 2022).

3.1. Regional GVC participation trends

Table 1 displays the evolution of average participation in GVC trade in 1996, 2009, and 2022 using the World Bank classification of regions (see table A1 for the country list in each region). The top reports the 3 measures in equation 1 across 7 regions. MENA and SSA are compared with Latin America & Caribbean and South Asia. At the world level, the share of trade in intermediates in gross exports rose to 50% by 2022. The share of GVC trade remained the same in 2009 and 2022. MENA's GVC participation increased at a constant rate over the three time periods. South Asia experienced the most significant increase in GVC participation between 2009 and 2022, followed by Latin America and the Caribbean which was still exhibiting the most minor participations among the regions at the end of the period.

[5] Within-region linkages are called RVCs (for Regional Value Chains). Melo and solleder (2025) estimate the potential for the AfCFTA to accelerate RVCs across Africa.

MENA and SSA started low and stayed low on pure backward shares, indicating relatively less increases in imported inputs over the 26-year period than for other regions. This pattern is consistent with high policy-imposed trade barriers, or at least with trade barriers falling less rapidly than in other regions. On average, according to these measures, exports from MENA and SSA embody fewer intermediate imports than other regions.

Table 1: Trends in GVC participation by region and by selected countries

	Pure Backward (GVCpb)			Pure Forward (GVCpf)			Double Sided (GVC2sd)			Total GVC share (GVC_s)		
	1996	2009	2022	1996	2009	2022	1996	2009	2022	1996	2009	2022
Column #	1	2	3	4	5	6	7	8	9	10	11	12
By Region												
World	**0.19**	**0.2**	**0.21**	**0.18**	**0.19**	**0.2**	**0.07**	**0.09**	**0.09**	**0.44**	**0.48**	**0.50**
M. East & North Africa	0.13	0.10	0.10	0.24	0.29	0.31	0.04	0.04	0.04	0.41	0.43	0.45
Sub-Saharan Africa	0.11	0.10	0.08	0.22	0.25	0.28	0.04	0.04	0.04	0.37	0.39	0.40
Comparator regions												
L. Am. & Caribbean	0.18	0.16	0.23	0.13	0.14	0.15	0.03	0.03	0.04	0.34	0.33	0.42
South Asia	0.09	0.11	0.17	0.18	0.2	0.21	0.02	0.03	0.06	0.29	0.34	0.44
Factory regions												
Europe & Central Asia	0.23	0.25	0.26	0.19	0.2	0.2	0.09	0.12	0.13	0.51	0.57	0.59
East Asia & Pacific	0.17	0.18	0.20	0.17	0.18	0.19	0.06	0.07	0.08	0.40	0.43	0.47
North America	0.12	0.13	0.12	0.16	0.18	0.2	0.03	0.04	0.05	0.31	0.35	0.37
By Selected countries												
Algeria	0.06	0.06	0.04	0.39	0.41	0.49	0.04	0.04	0.02	0.49	0.51	0.55
Egypt	0.08	0.09	0.09	0.23	0.25	0.27	0.03	0.04	0.04	0.34	0.38	0.40
Jordan	0.28	0.21	0.2	0.11	0.12	0.17	0.05	0.03	0.05	0.44	0.36	0.42
Kenya	0.12	0.14	0.07	0.18	0.19	0.26	0.03	0.03	0.02	0.33	0.36	0.35
Morocco	0.08	0.08	0.14	0.23	0.26	0.26	0.03	0.04	0.09	0.34	0.38	0.49
Nigeria	0.08	0.06	0.02	0.25	0.27	0.31	0.03	0.02	0.01	0.36	0.35	0.34
Oman	0.12	0.08	0.13	0.19	0.24	0.27	0.03	0.03	0.06	0.34	0.35	0.46
Rwanda	0.15	0.15	0.08	0.24	0.27	0.39	0.06	0.07	0.06	0.45	0.49	0.53
Saudi Arabia	0.16	0.13	0.06	0.2	0.25	0.36	0.06	0.05	0.02	0.42	0.43	0.44
South Africa	0.12	0.12	0.12	0.22	0.24	0.25	0.04	0.05	0.05	0.38	0.41	0.42

Notes

Estimates from the sample of 184 countries listed in table A1. Data cover the period 1995-2022 but the initial year is set is set at 1996 to have equal intervals of 13 years. UAE removed due to data quality. Total GVC share (GVC_s)= (GVC_{pb})+ (GVC_{pf})+($GVC2_{sd}$) weighted by gross trade at the regional level.

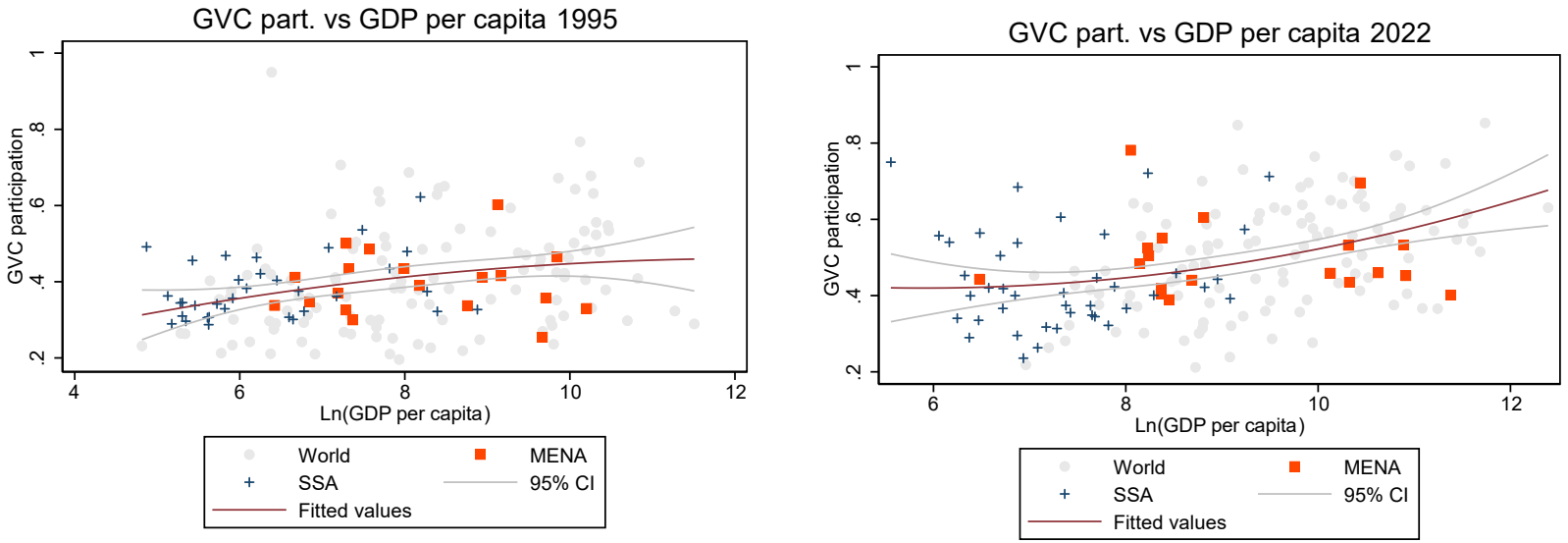
Source: Authors' estimates.

On the forward side, both regions have the highest shares throughout the period, indicating exports concentrated in raw materials and agricultural products with little transformation. For other regions, the share of further processing of exports in destination countries has exhibited smaller increases over the period.

The lower part of the table reports the 3 components for selected countries in MENA and SSA. Since regional figures are averages across countries, differences are greater at the

country level. The import content of exports is low in the resource-rich countries, Egypt, Morocco, and Nigeria (low GVC_{pb} values) and exports from these countries undergo further processing in the importing countries (high GVC_{pf} values). Morocco stands out for increased upstream and downstream participation over the period.

Figure 1: GVC Participation versus per capita income: MENA and SSA



Notes: Number of countries in parenthesis: SSA (40); MENA(20). Country list in annex A1).
GVC participation is captured by GVC_s defined in equation 1 and reported in table 1.
Source: Authors' calculations from EORA database.

The time path of the average indices of backward and forward participation since 1990 (not shown here) show a sharp increase in forward participation until 2008 for both regions then a decline around the time of the financial crisis. Since GVC measures are calculated at current prices, as Europe is the major trading region for Africa and MENA, the Euro's decline relative to the dollar could have contributed to the stagnating trend in forward shares. For both regions, the two-sided participation has remained fairly flat, slightly below 5%.

Figure 1 compares GVC participation for MENA and SSA countries along the fitted line linking GVC participation with per capita income for the whole sample. Countries are dispersed around the fitted line with a larger share of MENA countries under-performing in 2022. Comparing the 1995 and 2022 scatter plots for SSA countries suggest a growing disparity in GVC participation across countries with the lowest GDP per capita.

MENA and SSA have mainly developed supply chain trade with partners outside rather than within Africa. Table 2 shows that in SSA, only 5% of gross exports were connected to African supply chains both in 1996 and 2022. The 3 percentage point growth in intermediate goods trade was entirely with firms outside the region. The pattern is similar for MENA, but also for Latin America & the Caribbean. By contrast, for East Asia and the Pacific (EA&P), RVC trade grew from 21% to27%. By 2022, the share of intra-regional supply chain trade in EA&P was at times larger than in SSA. This presents a challenge for the AfCFTA project where the growth of Regional Value Chains (RVCs)[6] is an important objective. Even though these estimates should be interpreted cautiously, the magnitude of differences across regions is large enough to strongly suggest that MENA and SSA stand apart from the other regions.

The move towards greater intra-regional trade in intermediate inputs in EA&P also holds for Europe and Central Asia. In both regions, countries are both makers and buyers of components and parts. This suggests that goods were moving seamlessly across borders. By contrast, for both SSA and MENA most trade in value-added has been forward (i.e., selling export baskets with low imported content). Both regions export primarily raw materials. rather than backward (i.e., exports have a low share of imported inputs).

[6] We define RVC trade as GVC participation between two countries members of the same aggregate (e.g, MENA or SSA).g

Table 2:

Anatomy of GVC trade by region: 1996 and 2022

	Year	Share Backward	Share Forward	Share NRVC	Share RVC	OU/ID
Column #		1	2	3	4	5
Sub-Saharan	1996	0.11	0.22	0.32	0.05	0.78
Africa	2022	0.08	0.28	0.35	0.05	0.72
Middle East &	1996	0.13	0.24	0.37	0.02	0.80
North Africa	2022	0.10	0.31	0.41	0.07	0.67
South	1996	0.09	0.18	0.28	0.01	0.89
Asia	2022	0.17	0.21	0.42	0.02	0.92
East Asia &	1996	0.22	0.17	0.18	0.21	1.15
Pacific	2022	0.28	0.20	0.21	0.27	1.02
Latin America &	1996	0.18	0.13	0.28	0.05	0.77
Caribbean	2022	0.23	0.15	0.36	0.07	0.74

Notes:
col. 1 from table 1 cols.1 and 3; col.2 from table 1 cols.4 and 6.
Column 3 and 4: RVC: Regional Value Chain; NRVC: non-RVC. Note that RVC +NRVC = GVCs col. 10 For example for SSA (1996) from table 1, GVCs (0.37=0.32+0.05).
RVC are defined as within-aggregate GVC participation.
Col.5 Output Upstreamness (OU)/Input Downstreamness (ID). OU/ID<1. More downstream. Miller and Temurshoev (2017) derive the formula from inverting the multi-country IO table.

Source: Authors' calculations from EORA26 data.

Column 5 displays a measure of value chain positioning, the ration of Output Upstreamness (OU) over Input Downstreamness (ID). Both OU and ID have increased over the period, an indication of greater roundaboutness in production processes (a greater number of production stages as both distance from final users and distance from raw materials increased). The falling values of OU/ID over the period indicate that supply chains are getting closer to final users in all regions except South Asia MENA stands out as the region moving most downstream during the period.

In sum, a move towards RVCs would be expected if transaction costs associated with border crossings was falling more rapidly within regions than across regions. This pattern is observed for all regions during the quarter century except for SSA and MENA. Other geopolitical and economic factors, like less conflicts (that also take place among geographically close countries), also contribute to the observed development of RVCs. During the past quarter century, regional supply chains flourished in EA &P and Europe & Central Asia (not shown here). GVCs usually developing along geographically proximate production chains.

3.2. Sector-level participation: Manufacturing vs. Services

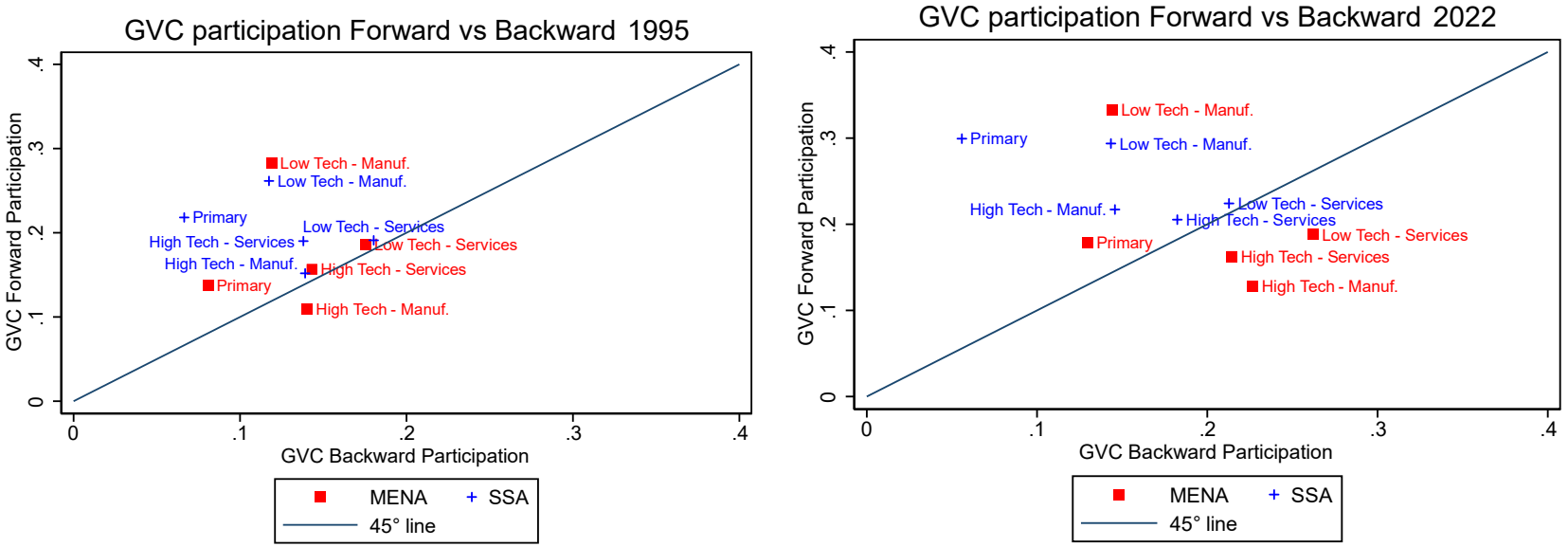
The rapid progress in the infrastructure of Information and Communication Technologies (ICT) is accelerating digitalization everywhere. It is likely that the arrival of 'Industry 4.0' (growth of artificial intelligence, automation and robotics, machine learning and big data analytics, the Internet of Things (IoT), and 3D printing) will further accelerate the growth in supply chains, even though the EORA data do not show any evidence of RVC growth, notably in MENA and SSA.

Evidence of complementarities between trade in Goods and trade in Services is also growing (Ariu et al. 2020). Countries with high growth rates in services also display high growth rates in goods trade. Despite an acceleration in the growth of African Services, Ariu and Ogliari (2023), report that the gap with the rest of the world has been increasing.[7] It is also likely that structural transformation in SSA will be service-sector-led rather than manufacturing-sector- led.

Figure 2 contrasts backward and forward GVC participation rates for a sector classification that distinguishes between high- and low-tech manufacturing and high and low-tech services. Has progress of the ICT infrastructure affected high and low-tech sectors differently and/or are there specificities to MENA or SSA? High-tech services include health and education, two activities with low value-added shares that are least traded but activities that are open to digital trade. Low-tech services include retail and transport, which are traded more intensely. Both manufacturing categories have greater engagement in supply chain trade.

[7] The slow growth of participation in GVCs for MENA and SSA could reflect slow growth in Services trade and low levels of GVC participation in services sectors. Africa has not participated in the explosion of world trade in services which grew by a factor of 10 between 1980 and 2014. Ariu and Ogliari (2023, figure 1) report that over 1980-99, services in Africa grew on average by less than 10% per year (compared to the world average of 15%) and, despite some acceleration during the 2000-2014 (13% annual growth compared with the world average of 16%).

Figure 2: GVC Participation by digitalization prospects



Notes: See table A2 for the aggregation from 26 EORA sectors to the 5 sectors.
Primary: (Agriculture. fishing. mining & quarrying); High-tech manufacturing (Petroleum products and chemicals). Low-tech manufacturing (all other manufacturing sectors). Low-tech services (electricity. gas. water; construction. maintenance & repair; wholesale trade; retail trade; hotels & restaurants; transport; private households; others). High-tech services (Port & telecommunications; financial intermediation; public administration; education. health and other services).

Source: Authors' estimates from EORA data base.

In interpreting the patterns in figure 2, recall that EORA has no national IO information for any of these countries. This lack of information and the recourse to algorithms to generate missing information is likely an important reason for the very similar patterns of GVC estimates for MENA and SSA (see Lenzen et al. (2013) for a discussion of how missing IO tables were estimated). Patterns:

- Patterns of forward and backward participation rates are broadly similar at the sector level for both regions and both years (e.g. low-tech manufacturing).
- Across sectors, SSA has a lower content of imports in its export basket than MENA (all Forward participation rates are higher and above the 45° line in both years)
- Import content of exports has increased for MENA, but barely for SSA
- In MENA, high-tech manufacturing and high-tech services have increased backward participation, an indication of greater participation in supply chain trade. Not so in SSA.
- The import-content of high- tech Services exports for MENA has increased over the period, a likely indicator of improved digital readiness necessary for a Services-sector led transformation.

The similarities between SSA and MENA and the stark difference with other regions begs for a search of underlying factors. This search is beyond the scope of this paper, though contributing factors must include high trade costs due to a geography that is inhospitable to trade (i.e., artificial borders, a high share of landlocked countries) and/or policy-imposed barriers (high tariffs and non-tariff barriers)[8]. In section 4, we look for correlations between the backward and forward measures of GVC trade and underlying factors capturing trade costs and/or weak governance and regulatory environments.[9]

4. Drivers of GVCs: trade costs and the quality of hard and soft infrastructure

We explore correlates of the GVC participation rates presented in Table 1, looking to detect particularities in estimated coefficient values for countries in MENA and SSA relative to countries in other regions. We report on three proxies for three drivers (DRIV, in equation (2) below): hard infrastructure, soft infrastructure, and a model-generated measure of trade costs, (TC). The sample of 159 countries includes the 38 SSA and 18 MENA countries used in the GVC participation estimates reported in Table 1.[10] Since no trends are detected for

[8] The three regions with the highest average applied tariffs and percentage tariff peaks—both in parenthesis are MENA (7.3%, 16.1%), SA (12.6%, 28.8%), SSA (11.3%, 334.3%) Dovis and Zaki (2020, figure 8).

[9] Nunn (2007) showed that higher technology industries that produce a more specialized product are more sensitive to institutional quality. Dollar and Kidder (2017) uncover a positive correlation between GVC participation and several measures of institutional quality.

[10] These numbers match the sample including all explanatory variables. When only trade cost is included, the sample includes years from 1995 to 2020 and 170 countries. The panel is unbalanced. For example, in column 4a and 4b the maximum number of observations is 1989, while the regression only includes 1576 due to missing data.

double-sided GVC shares that are quantitatively small, we look for correlates of backward (GVCpb) and total GVC share (GVCs), omitting the pure backward term since it is a component of GVCs. The drivers, DRIV, are first entered separately, then jointly along with dummy variables for countries belonging to SSA and for countries belonging to MENA. The estimated equation is:

$$logGVC_{it} = \alpha \quad DRIV_{it} + \beta_{MNA} MNA + \gamma_{SSA} SSA + \varepsilon_{it} \qquad (2)$$

Where $logGVC_{it}$ is, in turn, the log of the backward and total GVC participation; t index years (2007 to 2020); i index countries; MNA is a dummy set to 1 if country i is part of MENA; SSA is a dummy set to 1 if country i is part of SSA, DRIV is a vector of proxies, as described below.

Estimation is by OLS. Table 3 and 4 report the between (LS- BE) estimates to focus long-run cross-sectional variation rather than short-term fluctuations. Both tables have the same structure, each one of the two GVC measures is regressed against each regressor, first separately (cols. 1-3), then jointly in col.4.

Keeping a large sample limits our choice of drivers to proxies available on a high frequency basis. For hard infrastructure we use the number of mobile telecom subscriptions. Mobile subscriptions, a proxy for digital connectivity, are available for a large sample of countries.[11] Soft infrastructure is proxied by governance, captured by the political stability (PS) measure of the World Governance Indicators. A higher PS index value indicates more political stability.

High Trade Costs (TC) have been documented to be a major determinant of the low integration of low-income countries in the international trading system. This should also apply to integration in supply chain trade: for given gross exports, countries with high trade costs should have a lower share of GVC trade.

Here we use a model calibrated measure of trade costs proposed by Arvis et al. (2016).[12]

[11] Digital connectivity has been shown to be a significant determinant of firm export performance in developing countries (Imbruno et al. 2025).

[12] Figure B1 in annex B of Melo and Solleder (2023) compares the evolution of these calibrated bilateral trade costs on a slightly different sample. They estimate that, on average, the 35 SSA countries had bilateral trade costs of 256% above those of the top importers in 1995 and 226% above in 2015, showing catch-up during the period but less than for the 15 MENA where trade costs fell from 182% in 1995 to 144% in 2015. According to this gravity view of the world, average bilateral trade costs for both regions are about two to three times those of the top importers. For MENA, the average catch-up rate to the benchmark is 21%, almost twice that for SSA at 12%.

Note that measurement errors, reverse causality, or simultaneity between GVC participation rates and the regressors could bias the estimates. On the data side, low-income countries in the EORA database do not produce national supply-use tables, so the data are based on interpolations. Estimations are subject to measurement errors. Lack of firm-level heterogeneity could also lead to measurement errors. On the endogeneity side, countries that participate in GVCs could improve their hard and soft infrastructures. Measurement errors will bias LS-BE estimates towards zero while endogeneity could bias the estimates upwards. Facing similar issues in their EORA-based cross-section estimates of GVC participation rates, Fernandes et al. (2022) apply an Instrument Variable (IV) strategy to account for the potential biases in their LS-BE estimates. They report IV estimates quite close to their LS-BE estimates, so table 3 and 4 only report on LS-BE estimates.

Table 3 reports the estimates for backward participation, GVCpb, and table 4 total participation, i.e. GVCs. All coefficient values in both tables have the expected signs and are highly significant statistically. In both tables, higher mobility subscriptions and higher scores on political stability are associated with higher GVC participation rates. Higher trade costs are associated with lower backward participation and lower overall GVC participation. Note that, to identify the effect of the explanatories that are interacted with MENA or SSA dummy, it is necessary to sum the coefficient of the explanatory and the interaction. This is done in the lower part of the table.

Start with backward participation, i.e. the correlates of the share of imports in gross exports. Political stability and mobile subscription are significantly positively correlated with backward participation at the 1 percent level of significance. The estimated values for political stability for MENA (col 2a) and SSA (col.2b) are similar and significantly different from the estimates for countries in other regions. The same remarks hold for the coefficient estimates on mobile subscriptions, MENA (col 3a) and SSA (col.3b). The estimated coefficients for political stability, including the interaction, are 0.27 for MENA and 0.28 for SSA. For mobile subscriptions, at 0.58, the estimated coefficient for MENA is almost twice as high as 0.28, for SSA.

Table 3 Correlates GVC backward (GVCpb) participation: MNA and SSA

Dependent variable →	log(GVCpb)		log(GVCpb)		log(GVCpb)		log(GVCpb)	
	(1a-MNA)	(1b-SSA)	(2a-MNA)	(2b-SSA)	(3a-MNA)	(3b-SSA)	(4a-MNA)	(4b-SSA)
logTC	-8.111***	-7.235***					-3.880***	-3.391***
	(0.168)	(0.180)					(0.256)	(0.212)
MNA-a/SSA-b	-30.79***	-24.53***	0.456***	-2.693***	3.267***	3.474***	-13.23***	-4.202
	(3.408)	(2.335)	(0.0866)	(0.0716)	(0.660)	(0.453)	(3.849)	(3.747)
(MNA-a/SSA-b)	5.478***	3.956***					2.573***	1.030*
# logTC	(0.609)	(0.407)					(0.696)	(0.620)
Pol Stab			0.919***	0.577***			0.873***	0.752***
			(0.0506)	(0.0484)			(0.0500)	(0.0488)
(MNA-a/SSA-b)			-0.650***	-0.297***			-0.452***	-0.425***
# Pol Stab			(0.0785)	(0.0842)			(0.103)	(0.0915)
logMobile					0.798***	0.781***	0.642***	0.645***
					(0.0188)	(0.0182)	(0.0236)	(0.0217)
(MNA-a/SSA-b)					-0.219***	-0.399***	-0.0672	-0.222***
# logMobile					(0.0448)	(0.0348)	(0.0475)	(0.0375)
Constant	59.49***	54.96***	13.70***	14.38***	2.994***	3.667***	27.12***	24.59***
	(0.950)	(1.010)	(0.0461)	(0.0461)	(0.274)	(0.271)	(1.697)	(1.424)
Observations	3825	3825	3763	3763	1793	1793	1576	1576
R^2	0.481	0.562	0.136	0.278	0.486	0.604	0.715	0.747
logTC + inter.	-2.634***	-3.279***					-1.307**	-2.360***
	(0.587)	(0.372)					(0.649)	(0.586)
Pol. Stab + inter.			0.269***	0.280***			0.421***	0.327***
			(0.0592)	(0.0687)			(0.0906)	(0.0772)
Log(mob) + inter.					0.579***	0.382***	0.575***	0.423***
					(0.0425)	(0.0311)	(0.0440)	(0.0327)

Notes: Cols 1a (1b) report the coefficient for the dummy variable for MNA (SSA) for the TC driver
Cols 2a (2b) report the coefficient for the dummy variable for MNA (SSA) for the Political stability driver
Cols 3a (3b) report the coefficient for the dummy variable for MNA (SSA) for the Mobile subscription driver
Cols 4a (4b) report the coefficient for the dummy variable for MNA (SSA) when all drivers are included
All reported estimates are Least Squares-BEtween (LS-BE) coefficients. Robust standard errors in parentheses * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 4 Correlates GVC participation shares: MNA and SSA

Dependent variable →	logGVC		logGVC		logGVC		logGVC	
	(1a-MNA)	(1b-SSA)	(2a-MNA)	(2b-SSA)	(3a-MNA)	(3b-SSA)	(4a-MNA)	(4b-SSA)
logTC	-7.519***	-6.910***					-3.175***	-2.887***
	(0.154)	(0.176)					(0.164)	(0.195)
MNA-a/SSA-b	-30.01***	-24.54***	0.767***	-2.518***	2.936***	2.653***	-14.70***	-5.300***
	(3.157)	(1.760)	(0.0844)	(0.0684)	(0.596)	(0.431)	(3.212)	(1.868)
(MNA-a/SSA-b) # logTC	5.408***	4.012***					2.963***	1.104***
	(0.567)	(0.305)					(0.584)	(0.317)
Pol. Stab			0.679***	0.368***			0.664***	0.593***
			(0.0482)	(0.0463)			(0.0473)	(0.0467)
# Pol. Stab			(0.0736)	(0.0851)			(0.0870)	(0.0845)
logMob					0.808***	0.795***	0.688***	0.678***
					(0.0177)	(0.0167)	(0.0192)	(0.0199)
(MNA-a/SSA-b) # logMob					0.177***	0.309***	0.0987**	-0.160***
					(0.0400)	(0.0304)	(0.0441)	(0.0331)
Constant	57.22***	54.16***	14.79***	15.45***	3.923***	4.495***	23.56***	22.34***
	(0.874)	(0.988)	(0.0439)	(0.0447)	(0.264)	(0.254)	(1.117)	(1.293)
Observations	3825	3825	3763	3763	1793	1793	1576	1576
R^2	0.478	0.543	0.119	0.247	0.582	0.663	0.760	0.782
logTC + inter.	-2.111***	-2.898***					-0.213	-1.782***
	(0.548)	(0.257)					(0.562)	(0.252)
Pol. Stab + inter.			0.0691	-0.0201			0.362***	0.0464***
			(0.0549)	(0.0712)			(0.0732)	(0.0703)
Log(mob) + inter.					0.631***	0.486***	0.590***	0.518***
					(0.0378)	(0.0274)	(0.0418)	(0.0286)

Notes: Cols 1a (1b) report the coefficient for the dummy variable for MNA (SSA) for the TC driver
Cols 2a (2b) report the coefficient for the dummy variable for MNA (SSA) for the Political stability driver
Cols 3a (3b) report the coefficient for the dummy variable for MNA (SSA) for the Mobile subscription driver
Cols 4a (4b) report the coefficient for the dummy variable for MNA (SSA) when all drivers are included
All reported estimates are Least Squares-BEtween (LS-BE) coefficients Robust standard errors in parentheses * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
Source: Authors' estimates.

The similarity in estimated coefficient values for the two regions does not carry over to trade costs. The dampening effect of high trade costs on imports is greater for SSA countries compared to those in the MENA group. For MENA (col 1a), a 1% increase in trade costs reduces the import content of exports by 2.6% and by 3.3% for SSA (col.2b). These high estimates corroborate the very low levels of East-West and North-South African Goods trade which is estimated at less than 1% of GDP on average over 2010-2022 for countries in the respective regions (Krantz and Beltekian, 2025). When entered jointly (cols 4), the dampening effect of the drivers is about 50% higher for SSA countries than for MENA countries

Table 4 confirms similar coefficient estimates for aggregate GVC participation. Coefficient values are of similar magnitude mobile subscription for MENA and SSA and elasticities to trade costs are 37% higher for SSA than for MENA. Greater political stability is favorable to both MENA and SSA, but estimated values are not statistically different from other countries in the two regions. When drivers are entered jointly in col. 3, the dampening effect on aggregate GVC trade is only significantly higher for SSA countries.

In sum, all coefficient estimates have the expected sign and are statistically significant. Except for political stability, the estimates have larger magnitudes for countries in MENA and SSA. Coefficient estimates for the hard and soft infrastructure proxies have similar values for the two regions. However, the dampening effect of high trade costs on aggregate intermediate goods trade is highest for SSA than for MENA both when entered alone (2.9% reduction col 1a) and when entered with the other drivers (1.8% in col 4a).

5. Summary and conclusions

The paper uses two standard measures of supply chain participation to evaluate the integration of MENA and SSA in supply chains: the share of gross exports that embodies imported value-added [the backward participation share (GVC_{pb})]; and the share of gross exports that is not fully absorbed in the importing country [the forward-participation share (GVC_{pf})] which is the share of imports that undergoes further processing before final consumption. Controlling for 2-sided trade (imported inputs in a country's exports that are re-exported by the bilateral partner), the sum of these two shares, GVC_s, is then a comparable estimate across sectors and countries, of outsourcing/dispersion across countries in supply chains.

Based on these measures, both MENA and SSA started low and stayed low on backward shares indicating relatively lower increases in imported inputs over the 20-year period than for other regions. This pattern is consistent with high policy-imposed trade barriers, or at

least with trade barriers falling less rapidly than in other regions. On average, according to these measures, exports from MENA and SSA embody fewer intermediate imports than other regions. On the forward side, both regions have the highest shares throughout the period, an indication of exports concentrated in raw materials and agricultural products with little transformation. For other regions, the share of further processing of exports in destination countries has either remained constant or decreased.

Contrasting the patterns of supply-chain trade across regions over 1995-2022, reveals three distinct patterns. First is the very low growth of regional supply chain trade (or Regional Value Chains, RVCs) for SSA and MENA. Second, is the divergent experience between MENA and SSA and other regions. In MENA and SSA most supply chain trade is non-regional (NRVC), i.e., it takes place outside of the defined regional blocs. Third, this pattern is a challenge for the AfCFTA. In 2015, only 5% of total SSA exports were connected to supply chain trade within SSA, an RVC rate above 5 times short of the 27% RVC rate for EA& P.

The slow growth of participation in GVCs could reflect slow growth in trade in services and low levels of GVC participation in services sectors. Recent estimates show that over 1980-99, services grew on average by less than 10% per year in Africa (compared to the world average of 15%) and, despite some catching up during the 2000-2014 (13% annual growth compared with the world average of 16%), the gap with the rest of the world has been increasing. Could digitalization help close this gap?

Patterns of backward and forward participation rates are similar across MENA at the sector level. Across sectors, SSA has a lower content of imports than MENA. In MENA, high-tech manufacturing and high-tech services have increased their backward participation (i.e. the import content of gross exports has increased), an indication of greater participation in supply chain trade.

Hard infrastructure to transport goods and digital connectivity to transport data, are both necessary to participate fully in supply-chain trade. So is soft infrastructure: trade facilitation measures. Poor performance in both infrastructures result in high trade costs for transit of goods and for transit of data packets. Gravity-based estimates of average bilateral trade costs were over twice (for SSA) or close to twice (for MENA) than those for the 15 largest importers in the world in 1995.

To pull the threads together, the GVC participation measures presented in table 1 are regressed on indicators of the quality of national data infrastructure captured by mobile subscription rates, Political Stability capturing hard infrastructure, and a model-calibrated measure of trade costs. All estimated coefficient values have the expected signs and are highly significant statistically. Higher mobile subscriptions and higher scores on political stability are associated with higher GVC participation rates. Higher trade costs are

associated with lower backward participation and lower overall GVC participation. The dampening effect of high trade costs on imports is greater for SSA countries compared to those in the MENA group. For MENA, a 1% increase in trade costs reduces the import content of exports by 2.6% and by 3.3% for SSA

References

Ahir, Bloom, and Furceri (2019) "The Global Economy hit by Higher Uncertainty", VOXEU https://cepr.org/voxeu/columns/global-economy-hit-higher-uncertainty.

Ariu, A, F J Mayneris and M Parenti (2020) "One way to the top: How services boost the demand for goods", *Journal of International Economics,* 123.

Ariu, A., and L. Ogliari (2022) Services GVCs and Trade in Africa: Structure and Growth", mimeo.

Arvis, J.F, Y. Duval and B. Shepherd (2016) Trade Costs in the Developing World: 1996-2015, *World Trade Review*, 15(3).

Autor, D., D. Dorn and G. Hanson (2013) "The China Syndrome: Local Labor Market Effects of Import Competition in the United States", *American Economic Review*, 103(6), 2121-68.

Baldwin, R. (2006) "Globalisation: the great unbundling(s)", Graduate Institute of International Studies, Geneva.

Baldwin, R. (2016) *The Great Convergence Information Technology and the New Globalization*, Harvard University Press.

Baldwin, R., and R. Freeman (2021) "Risks and global Supply chains: What we know and what we we need to know", NBER WP#29444.

Berman, N., M. Couttenier, D. Rohner, M. Thoenig (2017) "This mine is mine ! How Minerals Fuel Conflicts in Africa", *American Economic Review*, 107(6), 1564-1610

Borin A.; M. Mancini and D. Taglioni, (2021), Economic Consequences of Trade and Global Value Chain Integration: A Measurement Perspective, No 9785, Policy Research Working Paper Series, The World Bank

Cadot, O., J. de Melo, P. Plane, L. Wagner, M. Woldemichael (2016) "Industrialization and Structural Change: Can sub-saharan Africa develop without factories?" *Revue d'Economie du Développement*, 2, 19-50.

Cariolle, J. (2021). International connectivity and the digital divide in sub-saharan africa. *Information Economics and Policy,*

Casella, B., R. Bolwijn, D. Moran and K. Kanemoto. (2019) Improving the analysis of global value chains: the UNCTAD-Eora Database. Transnational Corporations 26(3). New York and Geneva: United Nations

Dollar, D., and M. Kidder (2017) “Institutional quality and participation in global value chains”, in World Bank (Ed.) *Measuring and analyzing the impact of GVCs on economic development*, the World Bank: Washington, DC.

Dovis, M., and C. Zaki (2020) “Global Value Chains and Local Business Environments: Which Factors Really Matter in Developing Countries?“, *Review of Industrial Organization*, 57,481-533.

Evenett, Simon and Fritz (2015), “Throwing sand in the wheels: How Trade Distortions slowed LDC export Growth”, CEPR, https://cepr.org/publications/books-and-reports/gta-throwing-sand-wheels-how-foreign-trade-distortions-slowed-ldc

Fernandes, Ana Margarida, Hiau Looi Kee and Deborah Winkler (2020) “Determinants of Global Value Chain Participation: Cross-country evidence”, *World Bank Economic Review* , 36(2), 329-60.

Foster-McGregor, N., F. Kaulich and R. Steher (2015) “Global Value Chains in Africa”, MERIT Working Papers, https://econpapers.repec.org/paper/unmunumer/2015024.htm

Ghani, E., A. Goswami, and W. Kerr (2016) “Highway to Success: The Impact of the Golden Quadrilateral Project for the Location and Performance of Indian Manufacturing”, *Economic Journal*, 126,591, 317-57.

Gwilliam, K. (2011) Africa's Transport Infrastructure: Mainstreaming Maintenance and Management. Directions in Development; infrastructure. Washington, DC: World Bank.

Jedwab, R., and A. Storeygard (2022) “The Average and Heterogeneous Effects of Transportation Investments: Evidence from Sub-Saharan Africa 1960–2010.” ; Journal of the European Economic Association.

Krantz, S., and D. Beltekian (2025) “Africa’s Regional and Global Integration”, SSRN, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4929189

Lakner, C. and B. Milanovic (2015) “Global Income Distribution from the fall of the Berlin wall to the great recession”, *World Bank Economic Review*, 30(2), 203-32.

Lenzen, M., D. Moran, K. Kanemoto, and A. Gesckhe (2013) “Building EORA: A Global multi-region input-output database at high country and sector resolution”, *Economic Research Systems*, 25(1), 20-49.

Melo, J. de, and A. Twum (2021) “Prospects and Challenges for Supply Chain Trade under the African Continental Free Trade Area”, *Journal of African Trade, https://www.atlantis-press.com/journals/jat/125951740*”

Melo, J. de and J. M. Solleder (2022) “Structural Transformation in MENA and SSA: the role of Digitalization”, ERF working paper 1547.

Melo, J. de, and J.M. Solleder (2025) "How can the African Continental Free Trade Area (AfCTA) help develop regional value chains across Africa? An Exploration", *Review of World Economics*, https://doi.org/10.1007/s10290-024-00574-0

Miller, R., and U Temurshoev (2017). Output upstreamness and input downstreamness of industries/countries in world production. *International Regional Science Review*, *40*(5), 443–475.

Miroudot, S., and H. Nordstrom (2020) "Made in the World? Global Value Chains in the Midst of Rising Protectionism", *Review of Industrial Organization*, 57(2), 195-222.

Nunn, N., and D. Trefler (2015) "Domestic Institutions as a source of comparative advantage", chp. 5 in G. Gopinath, E. Helpman, and K. Rogoff *Handbook of International Economics*, Elsevier, 263-315.

United Nations (2019) Handbook of Accounting for Global Value Chains: GVC satellite accounts and integrated business statistics, UN, statistics division

Vezina, P. L. (2014) "Race to the bottom tariff cutting", *Review of International Economics*, 22(3), 444-58.

World Bank (2020) *Trading for Development in the Age of Global Value Chains*, World Development Report, https://www.worldbank.org/en/publication/wdr2020

ANNEX

This annex describes the selection of countries for the GVC analysis in section 3 and the classification of countries by region. It also provides the aggregation of EORA sectors into 5 categories for GVC analysis.

The EORA database covers 189 countries. In a first step, following the guidance provided by UNCTAD EORA (Casella et al., 2019), we drop the following 17 countries because of issues with their GVC data: Belarus, Benin, Burkina Faso, Congo, Eritrea, Ethiopia, Guinea, Guyana, Libya, Moldova, Serbia, Sudan, Yemen, Zimbabwe, Former USSR. In addition, South Sudan is dropped from the sample because of many outliers.

Next, we limit our set of countries to only those with a population over 1 million in 2015. Based on this criterion, we end up dropping 28 countries: Andorra, Antigua, Aruba, Bahamas, Barbados, Belize, Bermuda, Bhutan, British Virgin Islands, Cayman Islands, Djibouti, Fiji, French Polynesia, Greenland, Iceland, Liechtenstein, Luxembourg, Maldives, Malta, Monaco, Montenegro, New Caledonia, Samoa, San Marino, Sao Tome and Principe, Seychelles, Suriname, Vanuatu.

Finally, an inspection of the data for our three GVC measures led us to drop Oman and Algeria because their share of manufacturing to GDP was over 100% in the WDI database. Iraq and North Korea were dropped because of incomplete information on tariff lines. The result is the list of 150 countries in table A1.

Table A1 Countries in the analysis and their memberships across regional categories

East Asia & Pacific	Europe & Central Asia	Sub Saharan Africa	Middle East and North Africa
Brunei	Albania	Angola	Algeria
Australia	Andorra	Benin	Bahrain (●)
Cambodia	Armenia	Botswana(◊)	Djibouti
China	Austria	Burkina Faso (◊)	Iran
North Korea	Azerbaijan	Burundi (◊)	Iraq
Fiji	Belarus	Cameroon	Israel
French Polynesia	Belgium	Cape Verde	Jordan
Hong Kong	Bosnia and Herzegovina	Central African Republic(◊)	Kuwait(●)
Indonesia	Bulgaria	Chad (◊)	Lebanon
Japan	Croatia	Congo	Libya
Laos	Cyprus	Cote d'Ivoire	Malta
Macao SAR	Czech Republic	DR Congo	Morocco
Malaysia	Denmark	Egypt	Gaza Strip
Mongolia	Estonia	Eritrea	Oman(●)
Myanmar	Finland	Eswatini	Qatar
New Caledonia	France	Ethiopia (◊)	Saudi Arabia(●)
New Zealand	Georgia	Gabon	Syria
Papua	Germany	Gambia	Tunisia
New Guinea	Greece	Ghana	UAE(●)
Philippines	Greenland	Guinea	Yemen
South Korea	Hungary	Kenya	**North America**
Samoa	Iceland	Lesotho(◊)	Bermuda
Singapore	Ireland	Liberia	Canada
Taiwan	Italy	Madagascar	Mexico
Thailand	Kazakhstan	Malawi (◊)	USA
Vanuatu	Kyrgyzstan	Mali (◊)	
Viet Nam	Latvia	Mauritania(◊)	**South Asia**
Latin America & Caribbean	Liechtenstein	Mauritius	Afghanistan
Antigua	Lithuania	Mozambique	Bangladesh
Argentina	Luxembourg	Namibia	Bhutan
Aruba	Monaco	Niger(◊)	India
Bahamas	Montenegro	Nigeria	Maldives
Barbados	Netherlands	Rwanda(◊)	Nepal
Belize	Netherlands Antilles	Sao Tome and Principe	Pakistan
Bolivia	Norway	Senegal	Sri Lanka
Brazil	Poland	Seychelles	
British Virgin Islands	Portugal	Sierra Leone	
Cayman Islands	Moldova	Somalia	
Chile	Romania	South Africa	
Colombia	Russia	South Sudan(◊)	
Costa Rica	San Marino	Sudan	
Cuba	Serbia	Togo	
Dominican Republic	Slovakia	Uganda (◊)	
Ecuador	Slovenia	Tanzania	
El Salvador	Spain	Zambia (◊)	
Guatemala	Sweden	Zimbabwe (◊)	
Guyana	Switzerland		
Haiti	Tajikistan		
Honduras	North Macedonia		
Jamaica	Turkey		
Nicaragua	Turkmenistan		
Panama	Former USSR		
Paraguay	Ukraine		
Peru	UK		
Suriname	Uzbekistan		
Trinidad and Tobago			

Notes: Countries in MENA & SSA that are landlocked are denoted (◊) and belonging to GCC are marked with (●)

Table A2 gives the correspondence for the aggregation of the 26 EORA sectors into 5 categories: Primary; Low-Tech Manufacturing; High-Tech Manufacturing; Low-Tech Services; and High-Tech Services.

Table A2 Classification of EORA sectors by technological intensity

Sector Number	Short Name	Type
1	Agriculture	Primary
2	Fishing	Primary
3	Mining and Quarrying	Primary
4	Food and Beverages	Low-Tech Manufacturing
5	Textiles and Apparel	Low-Tech Manufacturing
6	Wood and Paper	Low-Tech Manufacturing
7	Petroleum and Chemicals	High-Tech Manufacturing
8	Metal Products	Low-Tech Manufacturing
9	Electrical and Machinery	High-Tech Manufacturing
10	Transport Equipment	High-Tech Manufacturing
11	Other Manufacturing	Low-Tech Manufacturing
12	Recycling	Low-Tech Manufacturing
13	Electricity, Gas and Water	Low-Tech Services
14	Construction	Low-Tech Services
15	Maintenance and Repairs	Low-Tech Services
16	Wholesale Trade	Low-Tech Services
17	Retail Trade	Low-Tech Services
18	Hotels and Restaurants	Low-Tech Services
19	Transport	Low-Tech Services
20	Post and Telecommunications	High-Tech Services
21	Financial Intermediation	High-Tech Services
22	Public Administration	High-Tech Services
23	Education, Health and Other Services	High-Tech Services
24	Private Households	Low-Tech Services
25	Others	Low-Tech Services

Source: Foster-McGregor, N., F. Kaulich and R. Steher (2015, table A1).

"Sur quoi la fondera-t-il l'économie du monde qu'il veut gouverner? Sera-ce sur le caprice de chaque particulier? Quelle confusion! Sera-ce sur la justice? Il l'ignore."

Pascal

FERDI

Created in 2003 , the **Fondation pour les études et recherches sur le développement international** aims to promote a fuller understanding of international economic development and the factors that influence it.

Contact
www.ferdi.fr
contact@ferdi.fr
+33 (0)4 73 17 75 30