Intra-African Trade Potential under AfCFTA

Hicham Doghmi – Kamal Lahlou
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Dakhla, 05-24-2024

Introduction and Motivation

International trade is an important driver of growth for emerging and developing economies.

Research finds that deep trade agreements boost trade, foreign investment and participation in global value chains (Laget et al. 2018; Mattoo, Mulabdic, and Ruta 2017; Mulabdic, Osnago, and Ruta 2017)

Introduction and Motivation

Why regional integration matters?

By removing trade barriers, regional economic integration:

- increases the size of the market
- contributes to the expansion of trade
- takes advantages of economies of scales

The primary aim is to increase intra-regional trade, which can boost economic growth, reduce poverty and improve the living standard.

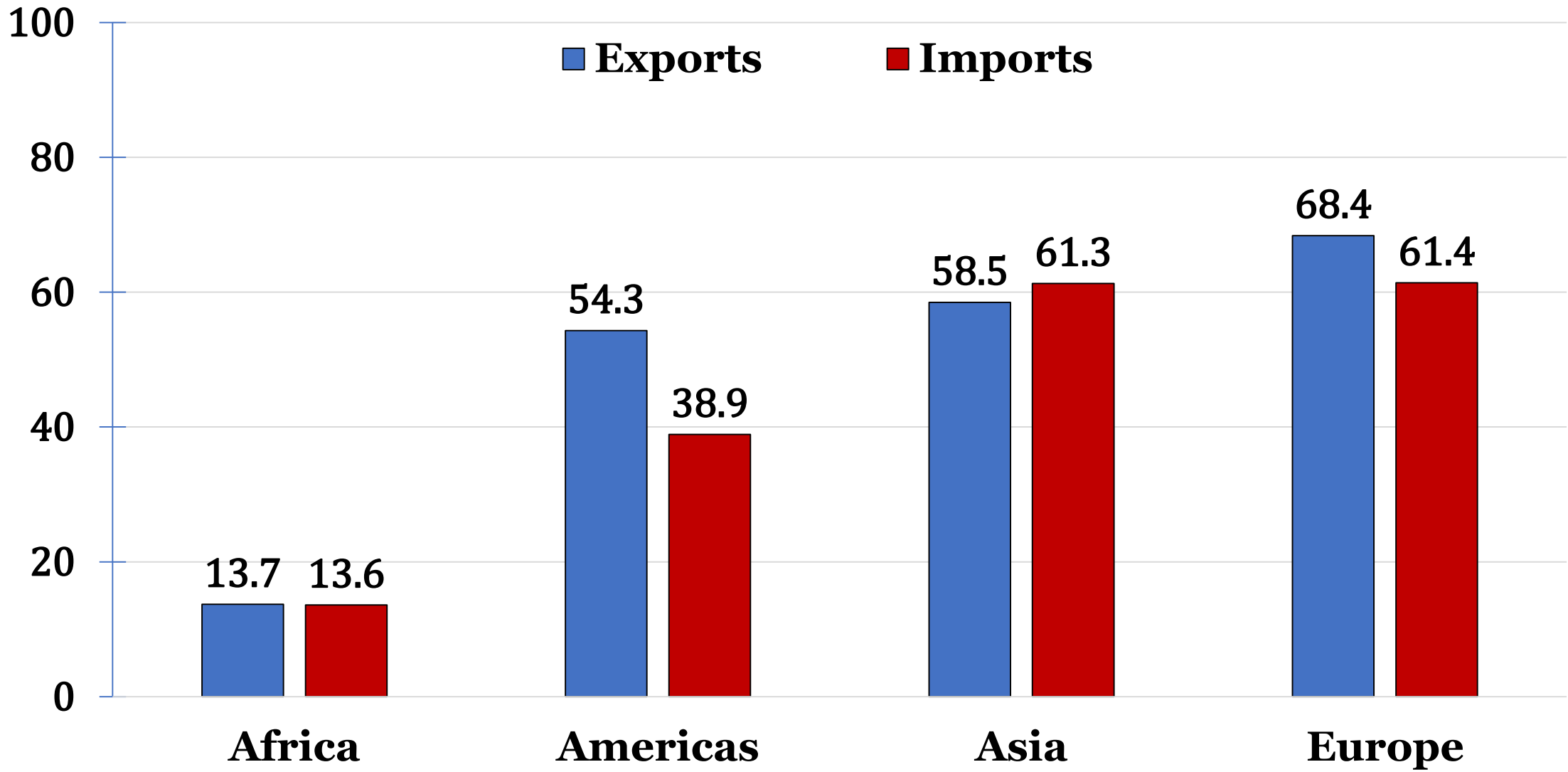
Introduction and Motivation

Several trade and regional economic integration communities (RECs) have been formed over the years (since the 1990s).

The African Continental Free Trade Area (**AfCFTA)** is the most recent and ambitious initiative in this vein.

→ (seeking) the revival of intra-African trade

Intra-Regional Trade (% total trade), 2022



Research Questions

1. Is there potential for increasing intra-African trade?

   → Is there any untapped trade capacity in intra-African trade?

2. If there is such a **potential** → what are the main constraints that have prevented African countries from exploiting this potential?

   → What was the impact of Africa's regional economic communities?

Objective

We assess trade efficiency between African countries:

- at the bilateral level
- at the regional level (within the same RECs)

How do we proceed?

We estimate trade potential defined as as **the maximum possible trade that can be achieved between two countries,** using:

- Concept of technical efficiency (Debreu, 1951; Farrel, 1957)
- Stochastic frontier analysis (Aigner et al., 1977)
- Gravity model (Tinbergen, 1962)

Outline

1. The Current State of intra-African Trade
2. Related Literature
3. Empirical Strategy
4. Data
5. Empirical Results

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The Current State of intra-African Trade

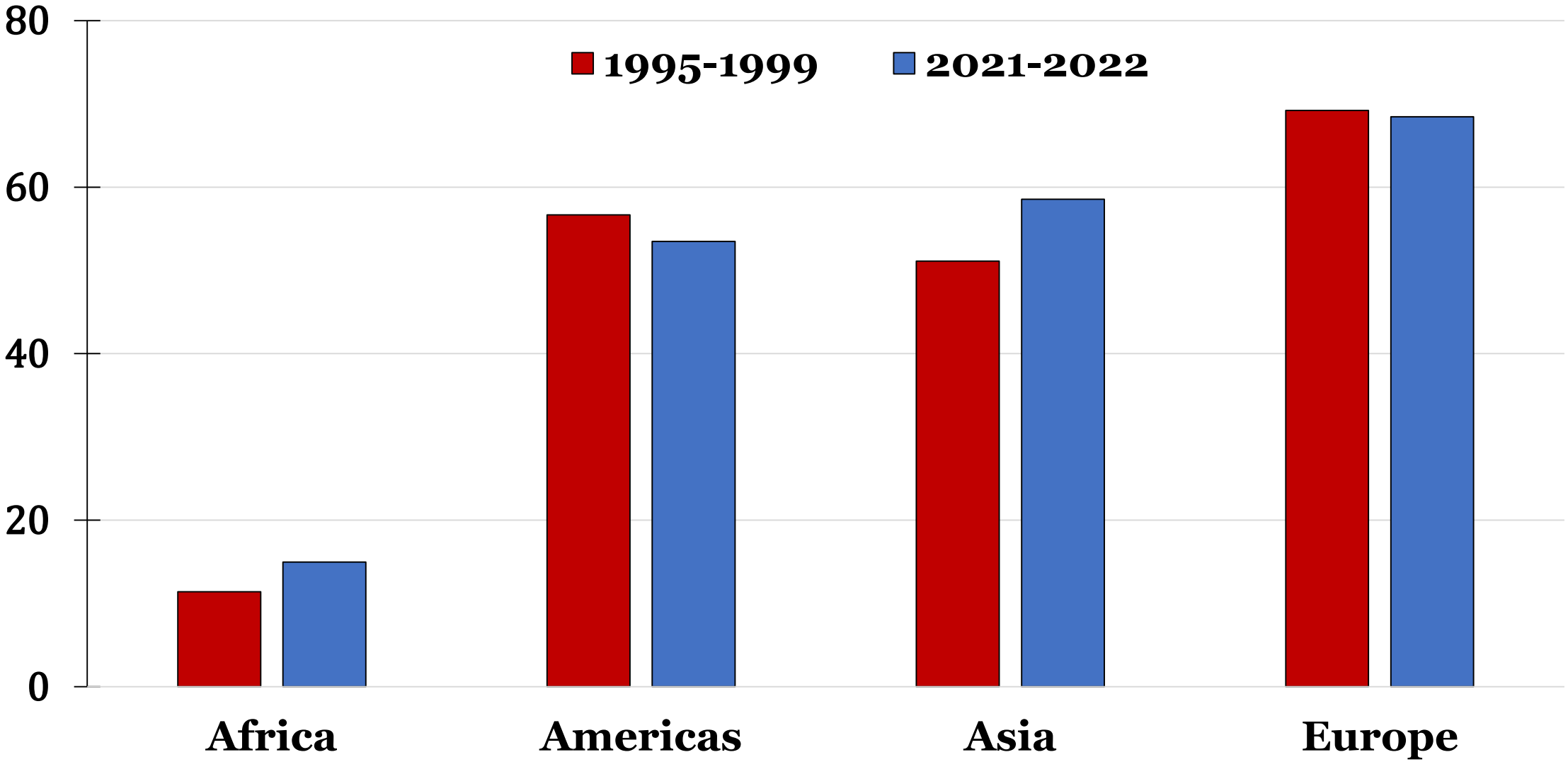
Africa is a vast and diverse continent:

Size: **16%** of the world's population
7 countries with a population less than 1.5 million
1 country has over 100 million (Nigeria)

Income level: Only **5%** of the world's income
27 Low income – 18 Lower-middle income
8 Upper-middle income – 1 High income

Openness to trade: from **38%** to **140%** of GDP
2.7% of world's exports
2.9% of world's imports

Intra-Regional Exports (% total exports)



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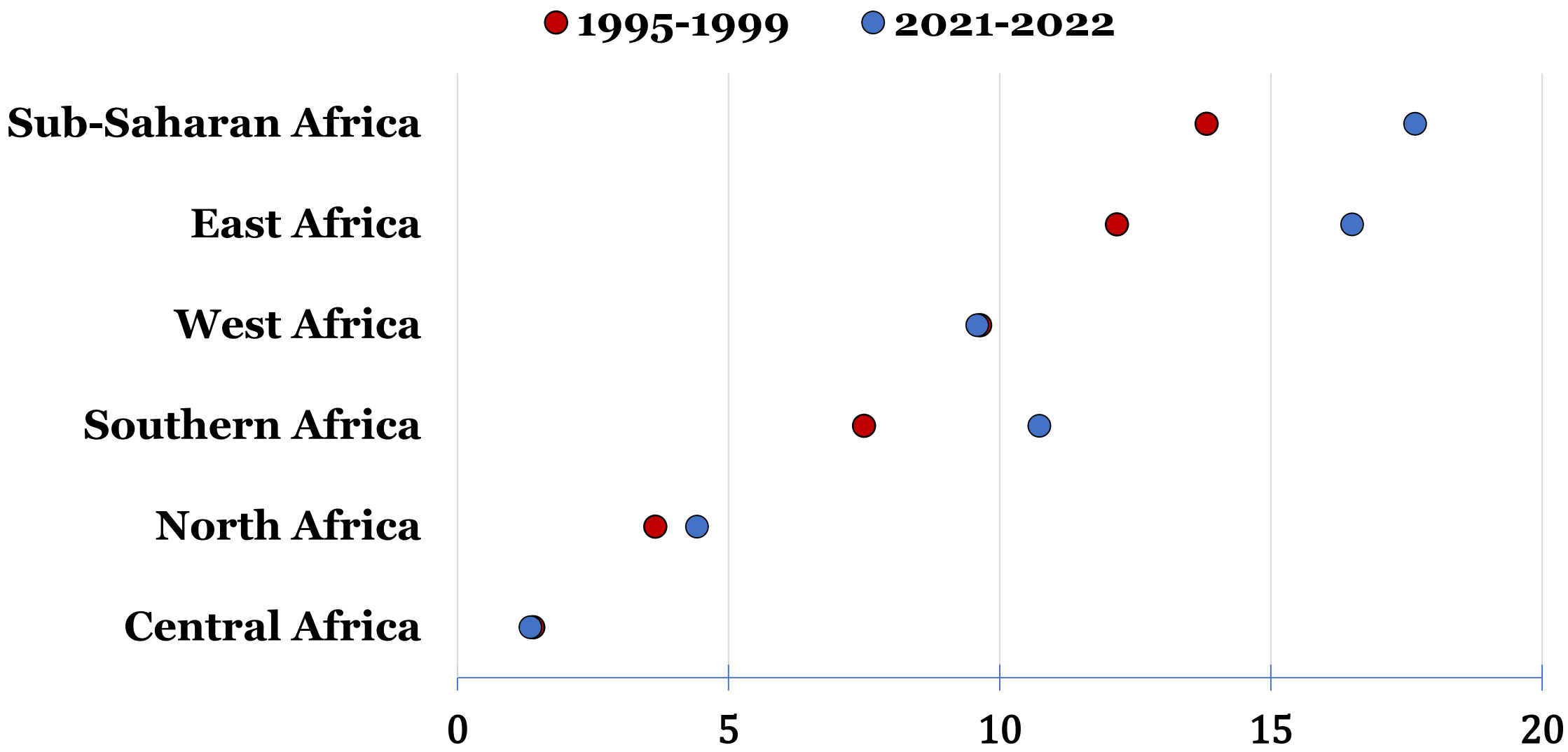
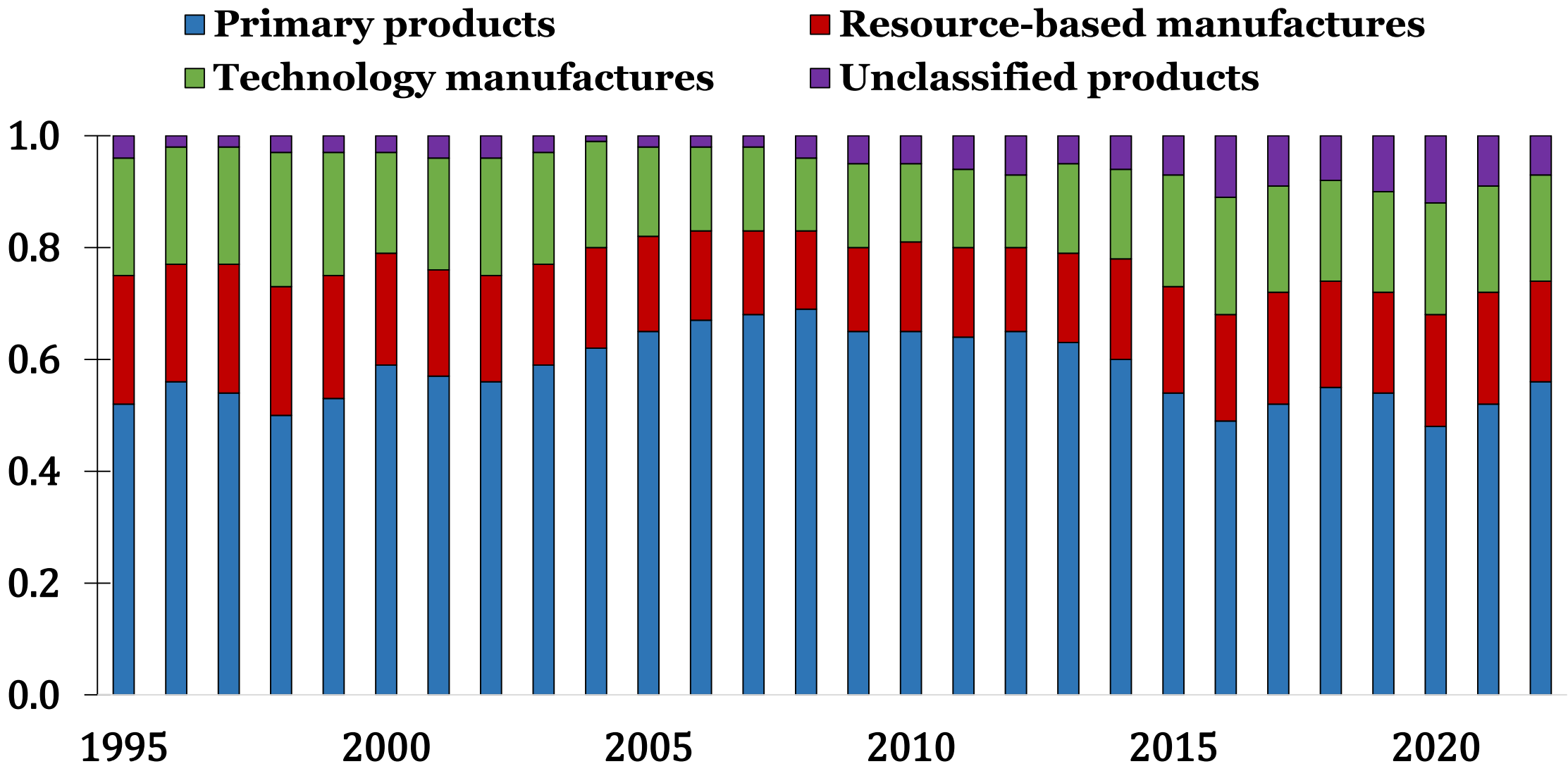
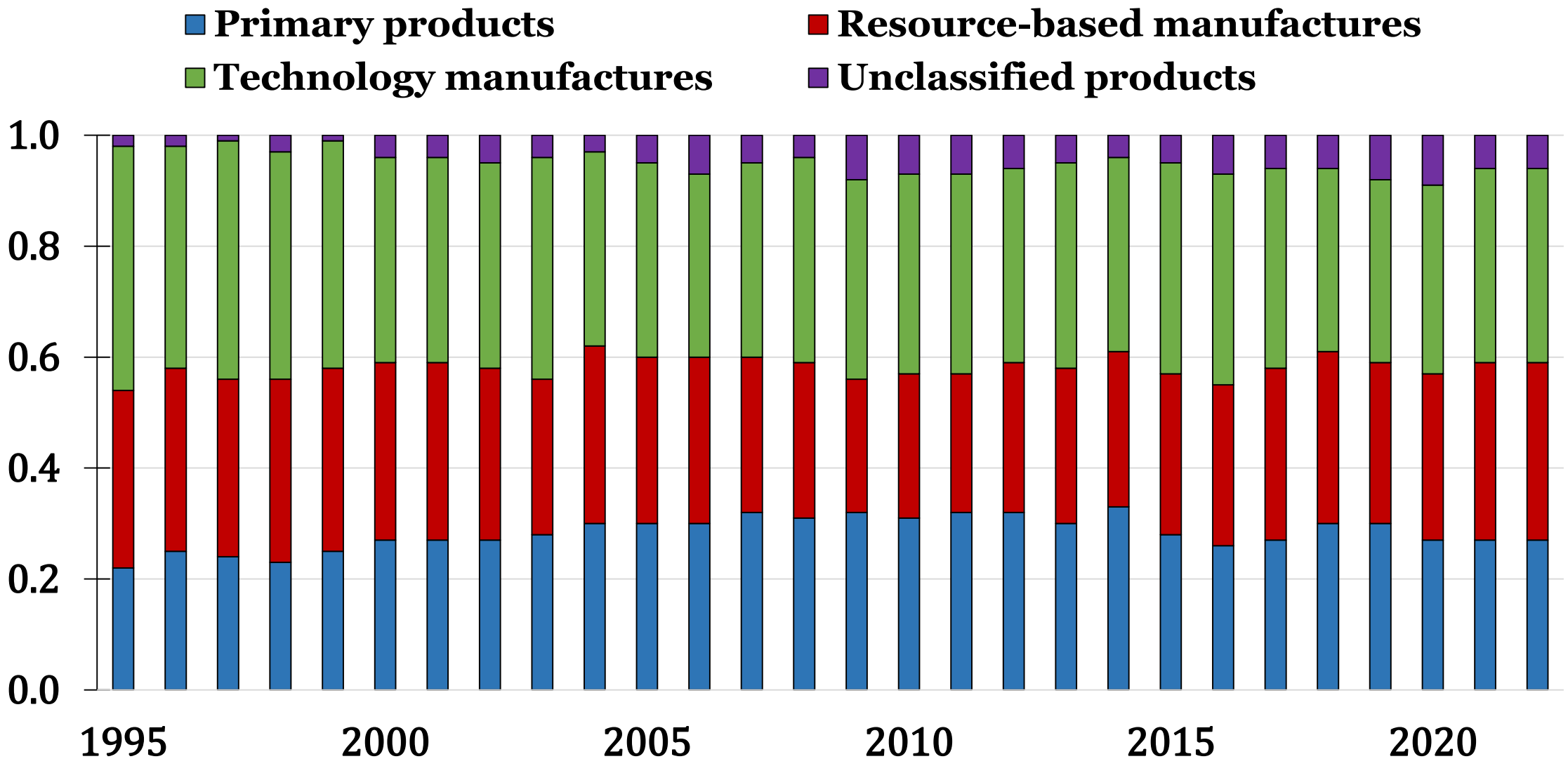


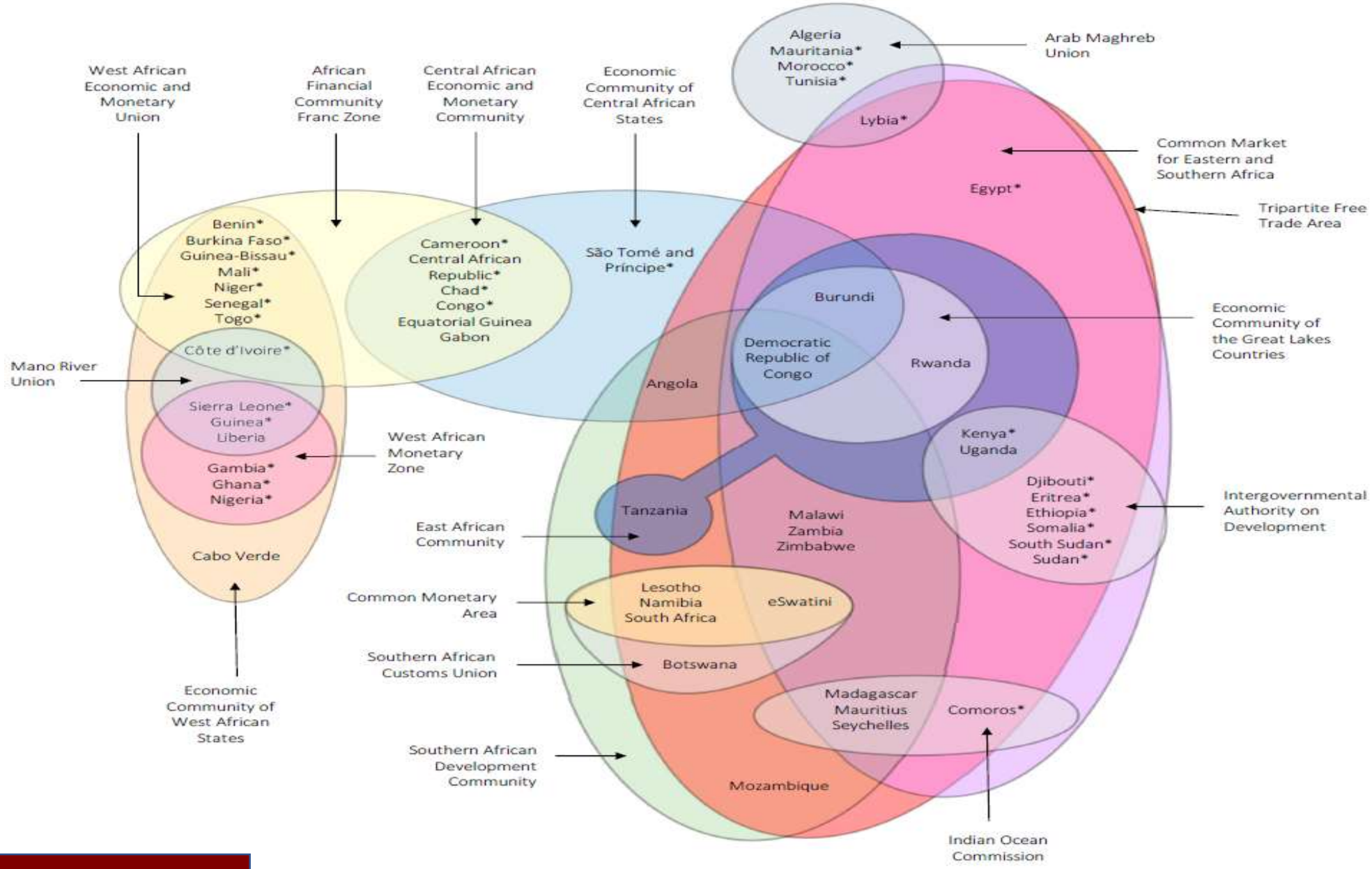
Composition of African exports (%)



Composition of intra-African exports(%)



Regional Trade Arrangements in Africa



Intra-African Trade Agreements

Name of agreement	Date of entry into force	Coverage	Type of agreement
Customs Unions among African countries			
COMESA	8-Dec-94	Goods	Customs Union
ECOWAS	25-Aug-95	Goods	Customs Union
CEMAC	24-Jun-99	Goods	Customs Union
WAEMU	1-Jan-00	Goods	Customs Union
EAC	7-Jul-00 (G) 1-Jul-12 (S)	Goods & services	Customs Union
SACU	15-Jul-04	Goods	Customs Union
Free Trade Agreements among African countries			
SADC	1-Sep-00	Goods	Free Trade Agreement
Agadir Agreement	27-Mar-07	Goods	Free Trade Agreement
AfCFTA	30-May-19	Goods	Free Trade Agreement

Trade Restrictions (index)

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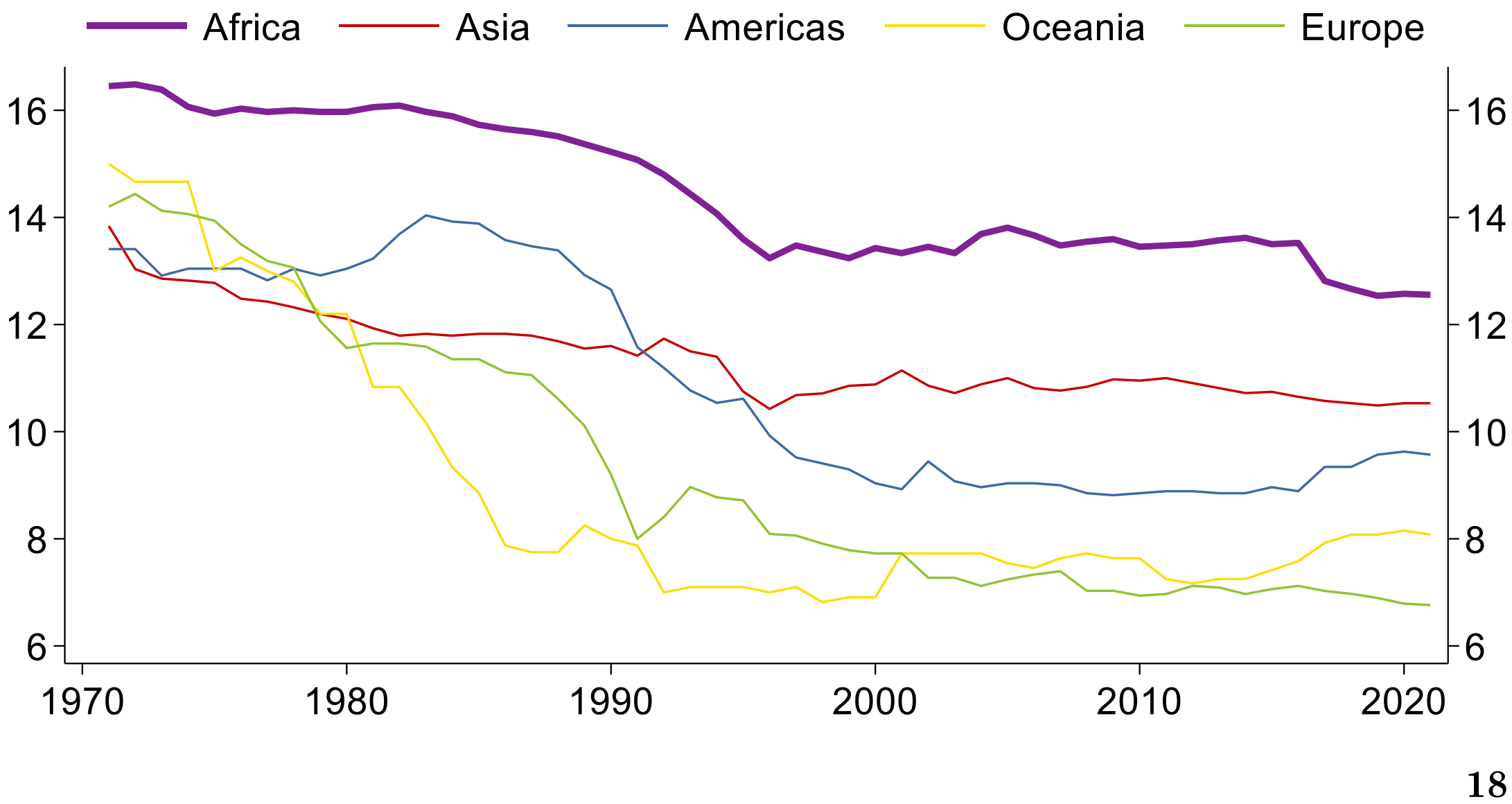
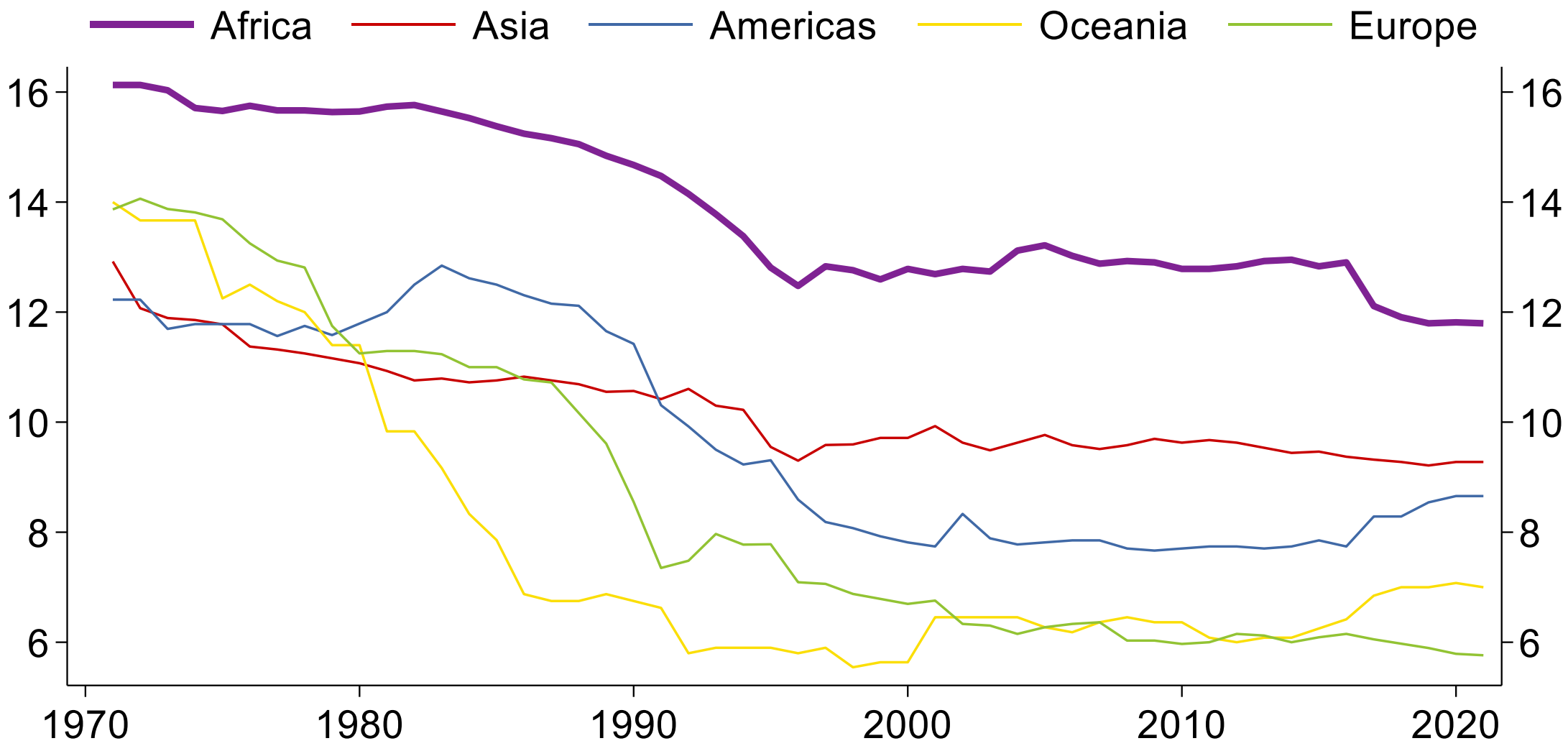


Non-tariff Trade Restrictions (index)



Level of Infrastructures - 2019, by region

Variable	Africa	Sub-Saharan Africa	Mena	High-Income Countries
Container port traffic per capita	**0.09**	0.07	0.31	0.75
Air transport passengers, per capita	**0.23**	0.25	1.36	1.36
Quality of port infrastructure,(1=low to 7=high)	**3.64**	3.64	4.34	5.35
Liner shipping connectivity index (max=100)	**14.38**	12.72	24.68	50.64
Infrastructure efficiency score, (1=low to 5=high)	**2.32**	2.34	2.59	3.75
Customs efficiency score, (1=low to 5=high)	**2.35**	2.39	2.44	3.58
International shipments efficiency, (1=low to 5=high)	**2.52**	2.52	2.81	3.56
Timeliness efficiency score, (1=low to 5=high)	**2.87**	2.86	3.12	4.09
Overall logistics efficiency score, (1=low to 5=high)	**2.49**	2.51	2.71	3.74

Outline

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Related Literature

How to assess potential bilateral trade between two countries?

Studies that aim to assess **trade potential** can be classified into **two strands**:

1. The conventional gravity model

2. The stochastic frontier gravity model (SFGM)

Related Literature

1. The conventional gravity model

Simwaka (2011):

Southern African Development Community (SADC) / 1998–2007
On average, the actual intra-regional trade is **57%** of the potential.

Related Literature

1. The conventional gravity model

Geda and Seid (2015):

West and Central Africa / 1993–2010
On average, the actual intra-regional trade is **18%** of the potential

North, East, and Southern Africa / 1993–2010
On average, the actual intra-regional trade is **10%** of the potential

Related Literature

1. The conventional gravity model

Umulisa (2019):

The East African Community's EAC/ 2000–2016
Intra-regional trade represents **45%** of trade potential.

Related Literature

2. The stochastic frontier gravity model

Ebaidalla and Elhaj (2023):

17 Arab countries (members of the Arab League) / 1998–2015
Intra-Arab total trade represents **62%** of trade potential.

Related Literature

2. The stochastic frontier gravity model

Masunda and Mhonyera (2024):

16 member countries of COMESA/ 1997–2021
Export efficiency averaged **8.2%** (trade gap: 91.8%)

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Empirical Strategy

The Gravity Intuition:

$$\log(Exports_{ij}) = \ c + \beta_1 \log(GDP_i) + \beta_2 \log\left(GDP_j\right) + \beta_3 \log\left(trade\ costs_{ij}\right) + e_{ij}$$

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$$\log(trade\ costs_{ij}) \approx \log(distance_{ij})$$ ← Standard gravity model

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$$\log(trade\ costs_{ij}) \approx \log(distance_{ij})$$ ← Standard gravity model

$$\log(trade\ costs_{ij}) = \alpha_1 \log(distance_{ij}) + \alpha' . \boldsymbol{X_{ij}}$$ ← Augmented gravity model

Empirical Strategy

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1. The unobservable/difficult to quantify, institutional characteristics and other trade resistances that affect exports are captured in the disturbance term.

2. Do not gauge export performance between two countries against a maximum possible level of export.

Empirical Strategy

We rely on the concept of **technical efficiency** and the **stochastic frontier analysis:**

Technical efficiency → Firm's production process:

A firm's production performance is technically efficient when it produces the maximum possible **output** from a given quantity of **inputs.**

in most cases, firms do not take full advantage of the inputs at their disposal, which lowers their production (technically inefficient)

Empirical Strategy

A firm ***i*** has a production function ***f*** and inputs $\boldsymbol{X_i}$ and produce:

$$output_i^{maximum} = f(X_i, \beta)$$

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The output deviate from the frontier due to technical inefficiency $\boldsymbol{\delta_i} \in]\mathbf{0}, \mathbf{1}]$**:**

$$output_i = f(X_i, \beta)\boldsymbol{\delta_i} < output_i^{maximum}$$

$if\ \boldsymbol{\delta_i} < \mathbf{1} \rightarrow$ the firm is not making the most of the inputs $\boldsymbol{X_i}$

$if\ \boldsymbol{\delta_i} = \mathbf{1} \rightarrow$ the firm is achieving the optimal output.

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Output is also subject to random shocks $\boldsymbol{\theta_i}$:

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Output is also subject to random shocks $\boldsymbol{\theta_i}$:

$$output_i = f(X_i, \beta)\boldsymbol{\theta_i}\delta_i$$

$e_i = \log(\theta_i) / v_{ij} = -\log(\delta_i)$:

$$\log(output_i) = \alpha + \beta'.\log(X_i) + e_i - v_i$$

Empirical Strategy

Stochastic frontier model:

$$\log(output_i) = \underbrace{\alpha + \beta'.\log(X_i) + e_i}_{\substack{maximum\ output \\ (\textbf{\textit{potential}})}} - \underbrace{v_i}_{\textbf{\textit{efficiency}}}$$

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Gravity model:

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Stochastic frontier gravity model:

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$$\log(exports_{ij,t}) = \underbrace{\alpha + \beta'.\log(\boldsymbol{X_{ij,t}}) + e_{ij,t}}_{\textbf{Export potential}} - \underbrace{\lambda'.\boldsymbol{Z_{ij,t}} + u_{ij,t}}_{\textbf{Export efficiency}}$$

Empirical Strategy

Estimation Method: Maximum likelihood estimation method (MLE).

Sample: All African countries

Period: 1996-2020

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Data

Export flows between two countries (i and j) are determined by several factors (Baldwin and Taglioni, 2006):

1. **Natural resistances**
   These factors can not be changed in the short and medium terms

2. **Man-made determinants**
   Policy factors that can be changed in the short and medium terms

Data

1. Natural resistances →X_{ij}

These factors can not be changed in the short and medium terms

- Economic size (GDP, Population) **{+}**
- Distance **{-}**
- Being landlocked **{-}**
- Sharing common border **{+}**
- Sharing common langage **{+}**
- Sharing common colonizer **{+}**

Data

2. Man-made resistances $\rightarrow Z_{ij}$

Policy factors that can be changed in the short and medium terms

- Using the same currency **{+}**
- Exchange rate **{-}**
- Tariffs **{-}**
- Trade restrictions **{-}**
- Infrastructure **{+}**
- Governance and institutional settings **{+}**
- Trade agreements **{+}**

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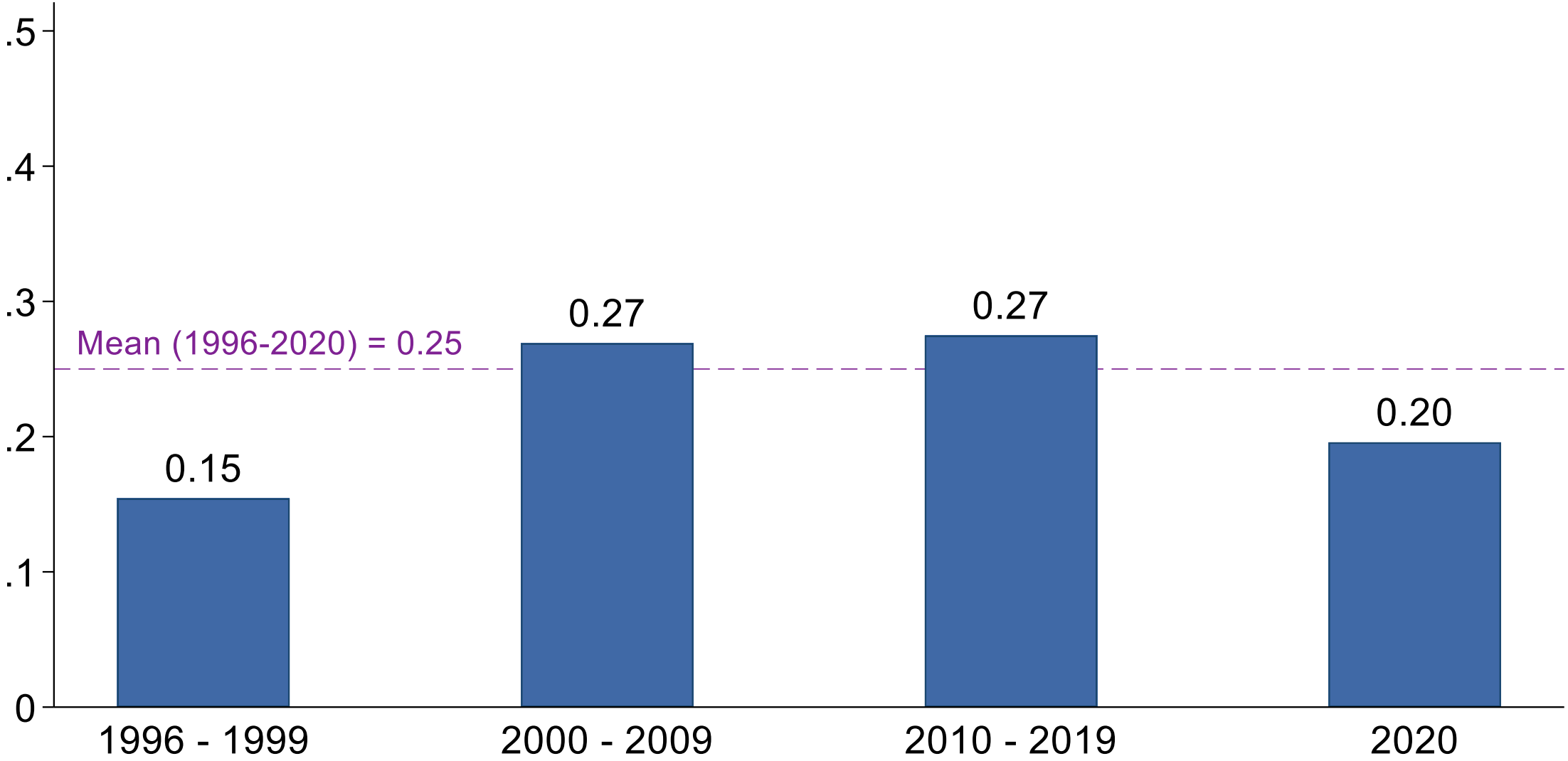
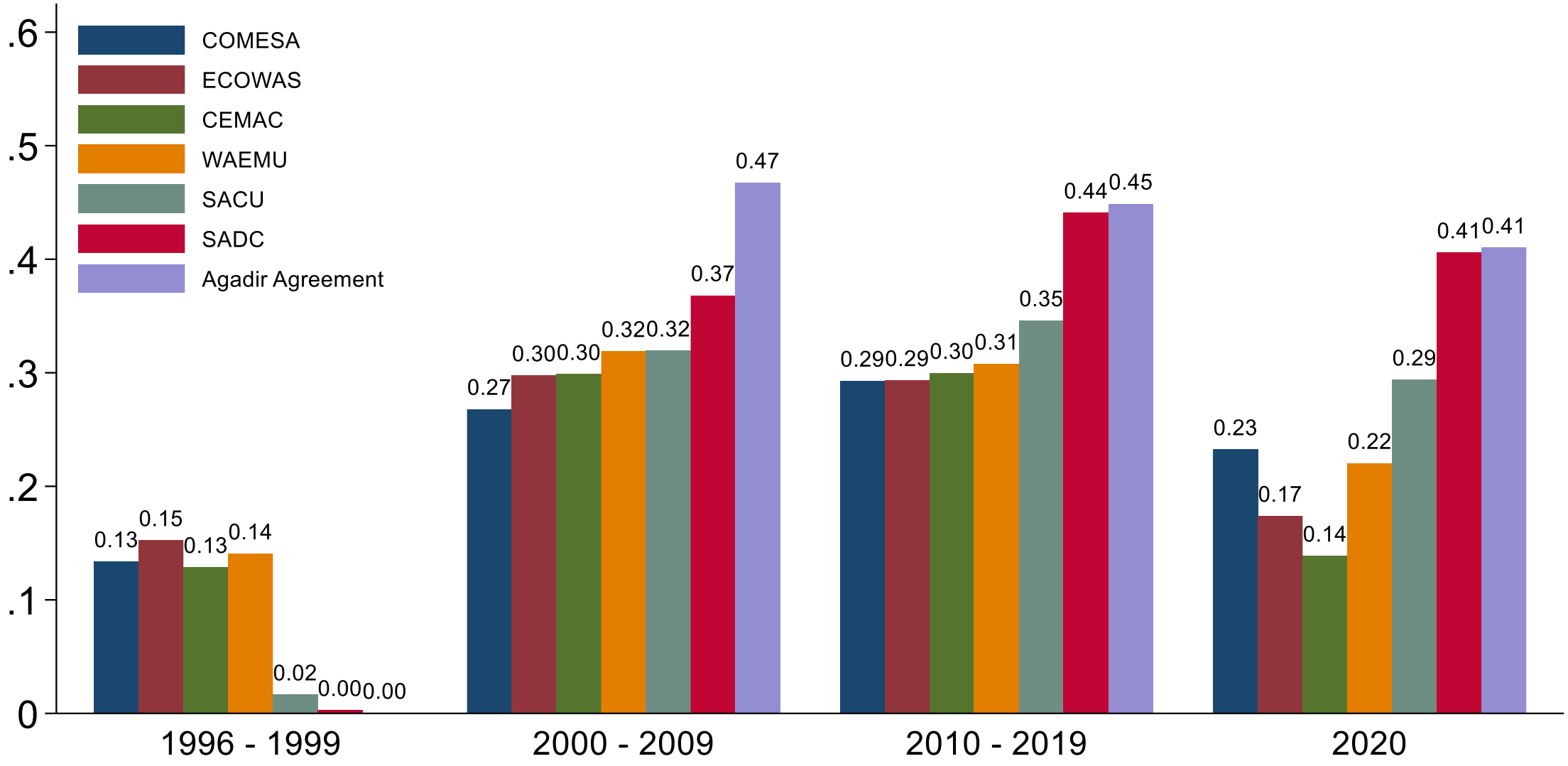
Stochastic frontier model

Dependent Variable:	*Export flows (Current USD)*						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Stochastic frontier:							
GDP - exporter	0.774***	0.712***	0.666***	0.659***	0.656***	0.662***	0.664***
	[0.03]	[0.05]	[0.05]	[0.05]	[0.05]	[0.05]	[0.05]
GDP - importer	0.431***	0.429***	0.344***	0.321***	0.314***	0.313***	0.312***
	[0.03]	[0.05]	[0.05]	[0.05]	[0.05]	[0.05]	[0.05]
Distance (km)	-1.543***	-1.524***	-1.566***	-1.593***	-1.245***	-1.230***	-1.196***
	[0.07]	[0.07]	[0.07]	[0.07]	[0.07]	[0.07]	[0.07]
Population size - exporter		0.129**	0.502***	0.527***	0.538***	0.524***	0.528***
		[0.06]	[0.06]	[0.07]	[0.06]	[0.06]	[0.06]
Population size - importer		0.021	0.111*	0.150**	0.164***	0.153***	0.159***
		[0.05]	[0.06]	[0.06]	[0.06]	[0.06]	[0.06]
Area (km^2) - exporter			-0.356***	-0.358***	-0.385***	-0.361***	-0.376***
			[0.03]	[0.03]	[0.03]	[0.03]	[0.03]
Area (km^2) - importer			-0.043	-0.041	-0.067**	-0.041	-0.055*
			[0.03]	[0.03]	[0.03]	[0.03]	[0.03]
Landlocked - exporter, Y/N				-0.338***	-0.335***	-0.387***	-0.370***
				[0.09]	[0.09]	[0.09]	[0.08]
Landlocked - importer, Y/N				-0.538***	-0.538***	-0.594***	-0.578***
				[0.09]	[0.09]	[0.09]	[0.09]
Sharing common border, Y/N					1.740***	1.498***	1.535***
					[0.25]	[0.25]	[0.24]
Sharing common language, Y/N						0.859***	0.424***
						[0.08]	[0.11]
Sharing common colonizer, Y/N							0.808***
							[0.12]
Observations	76,178	76,178	75,174	75,174	75,174	75,174	75,174
Log Likelihood	-176,182	-176,175	-173,525	-173,501	-173,459	-173,402	-173,374
AIC	352,376	352,365	347,070	347,026	346,944	346,832	346,779
BIC	352,431	352,439	347,163	347,137	347,064	346,961	346,917

Export efficiency scores (%)



Export efficiency scores, by RECs (%)



Efficiency Model

Dependent Variable:	*Export flows (current USD)*				
	(1)	(2)	(3)	(4)	(5)
Export inefficiency:					
Nominal ER - exporter	0.041***	0.041***	0.031***	0.030***	0.030***
	[0.01]	[0.01]	[0.00]	[0.00]	[0.01]
Regional trade agreement (RTA)	-0.683***				
	[0.03]				
Customs union (CU)		-0.093***	-0.018	-0.006	-0.052
		[0.03]	[0.03]	[0.04]	[0.04]
Free trade agreement (FTA)		-3.277***	-0.974***	-0.956***	-0.963***
		[0.15]	[0.09]	[0.09]	[0.10]
Governance index - exporter			-0.230***	-0.231***	-0.273***
			[0.02]	[0.02]	[0.03]
Governance index - importer				-0.183***	-0.224***
				[0.03]	[0.03]
Trade restrictions index					0.161***
					[0.05]
Observations	74,624	74,624	55,634	55,634	48,315
Log Likelihood	-181,137	-180,176	-132,252	-132,225	-116,163
AIC	362,305	360,387	264,540	264,488	232,366
BIC	362,453	360,544	264,701	264,658	232,542

Contributions

An empirical investigation of trade-impeding and of trade-stimulating factors for all African countries.

We provide precise estimates of trade potential/efficiency using the stochastic frontier model.

An important distinction between factors affecting:

- export frontier (**natural resistances**)
- export efficiency (**man-made resistances**)

We identify the main sources of trade efficiency (preliminary results)

Intra-African Trade Potential under AfCFTA

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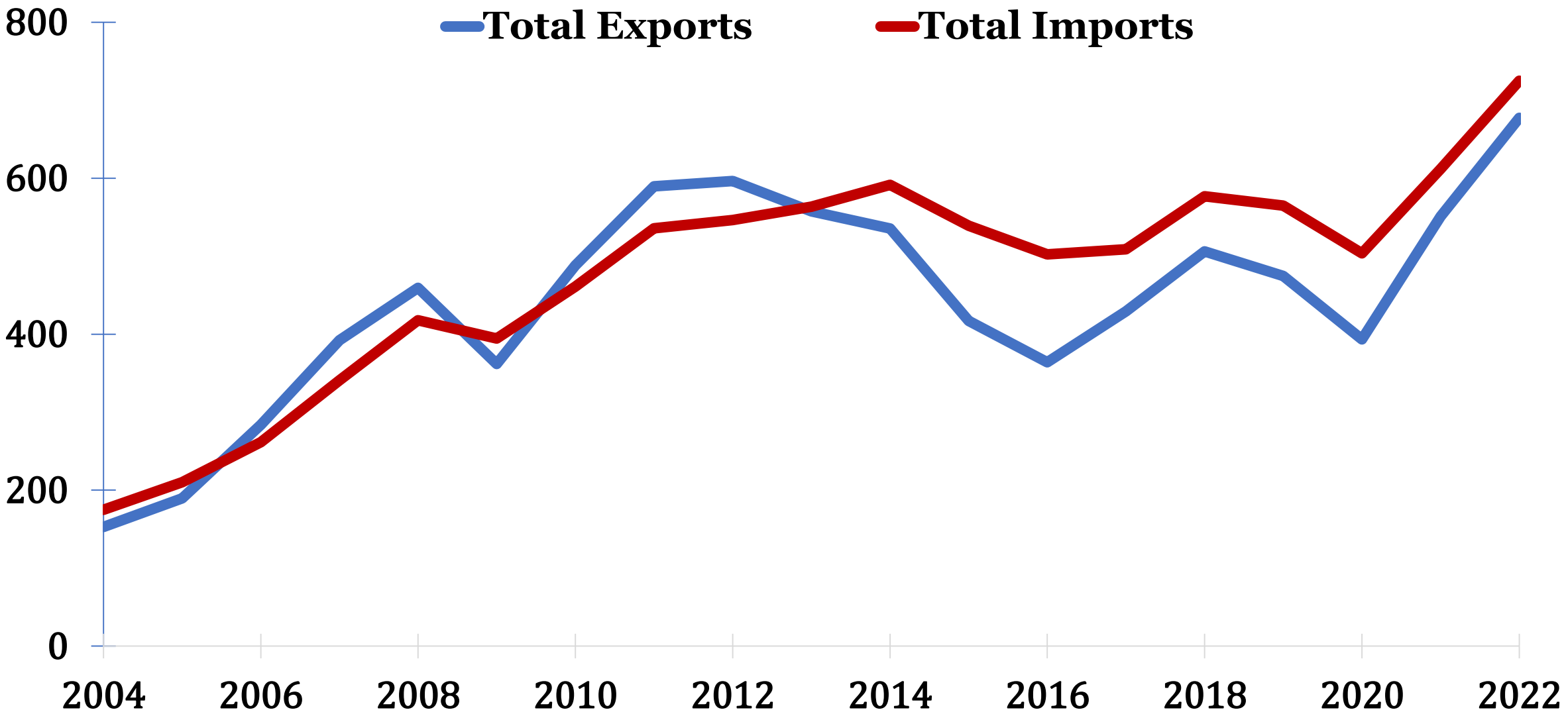
Appendix

African Trade ()



Trade Complementarity Index (0 – 100)