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Deeper Integration or Open Regionalism in the Indian Ocean Rim Association (IORA): A CGE Approach

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Abstract The Indian Ocean Rim Association (IORA) is a regional association based on the principle of open regionalism to promote liberalization through trade and investment facilitation. This study compares two main scenarios with the ingredients of a deeper regional integration compared to the IORA's present open regionalism status. Scenario I evaluates the effects of gradual tariff cuts on IORA, while Scenario II combines the impact of tariff cuts, non-tariff measures (NTM) reduction, and trade facilitation. A recent recursive dynamic model, called Global Trade Analysis Project recursive dynamic model (GTAP-RD), was used to understand the adjustment path. The result shows welfare gain for all IORA countries when a trade liberalization involving tariff cuts is complemented with NTM reduction and trade facilitation. In addition, the "NTM spillover" effect on some non-IORA members (the rest of Gulf Cooperation Council, the rest of Greater Arab Free Trade Agreement, and the United Kingdom) was observed. The results suggest that IORA has more to gain if it involves a deeper regional integration than the present form of open regionalism.

Keywords: integration, Indian Ocean Rim Association, non-tariff measures, trade facilitation, dynamic model

JEL Classifications: F14, F15

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I. Introduction

The relevance of non-tariff measures (NTMs) in global trade circles has become increasingly

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pertinent because it is reshaping the focus of international trade and impacting the drive to attain regional and global sustainable development (UNCTAD, 2019). Recent trade agreements are shifting away from traditional integration agreements, mainly comprising tariff cuts, to deeper integration involving the reduction and harmonization of NTMs. The trade cost of NTMs is more than double the custom tariffs, although some NTMs help correct market inefficiencies and protect human, animal, and plant welfare (Knebel and Peters, 2018; UNCTAD, 2019).

The Indian Ocean Rim Association (IORA) comprises 23 countries from different regions and regional trade agreements. Like the world, the IORA region recently witnessed an increase in the prevalence of NTMs, accounting for about 18% of global NTMs notified to the World Trade Organization (WTO) (Akintola et al., 2021). NTMs are expected to reduce trade costs and facilitate regional trade and investment.

IORA operates an open regionalism framework, and the ability of this framework to strengthen the region's economic integration has faced criticism (Attri, 2019). As a result, there have been discussions to consolidate regional economic integration through forming a preferential trade agreement (PTA)[1] and recent prospects of forming a comprehensive economic partnership agreement (IORA-CEPA)[2]. If implemented, the IORA-CEPA is expected to cover broad areas, such as market access, trade, and investment facilitation, and reduce NTMs. Consequently, this study explores integration scenarios using a dynamic computable general equilibrium (CGE) to determine the economy-wide impact of tariff liberalization, NTM reduction, and trade facilitation in light of deeper trade integration in the IORA region. Trade theory suggests that trade liberalization involving tariff reduction and the elimination of non-tariff barriers promotes efficiency, scale economies, and trade flows, which might translate into a country's welfare and economic growth.

The Indian Ocean has always been a trade nexus connecting Asia, the Middle East, and Africa, and half of the world's container ships transit through this region. The region has recently seen key players in global trade showing great interest. In the coming decades, the region's economic and productivity growth is expected to rise, considering its relative population, growing market, and strategic location (Akintola et al., 2021; IORA, 2016, 2020); thus, it becomes compelling to understand the impact of deeper integration, such as IORA-CEPA, on global trade.

The paper is organized as follows. The next section reviews relevant CGE literature related to IORA, Section III specifies the CGE-recursive dynamic model adopted for this study, Section IV discusses the results, and Section V concludes.

1) The formation of the PTA has suffered some setbacks, with some members citing economic disparity and development as reasons.

2) Discussed at the 22nd Indian Ocean Rim Business Forum (IORBF) on 13 of October 2016 in Jakarta

II. Literature Review

Several studies have employed the static CGE model in analyzing the impact of trade liberalization reforms involving NTM reduction and trade facilitation (TF) on trade agreements. Using a static CGE model, Egger et al. (2015) explored the potential impact of tariff and burdensome NTM reductions on goods and services in the proposed Transatlantic Trade and Investment Partnership (TTIP) involving the United States and the European Union (EU). The study employed the iceberg method[3], reporting that bilateral trade would increase by around 80% within TTIP, and the spillover effect on third countries would be determined by the level of NTM discriminatory policy that might be used in the TTIP agreement. Similarly, Boughanmi et al. (2016) also used the iceberg method in analyzing the effect of various deeper integration (NTMs reduction and trade facilitation) paths between the Gulf Cooperation Council (GCC), Greater Arab Free Trade Agreement (GAFTA), and EU. They found that complementing tariff liberalization with trade facilitation leads to welfare enhancement across GCC countries, suggesting that a deeper integration involving investment liberalization should be considered due to the benefit that can be accruable from the dynamic investment effect of integration. Among the literature that quantifies the impact of deeper integration, "new age agreement," on FTA is the study of Hertel et al. (2001). While studying the impact of the reduction of tariffs and burdensome NTMs on the Japan-Singapore FTA, they concluded that there are significant benefits in terms of investment, capital accumulation, and economic growth for both countries and the rest of the world.

Focusing on the IORA region, there is a dearth of literature that empirically analyzed trade and regional integration within the IORA region with a focus on trade liberalization concerning tariff reduction and the formation of PTAs in the framework of CGE. Anderson (2002) used a CGE model in analyzing the implication of agricultural trade liberalization in the IORA countries. The study revealed that agriculture would provide more than one-third of the IORA developing countries' gains from freeing all merchandize trade globally in 2005. It further states that Sub-Saharan African and South-East Asia countries in IORA must reduce trade barriers in numerous sensitive products to gain from trade reforms.

Rahman and Kai (2014) assessed the economic impact of the proposed PTAs by IORA using a CGE. They simulated high-income countries eliminating all tariffs and the middle-income and the least developed countries cutting tariffs by 75% and 50%, respectively; the findings indicated that welfare and exports improved for all IORA countries except Madagascar. They concluded that the proposed PTA is likely to significantly impact the economy of these countries,

3) Various methods have been employed to incorporate NTM into the GTAP model. Our study follows the iceberg approach because NTM is assumed to be primarily technical NTM, to be institutional friction (Sand in the wheels), which does not generate economic rent but serves as red tape to importation, leading to resource wasting and trade inefficiency. For more details, see Andriamananjara et al. (2003) and T. Walmsley and Strutt (2021).

with highly labor-intensive manufacturing sectors benefiting the most.

Salam and Meyrandhoyo (2017) also used a static CGE to analyze tariff liberalization's impact on Indonesia and IORA countries. The study conducted two simulations involving partial (50%) and full (100%) tariff cuts. The partial tariff cut witnessed an increase in real gross domestic product (GDP) and welfare for both Indonesia and IORA. In contrast, the full tariff cut had negative welfare on IORA countries. The study concluded that a partial tariff cut would be more beneficial for IORA if IORA considers an FTA in the future because it leads to higher investment and lowers trade balance deficits.

The existing literature on IORA had only captured tariff liberalization using a static CGE approach without considering the long-run adjustment path of IORA countries. Hence, our study employs a recursive dynamic model to better understand the impact of the IORA region engaging in deeper integration.

III. Model Specification

This study uses the Global Trade Analysis Project recursive dynamic model (GTAP-RD) recently developed by Angel Aguiar et al. (2019). Recursive dynamic models are useful in assessing long-term structural changes[4] and the adjustment path of economies involved in trade liberalization, which static CGE models do not capture. In addition, the dynamic model allows capturing the adjustment process of the imposition of an NTM (Fugazza, 2013), which is pertinent in modern trade agreements.

A. Data

The primary data source was the GTAP10a database[5] (A Aguiar et al., 2019). This database comprises 141 regions, 65 sectors, and 5 endowments. The database using GTAP-RD Aggin is aggregated into 31 regions, 31 sectors, and 5 endowments (Table 1). The GTAP region contains only 17 IORA members as a separate region. AVE of NTMs is taken from the World Bank database based on the estimation method developed by Kee and Nicita (2016).

4) Britz and Roson (2018) explain that structural change involves variations that occur over time on the productive structure, primary endowments of resources, and trade and demand patterns of an economy.

5) https://www.gtap.agecon.purdue.edu/databases/v10/index.aspx

Table 1. *GTAP Regional, Sectorial, and Factor Aggregations*

REGION (31)		SECTOR (31)	
Australia*	United Kingdom	Rice	Oil
China	Switzerland	Wheat	Gas
USA	Iran*	Vegetables	Chemicals
Japan	Oman*	Vegetable oil	Machinery Equipment
Korea	United Arab Emirates (UAE)*	Dairy	Metals
Taiwan	Kenya*	Other Crops	Coal_Mining
Indonesia*	Madagascar*	Meat	Transport Equipment
Malaysia*	Mauritius*	Forestry	Electrical Equipment
Singapore*	Mozambique*	Fishery	Manufacturing
Thailand*	Tanzania*	Food products	Motor_Parts
Bangladesh*	South Africa*	Beverage_Tobaco	Land Transport
India*	R_GCC	Sugar	Water Transport
Sri Lanka*	R_GAFTA	Textile	Air Transport
France	R_EU_24	Light Manufacturing	Utilities
Germany	ROW	Heavy Manufacturing	Services
Italy		Petroleum coal	

(Source) GTAP 10 Database
Note. * are IORA countries; UAE: United Arab Emirates, R_GCC: Rest of Gulf Cooperation Council, R_GAFTA: Rest of Greater Arab Free Trade Agreement, R_EU: Rest of European Union, ROW: Rest of the world.

B. Baseline construction/projections

Baseline projection involves projecting the baseline economy (baseline scenario) to accommodate the anticipated global structural changes. The baseline scenario, the business-as-usual scenario, depicts an economy's past and likely future state. The successive approximation model serves as the baseline scenario in static CGE models. At the same time, dynamic CGE requires constructing a baseline scenario to meet exogenous projections of macroeconomic indicators such as GDP, population, and labor force growth, while capital stock and total factor productivity growth are endogenous in the baseline (Chappuis and Walmsley, 2011; Strutt, 2008). The baseline data for the GDP, labor, and population in the GTAP10a database was projected from the year 2014 to 2030 using the GTAP-RD projection[6].

C. Scenarios and simulations

The following scenarios were simulated:

Baseline case: IORA continues with the principle of open regionalism reflecting the present status quo in the region.

6) The baseline scenario comes with the GTAP-RD Aggin software.

Scenario I involves a trade integration scenario with a gradual tariff cut over 10 years within IORA in a reciprocal fashion.

Scenario II combines Scenario I with a 50% NTM reduction[7] and trade facilitation. This scenario captures deeper integration, such as IORA-CEPA.

We assume a gradual 75% tariff cut in the agricultural sector and complete removal of tariffs in the manufacturing sector; the 75% tariff cut in agriculture is based on the premise that agriculture is a sensitive sector in trade negotiation. The 50% reduction in NTM mirrors that countries would not remove measures to protect human and social welfare. All scenarios should lead to an overall efficiency gain, but the extent of these gains depends on the sectors considered.

The simulation shocks target two key variables in the GTAP-RD model of IORA. The first is the *TMS* variable (bilateral import tariff) used in implementing the tariff cut, which is captured in the equation and links the basic domestic import prices and cost, insurance and freight import prices (eq.1). A shock (reduction) to the $tms_{(c,s,d)}$ would reduce the domestic market price in the destination country.

$$pmds_{(c,s,d)} = pcif_{(c,s,d)} + tm_{(c,d)} + tms_{(c,s,d)} \quad \text{(eq.1)}$$

Where: $pmds_{(c,s,d)}$ represents domestic market price

$pcif_{(c,s,d)}$ is the border price of c imported by d from s

$tm_{(c,d)}$ is the source generic import tariff on c from d

$tms_{(c,s,d)}$ is the bilateral import tariff

The second variable, *AMS*, is used in implementing NTM reduction and TF when they are treated as non-rent seeking or efficiency-related (iceberg method). The *AMS* variable represents the technological advancement reflecting the price of imports from a particular trade partner (Fugazza and Maur, 2008).

$$PMS^{1}_{c,s,d} = PMS_{c,s,d} - AMS_{c,s,d} \quad \text{(eq.2)}$$

The "AMS" is an additional "effective" import price as explained by Hertel et al. (2001) where: PMS^{1} is a percentage change of the effective import price of c supplied from region s to region d; *PMS* is a percentage change of domestic price for c supplied from s to region d; *AMS* is import c from region s augmenting technical change in region d.

7) This means a 50% reduction in the estimated AVEs of NTM retrieved from Kee and Nicita (2016).

An *AMS* increase indicates that the effective domestic price of good *c* exported from region *s* to *d* falls, thereby reducing costs.

IV. Results and Discussion

Explaining results is one of the most challenging aspects of the CGE policy analysis because of the multitude and sometimes counter-intuitive interpretations of the results (Angel Aguiar et al., 2019). This section discusses the results of some key macroeconomic variables.

A. Welfare effects

Welfare is measured in the GTAP model through the equivalent variation (EV). It allows a monetary metric for analyzing the welfare impact of a policy shock. Obtaining the welfare in static GTAP is relatively straightforward; however, it is complicated in the recursive dynamic GTAP model due to cumulating welfare results over time in the absence of a feasible discount factor and path dependency (Strutt, 2008; T. L. Walmsley et al., 2012). As a result, a comparative static simulation[8] is conducted following T. L. Walmsley et al. (2012) and Strutt (2008) in obtaining welfare decomposition to remove the impact of time-dependent variables.

Depending on the policy shock involved, the overall welfare sources can be decomposed into four effects; allocative efficiency, technological change, terms of trade (TOT), and investment savings. Allocative efficiency explains the efficient use of scarce resources by industry to produce an optimal combination of outputs. Technological change captures improvement effects in technology within a country, while TOT pertains to the relative changes in a country's export price to import price. Finally, investment-savings refers to the changes in investment price (capital goods) and savings (Bhattacharyay and Mukhopadhyay, 2013; Hertel and Huff, 2001).

In Scenario I (Table 2), there is an overall welfare gain for all IORA countries except Bangladesh, Iran, Mauritius, and Mozambique, whose welfare losses are primarily due to the deteriorating TOT and investment- savings. The IORA countries had an increase in allocative efficiency except for Iran. The allocative efficiency significantly impacted the overall welfare gain. This impact is expected because tariff elimination allows domestic industries to become more productive by shifting resources to more efficient sectors; resources would be drawn from previously protected industries that contracted due to a policy reform (Anderson, 2004; Beckman, Arita, Mitchell, et al., 2015; Strutt, 2008). Technological change's effect on welfare is zero because the policy shocks do not directly relate to technological improvement. The TOT for IORA countries improved significantly, except in Bangladesh, Srilanka, Iran, Oman, Kenya,

8) This involves determining the difference in welfare at a given point in time, with and without the policy shock.

Mauritius, and Mozambique. The deteriorating TOT in these countries is due to a reduction in export prices relative to import prices (Appendix Table A2).

Table 2. *Scenario I Decomposition of IORA Welfare Effects, 2030 (USD Millions)*

	Allocative efficiency	Technological change	Terms of Trade	Investment-Savings	Total
Australia	69	0	187	-19	238
Indonesia	37	0	228	-9	255
Malaysia	36	0	110	-9	137
Singapore	1	0	50	-3	48
Thailand	69	0	122	0	190
Bangladesh	20	0	-25	-5	-9
India	791	0	200	25	1016
Srilanka	39	0	-6	-9	24
Iran	-41	0	-4	17	-28
Oman	5	0	-1	-2	3
UAE	34	0	146	8	187
Kenya	16	0	-6	-7	4
Madagascar	1	0	0	0	1
Mauritius	0	0	-1	0	-1
Mozambique	1	0	-3	-2	-5
Tanzania	22	0	-10	-10	2
South Africa	31	0	71	4	106

(Source) Authors' calculation

In Scenario II, tariff elimination coupled with NTM reduction and trade facilitation led to welfare gain for all IORA countries (Table 3). The TOT contributed significantly to the welfare gain in Indonesia, Singapore, Thailand, India, Tanzania, and South Africa. Kenya witnessed the highest TOT deterioration; however, the improvement in technology contributed significantly to Kenya's overall welfare gain. The technological change, and removal of NTMs and TF, contributed significantly to overall welfare gain across IORA countries. This is expected because efficiency shocks imply lower import prices and increase the real production contents of exported goods (Fugazza and Maur, 2008).

Table 3. *Scenario II Decomposition of IORA Welfare Effects, 2030 (USD Millions)*

	Allocative efficiency	Technological change	Terms of Trade	Investment Savings	Total
Australia	203	1176	470	-30	1818
Indonesia	136	481	695	-24	1289
Malaysia	60	545	317	-29	893
Singapore	34	174	255	-10	453
Thailand	176	358	521	2	1057
Bangladesh	51	305	-40	1	317
India	1114	630	701	120	2565
Srilanka	72	106	-3	0	176
Iran	-378	633	-12	33	276
Oman	4	151	-1	4	157
UAE	44	403	154	15	616
Kenya	84	3379	-1101	-669	1692
Madagascar	2	15	-4	0	13
Mauritius	2	14	5	2	22
Mozambique	4	20	-13	-2	10
Tanzania	28	65	767	221	1081
South Africa	48	98	102	7	255

(Source) Authors' calculation

Comparing both scenarios to baseline (open regionalism) shows that all IORA countries had a welfare gain in Scenario II compared to Scenario I, implying that IORA countries have much to gain when a regional integration involves a tariff cut, NTM reduction, and trade facilitation (Figure 1). Beckman, Arita, and Mitchell (2015) explain that reducing NTMs could induce equal or greater benefits than tariff removal, reflecting that all IORA countries are meant to gain when a deeper integration, such as IORA-CEPA, comes to light.

To further compare countries that benefit the most from the policy reforms, the dollar measures of the EV presented above are measured[9] relative to GDP (Appendix Tables A1 and A2). In this regard, Scenario I shows that Thailand benefited the most, followed by UAE, India, Malaysia, and South Africa when reform targets tariff liberalization. In Scenario II, Kenya benefits the most, followed by Tanzania, Malaysia, Thailand, Srilanka, and Oman. Notably, countries like Kenya, Tanzania, and Oman, which benefit less in Scenario I, benefit more in Scenario II.

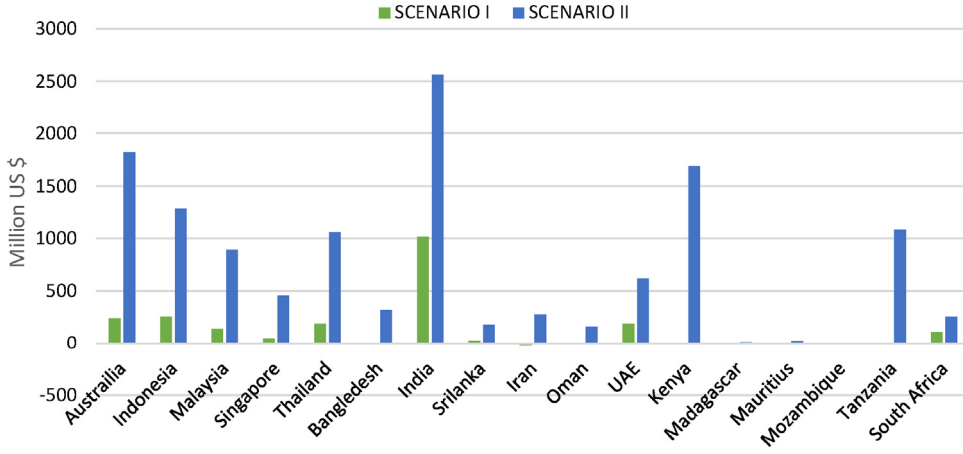
The impact of both scenarios on non-IORA countries is mixed (Figure 2) as "NTM reduction spillovers"[10] is experienced in some regions, as explained by Egger et al. (2015). Surprisingly, both scenarios show a welfare gain for the rest of the GCC countries, which might explain

9) The EV is presented as the percentage of the base year's GDP.

10) This means that there might be ancillary benefits to a third country when two countries are involved reducing burdensome NTMs.

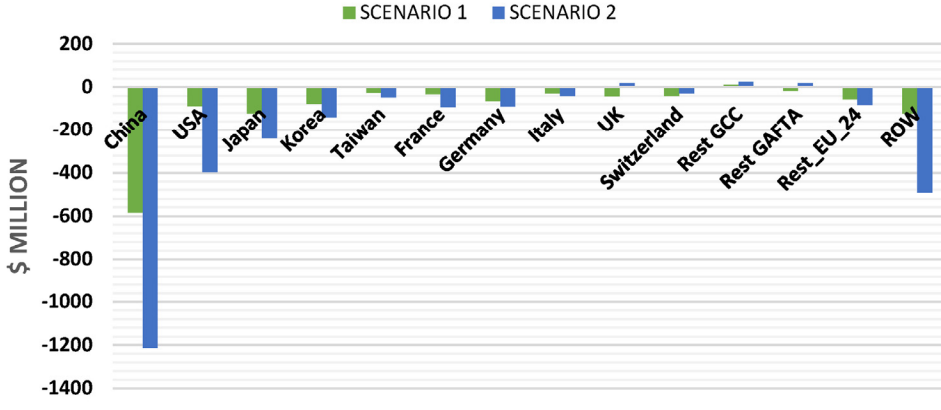
why joining a new agreement might benefit GCC countries. The United Kingdom (UK) and the rest of GAFTA had a welfare gain when policy reform in IORA a geared towards tariff cuts, NTM reductions, and trade facilitation. Other non-IORA countries witnessed welfare losses (Figure 2). The following section reports the real GDP, another metric to measure the welfare of policy reform in an economy.

Figure 1. Comparison of scenarios welfare effect in IORA compared to baseline 2030 (USD Millions)



(Source) Authors' calculation

Figure 2. Comparison of welfare effect in non-IORA compared to baseline 2030 (USD Millions)



(Source) Authors' calculation

B. Effects on real GDP

Tables 4 and 5 present the projected impact on real GDP for IORA countries. A clear and substantial gain from both policy reforms in the scenarios is observed for almost all IORA countries, except for Iran (both scenarios), Mauritius (Scenario I), and Tanzania (Scenario II). Scenario II (Tariff cut + NTM removal + TF) had more impact on the real GDP than Scenario I, which only considered tariff liberalization (Figure 3).

Despite the negative change in real GDP for Iran, Scenario II shows that Iran can further increase their real GDP by reducing NTMs and facilitating trade. As for Mauritius, Table 4 reveals that the real GDP grew from baseline but started decreasing in 2027, dropping further in 2029-2030. Tanzania also shows a similar trend in Scenario II; however, it is surprising to see the real GDP for Tanzania become negative under Scenario II, which involves efficiency gain. A closer look at Table 5 shows that the GDP started declining right after introducing policy reform; however, Figure 4 shows that Tanzania's real exchange rate[11] appreciated significantly under Scenario II, which made exports decline (more expensive for other countries) and increased import demand.

Table 4. *Scenario I Real GDP (% Change Relative to Baseline)*

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Australia	0.009	0.015	0.021	0.028	0.035	0.044	0.052	0.061	0.070	0.080
Indonesia	0.010	0.017	0.024	0.032	0.040	0.049	0.058	0.068	0.078	0.088
Malaysia	0.038	0.037	0.035	0.036	0.037	0.039	0.040	0.041	0.040	0.039
Singapore	0.004	0.008	0.013	0.019	0.027	0.036	0.047	0.059	0.072	0.085
Thailand	0.042	0.065	0.089	0.115	0.144	0.176	0.210	0.246	0.284	0.325
Bangladesh	0.016	0.027	0.038	0.048	0.058	0.067	0.078	0.088	0.098	0.107
India	0.149	0.167	0.185	0.211	0.239	0.269	0.300	0.333	0.368	0.404
Srilanka	0.128	0.173	0.226	0.295	0.377	0.482	0.603	0.745	0.902	1.049
Iran	-0.120	-0.133	-0.141	-0.165	-0.192	-0.225	-0.261	-0.304	-0.353	-0.416
Oman	0.014	0.024	0.034	0.047	0.060	0.075	0.090	0.107	0.124	0.142
UAE	0.015	0.031	0.052	0.077	0.107	0.141	0.181	0.226	0.275	0.330
Kenya	0.065	0.076	0.087	0.095	0.102	0.104	0.105	0.101	0.092	0.076
Madagascar	0.013	0.019	0.026	0.032	0.038	0.043	0.049	0.053	0.055	0.055
Mauritius	0.002	0.002	0.003	0.003	0.002	0.002	0.001	0.000	-0.001	-0.004
Mozambique	0.012	0.026	0.043	0.060	0.078	0.097	0.119	0.142	0.166	0.187
Tanzania	0.107	0.124	0.142	0.164	0.187	0.209	0.232	0.255	0.278	0.298
South Africa	0.025	0.038	0.054	0.071	0.089	0.108	0.128	0.150	0.173	0.198

(Source) Authors' calculation

11) The p factor variable measures the real exchange rate in GTAP-RD, the percent change in a region's index of factor prices, similar to real appreciation (Yuan and Burfisher, 2021).

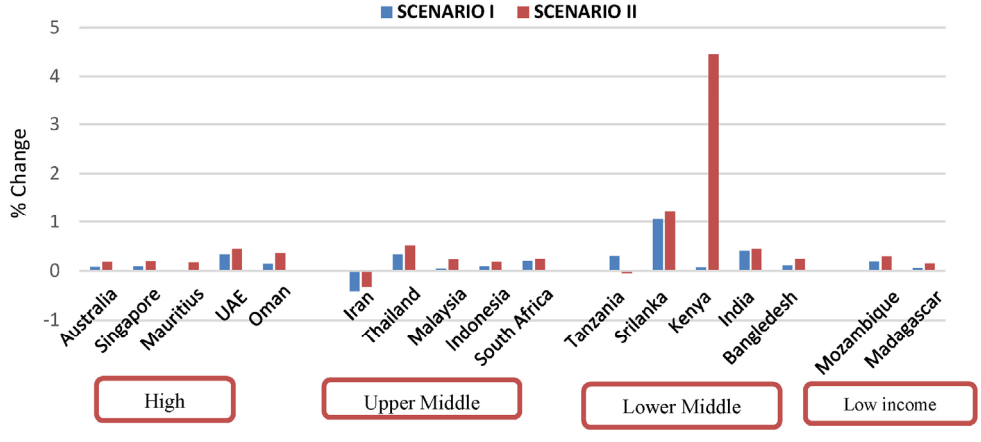
Table 5. *Scenario II Real GDP (% Change Relative to Baseline)*

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Australia	0.070	0.080	0.100	0.110	0.120	0.130	0.140	0.160	0.170	0.180
Indonesia	0.050	0.070	0.080	0.100	0.110	0.120	0.140	0.150	0.170	0.180
Malaysia	0.160	0.170	0.180	0.190	0.200	0.200	0.210	0.220	0.230	0.230
Singapore	0.060	0.070	0.080	0.090	0.110	0.120	0.140	0.160	0.170	0.190
Thailand	0.120	0.160	0.200	0.240	0.280	0.320	0.370	0.420	0.460	0.510
Bangladesh	0.130	0.150	0.160	0.170	0.180	0.200	0.210	0.220	0.230	0.240
India	0.180	0.200	0.220	0.240	0.270	0.300	0.340	0.370	0.410	0.440
Srilanka	0.270	0.320	0.370	0.440	0.530	0.640	0.760	0.910	1.070	1.220
Iran	-0.070	-0.080	-0.090	-0.110	-0.130	-0.160	-0.190	-0.230	-0.270	-0.320
Oman	0.150	0.170	0.190	0.210	0.240	0.260	0.280	0.310	0.330	0.360
UAE	0.090	0.110	0.130	0.160	0.200	0.230	0.280	0.320	0.380	0.440
Kenya	4.070	4.110	4.160	4.210	4.250	4.290	4.330	4.370	4.410	4.450
Madagascar	0.110	0.120	0.120	0.130	0.130	0.140	0.140	0.150	0.150	0.150
Mauritius	0.100	0.110	0.120	0.130	0.140	0.140	0.150	0.160	0.160	0.170
Mozambique	0.100	0.120	0.130	0.150	0.170	0.190	0.220	0.240	0.270	0.290
Tanzania	0.200	0.180	0.170	0.150	0.130	0.100	0.070	0.030	-0.010	-0.050
South Africa	0.050	0.070	0.080	0.100	0.120	0.150	0.170	0.190	0.220	0.240

(Source) Authors' calculation

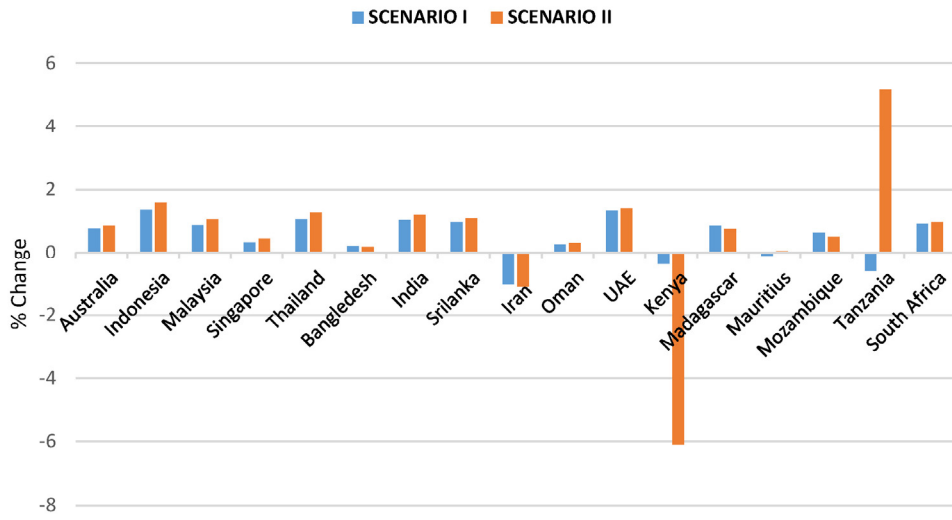
The results further show that countries that belong to lower middle income and low income would benefit more from a deeper liberalization, which involves tariff cuts and NTM reduction involving trade facilitation (Figure 3).

Figure 3. IORA countries' real GDP (% cumulative change from baseline at 2030)



(Source) Authors' calculation

Figure 4. changes in IORA real exchange rate (compared to baseline, 2030)



(Source) Authors' calculation

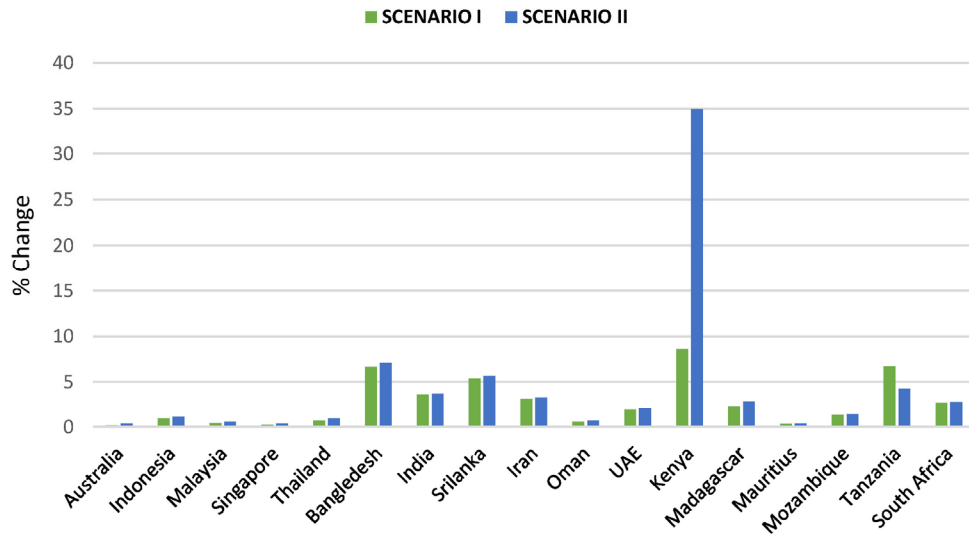
C. Trade and sectorial effect

1. Trade effects

Figures 5 and 6 capture the cumulative change in the real quantity of export and import by IORA countries, which increased in both scenarios; however, Scenario II showed a more significant increase in merchandize export (Figure 5). In Scenario II, Kenya's export more than tripled that in Scenario I, while Tanzania exports fell compared to Scenario I. The significant increase in Kenya's export resulted from the exchange rate depreciation, which made its exports more affordable to other countries. Concerning Tanzania, the export decline can be attributed to the significant appreciation of the country's exchange rate (Figure 4), which made its export expensive to other countries but increased the demand for imports (Figure 6).

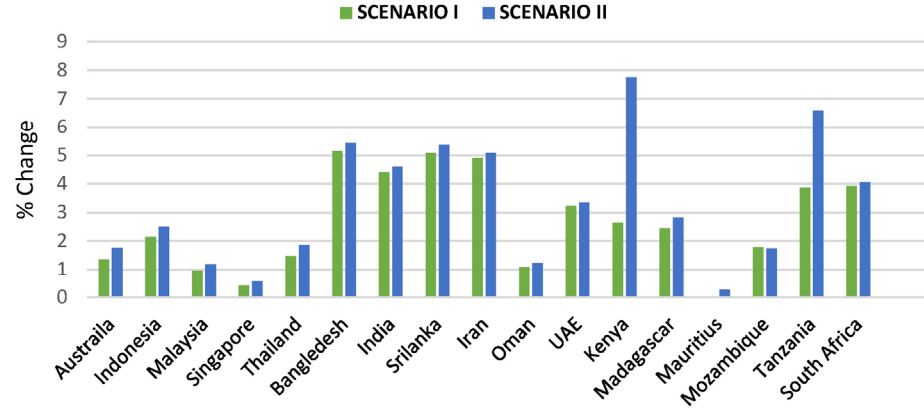
The same export trend occurs in the import demand. All the IORA countries witnessed an increased demand for their imports (Figure 6). Comparing the imports and exports across the Scenario shows that a deeper liberalization, such as Scenario II, would favor trade expansion for IORA members. The following subsection looks at the impact of sectorial export.

Figure 5. IORA real quantity export (% cumulative change from baseline at 2030)



(Source) Authors' calculation

Figure 6. IORA real quantity import (% cumulative change from baseline at 2030)



(Source) Authors' calculation

2. Sectorial export growth

The overall sectorial export percentage was positive for IORA countries (Appendix Tables A3 and A4). Under the agrifood sectors in Scenario I, the top IORA sectors with more positive export performance include vegetables, vegetable oil, dairy, food products and beverages, and tobacco. In the manufacturing sectors, metals, heavy manufacturing, and motor parts showed more positive export performance across IORA countries. Overall, there was a more positive

sectorial export performance in the manufacturing sector compared to the agrifood sectors. At the country sectorial level[12], Tanzania, Iran, India, Kenya, Bangladesh, and Srilanka had high sectorial export performance; other IORA countries had medium sectorial export performance except for Indonesia, which had the least sectorial export performance.

Like Scenario I, a similar trend is also observed in Scenario II, where the top agrifood sectors with more positive sectorial change across IORA countries include food products, dairy, vegetables and beverages, and tobacco. Motor parts, metals, chemical, and heavy manufacturing had more positive sectorial export under the manufacturing sectors. Similar sectorial export performance occurs at the country sectorial level, except Tanzania, which had a low sectorial export performance.

Overall, the intended policy reforms in both scenarios should have a more positive impact on sectorial export of the manufacturing sectors than the agrifood sectors. The increased sectorial export across IORA countries is expected because resources shift to more efficient sectors when trade liberalization reform occurs.

3. Sector output

The sectorial production (output) change across IORA countries varies (Tables 6 and 7). In Scenario I, the manufacturing sector had a more positive impact on output across IORA countries than the agricultural sector. More positive output changes occurred in metals, machinery equipment, coal mining, heavy manufacturing, and petroleum coal across most IORA countries in the manufacturing sector. In the agricultural sector, the increased output effect is witnessed primarily in vegetables and other crops across IORA countries.

In Scenario II, the manufacturing sector also had a more positive impact on output across IORA countries than the agricultural sector. Manufacturing sectors such as metals, motor parts, heavy manufacturing, fishery, and petroleum coal had increased output across most IORA countries, while agricultural sectors such as dairy, forestry, vegetable oil, and vegetable had increased output across most IORA countries. The IORA countries' sectorial output changes are largely in tandem with the sectorial export changes discussed in the previous section. The increased demand for IORA countries' exports has induced production expansion in the same sectors. In both scenarios, IORA countries have expanded their sectorial outputs because the elimination of import tariffs and reduction in burdensome NTMs leads to lower import prices. This decrease might cause domestic producers to substitute domestic goods for cheaper imported intermediate goods, which increases their profits and induces more demand for primary factors of production.

12) For easy explanation, the total merchandise sectors are 26, so countries with between 20-26 total positive export sectorial percentage change are classified as high export performance, 11-19 as medium sectorial export performance and 0-10 as low export performance.

Table 6. *IORA Sectorial Output Scenario I (% Cumulative Change Relative to Baseline 2030)*

		Australia	Indonesia	Malaysia	Singapore	Thailand	Bangladesh	India	Srilanka	Iran	Oman	UAE	Kenya	Madagascar	Mauritius	Mozambique	Tanzania	South Africa
	Rice	-0.34	-0.82	-9.39	7.6	1.75	-0.54	2.51	-5.89	-27.94	0.51	2.17	-22.1	-0.26	-1.57	-4.43	-7	-2.88
	Wheat	15.22	-7.86	-15.48	-3.95	-2.11	0.07	0.4	7.66	-18.33	3.25	10.92	22.12	0.23	-8.79	-0.68	-0.13	-1.52
	Vegetables	2.67	-1.71	-5.29	-4.48	-0.45	-0.56	-0.34	-3.25	1.14	3.48	-0.58	0.38	1.78	0.2	1.07	1.3	1.29
	Veg_oil	0.66	16.29	10.77	2.52	0.18	-6.93	-29.6	-21.39	-0.5	1.5	-17.85	-0.67	-13.35	2.12	-0.65	2.56	-1.65
	Dairy	1.19	-1.61	0.34	0.19	-0.91	-1.7	0.26	-4.84	0.38	14.3	-1	-4.3	-1.5	-0.16	-7.44	-12.36	0.37
Agrifood	Other Crops	-3.78	2.91	3.73	10.15	1.19	-0.73	-2	2.63	-0.07	-1.08	-1.1	0.86	1.99	0.04	0.82	0.84	-0.17
	Meat	-2.28	-1.19	-2.24	-0.08	-2.5	-0.03	2.56	-1.28	0.25	-1.03	-2.05	0.04	-0.3	0.11	-2.87	-0.1	0
	Forestry	-0.23	-0.35	1.38	0.68	5.81	-0.17	-0.09	-0.3	0.33	-0.34	0.83	-0.18	0.27	0.18	-0.21	0.31	0.04
	Food products	-0.25	-1.12	-0.48	5.25	1.38	-0.7	0.31	0.11	0.57	5.81	-1.13	0.14	-1.62	-0.17	-0.67	-0.45	-0.14
	Bever_Tob	0.01	-0.29	-5.81	10.87	-0.08	0.19	2.01	0.05	-0.1	-3.03	1.35	0	-0.32	-0.13	3.24	1.18	0.55
	Sugar	1.48	-7.36	-15.67	4.18	6.52	-0.78	1.76	-16.37	-3.99	3.15	4.48	-17.4	-2.5	-0.02	0.27	-57.54	2.59
	Fishery	-0.1	-0.13	0.01	0.03	0.27	-0.14	0.13	0.03	-0.19	0.08	0.11	-0.15	-0.22	-0.01	0.03	0.04	-0.14
	Textile	-2.26	-0.98	1.72	1.36	1.97	4.53	2.11	1.54	-6.03	-3.96	-2.56	-0.62	-1.63	-0.95	-9.73	-4.19	-6.14
	LightMnfc	-0.39	-1.12	0.2	0.64	4.6	-2.01	-0.84	1.98	-0.56	0.38	0.06	0.94	-1.14	0.14	0.94	-0.01	-0.77
	HeavyMnfc	-0.02	0.09	-0.11	0.15	0.43	-0.46	0.76	0.95	0.87	3.23	2.68	-1.82	-1.96	0.33	0.84	-0.55	0.17
	Petro_coal	0.04	-0.15	0.88	1.18	0.04	-12.76	0.56	-5.3	1.37	-0.06	0.83	-1.97	0.69	0.5	1.26	-3.45	-0.41
	Oil	-0.14	-0.2	-0.1	0.03	-0.17	-0.67	-0.13	-0.33	0.33	-0.08	-0.25	0.14	-0.09	0.04	-0.01	0	-0.17
	Gas	-0.14	-0.22	-0.05	-0.03	-0.21	-0.71	-0.22	-0.33	0.25	-0.06	-0.23	0	0.06	0.04	0.34	0.19	0.41
Manufacturing	Chemicals	-0.62	-1.16	-0.43	0.86	-0.28	-3.45	0.04	-4.75	5.06	2.83	-0.68	2.7	-0.72	0.03	-0.64	3.37	2.23
	Mach_Equip	-0.98	-1.72	-0.38	0.48	0.5	-1.15	1.06	5.61	1.16	4.48	-4.02	2.3	7.13	0.25	2.27	3.15	-0.48
	Metals	1.14	-0.94	1.77	1.49	0.42	-1.51	0.97	2.27	0.97	1.65	6.2	0.69	5.88	1.63	0.89	4.39	1.3
	Coal_Mining	-0.05	0.02	0.03	-0.42	0.08	-0.44	-0.18	1.16	1.19	-0.2	-0.07	0.78	0.04	0.26	0.02	0.7	0.15
	Trans_Equi	-1.07	-1.41	0.46	-1.15	0.16	-12.46	7.35	4.78	-35.43	-1.47	-8.88	-2.54	8.15	0.41	-5	-1.6	3.48
	Elec_Equip	-2.13	-1.53	-1.53	-0.77	-0.95	-2.22	1.52	5.09	2.06	-1.37	-4.07	-0.02	16.5	0.59	-0.42	-3.87	-0.89
	Manuf	-1.37	0.47	3.64	4.41	-0.07	-5.29	0.87	2.15	-0.4	-4.95	7.54	-0.17	-0.66	0.6	-0.28	1.85	-0.96
	Motor_Part	-1.8	-0.73	0.27	0.33	2.61	-13.13	5.5	-4.56	0.48	0.44	-1.38	0.14	5.29	0.16	-4.25	-1.65	1.73

(Source) Authors' calculation

Note. Veg_oil = Vegetable oil, Bever_Tob = Beverage_Tobacco, LightMnfc = Light Manufacturing, Heavy Manufacturing, Petro_coal = Petroleum and coal, Mach_Equip = Machinery Equipment, Trans_Equi = Transport Equipment, Elec_Equip = Electrical Equipment, Manufacturing

Table 7. *IORA Sectorial Output Scenario II (% Cumulative Change Relative to Baseline 2030)*

		Australia	Indonesia	Malaysia	Singapore	Thailand	Bangladesh	India	Srilanka	Iran	Oman	UAE	Kenya	Madagascar	Mauritius	Mozambique	Tanzania	South Africa
	Rice	-0.79	-0.87	-9.94	8.66	1.36	-0.85	3.05	-8.51	-33.12	0.08	6.5	-17.7	-1.77	26.58	-7.2	-12.48	12.44
	Wheat	19.24	-13	-31.2	-12.61	-2.41	-4.16	1.26	-7.23	-24.48	0.87	67.38	20.82	-0.04	-10.14	0.79	-12.93	-2.02
	Vegetables	3.21	-1.81	-5.58	-5.74	-0.37	-0.49	-0.48	-2.43	1.64	3.63	-1.04	4.65	2.09	0.04	1.33	-2.57	1.4
	Veg_oil	0.42	16.85	11.34	9.18	0.09	-11.09	-30.83	-27.47	-2.89	5.57	-12.17	10.64	-13	2.28	-0.41	-8.44	-2.46
	Dairy	1.83	-1.94	0.89	1.93	-0.21	-1.87	0.27	-5.8	0.6	18.12	0.96	-2.15	-1.47	0.12	-7.33	-17.91	0.42
Agrifood	Other Crops	-4.73	2.94	3.92	13.16	1.36	-1.03	-2.05	2.69	-0.65	-4.1	-1.54	-13.4	2.05	-0.3	-0.06	22	-0.77
	Meat	-3.01	-1.27	-2.8	-1.17	-2.64	0.14	3.92	-1.5	0.36	7.06	-4.01	2.59	-0.27	-0.03	-2.68	-1.44	0.06
	Forestry	-0.36	-0.3	1.86	0.72	5.85	-0.12	-0.09	-0.27	0.5	-0.29	0.94	2.05	0.36	0.1	-0.16	-1.42	0.1
	Food products	-0.16	-0.77	0.48	6.47	2.17	-0.4	0.28	0.3	0.79	12.54	-0.43	2.3	-1.79	-0.14	-0.77	-3.87	-0.23
	Bever_Tob	0.1	-0.31	-5.83	14.49	-0.23	0.27	2.15	0.09	-0.79	-5.18	3.24	1.28	-0.28	-0.27	3.9	-0.55	0.65
	Sugar	1.51	-8.58	-15.99	5.09	7.16	-0.57	1.66	-18.2	-4.16	5.33	7.47	-12.13	-2.75	-0.32	0.54	-64.17	2.72
	Fishery	-0.08	-0.07	0.11	0.11	0.46	-0.08	0.17	0.05	-0.16	0.09	0.13	0.22	-0.19	0.02	0.05	0.2	-0.16
	Textile	-3.44	-1.24	3.1	1.58	2.04	4.85	2.16	1.42	-5.51	-3.84	-2.39	5.62	-1.09	-1.22	-9.23	-16.37	-6.04
	LightMnfc	-0.79	-1.16	1.62	1.09	4.75	-2	-1.04	2.1	-0.41	-0.3	0.01	7.63	-0.92	-0.08	1.01	-7.43	-0.73
	HeavyMnfc	-0.07	0.17	-0.05	0.25	0.59	-0.31	0.77	1.04	1.02	3.35	2.84	0.03	-1.59	0.89	0.98	-3.42	0.19
	Petro_coal	-0.01	-0.1	0.89	1.5	0.08	-13.1	0.58	-5.47	1.5	0.05	0.8	0.71	0.02	0.13	1.35	-9.51	-0.4
	Oil	-0.14	-0.24	-0.13	0.02	-0.21	-0.69	-0.15	-0.35	0.34	-0.08	-0.26	0.62	-0.07	0.01	-0.01	-0.17	-0.17
	Gas	-0.14	-0.27	-0.09	-0.05	-0.25	-0.68	-0.24	-0.36	0.27	-0.06	-0.24	0.57	0.12	0	0.34	0.01	0.39
Manufacturing	Chemicals	-0.85	-0.95	0.08	1.07	-0.36	-3.64	-0.13	-4.73	5.03	2.74	-0.67	13.8	0.28	-0.16	-0.55	-4.2	2.19
	Mach_Equip	-1.26	-1.83	-0.45	1.12	0.9	-1.44	1.06	5.5	1.36	4.24	-4.27	8.41	7.26	-0.14	2.42	-6	-0.63
	Metals	0.8	-0.98	2.05	1.66	1.06	-1.49	0.96	2.39	1.18	1.72	5.97	8.3	6.16	1.88	1.07	-8.13	1.22
	Coal_Mining	-0.06	-0.02	0.03	-0.45	0.14	-0.4	-0.2	1.23	1.28	-0.22	-0.14	2.02	0.09	0.35	0.03	-0.54	0.15
	Trans_Equi	-1.06	-1.6	0	-1.46	0.43	-12.34	7.15	4.5	-35.58	-1.75	-9.2	3.46	8.15	-0.03	-4.81	-10.86	3.49
	Elec_Equip	-2.32	-1.77	-2.06	-0.79	-0.82	-2.31	1.47	4.68	2.15	-1.8	-4.13	7.3	16.33	7.1	-0.23	-12.37	-0.78
	Manuf	-2.44	0.13	4.89	4.67	-0.18	-5.25	0.84	2.58	-0.15	-4.87	10.21	7.89	-0.44	0.64	-0.02	-3.93	-0.97
	Motor_Part	-2.25	-1.02	0.45	2.8	3.14	-13.04	5.55	-4.48	0.59	0.53	-1.43	3.92	5.33	0.05	-4.09	-6.4	2.08

(Source) Authors' calculation

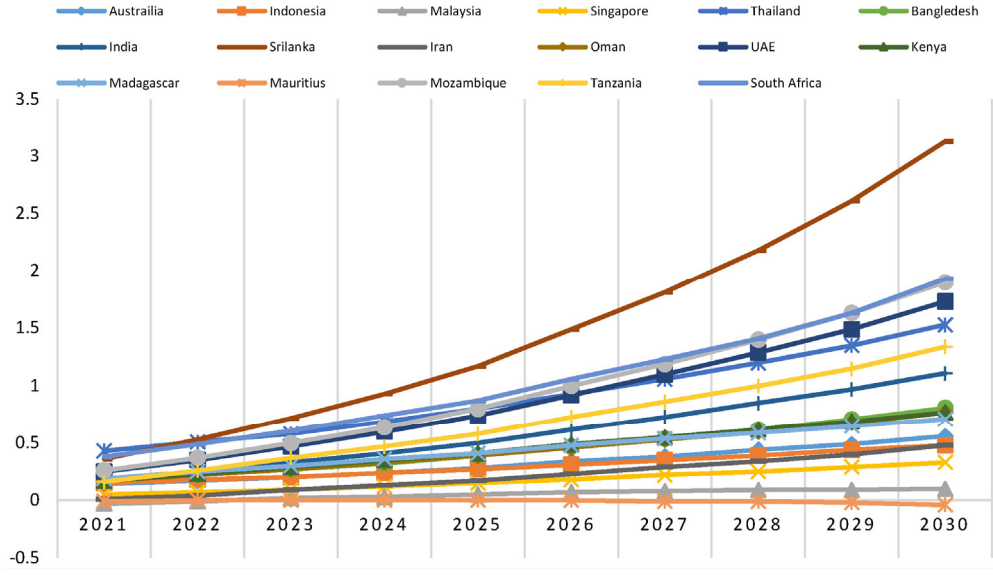
Note. Veg_oil = Vegetable oil, Bever_Tob = Beverage_Tobacco, LightMnfc= Light Manufacturing, Heavy Manufacturing, Petro_coal = Petroleum and coal, Mach_Equip = Machinery Equipment, Trans_Equi = Transport Equipment, Elec_Equip = Electrical Equipment, Manufacturing

D. Investment

Economic theory has generally supported the positive impact of trade liberalization on economic growth through investment and capital accumulation (Ferrantino et al., 1997). Dynamic modeling of trade liberalization helps capture the time-sensitive behavior of investment, which a static model cannot capture (Ferrantino et al., 1997).

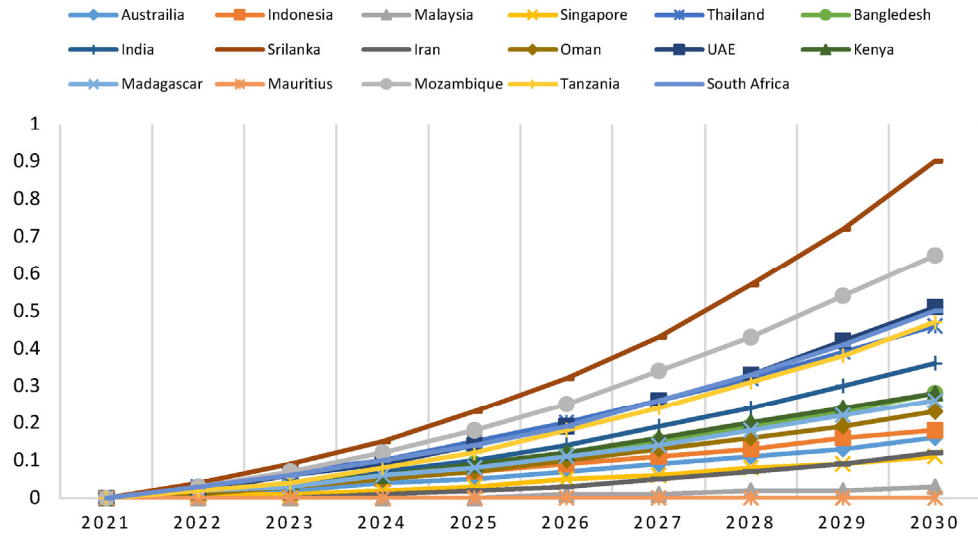
In Scenario I, all IORA countries experienced steady growth in investment expansion and capital stock accumulation over the year except for Mauritius (Figures 7 and 8). This growth results from gradual tariff cuts, which induce a fall in prices of capital goods (Figure 9) and an increase in investment and capital stock growth (Ho and Jorgenson, 1994). Countries like Australia, Indonesia, Singapore, and Malaysia, with increased capital goods, experienced slow marginal changes in investment compared to countries like Srilanka, South Africa, and Thailand, which experienced sharp changes in investment due to a fall in their price of capital goods.

Figure 7. IORA real investment Scenario I (% change relative to baseline)



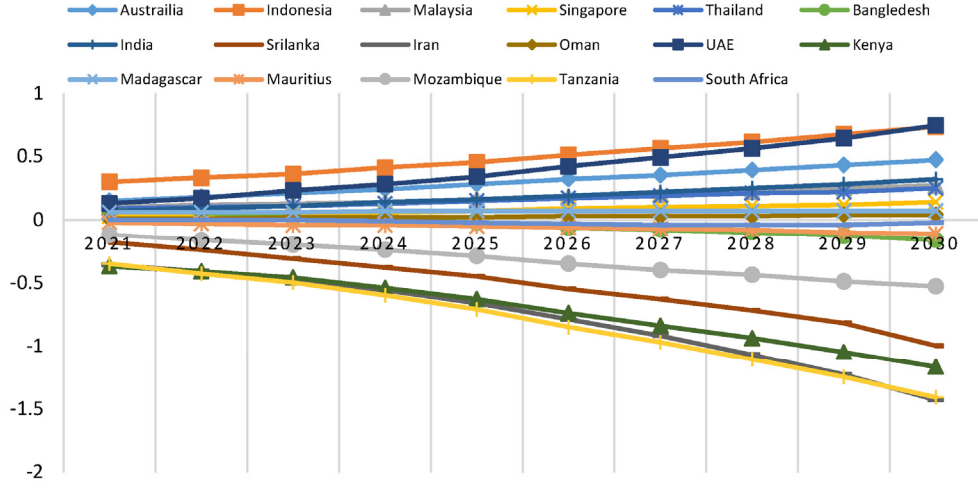
(Source) Authors' calculation

Figure 8. IORA capital stock accumulation Scenario I (% change relative to baseline)



(Source) Authors' calculation

Figure 9. IORA price of capital goods Scenario I (% change relative to baseline)

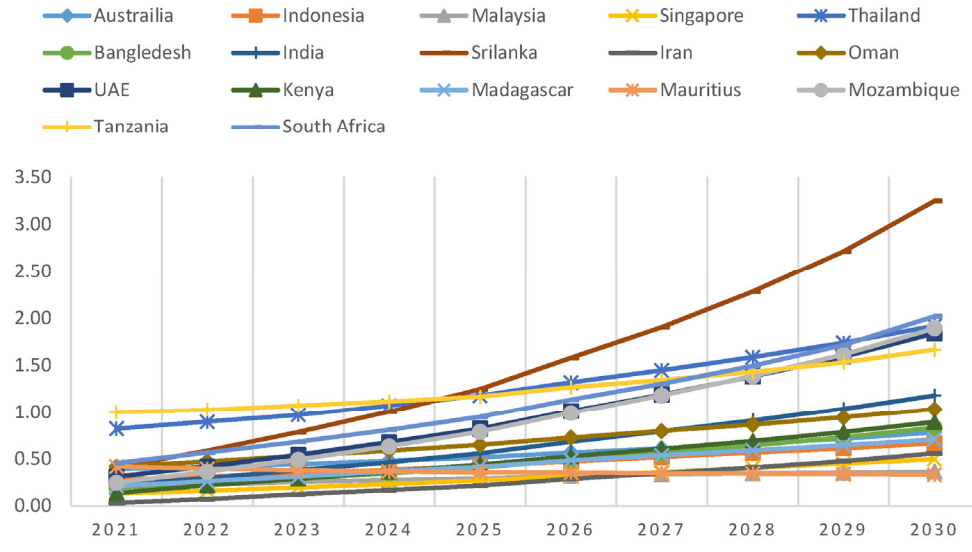


(Source) Authors' calculation

A similar trend of investment and capital stock accumulation changes is observed in Scenario I as observed in Scenario II. In Scenario II, tariff cuts coupled with NTM reduction and trade facilitation steadily expanded investment in all IORA countries except Mauritius, where it contracted slowly (Figure 10). All IORA had a steady increase in capital accumulation across the years (Figure 11). The sharp increase in investment and price fall of capital goods (Figure

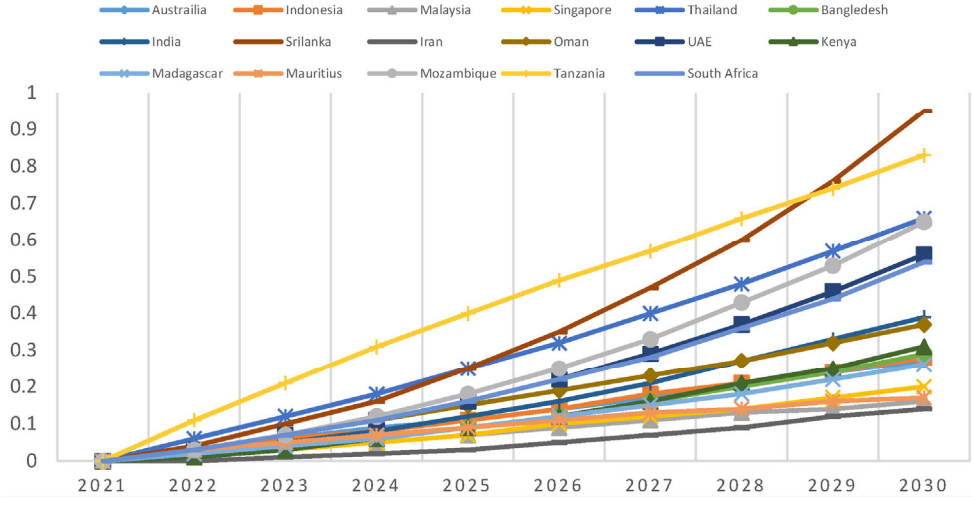
12) have boosted the import demand compared to exports in countries like South Africa, Mozambique, Tanzania, and Thailand.

Figure 10. IORA real investment Scenario II (% change relative to baseline)



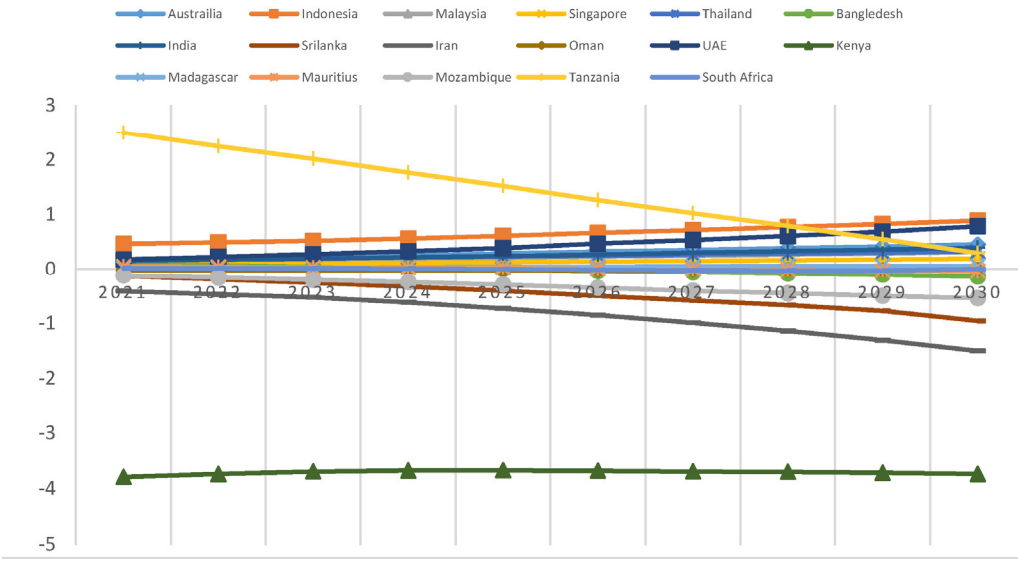
(Source) Authors' calculation

Figure 11. IORA Capital Stock Accumulation Scenario II (% change relative to baseline)



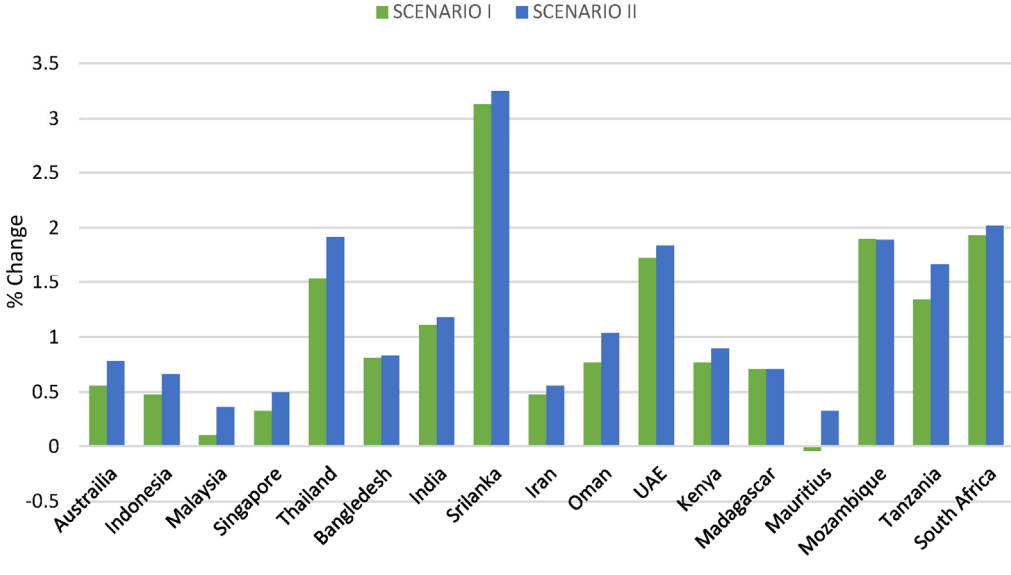
(Source) Authors' calculation

Figure 12. IORA Price of Capital Goods Scenario II (% change relative to baseline)



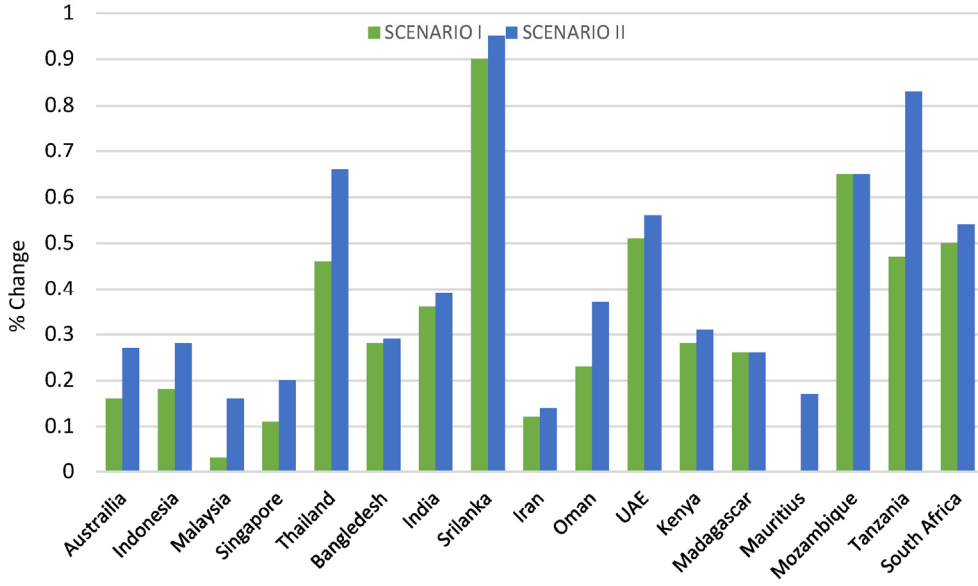
(Source) Authors' calculation

Figure 13. Comparison of Investment under both Scenarios (% cumulative change relative to baseline 2030)



(Source) Authors' calculation

Figure 14. Comparison of capital stock under both scenarios (% cumulative change relative to baseline 2030)



(Source) Authors' calculation

Scenario II is more impactful than Scenario I in expanding investment and capital accumulation across virtually all IORA countries (Figures 13 and 14)[13], which is more pronounced in Mauritius, where earlier contractions in investment have expanded under Scenario II. Scenario I had an infinitesimal impact on investment in Mauritius compared to Scenario II because Mauritius has one of the most liberal tariff regimes[14] in IORA. A deeper integration involving tariff cuts and NTM reduction coupled with trade facilitation is expected to induce investment expansion and capital accumulation in IORA.

V. Conclusion

The Indian Ocean has always been a trade nexus connecting Asia, the Middle East, and Africa, and its importance to world trade has continued to increase. The region's economic growth and productivity should rise, capitalizing on its relatively large population, growing markets, and strategic location. There have been various proposals in IORA on forming a PTA and Comprehensive Economic Partnership Agreement (IORA-CEPA). Most of the studies had only evaluated the effect of tariff liberalization without considering deeper economic integration

13) The cumulative comparison of price of capital goods is presented in Appendix Figure A1.
14) He Effectively Applied Average Tariff of Mauritius in 2019 was 1.3%.

and the long-term effect of trade liberalization within the region. Our study uses a recursive dynamic CGE, GTAP-RD, model to study the impact of regional integration in IORA, which involves tariff cuts and reduction in NTMs coupled with trade facilitation.

Results from welfare effects, GDP, exports, imports, sectorial output, and investment accentuate the benefits that would be derived from deeper integration, such as IORA-CEPA, which involves tariff elimination, NTMs reduction, and trade facilitation compared to only tariff cut and open regionalism framework. The results also depict an "NTM spillover" effect on some non-IORA members (the rest of GCC, the rest of GAFTA, and the UK) regarding welfare gain. The overall results also indicate that middle and low-income countries in IORA benefited more than higher-income countries (in terms of welfare, GDP, and trade expansion), which is in line with the general equilibrium analysis conducted worldwide. The results from this study suggest that (i) any future proposed regional agreements should include NTM reduction and WTO trade facilitation implementation as a cogent part of their negotiations; (ii) the region can gain more from deeper regional integration compared to the currently operating form of open regionalism.

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Appendix

Appendix Table A1. *Welfare Effect in IORA as a Percentage of GDP*

	SCENARIO I	SCENARIO II
Austrailia	0.013	0.098
Indonesia	0.018	0.089
Malaysia	0.028	0.185
Singapore	0.013	0.118
Thailand	0.033	0.184
Bangledesh	-0.003	0.106
India	0.031	0.079
Srilanka	0.020	0.148
Iran	-0.005	0.047
Oman	0.002	0.130
UAE	0.032	0.105
Kenya	0.004	1.672
Madagascar	0.006	0.064
Mauritius	-0.003	0.128
Mozambique	-0.015	0.032
Tanzania	0.003	1.170
South Africa	0.021	0.051

(Source) Authors' calculation

Appendix Table A2. *Scenario I Terms of Trade Decomposition for IORA (Percentage Change)*

	World Price	Export Price	Import Price	Total
Australia	0.014	0.035	-0.001	0.048
Indonesia	0.007	0.060	-0.003	0.065
Malaysia	0.000	0.032	-0.005	0.028
Singapore	-0.001	0.014	-0.003	0.010
Thailand	-0.001	0.032	-0.001	0.030
Bangladesh	-0.005	-0.034	-0.007	-0.045
India	-0.004	0.034	-0.003	0.027
Srilanka	-0.002	-0.004	-0.010	-0.017
Iran	0.003	-0.008	0.002	-0.003
Oman	0.006	0.003	-0.013	-0.005
UAE	0.005	0.045	-0.001	0.050
Kenya	-0.001	-0.032	-0.003	-0.035
Madagascar	0.000	0.010	-0.008	0.002
Mauritius	-0.001	0.000	-0.005	-0.006
Mozambique	0.001	-0.006	-0.011	-0.017
Tanzania	0.002	-0.053	-0.005	-0.056
South Africa	0.005	0.043	0.000	0.047

(Source) Authors' calculation

Appendix Table A3. *IORA Sectorial Export Performance Scenario I (% Cumulative Change Relative to Baseline, 2030)*

		Australia	Indonesia	Malaysia	Singapore	Thailand	Bangladesh	India	Srilanka	Iran	Oman	UAE	Kenya	Madagascar	Mauritius	Mozambique	Tanzania	South Africa
Agrifood Sector	Rice	-1.61	-9.94	-3.34	24.62	4.81	3.99	21.25	8.39	37.78	14.22	2.24	21.39	-5.12	-1.78	1.43	0.71	-3.42
	Wheat	19.09	-25.2	-19.37	-25.97	-2.42	11.95	3.47	19.48	45.28	-0.94	13.06	30.75	-1.77	-9.16	1.08	10.62	-2.3
	Vegetable	11.29	0.56	-5.93	-4.02	-2	33.4	6.3	3.09	22.69	14.31	7.66	11.15	6.61	0.84	13.37	14.86	1.63
	Veg_oil	2.87	25.3	18.49	2.95	67.43	-34.85	54.89	7.2	-25.98	2.55	-17.87	2.79	1.72	4.83	-1.52	5.52	5.55
	Dairy	9.51	-6.52	11.06	-0.57	1.45	5.74	16.8	1.75	27.67	29.09	0.77	-13.39	-5.24	-1.84	2.57	8.6	4.39
	Other Crops	-5.96	4.11	-26.11	10.9	-4.19	28.88	13.59	42.62	37.46	-3.08	-0.62	17.01	6.97	-0.12	9.99	11.57	-0.21
	Meat	-4.4	-20.76	-21.52	-2.83	-0.09	9.15	14.66	-4.33	27.11	-0.81	-4.39	8.49	-4.89	-0.2	-1.01	4.54	0.16
	Forestry	-1.5	8.44	6.01	0.68	42.73	-0.22	-1.3	-1.63	28.1	-0.89	1.16	7.05	-1.2	32.45	-0.74	3.77	-1.86
	Foodprod	-0.49	-4.55	0.4	6.01	2.48	2.45	3.89	2.22	18.99	7.48	0.52	8.09	-1.41	-0.35	2.92	2.59	-0.04
	Bever_Tob	0.28	-4.66	1.49	21.99	-0.74	16.21	42.11	24.22	76.53	-0.75	6.43	3.97	-1.63	1	9.3	7.75	3.13
	Sugar	7.44	-15.98	-26.34	2.84	10.96	5.21	16.52	-5.95	19.11	2.8	4.49	-10.27	-31.66	-0.09	0.49	-1.24	12.39
Manufacturing sector	Fishery	-0.44	-1.02	-0.02	-0.43	-3.07	2.45	1.23	-1.5	6.17	-0.47	0.73	3.45	1.58	0.29	4.17	2.81	-0.1
	Textile	-2.65	-0.53	4.56	3.62	5.71	6.86	6.36	2.09	20.44	1.87	33.74	12.35	0.17	-0.82	2.17	3.45	0.91
	LightMnfc	-1.28	-2.34	1.69	0.7	11.15	2.88	-0.15	17.11	27.04	36.24	21.6	10.38	1.49	2.3	0.29	2.42	0.22
	HeavyMnfc	0.49	1.42	0.93	1.38	0.17	1.01	5.41	6.78	10.42	13.81	17.09	1.38	0	2.26	5.81	4.26	0.03
	Petro_coal	0.59	0.21	2.49	1.5	0.26	0.99	2.16	8.38	6.07	-0.79	2.42	1.32	-0.9	0.46	12.92	3.33	-0.69
	Oil	-0.36	-0.1	1.27	-3.04	-0.4	28.43	-0.22	10.03	-0.71	-0.08	-0.32	3.29	-0.08	0.03	-0.01	25.4	0.18
	Gas	-0.14	-0.1	0.13	0.04	-2.55	203.3	100.92	39.93	5.68	-1.14	-1.25	39.16	0	0.08	0.34	-9.58	-48.51
	Chemicals	0.62	-0.18	0.23	0.94	-0.3	6.48	2.77	10.61	16.1	3.88	-0.13	9.07	11.35	0.98	7.53	11	13.6
	Mach_Equip	1.02	-2.49	-0.34	0.72	0.86	3.71	3.37	8.15	18.49	7.84	-3.8	7.57	8.23	0.45	15.33	9.85	-1.63
	Metals	4.49	-2.83	5.79	3.15	1.54	5.74	7.82	7.78	21.01	3.99	11.46	11.42	8.43	8.81	0.93	8.09	2.46
	Coal_Mining	-0.21	0.35	-0.5	-0.42	-2.41	-0.9	2.49	-4.35	1.52	-0.59	0.25	0.56	-0.31	-0.5	-0.38	0.27	-0.17
	Trans_Equi	-3.42	-6.41	1.22	-1.59	0.73	2.2	14.36	4.04	38.06	-3.07	-9.1	-1.03	8.24	1.03	-0.49	10.27	6.38
	Elec_Equip	-2.62	-1.46	-1.57	-0.78	-1.3	18.44	6.92	11.39	27.63	-1.76	-4.09	6.77	18.02	2.67	1.4	8.1	-1.24
	Manuf	-2.64	2.31	6.43	6.16	-0.21	12.06	2.72	4.28	13.79	-9.56	19.74	11.85	-0.75	2.51	-0.12	7.6	-0.72
	Motor_Part	2.14	-0.17	-0.05	0.43	4.34	1.31	22.57	6.54	10.43	6.37	0.2	3.39	6.47	1.93	1.98	2.39	15.3

(Source) Authors' calculation

Note. Veg_oil = Vegetable oil, Bever_Tob = Beverage_Tobacco, LightMnfc = Light Manufacturing, Heavy Manufacturing, Petro_coal = Petroleum and coal, Mach_Equip = Machinery Equipment, Trans_Equi = Transport Equipment, Elec_Equip = Electrical Equipment, Manufacturing

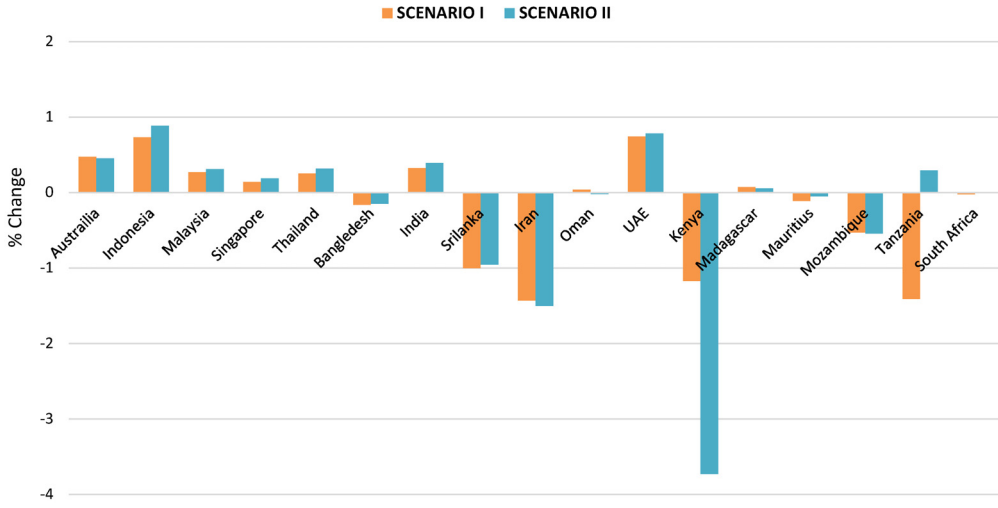
Appendix Table A4. *IORA Sectorial Export Performance Scenario II (% Cumulative Change Relative to Baseline, 2030)*

		Australia	Indonesia	Malaysia	Singapore	Thailand	Bangladesh	India	Srilanka	Iran	Oman	UAE	Kenya	Madagascar	Mauritius	Mozambique	Tanzania	South Africa
Agrifood	Rice	-0.91	-10.88	1.62	29.23	3.71	9.94	25.32	8.12	48.35	32.17	7.14	37.75	-3.83	29.93	3.75	-26.79	14.79
	Wheat	24.11	-20.03	-36.23	-23.54	-2.62	32.83	19.67	-6.38	56.89	8.19	79.29	30.21	-2.72	-10.59	3.87	-26.65	-3.21
	Vegetable	13.59	0.29	-5.65	-3.66	-2.22	39.64	5.75	13.16	33.55	16.07	10.16	40.23	7.48	0.50	14.51	-16.12	1.78
	Veg_oil	3.29	26.20	20.57	14.31	67.04	-34.72	54.68	9.66	-20.73	9.05	-12.18	31.82	-0.33	4.70	-1.08	-7.99	6.84
	Dairy	14.04	-1.28	14.82	2.83	8.16	6.26	19.69	2.38	34.82	36.62	4.04	17.28	-4.45	-1.55	2.84	-22.19	5.11
	OtherCrops	-7.20	5.39	-23.76	14.15	-4.30	34.85	16.70	46.10	36.28	-3.76	-0.35	88.02	7.11	-1.34	0.80	187.37	-2.04
	Meat	-5.90	-20.50	-10.85	-4.53	-0.32	8.77	22.62	-5.83	30.07	25.45	2.42	44.12	-4.39	-0.56	-0.57	-31.69	0.59
	Forestry	-1.17	8.12	4.22	0.72	41.88	-0.45	-1.66	-2.02	29.81	-0.94	1.29	20.77	-0.49	32.88	-0.67	-6.56	-1.27
	Foodprod	2.28	-1.45	3.79	7.85	4.39	6.87	4.43	3.87	25.30	16.10	4.47	25.51	-0.36	0.02	3.18	-21.40	0.56
	Bever_Tob	0.74	-4.96	5.35	29.46	-0.90	16.28	45.53	27.65	91.57	3.89	10.21	11.28	-1.49	1.50	10.43	-1.47	3.75
	Sugar	7.52	-16.69	-26.43	5.35	11.90	5.97	15.80	-6.14	21.72	3.14	7.48	52.14	-33.32	-0.37	0.73	-27.63	13.05
Manufacturing	Fishery	-0.45	-1.79	-0.36	-0.02	-4.71	1.84	0.85	-1.71	6.20	-0.94	0.52	10.49	1.35	-0.22	4.34	-3.50	0.01
	Textile	-2.38	-0.78	6.94	4.22	5.89	7.24	6.48	1.90	22.43	2.41	38.27	34.81	0.80	-1.13	3.40	-14.21	1.94
	LightMnfc	-1.14	-2.36	5.48	1.30	11.66	2.78	-0.58	17.29	27.70	35.43	20.59	34.93	1.79	1.67	0.69	-13.11	0.48
	HeavyMnfc	0.45	1.41	1.05	1.80	0.19	1.37	5.31	7.54	11.01	13.60	17.80	17.15	0.21	2.92	6.25	-5.93	-0.04
	Petro_coal	0.99	0.26	2.62	1.91	0.35	0.98	2.19	8.30	6.52	-0.71	2.54	3.19	-1.91	-0.08	13.16	-6.14	-0.70
	Oil	-0.29	-0.31	1.19	-3.59	-0.59	29.31	-0.29	10.29	-0.81	-0.10	-0.33	-0.11	-0.07	0.01	-0.01	30.35	0.27
	Gas	-0.13	-0.22	0.17	-0.93	-3.26	187.2	101.3	42.38	5.52	-1.26	-1.19	-3.60	-12.21	-1.02	0.34	0.75	-47.82
	Chemicals	0.98	1.17	1.19	1.20	-0.15	8.35	2.86	11.04	16.04	3.94	-0.04	30.89	24.16	0.46	7.51	-0.67	13.53
	Mach_Equip	2.16	-2.23	-0.39	1.61	1.41	4.21	3.52	8.16	19.25	7.42	-3.96	30.89	8.32	-0.66	15.39	-6.44	-1.75
	Metals	4.94	-3.02	6.76	3.35	2.80	5.97	7.81	8.32	21.72	3.95	11.06	23.64	8.74	8.87	1.10	-6.44	2.33
	Coal_Mining	-0.19	0.25	-0.70	-0.45	-2.90	-1.09	2.47	-4.74	1.57	-0.70	0.13	2.34	-0.32	-1.12	-0.39	-0.36	-0.19
	Transport Equipment	-3.20	-7.25	0.58	-1.99	1.17	2.14	13.99	3.57	40.20	-3.85	-9.76	12.76	8.24	-0.25	-0.25	-6.41	6.39
	Elec_Equip	-0.69	-1.67	-2.14	-0.80	-1.14	18.38	7.14	10.84	28.49	-1.88	-4.01	23.98	17.80	28.13	1.63	-9.78	0.11
	Manuf	-2.45	1.36	8.50	6.52	-0.47	12.01	2.88	5.33	14.63	-9.54	24.30	38.00	-0.42	2.39	0.15	2.49	-0.99
	Motor_Part	2.71	-0.87	0.06	3.29	5.10	1.26	22.66	6.64	10.84	6.12	0.13	8.57	6.46	1.19	2.33	-8.52	16.35

(Source) Authors' calculation

Note. Veg_oil = Vegetable oil, Bever_Tob = Beverage_Tobacco, LightMnfc = Light Manufacturing, Heavy Manufacturing, Petro_coal = Petroleum and coal, Mach_Equip = Machinery Equipment, Trans_Equi = Transport Equipment, Elec_Equip = Electrical Equipment, Manuf = Manufacturing

Appendix Figure A1. Comparison of the price of capital goods under both scenarios (% cumulative change relative to baseline 2030)



(Source) Authors' calculation