



UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

Inclusive and Sustainable Industrial Development Working Paper Series
WP 01 | 2015

REGIONAL TRADE INTEGRATION AND TRADE FACILITATION AS A PRO-INDUSTRIALIZATION POLICY TOOL

THE CASE OF NORTH AFRICAN COUNTRIES

RESEARCH, STATISTICS AND INDUSTRIAL POLICY BRANCH

WORKING PAPER 1/2015

**Regional trade integration and trade facilitation as a
pro-industrialization policy tool
The case of North African countries**

Simon Mevel
African Trade Policy Centre
Regional Integration and Trade Division
United Nations Economic Commission for Africa

Jaime Moll de Alba
Representation of UNIDO in the Kingdom of Morocco
Industrial Policy, External Relations and Field Representation Division
UNIDO

Nassim Oulmane
North Africa Office
United Nations Economic Commission for Africa



UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

Vienna, 2015

Acknowledgement

This paper was prepared by Simon Mevel, Economic Affairs Officer, African Trade Policy Centre, Regional Integration and Trade Division, United Nations Economic Commission for Africa, Jaime Moll de Alba, UNIDO Representative in the Kingdom of Morocco and Nassim Oulmane, Chief Sub-Regional Data Center, Sub-Regional Office, Northern Africa, United Nations Economic Commission for Africa. Sincere thanks also go to the editor of this Working Paper, Niki Rodousakis, as well as to Shoreh Mirzaei Yeganeh, who compiled the data used in Section 1.

The designations employed, descriptions and classifications of countries, and the presentation of the material in this report do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations Industrial Development Organization (UNIDO) concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries, or its economic system or degree of development. The views expressed in this paper do not necessarily reflect the views of the Secretariat of the UNIDO. The responsibility for opinions expressed rests solely with the authors, and publication does not constitute an endorsement by UNIDO. Although great care has been taken to maintain the accuracy of information herein, neither UNIDO nor its member States assume any responsibility for consequences which may arise from the use of the material. Terms such as “developed”, “industrialized” and “developing” are intended for statistical convenience and do not necessarily express a judgment. Any indication of, or reference to, a country, institution or other legal entity does not constitute an endorsement. Information contained herein may be freely quoted or reprinted but acknowledgement is requested. This report has been produced without formal United Nations editing.

Table of Contents

Introduction	1
1. State of manufacturing production in North African countries	3
1.1. Industrial production.....	3
1.2. Relative industrial performance.....	12
2. Model used and description of trade reforms	20
2.1 Main model assumptions, data requirements, geographic and sectoral decomposition	20
2.2. Trade reforms	22
3. Economic impact of implemented reforms.....	23
3.1 Impact of different scenarios on exports	23
3.2 Changes in tariff revenues and real income.....	32
4. Conclusions and recommendations	34
References	38
Annex 1: Key features of the MIRAGE CGE model	41
Annex 2: Geographic decomposition determined for the modelling exercise.....	43
Annex 3: Sectoral decomposition determined for the modelling exercise	44
Annex 4: Changes in bilateral trade, following the CFTA reforms (without trade facilitation measures), percent, 2020	45
Annex 5: Changes in bilateral trade, following the CFTA reforms (without trade facilitation measures), USD billion, 2020.....	46
Annex 6: Changes in bilateral trade, following the CFTA reforms with trade facilitation measures, percent, 2020.....	47
Annex 7: Changes in bilateral trade, following the CFTA reforms with trade facilitation measures, USD billion, 2020.....	48
Annex 8: Distribution by main sectors of NACs' exports to selected destinations, percent, average 2010-2012	49

List of Tables

Table 1: Level and growth of MVA by country group, USD constant 2005, in billion	5
Table 2: Level and growth of MVA per capita by country group, USD constant 2005	7
Table 3: Level and growth of MVA by country group, USD constant 2005, in million.....	10
Table 4: Level and growth of MVA per capita by country, USD constant 2005	10
Table 5: Share of MVA in GDP	17
Table 6: Changes in total exports by country/region, following implementation of the CFTA with or without trade facilitation (TF) reforms, percent vs. USD billion, 2020	24
Table 7: Changes in total exports by country/region, following each of the envisaged trade reforms, USD billion, 2020	31
Table 8: Changes in exports from North Africa to main destinations, following each of the envisaged trade reforms, in percent, 2020	32
Table 9: Changes in tariff revenues by country/region, following each of the envisaged trade reforms, percent, 2020	33
Table 10: Changes in real income by country/region, following each of the envisaged trade reforms, percent, 2020.....	34

List of Figures

Figure 1: Structure of industry - Developing world regions (2008-2012).....	4
Figure 2: Catching-up of African regions to selected countries or country groups based on 2013 MVA per capita, USD 2005 constant	9
Figure 3: Catching-up of North African countries with selected countries based on 2013 MVA per capita, USD 2005 constant	11
Figure 4: Technological structure of MVA - Regional level.....	13
Figure 5: MVA per capita, 5-year average (2008-2013)	14
Figure 6: MVA per capita, 5-year average (2008-2013)	16
Figure 7: Growth of MVA and GDP (%) – Regional level	19
Figure 8: Changes in intra-African trade by main sectors, following the implementation of the CFTA with vs. without trade facilitation reforms, USD billion, 2020	25
Figure 9: Changes in intra-North African trade by industry, following CFTA reforms, with vs. without TF measures, USD billion, 2020	27
Figure 10: Changes in North African countries' exports to the rest of the Arab League, by main sector, following the CFTA and Pan-Arab FTA reforms, with vs. without TF measures, USD billion, 2020.....	28
Figure 11: Changes in intra-North African trade by industry, following the CFTA and Pan-Arab FTA reforms, with vs. without TF reforms, USD billion, 2020	29
Figure 12: Changes in North Africa's total exports by main sector, following each of the envisaged trade reforms, USD billion, 2020	30

Introduction

The economic emergence of North African countries¹ (NACs) requires a significant transformation of their economies and raises the question about the process guiding their structural change. Despite their different levels of diversification, the economic performance of most countries in the North Africa region remains dependent on either commodity prices or weather conditions. North African economies are, in general, poorly diversified and specialized in a handful of industries or non-dynamic products with low added value. The high levels of unemployment, particularly among youth, call for the urgent creation of several million jobs in the region. Only a significant increase in economic growth can help meet this pressing challenge. Such an increase, oftentimes called ‘explosive growth’, has in the past been experienced through structural change in either industries or services. The growing participation in international trade, namely through manufactured exports which are increasingly diverse and sophisticated, signifies a prominent engine, guiding the structural transformation of successful developing countries.

The North African countries began diversifying their structures in the 1960s and 70s through state-led import substitution strategies (Morocco, Tunisia) or heavy industrialization strategies (Algeria, Egypt). The diversification of their economies continued at different paces during the period of structural change in the 1980s and 90s. As a result, the economic structures of most countries in the region changed between the mid-1980s and 2007, as demonstrated by the larger shares of industry and services in their economies. This change was also confirmed by the increase in diversification indices (Ben Hammouda and al., 2009), particularly in Egypt, Tunisia and, to a lesser extent, Morocco. These countries’ share in the global market of manufactured goods has, however, remained marginal at slightly above 1 percent between 1975 and 2008, while East Asia’s share increased from 1.7 to 20 percent in the same period.

The apparent paradox between the level of diversification and the international integration of the NACs can be explained by several factors: on the one hand, by their relatively weak pace of diversification compared to the rest of the world’s and, on the other, by their focus on not necessarily the most dynamic world products with limited growth of manufacturing value added (MVA). Moreover, North Africa’s regional market has witnessed increasing competition from newcomers such as China, India and Turkey. All of these factors have resulted in the currently limited integration of these countries into global value chains (GVCs), which account for a significant share of global MVA.

¹ In this paper, NACs refers to Algeria, Egypt, Libya, Morocco, Tunisia and Sudan. However, in the simulations Sudan is not included in the rest of North Africa.

Since 2008 (Moll de Alba, 2014), North Africa's MVA growth rate has declined, as witnessed in nearly all world regions, partly as a consequence of the overall economic downturn. What is alarming, however, is that North Africa recorded the second lowest MVA growth rate of all African regions in 2008-2012. Despite leading in terms of MVA per capita among African regions, North Africa's level falls far behind that of the world's most dynamic regions. Moreover, the gap increased during 2008-2012 due to the stagnant MVA per capita growth rate experienced by the region on the whole.

Manufacturing plays a modest role in North Africa's economy, and it is comparatively less important than in the most dynamic developing regions and has failed to expand over the last decades. Deindustrialization thus remains a reality in the North Africa region, where MVA accounts for barely one-tenth of its GDP, and the growth of its manufacturing sector lags behind that of its overall economy. The region has failed to spur industrial development and hence to realize significant advances in terms of structural change.

The experience of developed as well as of emerging countries, particularly in Asia, demonstrates that they have achieved real development (UNIDO, 2009). Similarly, research (Imbs and Wacziarg, 2003) shows that the transition from low- to middle-income countries takes place through the development of a strong and diversified economy, with the state playing a role in this process. For economies such as the NACs, in which minerals and hydrocarbons are predominant, structural change should take place through the acceleration of the pace of diversification towards manufactured goods and through the nature of the process based on its reorientation towards more dynamic and efficient technologies. Indeed, the literature suggests that beyond economic diversification and exports, it is the nature of this particular diversification and sophistication in the process of production and exports, which constitutes a lever for the structural shift of these economies (Hausmann et al., 2007). Active policy reforms have proven to play an important role in supporting that process. Trade policy can make significant contributions, particularly to an increase in processing to lead to higher value added. Regional trade agreements may constitute a key instrument to raise the participation of NACs in global trade. The positive growth prospects of the African continent may convert the Continental Free Trade Agreement (CFTA)² into a major *ex-ante* opportunity for NACs to expand their manufactured exports based on the continent's rapid urbanization and demographic evolution (Ref ERA, 2014). This assumption needs to be assessed to

² At the 2012 African Union (AU) Summit, African heads of state and government endorsed an AU action plan for "Boosting intra-African trade and establishing the continental free trade area (CFTA)"; it was agreed that the CFTA, for which negotiations are expected to be launched at the June 2015 AU Summit, would be tentatively established by 2017.

measure the extent to which such trade reforms would play a pivotal role in the re-industrialization of NACs. Beside the CFTA, NACs are involved in two other major regional integration processes. The Great Arab Free Trade Area (GAFTA) with the countries of the League of Arab States (LAS), and the Euro-Mediterranean Partnership (EUROMED) process with the European Union.

Given the relative modest size of NACs' economies—and in fact of the entire region—a deeper integration with the African continent, the LAS countries and within the EUROMED framework might strengthen the optimization of the region's comparative advantages. However, this process will not entail the same pattern of trade with each partner, particularly with regard to manufactured exports. The purpose of this paper is to assess different scenarios of regional integration with the main NACs trade partners and to analyse which form of regional integration would imply a higher level of industrialization of NACs.

This paper is structured as follows: the first section describes the state of manufacturing production in NACs and analyses its recent development. Section two presents the methodology and different scenarios put forward for the regional trade integration analysis. The third section discusses the main findings of the trade reforms envisaged based on the NACs' trade and income performance. Finally, the fourth section provides a set of policy recommendations.

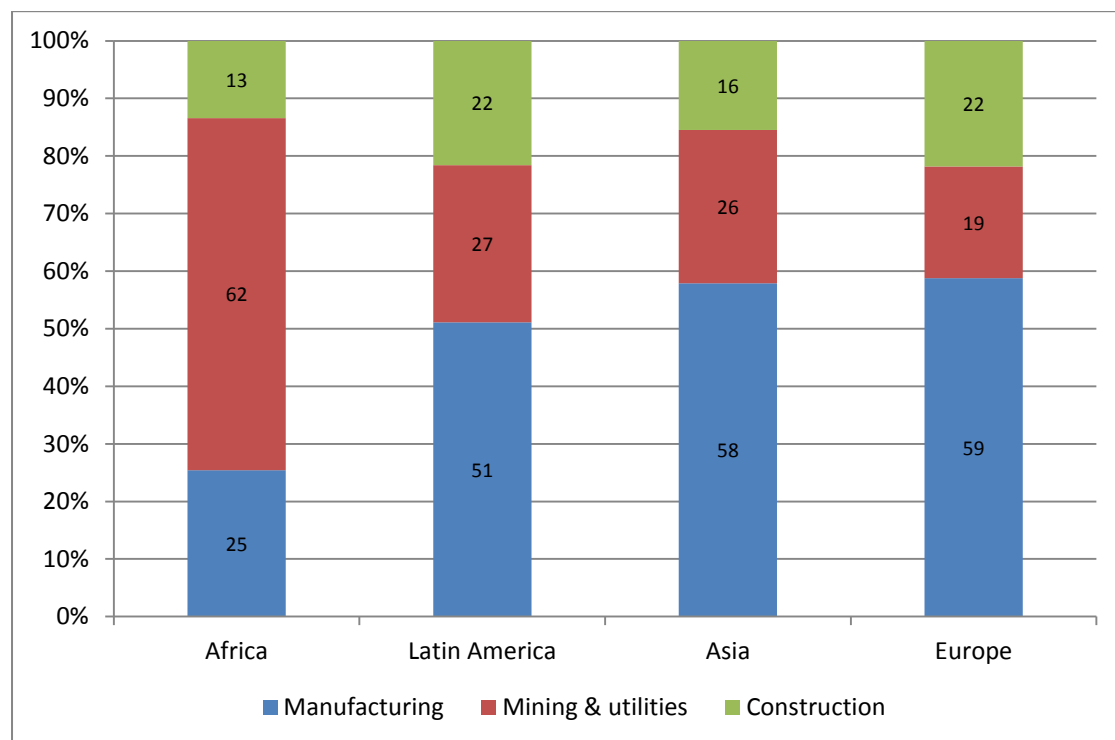
1. State of manufacturing production in North African countries

This section examines North African countries' current industrial production growth and structure in comparison to other country groups. It then compares the relative industrial performance of North Africa with other major regions.

1.1. Industrial production

Manufacturing accounted for only one-fourth of Africa's industrial structure, on average, for the period 2008-2012, while mining and utilities made up 61 percent, the largest share of the overall structure of African industry (Figure 1). The share of mining and utilities in Africa was more than double that of other regions, including Europe, Asia and Latin America, where manufacturing played the leading role in industry with 59 percent, 58 percent and 51 percent, respectively.

Figure 1: Structure of industry - Developing world regions (2008-2012)



Source: UNSD (2014a)

Within Africa, variations among the regions are significant. On the one hand, mining and utilities accounted by far for the largest share of industry in Central Africa (81 percent), Western Africa (79 percent), North Africa (59 percent) and Southern Africa (51 percent). On the other hand, manufacturing was the leading contributor to industry in Eastern Africa (45 percent); Southern and North Africa followed in terms of the highest contribution of manufacturing with one-third and one-fourth, respectively.

The structure of industry in North Africa also reveals a great deal of divergences between the different countries. The contribution of manufacturing to national industrial structure is highest in Tunisia and Sudan (both at 58 percent), followed by Morocco (52 percent) and Egypt (44 percent). At the other extreme, mining and utilities play the leading role in Libya with 85 percent and Algeria with 74 percent.

The share of Africa's population to total world population increased from 14.4 percent to 15.5 percent, growing faster than its share in world MVA, which increased moderately to reach 1.50 percent in 2013. The share of Africa's MVA in the total MVA of developing countries, which increased their overall share in world MVA, declined from 5 percent in 2008 to 4.2 percent in 2013. During the same period, the share of North Africa's population in world population grew from 0.28 percent to 0.29 percent, while its share in world MVA stagnated at

0.53 percent. Developed countries with a combined population of 17 percent held more than 64.5 percent of global industrial production in 2013.

In line with the overall trend in Africa, the North Africa region exhibited a significant slowdown of its already comparatively moderate MVA growth rate from 4.18 percent during 2003-2008 to 1.67 percent in 2008-2013 (Table 1). This compares to Western Africa, which only accounted for 10.66 percent of Africa's overall MVA, but managed to increase its average annual MVA growth rate from 3.67 percent to 5.24 percent during the same period. Eastern Africa's annual MVA growth rate, which remained close to 5 percent, only accounted for 4.05 percent of Africa's total MVA. Despite the decline in developing countries and in China, their average annual growth rates were comparatively much higher, i.e. at 5.51 percent and 8.37 percent, respectively, during the period 2008-2013.

Table 1: Level and growth of MVA by country group, USD constant 2005, in billion

Country group	2008	2009	2010	2011	2012	2013	Average annual growth rate (in %)	
							2003-2008	2008-2013
World	8,248	7,581	8,299	8,627	8,829	8,980	4.10	1.72
Developed	5,810	5,090	5,595	5,740	5,799	5,793	2.65	-0.06
Developing	2,438	2,491	2,704	2,886	3,030	3,187	8.16	5.51
Central Africa	4	4	4	4	5	5	2.16	3.12
Eastern Africa	4	4	5	5	5	5	5.61	5.06
North Africa	44	45	46	45	47	48	4.18	1.67
Southern Africa	59	54	57	59	61	62	5.30	1.27
Western Africa	11	12	12	13	14	14	3.67	5.24
Africa	122	119	124	126	131	135	4.64	2.00
Caribbean	15	15	17	18	14	14	3.02	-1.50
Central America	178	162	177	185	192	193	2.97	1.59
South America	292	274	296	306	307	312	5.25	1.33
Latin America	486	452	490	509	513	519	4.31	1.34

Country group	2008	2009	2010	2011	2012	2013	Average annual growth rate (in %)	
China	1,059	1,141	1,243	1,364	1,470	1,582	11.47	8.37
Central Asia	10	10	11	12	12	13	4.60	4.83
South Asia	199	216	236	244	252	262	9.12	5.66
South East Asia	209	206	225	231	248	262	5.69	4.64
West Asia	80	83	91	96	98	102	9	5
Other Asia & Pacific	3	3	3	3	1	1	1.62	-21.08
Asia	1,560	1,659	1,810	1,949	2,081	2,222	10.07	7.32
Europe	269	261	280	301	305	312	7.20	2.96

Source: UNIDO (2015)

Low and stagnant MVA levels explain Africa's low MVA per capita level at constant 2005 USD 130 in 2013 (Table 2). This is 36 times lower than that of developed countries and more than four times lower than developing countries' MVA per capita. Despite the North Africa region having recorded the highest MVA per capita among Africa's regions in 2013 at USD 276 (constant 2005 dollars), followed closely by the Southern Africa region at USD 213, its MVA per capita is comparatively lower than that of other country groups, namely 17 times lower than that of developed countries and more than four times lower than Central America's MVA per capita. Previous research by UNIDO indicates that Africa has not benefited from the increase of manufacturing production and exports recorded by developing countries since 2000 (UNIDO, 2009). Moreover, during the period 1990-2010, the Middle East and North Africa only managed to achieve a small increase in MVA per capita, with the exception of Turkey, with no sign of diversification, i.e. the region continues to remain dependent on oil (UNIDO, 2013a).

Table 2: Level and growth of MVA per capita by country group, USD constant 2005

Country group	2008	2009	2010	2011	2012	2013	Average annual growth rate (in %)	
							2003-2008	2008-2013
World	1,233	1,121	1,213	1,247	1,275	1,284	2.89	0.81
Developed	4,863	4,232	4,625	4,719	4,748	4,738	2.00	-0.52
Developing	444	448	480	506	531	552	6.77	4.47
Central Africa	104	101	104	105	107	108	-0.28	0.79
Eastern Africa	23	24	25	25	27	28	2.91	3.47
North Africa	274	277	280	266	274	276	2.57	0.20
Southern Africa	224	203	209	212	213	213	2.93	-1.01
Western Africa	39	40	40	41	42	44	1.05	2.56
Africa	131	125	128	126	130	130	2.25	-0.10
Caribbean	422	427	467	484	532	539	2.12	5.04
Central America	1,176	1,054	1,134	1,172	1,200	1,189	1.55	0.21
South America	761	707	754	773	767	772	4.01	0.28
Latin America	850	782	837	862	875	876	3.04	0.60
China	797	855	927	1 012	1 086	1 164	10.88	7.87
Central Asia	176	170	187	198	204	210	3.57	3.59
South Asia	125	135	145	147	150	154	7.47	4.16
South East Asia	383	373	403	408	434	455	4.46	3.53
West Asia	404	408	441	456	517	526	7	5
Other Asia & Pacific	101	97	99	100	95	97	0.57	-0.76
Asia	416	438	472	504	539	569	8.83	6.47
Europe	1,120	1,081	1,160	1,245	1,258	1,282	7.03	2.75

Source: UNIDO (2015)

The situation in the North Africa region looks comparatively worse when considering both its limited industrial fabric and its growing population. MVA per capita increased marginally by 0.20 percent during 2008-2013 to reach USD 276 in 2013 compared to a 2.57 percent growth

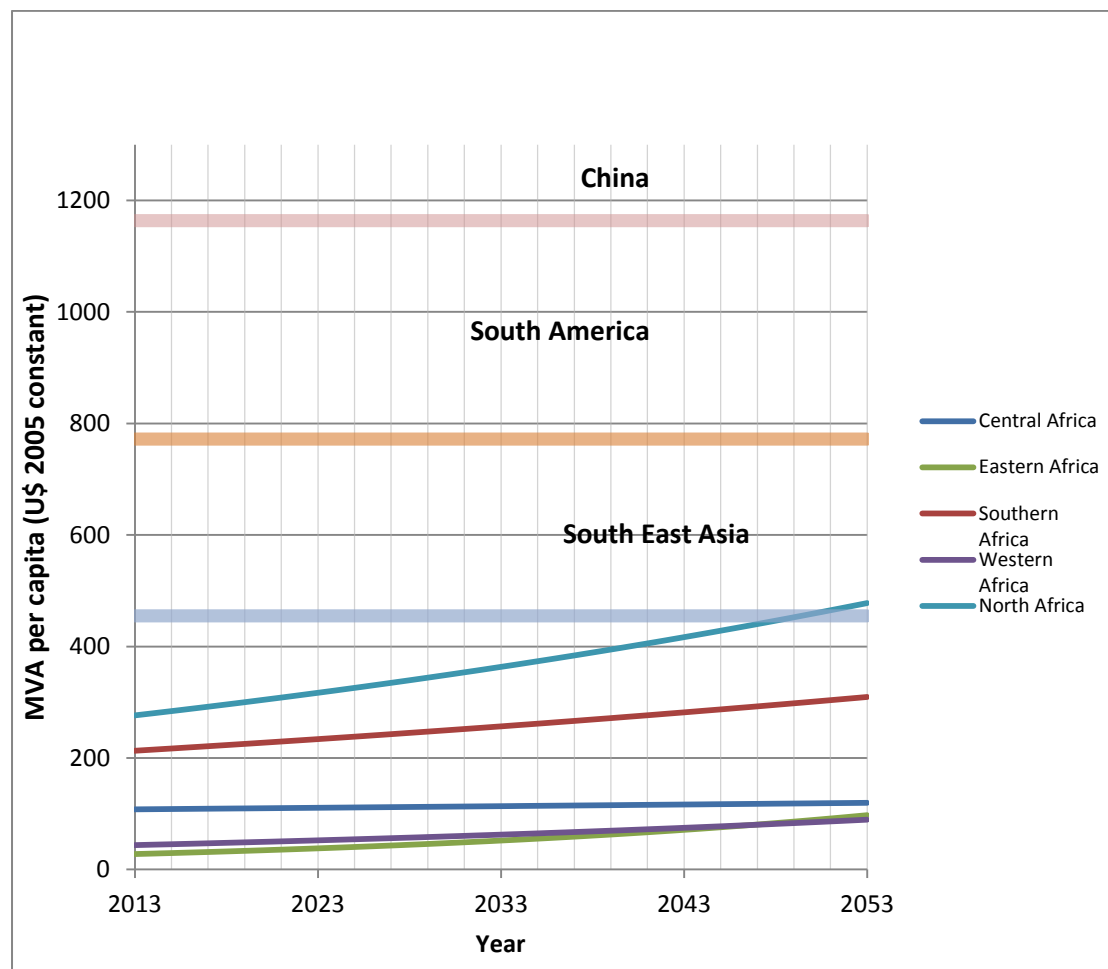
in 2003-2008 (Table 2). Despite significantly lower levels of MVA per capita, Western Africa increased its MVA per capita at 2.56 percent during 2008-2013 to reach USD 42, and Eastern Africa recorded an average annual growth rate of 3.47 percent, recording USD 28 in 2013. The marginal increase of USD 2 in North Africa's MVA per capita compares to an increase of nearly USD 108 during the period 2008-2013 in developing countries, which reached a value of USD 552 (constant 2005 dollars) in 2013 or to China, which recorded an impressive increase of USD 367, reaching a per capita MVA in 2013 of USD 1,164.

Despite registering the highest MVA per capita in Africa, the North Africa region not only continues to lie far behind other world country groups, but the existing gap is also increasing due to the region's marginal increase in 2008-2013.

According to their average growth rates for 2003-2013, North Africa only managed to catch up with one other selected country group, namely South East Asia in 37 years' time (Figure 2). No other African region caught up with any of the selected country groups. If North Africa succeeded in increasing its MVA per capita growth rate to 10 percent per annum, the region could reach the 2013 MVA per capita level of South America within 11 years and China's within 16 years.

The aggregate growth rate of the North Africa region masks the differences between the various countries. All countries in the region experienced lower average annual MVA growth rates during 2008-2013 compared to 2003-2008 (Table 3). Egypt, which accounted for more than 42 percent of the region's MVA in 2013, witnessed a drop in its growth rate from 5.74 percent to 2.73 percent, while Libya's MVA, which constituted less than 3 percent of North Africa's total MVA, plummeted in 2008-2013 to a rate of -12.93 percent.

Figure 2: Catching-up of African regions to selected countries or country groups based on 2013 MVA per capita, USD 2005 constant



Source: Authors' estimations based on UNIDO data (2015)

Consequently, most of the region's countries also recorded considerable declines in their MVA per capita growth rates (Table 4). Tunisia was the only country in the region to record a higher per capita growth rate in 2008-2013—namely 2.32 percent—than in 2003-2008, reaching the highest per capita growth figure in North Africa at USD 634 (constant 2005 dollars), nearly double that of Morocco (USD 326). The latter country registered the second highest per capita growth figure in the region, with an MVA per capita which experienced a moderate decline in its growth rate from 1.69 percent in 2003-2008 to 1.27 percent in 2008-2013. Algeria (-1.22 percent) and Libya (-13.91 percent) witnessed a decline in their MVA per capita in 2008-2013 with their respective values dropping to USD 170 and USD 204 (constant 2005 dollars) in 2013, respectively.

Table 3: Level and growth of MVA by country group, USD constant 2005, in million

Country	2008	2009	2010	2011	2012	2013	Average annual growth rate (in %)	
							2003-2008	2008-2013
Algeria	6,221	6,594	5,676	6,105	6,199	6,285	2.69	0.21
Egypt	17,614	18,345	19,322	1,9148	19,684	20,155	5.74	2.73
Libya	2,653	2,747	2,780	6,39	1,433	1,328	4.62	-12.93
Morocco	9,574	9,636	9,913	10,121	10,414	10,721	2.73	2.29
Sudan	2,068	2,139	2,429	2,336	2,313	2,373	5.22	2.79
Tunisia	5,791	5,598	6,248	6,329	6,593	6,855	3.27	3.43

Source: UNIDO (2015)

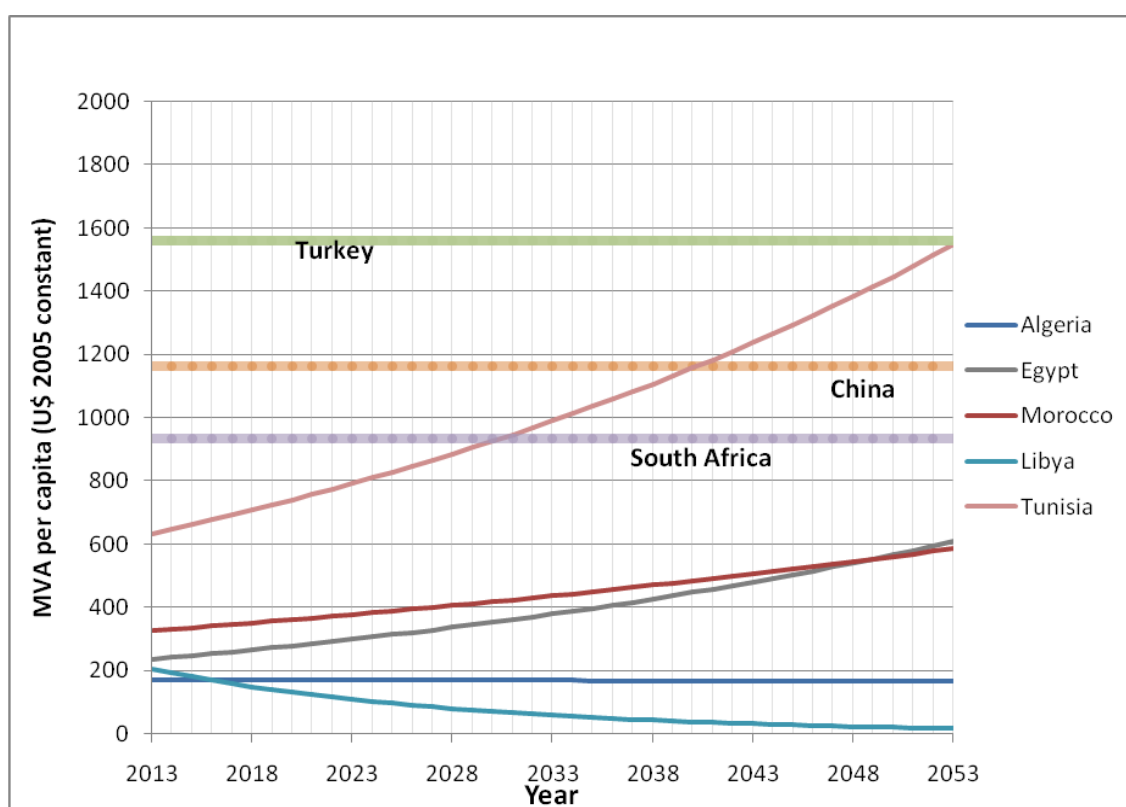
Table 4: Level and growth of MVA per capita by country, USD constant 2005

Country	2008	2009	2010	2011	2012	2013	Average annual growth rate (in %)	
							2003-2008	2008-2013
Algeria	181	189	160	170	170	170	1.15	-1.22
Egypt	225	230	238	232	234	236	3.83	0.98
Libya	431	439	437	100	222	204	2.46	-13.91
Morocco	306	305	310	314	319	326	1.69	1.27
Sudan	61	61	68	64	62	63	2.58	0.57
Tunisia	565	540	596	597	616	634	2.19	2.32

Source: UNIDO (2015)

Based on the region’s average growth rates for 2003-2013, only one country in the region, Tunisia, reached the MVA per capita level achieved by some selected countries within 40 years. Tunisia could reach South Africa’s level of MVA per capita within 18 years and China’s within 28 years (Figure 3). Tunisia could come close to catching up with the MVA per capita level of Turkey within 40 years. At current growth rates, all other North African countries would fail to catch up with the current MVA per capita levels of other countries. North African countries need to record significantly higher growth rates to close the gap with selected countries’ MVA per capita in the coming years.

Figure 3: Catching-up of North African countries with selected countries based on 2013 MVA per capita, USD 2005 constant



Source: Authors’ estimations based on UNIDO data (2015)

The intra-industry structure of manufactured production in African regions is presented in Figure 4. It is worth noting that sub-Saharan Africa (SSA) and Latin America recorded the lowest change in their industrial structures. Resource-based (RB) activities continue to dominate SSA’s industrial structure. SSA failed to follow the pace of the general shift to more complex industrial activities (UNIDO, 2013b). Moreover, SSA reduced its capacity in 1990-2010 to capture manufacturing value as demonstrated by the decline of its share of medium- and high-tech MVA in total manufacturing by one-third (UNIDO, 2013a).

Southern and North Africa, which together accounted for four-fifths of Africa's total MVA in 2012, also had the highest share of medium- and high-technology (MHT) products in the region at 31 percent and 23 percent, respectively. MHT activities are particularly valuable as they grow faster, especially at medium- and high-income levels, offer enhanced learning opportunities and spillover effects (UNIDO, 2009). The share of resource-based activities accounted for nearly half of their MVA and remained significant in both Southern (45 percent) and North Africa (46 percent). Low-tech (LT) MVA plays a less significant role in African manufacturing than one would expect, bearing in mind its stage of development. Africa's low-tech MVA recorded a decline, which is associated with the decrease in textiles production (UNCTAD and UNIDO, 2011).

During 2002-2011, the Middle East and North Africa roughly followed the world trend, continuously shifting towards more complex products over time. Thus, the share of resource-based manufacturing dropped to 40.3 percent while MHT activities increased to 32.7 percent (UNIDO, 2013b).

North and Southern Africa, Africa's two largest industrial regions, also displayed the highest increases and shares of MHT activities in manufacturing, at 23 percent and 31 percent, respectively. Overall, despite moderate declines, the share of resource-based activities remains the largest component in all African regions. Central, Eastern and Western Africa also displayed high shares of resource-based activities accounting for 76 percent, 64 percent and 60 percent, respectively.

1.2. Relative industrial performance

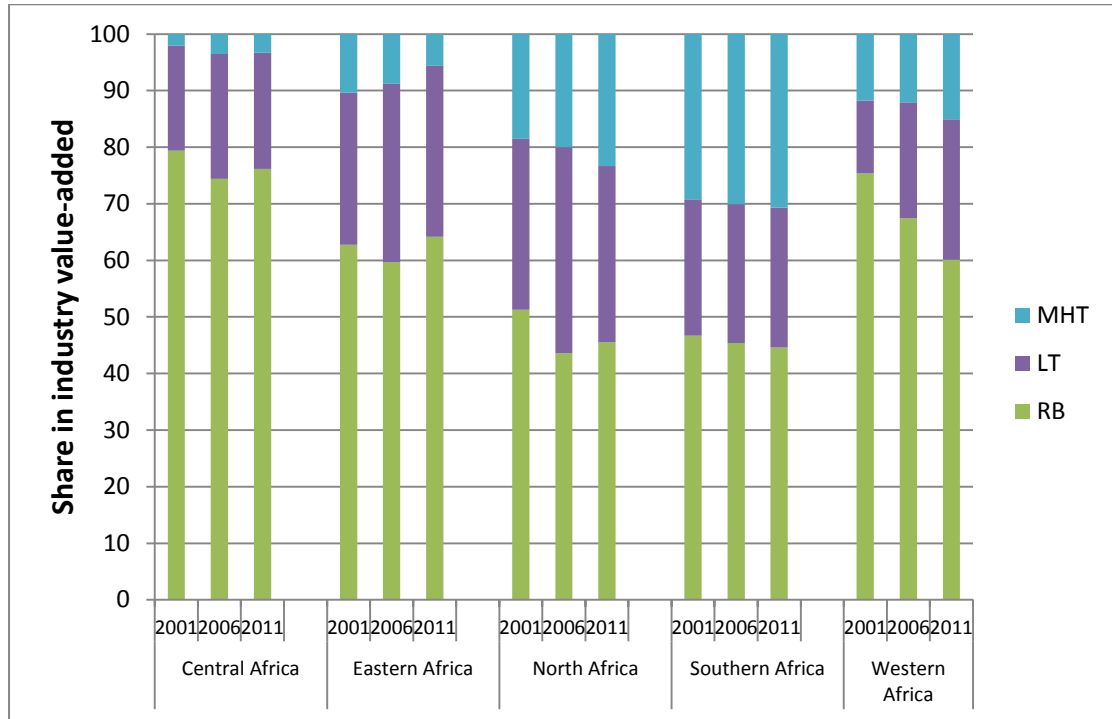
This sub-section examines North Africa's relative industrial performance compared to that of other selected world regions.

Figure 5 presents the MVA per capita level of selected world regions and their MVA per capita growth. Using the MVA median growth (2.4 percent) during 2008-2013 and the MVA per capita median level (USD 274) in 2013 of selected regions, the graph can be divided into four zones to illustrate relative performance.

In the top-right quadrant, we find regions such as Europe, South East Asia, the Caribbean and South America as well as countries such as China, which recorded an impressive 7.89 percent average growth rate with comparatively higher MVA levels and growth rates. The bottom-right quadrant includes regions such as Central and South America which have also achieved relatively higher levels of MVA per capita, but are experiencing difficulties in sustaining their

growth. The top-left quadrant includes regions such as South Asia with a relatively lower manufacturing base but a significant level of growth with a 2008-2013 average MVA per capita growth rate of 4.16 percent as well as Eastern and Western Africa, with a 3.47 percent and 2.56 percent average growth rate, respectively.

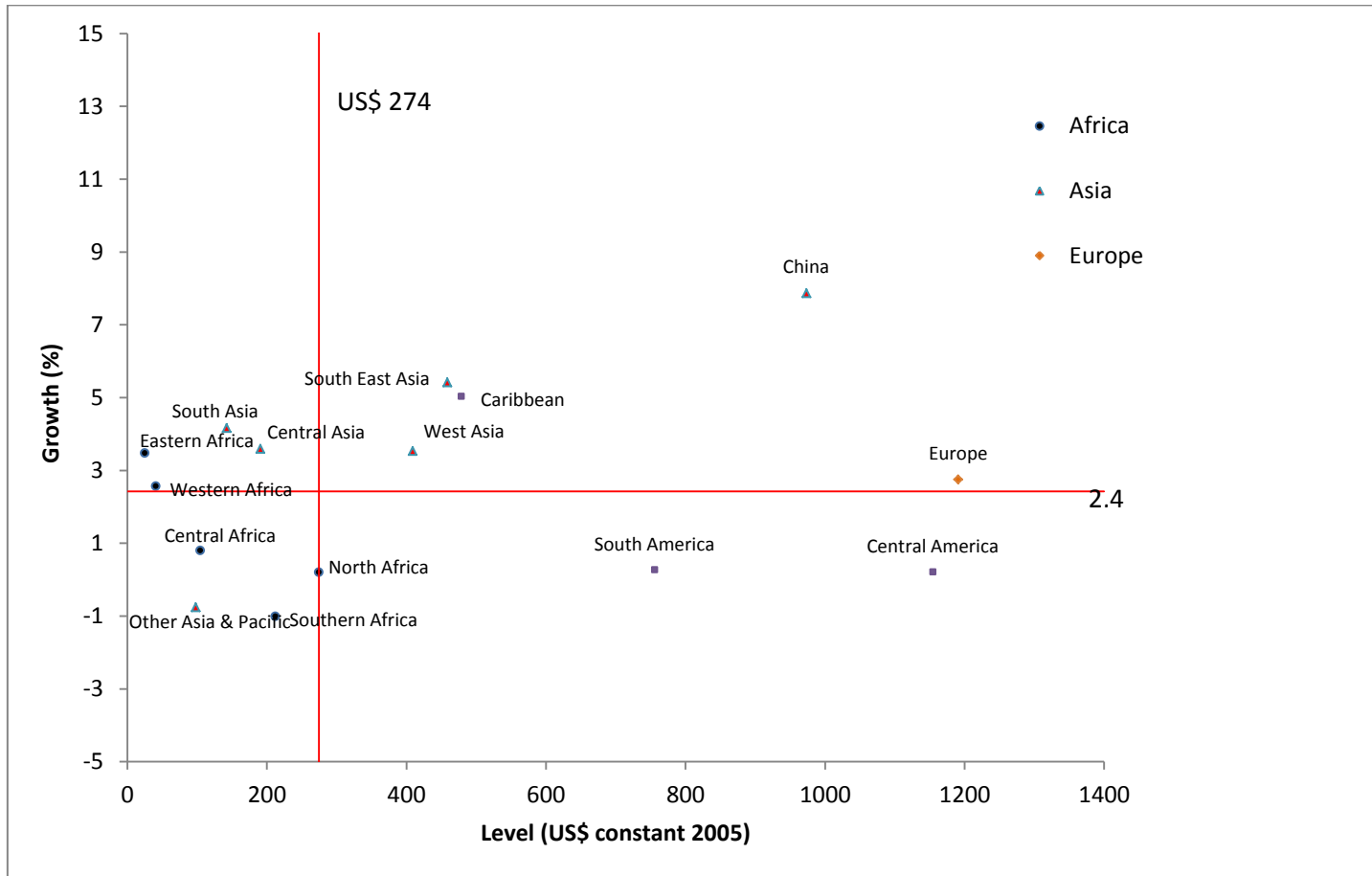
Figure 4: Technological structure of MVA - Regional level



Source: UNIDO (2014b)

Finally, regions with a comparatively less dynamic MVA per capita growth rate from already relatively low levels are found in the bottom-left quadrant. These include Central Africa at 0.79 percent in 2008-2013. North Africa shows relatively low average growth rates (0.20 percent in 2008-2013) combined with an MVA per capita that falls precisely into the median of all regions. The relative performance of African regions is comparatively weak; none of them recorded higher values than the median for the two chosen variables.

Figure 5: MVA per capita, 5-year average (2008-2013)



Source: UNIDO (2015)

Figure 6 presents the relative average MVA per capita level of African countries and their average growth rate. Using the MVA per capita median growth (1.5 percent) during 2008-2013 and its average level (USD 45) of selected regions in 2013, the graph can be divided into four zones to illustrate relative performance.

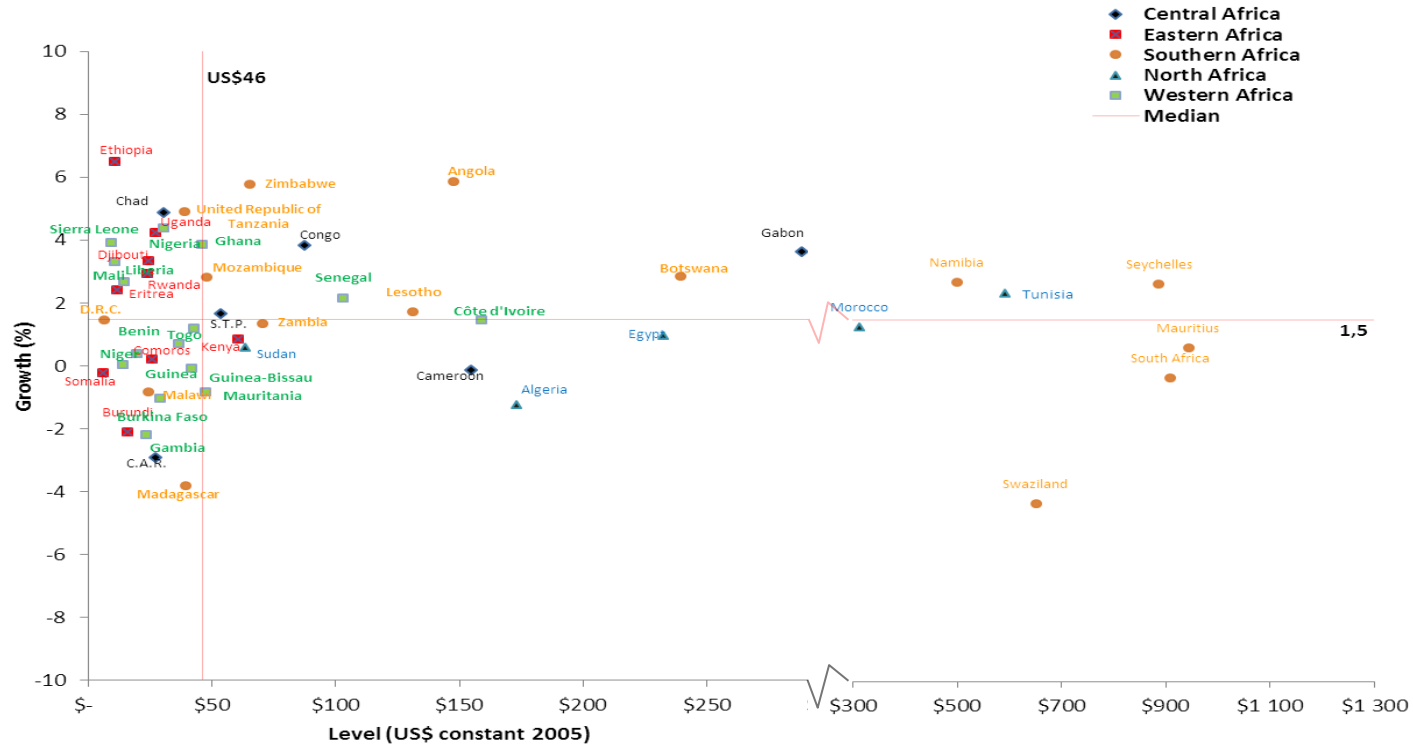
In the top-right quadrant, we find countries that recorded comparatively higher MVA levels and growth rates (relative to other African countries). Only one North African country is included in this group, namely Tunisia with an average MVA per capita of USD 592.42 and a 2.32 percent average growth rate. In this group, the growth rates recorded by Angola at 5.84 percent and Zimbabwe at 5.76 percent were remarkable, even though their MVA per capita levels were not among the highest in this quadrant. Seychelles with an average MVA growth rate of USD 896.96 displayed the highest average MVA per capita in this group, coupled with a significant average growth rate of 2.62 percent.

The bottom-right quadrant includes countries that achieved relatively higher levels of MVA per capita, but experienced difficulties in sustaining their growth. Five North African countries, namely Morocco, Egypt, Algeria, Sudan and Libya are included in this group, but displayed significant differences in terms of the 2008-2013 average MVA per capita ranging from USD 313 in Morocco with the highest level in this quadrant, to USD 63 in Sudan with the lowest. Their average growth rates during 2008-2013 varied from 1.27 percent in Morocco to -1.21 percent in Algeria. The two countries with the highest MVA per capita levels, namely Mauritius at USD 944 and South Africa at USD909 fall into this quadrant. Among this group, Swaziland recorded the lowest growth rate at 4.34 percent. Libya belongs to this group as well (albeit not displayed in the figure) with an average growth rate of -13.90 percent.

The top-left quadrant includes countries with a relatively lower manufacturing base but a significant level of growth, and includes Ethiopia, Chad, Tanzania and Nigeria. Ethiopia recorded the highest average growth rate at 6.48 percent during 2008-2013, followed by Tanzania with 4.91 percent.

Finally, in the bottom-left quadrant, we find countries with a declining MVA per capita from already relatively low levels, such as Burkina Faso, the Gambia and Burundi.

Figure 6: MVA per capita, 5-year average (2008-2013)



Source: UNIDO (2015)

Africa's industrial sector remains underdeveloped (Lall, 2005; Bigsten and Söderbom, 2011; UNIDO, 2010, 2013a, 2013b). Moreover, Africa deindustrialized during 1993-2013 (Table 7). Its level of industrialization, using share of MVA in GDP as a proxy, declined from 11.51 percent in 1993 to 9.88 percent in 2013. This accentuates the overall trend experienced in 1950-2005, when manufacturing industries followed an almost flat trajectory, reaching a share of 11 percent MVA in GDP in 2005, equivalent to that of 1950 (Szirmai, 2012; UNIDO, 2013a). The share of MVA in GDP declined in all African regions to values ranging from 5.07 percent in Western Africa to 12.64 in Southern Africa (Table 5). In North Africa, that share slightly declined to 10.40 percent in 2013. This compares to an increase in developing countries as a whole, where MVA reached 20.84 of GDP in 2013 while South East Asia and China reached 26.95 percent and 32.54 percent, respectively.

Table 5: Share of MVA in GDP

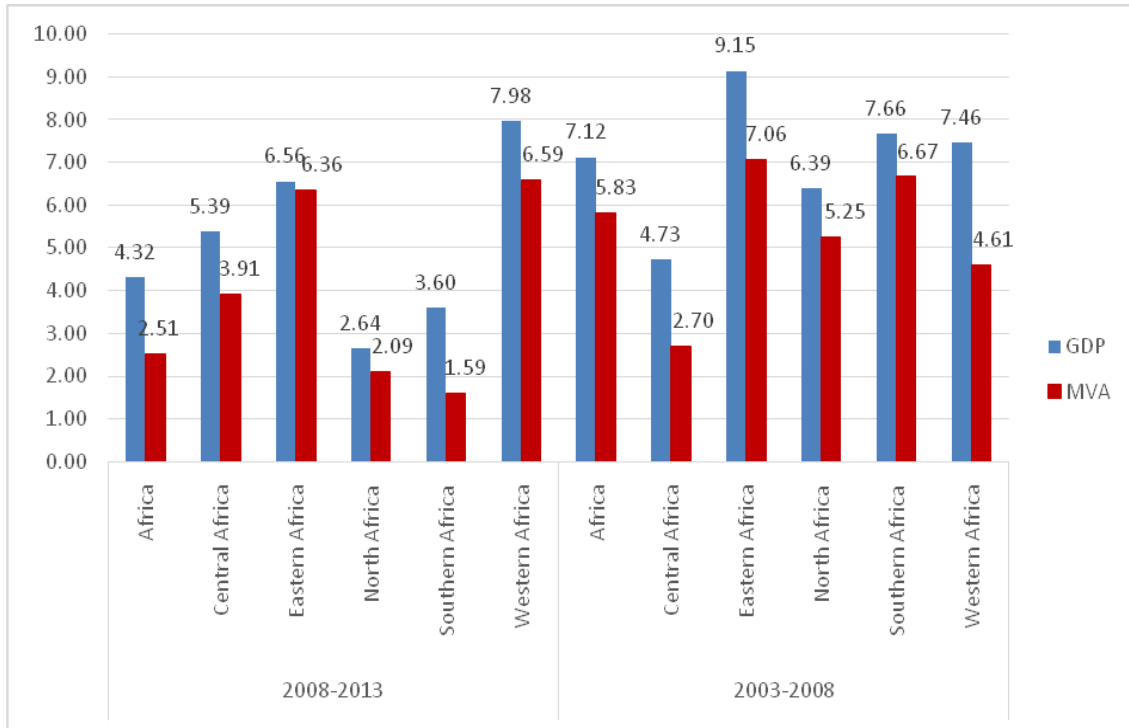
Country/Region	1993	2003	2013
World	15.44	15.90	16.44
Developed	15.12	15.06	14.73
Developing	16.88	19.21	20.84
Central Africa	10.07	10.66	9.32
Eastern Africa	8.42	7.74	7.11
North Africa	10.94	11.09	10.40
Southern Africa	15.01	14.19	12.64
Western Africa	6.55	5.94	5.07
Africa	11.51	11.12	9.88
Caribbean	11.69	11.84	13.62
Central America	16.91	17.53	16.88

Country/Region	1993	2003	2013
South America	17.03	15.50	13.69
Latin America	16.78	16.06	14.72
China	28.54	33.39	32.54
Central Asia	13.81	12.09	9.69
South Asia	13.53	14.38	15.07
South East Asia	23.65	27.37	26.95
West Asia	7.07	8.82	10.52
Other Asia & Pacific	17.30	14.27	7.12
Asia & Pacific	19.29	24.15	25.58
Europe	15.05	15.25	18.14

Source: UNIDO (2015)

An additional issue of concern is the fact that Africa's manufacturing sector grew slower in general at 2.51 percent than its economy as a whole at 4.32 percent during 2008-2013. The same applies to the previous period of 2003-2008, despite higher growth rates at 5.83 percent and 7.12 percent, respectively. Even Africa's post-1995 growth was weak and the lack of industry on the continent continues to represent a barrier to its growth prospects and makes it more difficult to attract industry compared to regions that have already industrialized (Page, 2010). Thus, despite some evidence of growth in sub-Saharan Africa, the challenge to accelerate and sustain it remains (Abarche et al., 2008).

Figure 7: Growth of MVA and GDP (%) – Regional level



Source: UNIDO (2015)

No African region recorded a higher growth rate of its manufacturing sector than of its economy as a whole, neither in 2003-2008 nor in 2008-2013. The highest manufacturing and economic growth rates during 2008-2013 were recorded in Western and Eastern Africa. Both belong to the least industrialized regions in Africa and only accounted for 10.66 percent and 4.05 percent, respectively, of Africa’s MVA in 2013. Unlike other developing regions, Africa’s economic growth over the last decades has not resulted in any significant structural change, jeopardizing the continent’s future sustained growth. This trend has been exacerbated by the decline in growth rates during 2008-2013. The same applies to North Africa (Figure 7), whose MVA (2.09 percent) grew slower than its GDP (2.64 percent). This can be explained by the fast growing services sector in the close proximity of the European market and by the fact that the mining industry remains the main component of industrial activity in a number of economies within this region.

Our analysis suggests that, to varying degrees, the manufacturing base of the North Africa region remains comparatively weak and its potential contribution to the sustained economic growth of the region is far from being realized. Moreover, our study suggests that different patterns exist within the region in terms of the development of the manufacturing sector. The manufacturing base of two natural resource-rich countries, Algeria and Libya, remains weak and calls for an urgent diversification of their economies, which are almost exclusively dependent

on their natural resources, i.e. natural gas and oil. Despite having a relatively larger manufacturing base, the second group of countries, Tunisia, Egypt and Morocco, have witnessed a stagnation or decline in the contribution of their manufacturing sector to their economic growth over the last years attributable, among other reasons, to political and social changes and to their strong dependence on a handful of markets which have suffered a severe downturn. This has exacerbated the trend of previous years when North Africa's industrial sector failed to keep pace with the world's most dynamic developing regions. With regard to international trade, North Africa continues to play a minor role at the global level, particularly in manufactured trade. Primary exports, which are exposed to the volatility of world prices, continue to lead North Africa's export structure (Moll de Alba, 2014). The benefits of past commodity booms and regional economic growth have not been exploited to push forward the region's necessary structural transformation. Moreover, North African manufactured exports are dominated by resource-based and low-technology products and concentrate on a limited number of products and markets, thereby increasing their vulnerability to external shocks.

Given these facts, NACs are implementing several reforms to accelerate the diversification of their economies. Against this background, regional trade agreements (RTAs) could become a key instrument to raising the participation of NACs in global trade. The positive growth prospects of the African continent may convert the Continental Free Trade Agreement (CFTA) into a major opportunity, ex-ante, for NACs to expand their manufactured exports based on the continent's rapid urbanization and demographic evolution (Ref ERA, 2014). This assumption needs to be assessed to measure the extent to which such trade reforms would play a pivotal role in the re-industrialization of NACs. Beside the CFTA, NACs are participating in two other major regional integration processes: The Great Arab Free Trade Area (GAFTA) with the countries of the League of Arab States, and the EUROMED process with the European Union.

2. Model used and description of trade reforms

2.1 Main model assumptions, data requirements, geographic and sectoral decomposition

This analysis relies on the Modelling International Relationships in Applied General Equilibrium (MIRAGE) and the multi-country, multi-sector Computable General Equilibrium (CGE) model, which is particularly well designed for trade policy analysis. The dynamic version of the model is utilized with its standard closure³. The dynamic is recursive, implying a succession of equilibria being solved sequentially from one year to another (see Annex 1 for a

³ See Annex 1.

more detailed description of the model and its main assumptions)⁴. The model relies on the Global Trade Analysis Project (GTAP) database version 8.1⁵ for macroeconomic and bilateral trade data, while the Market Access Map at Harmonized System 6-digit (MAcMap-HS6) database version 2⁶ is employed for bilateral protection information. The MAcMap-HS6 database is updated with key developments to date (such as the Everything But Arm (EBA) initiative, the African Growth and Opportunity Act (AGOA) and the enlargement of the European Union to 28 members).

Considering both solver limitations and constraints of the GTAP database in terms of geographic and sectoral details, simulations are conducted with a total of 14 countries or regions and 29 industries.

As the focus is on North Africa, all North African countries available in the GTAP version 8.1 database are retained⁷. The rest of the African countries are categorized into the 4 remaining African regions. The main trading partners (i.e. the European Union, the United States and China) are also maintained as they are available in the database, while all other countries and regions are aggregated into two groups: Emerging Industrialized Economies (EIE) and rest of the world (see Annex 2).

Regarding sectoral aggregation, emphasis is put on manufacturing industries that are key for NACs' structural transformation. In other words, as many details as possible were retained for these industries. In total, 29 industries were considered, which can be decomposed into Agriculture (1), Food (7), Industrial Manufacturing (16), Mining and Energy (3) and Service Sectors (2) (see Annex 3).

Following the decision to tentatively establish a CFTA by 2017, all scenarios in this study are fully implemented by 2017. Moreover, while the reforms are assumed to be effective after 2017, the outcomes are given for the year 2020 in order for all variables of the model to properly adjust to shocks. Unless otherwise indicated, these annual outcomes are based on a comparison between the scenarios and the reference (or baseline; i.e. without trade reforms), either in percent or in absolute changes.

⁴ See Decreux and Valin (2007) for full description of the model features.

⁵ See Narayanan et al. (2012).

⁶ See Boumellassa et al. (2009).

⁷ It should be noted that Algeria and Libya are lumped together into the GTAP database under the "Rest of North Africa" region and therefore results from the simulation exercise cannot be drawn for each of the two countries separately. Similarly, Sudan is part of the "Rest of Eastern Africa region" in the GTAP database.

2.2. Trade reforms

A clear roadmap for the regional integration process in Africa was initially provided by the Abuja Treaty, which came into effect in 1994. In line with the Treaty, African Heads of States and Governments agreed in January 2012—by endorsing the African Union Action Plan for “Boosting Intra-African Trade and the Establishment of a Continental Free Trade Area”—to set up a CFTA, with 2017 as the tentative target. Therefore, a first scenario assumes the removal of all tariff barriers on goods within the African continent to be effective by 2017. An alternate scenario is to consider a reduction of costs to trade across borders in addition to the trade liberalization associated with the CFTA, assuming that all countries are implementing the trade facilitation part of the WTO agreement reached in December 2013, referred to as “the Bali package”. These trade costs are obtained by crossing information on: 1) the average number of days required for export and import processes (World Bank, 2013) and 2) export and import weighted average time costs obtained at the GTAP level of industries and by exporting and importing countries/regions (Minor and Hummels, 2011). Twenty-five percent reductions of these trade costs or “iceberg costs” were then applied, such as customs procedures, port handling and inland transport in import and export processes, which are assumed to become more efficient worldwide by 2017 compared to the base year. The assumption is that reforms will lead to improved productivity (Portugal-Perez and Wilson, 2010) and improve in particular the competitiveness of manufactured industrial products. Trade facilitation can boost productivity; Karingi and Spencer (2011) confirm these results on TFP from a sample of 18 African countries and indicate that trade facilitation can also influence production, catalysing transition towards more sophisticated exports and greater future growth.

A second set of scenarios is based on the first one with an additional FTA within the Great Arab Free Trade Area framework. The implementation of the Pan-Arab FTA has already started in the majority of Arab countries. However, in many cases, product coverage is low and the lists of exclusions of sensitive products are important. In this scenario, we assume a full FTA by 2017 without any exclusion. As for the first scenario, we assess an alternative reform that includes a 25 percent reduction of costs of trade across borders by 2017.

A third set of scenarios is based on the second set to which we add a deep FTA between NACs and the EU countries. This scenario is an expansion of the current bilateral EUROMED agreement—which focuses on manufactured products—to all industries by 2017, without exclusion. As for the previous set of scenarios, an additional reform including a 25 percent reduction of costs of trade across borders by 2017 is envisaged.

3. Economic impact of implemented reforms

3.1 Impact of different scenarios on exports

3.1.1 With only the CFTA in place

Global trends

The implementation of the first scenario will have a significant impact on African countries' exports which would strongly increase. North African exports would rise by 2.7 percent (or USD 8.9 billion) while the rest of Africa will experience an exports increase of 8.2 percent (or USD 42.4 billion) in 2020 compared to the baseline (see Table 6).

The impact on the other countries would remain very limited, as third countries (i.e. countries from outside Africa) would see their exports slightly decrease by a maximum of 0.2 percent in the case of the EU.

An increase in Africa's exports would essentially be the result of a boost in intra-African trade, which would expand (in absolute terms) by nearly USD 70 billion in 2020. North African exporters would grab as much as 20 percent of this gain (i.e. USD 13.6 billion); 52 percent of which would be attributable to an expansion in intra-North African trade alone (i.e. USD 7.1 billion), and the rest would be attributable to an increase in North African countries' exports to the rest of Africa (i.e. USD 6.5 billion), while North African exports to the rest of the world would decrease by USD 4.7 billion (see Annex 5).

The reverse can be observed for the rest of Africa, where an increase in exports to each other (+ USD 52 billion) is expected, which is considerably larger than their exports to North Africa (+ USD 3.8 billion) in absolute terms. Yet in relative terms (i.e. percentage), exports from African (excluding North African) countries to North African economies would increase (+114.3 percent) more than exports to each other (+72.7 percent), thanks to much larger increases in exports to North Africa, Central Africa and Southern Africa than to their African partners outside North Africa (see Annex 4).

In fact, in relative terms, all North African countries, with the exception of Egypt, would expand their trade with African partners outside North Africa (this would be particularly evident in the case of Morocco).

Third countries would export less to African economies, redirecting some of their trade towards non-African partners; but in net, as indicated earlier, the CFTA reform would be slightly trade diverting for them.

Table 6: Changes in total exports by country/region, following implementation of the CFTA with or without trade facilitation (TF) reforms, percent vs. USD billion, 2020

	CFTA		CFTA + TF	
	%	USD bn	%	USD bn
China	-0.1	-2.0	8.7	257.1
European Union	-0.2	-6.2	5.3	158.3
United States	-0.1	-1.1	6.2	120.7
North Africa	2.7	8.9	6.3	20.4
<i>Algeria & Libya</i>	<i>1.0</i>	<i>1.8</i>	<i>3.4</i>	<i>5.9</i>
<i>Egypt</i>	<i>3.2</i>	<i>2.7</i>	<i>7.5</i>	<i>6.2</i>
<i>Morocco</i>	<i>6.0</i>	<i>2.1</i>	<i>10.7</i>	<i>3.8</i>
<i>Tunisia</i>	<i>6.8</i>	<i>2.3</i>	<i>13.2</i>	<i>4.4</i>
Rest of Arab League	-0.1	-0.5	4.1	35.9
Rest of Africa	8.2	42.4	15.6	80.8
<i>Central Africa</i>	<i>3.2</i>	<i>3.5</i>	<i>7.0</i>	<i>7.5</i>
<i>Western Africa</i>	<i>13.2</i>	<i>21.3</i>	<i>18.1</i>	<i>29.1</i>
<i>Eastern Africa</i>	<i>9.8</i>	<i>9.1</i>	<i>20.8</i>	<i>19.2</i>
<i>Southern Africa</i>	<i>5.4</i>	<i>8.6</i>	<i>15.8</i>	<i>25.0</i>
EIE	-0.1	-2.1	8.3	196.0
Rest of the World	0.0	-2.0	6.5	391.8

Source: Authors' calculations based on the MIRAGE model

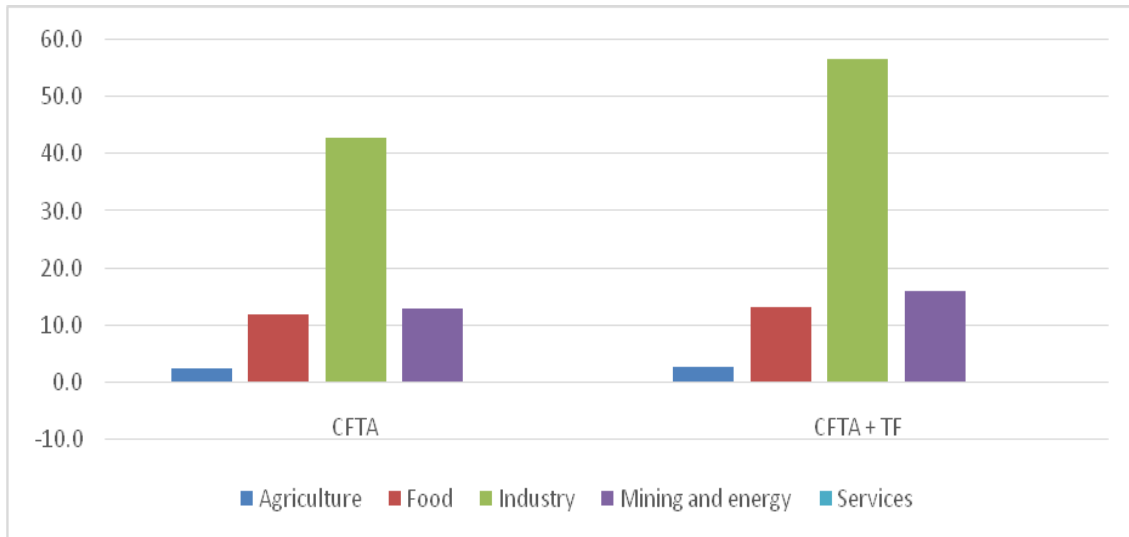
The improvement of trade facilitation measures (i.e. reduction of costs to trade across borders) would considerably enhance export gains for Africa; and also stimulate exports for third countries, thereby reversing the negative effects these economies would feel from the CFTA reform alone.

Trade expansion would be observed for nearly all bilateral relationships; elsewhere, variations would be less negative than without trade facilitation reforms. It is also important to note that African countries (both from North Africa and from the rest of the continent) would not only be able to capture significant export opportunities within Africa, on account of the CFTA, but also outside of Africa due to trade facilitation measures which would improve their competitiveness on foreign markets (see Annexes 6 and 7).

Sectoral analysis: Change in trade by main sectors.

As the primary change in exports following the implementation of the CFTA relates to trade within the continent, we focus our analysis on changes in intra-African trade and intra-North-African trade by main sectors.

Figure 8: Changes in intra-African trade by main sectors, following the implementation of the CFTA with vs. without trade facilitation reforms, USD billion, 2020



Source: Authors' calculations based on the MIRAGE model

In absolute terms, and following the establishment of the CFTA, intra-African trade would increase most in industrial products (USD 42.7 billion), bringing positive perspectives for Africa's industrialization. The industrial content of intra-African trade would expand further if trade facilitation measures were improved in addition to the CFTA (at 61.5 percent and 64.3 percent of the increase in intra-African trade explained by industrial sectors alone following the introduction of the CFTA and CFTA+TF, respectively).

These results indicate that: i) The CFTA has a positive bias towards trade of industrial products; ii) Trade facilitation measures will increase trade of industrial products compared to other product categories (Figure 8). Indeed, TF measures in addition to the CFTA reform will further increase intra-African trade of industrial products by USD 14 bn (21 percent), while additional increases would only be USD 0.3 bn (1 percent), USD 1.4 (19 percent) and USD 3.1 (14 percent) in agriculture, food and mining & energy, respectively.

It should be highlighted that the initial trade conditions play an important role in driving the results. The share of industrial products in intra-African trade tends to dominate, while exports from African countries to the rest of the world are largely skewed towards raw materials and energy commodities (see Mevel and Karingi, 2013). This also holds in the case of the NACs (see Annex 8).

Furthermore, trade of intermediate products within the continent but also with the rest of the world will increase, thanks to trade facilitation reforms, and will have an impact on the trade of final products. Trade facilitation measures could have a significant impact on the incorporation

into the global value chains as well, but also on the development of regional value chains across the continent or within North Africa; according to Portugal-Perez and Wilson (2010), trade facilitation can boost productivity.

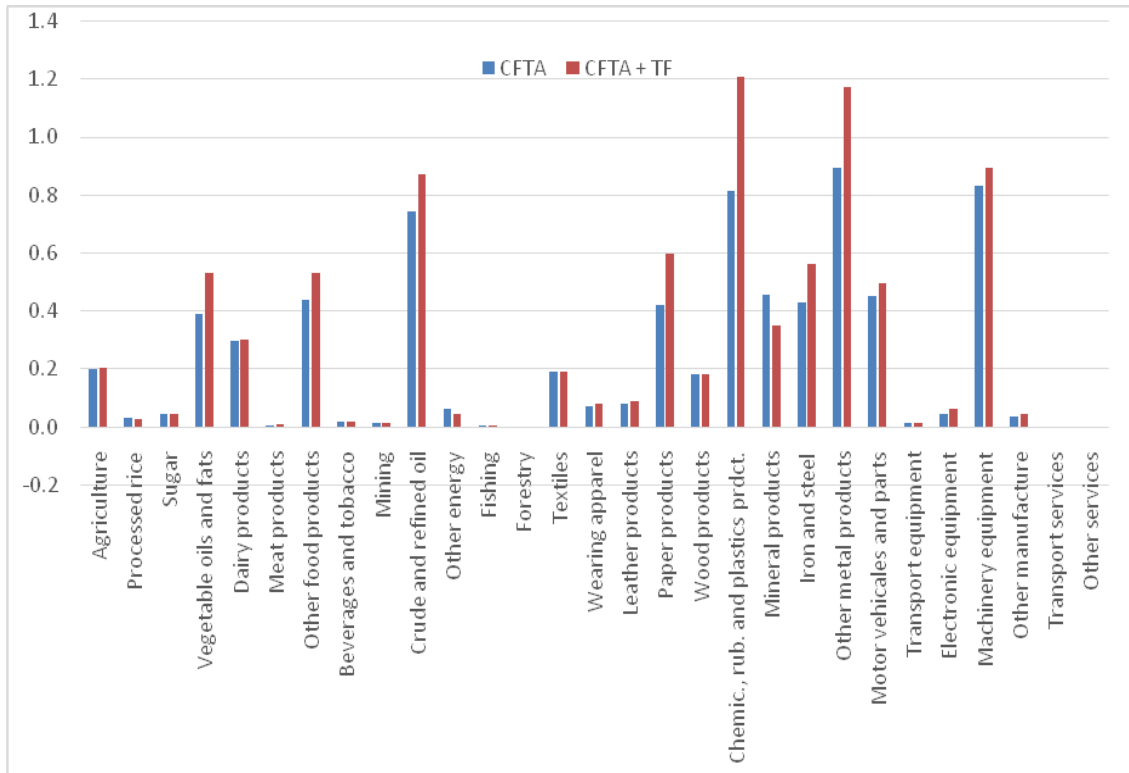
Focusing solely on North African countries' exports to all of Africa, the above still holds; with 59.0 percent and 61.4 percent of the increase in North African exports to all of Africa concentrated in industrial sectors alone following implementation of the CFTA, and the CFTA accompanied by efforts to facilitate trade across borders, respectively.

However, focusing on intra-North African trade only, the positive impact of the CFTA and trade facilitation reforms in industrialization would be much more pronounced (with about 68.8 percent and 69.7 percent of the increase in intra-African trade concentrated in industrial sectors alone following the implementation of the CFTA without and with trade facilitation reforms, respectively).

At sector level, and although crude and processed oil would represent a significant share (namely 10 percent) of the increase in intra-North African trade following CFTA reforms, the largest expansion would be for industrial products such as chemicals, metals, motor vehicles and parts, as well as machinery equipment; the increase in processed foods would also be significant for vegetable oils, dairies and other food products (see Figure 9).

The adoption of trade facilitation measures would favour most intra-North African trade in vegetable oils, mining, paper products, chemicals, metals and electronic equipment; intra-trade in those industries increasing by at least an additional 25 percent with a reduction of costs to trade across borders compared to the CFTA without trade facilitation.

Figure 9: Changes in intra-North African trade by industry, following CFTA reforms, with vs. without TF measures, USD billion, 2020



Source: Authors' calculations based on the MIRAGE model

3.1.2 If a Pan-Arab FTA is in place in addition to the CFTA

Changes at global level

The second set of scenarios implies an additional FTA with Arab League countries in addition to the CFTA. Against this background, the significant increase in intra-African trade, attributable to the CFTA, is complemented by a substantial increase in intra-Arab League trade (i.e. North Africa plus the rest of the Arab League), which would expand (in absolute terms) by nearly USD 15 billion in 2020. Export benefits for North African countries alone would expand by an additional USD 3.8 billion compared to if only the CFTA is in place (i.e. USD 12.7 billion with both the Pan-Arab FTA and CFTA versus USD 8.9 billion with only the CFTA). Countries from the rest of the Arab League would shift from a net trade diversion situation under the CFTA alone to a net trade creation if a Pan-Arab FTA is established in addition to the CFTA reform.

The trade diversion for intra-African trade is only very limited (based on the fact that some North African countries tend to export more to the rest of the Arab League at the expense of exports to African partners from North Africa as well as the rest of Africa): intra-African trade would increase by USD 69.5 billion and USD 68.9 billion with the CFTA and the CFTA plus

the Pan-Arab FTA, respectively. Third countries' exports to the Arab League (North Africa and the rest of the Arab League) would be further reduced (than if only the CFTA were implemented), but this trade diversion effect for third countries would continue to remain fairly limited.

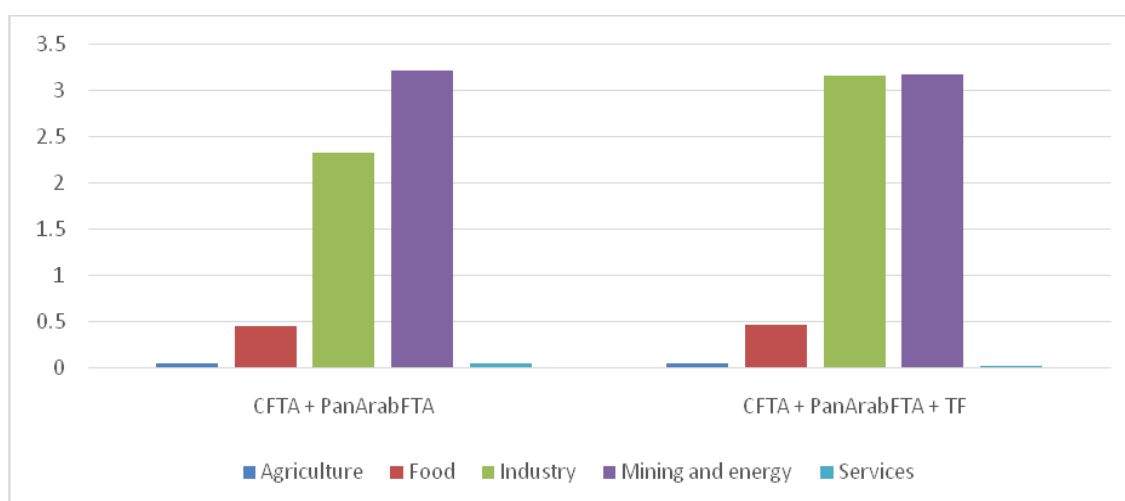
Trade facilitation would considerably expand the benefits for all Arab League countries; for other countries (i.e. those outside the Arab League), the benefits from trade facilitation would remain nearly unchanged compared to what was observed under the CFTA reform alone.

Change in North African exports to the rest of the Arab League, trade by main sector

As far as intra-Arab League trade is concerned, a Pan-Arab FTA would drive industrial products the most. However, it is worth noting that if the CFTA stimulates intra-African trade of food products more than in mining/energy and agriculture, a Pan-Arab FTA would stimulate intra-Arab League trade in mining and energy significantly more than in food and agricultural products.

This would specifically be driven by: i) The strong increase of mining and energy exports from North Africa to the rest of the Arab League following the implementation of the Pan-Arab FTA (see Figure 10); ii) A significant increase in the rest of the Arab League countries' exports to North African countries; iii) A noticeable increase in intra-Rest of Arab League's (excluding North African countries) trade in mining and energy.

Figure 10: Changes in North African countries' exports to the rest of the Arab League, by main sector, following the CFTA and Pan-Arab FTA reforms, with vs. without TF measures, USD billion, 2020

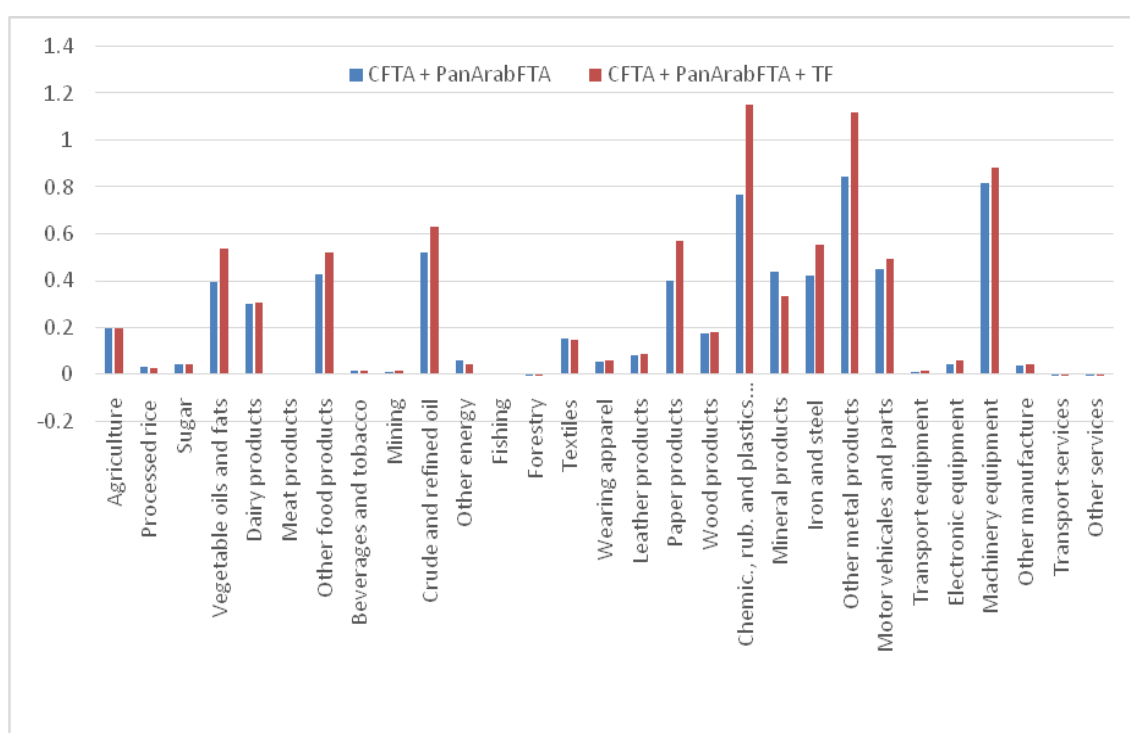


Source: Authors' calculations based on the MIRAGE model

Looking at intra-North African trade gains, and as mentioned earlier, they would only be slightly reduced if the Pan-Arab FTA were introduced in addition to the CFTA, simply because North African countries would grab export opportunities to the rest of the Arab League, thereby increasing less their exports to their North African counterparts as well as their counterparts from the rest of Africa than with the implementation of the CFTA only.

Yet this would not undermine the industrialization of intra-North African trade with or without trade facilitation measures (Figure 11).

Figure 11: Changes in intra-North African trade by industry, following the CFTA and Pan-Arab FTA reforms, with vs. without TF reforms, USD billion, 2020



Source: Authors' calculations based on the MIRAGE model

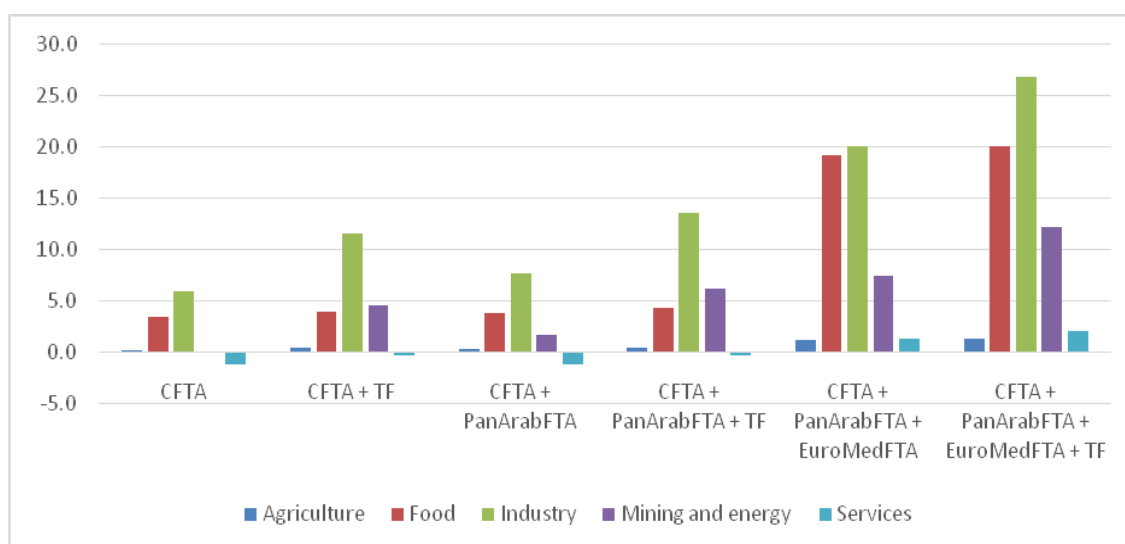
Turning to the intra-rest of Arab League trade, industrial products are also those products most stimulated, and the benefits of having a Pan-Arab FTA in place are clear. But benefits for mining and energy products in intra-trade expansion (as highlighted earlier) are also evident; it is interesting to note that trade facilitation measures matter tremendously for intra-Arab League trade of industrial products (as it is the sector that makes the most impressive progress in relative terms with additional trade facilitation reforms than without). This result confirms in a more pronounced way the previous result in the case of the introduction of the CFTA and trade facilitation measures.

3.1.3 EUROMED FTA in addition to the CFTA and the Pan-Arab FTA

When a EUROMEDFTA is established in addition to both the CFTA and the Pan-Arab FTA, trade creation becomes significant. More precisely, exports to the EU and all other countries of the Mediterranean alliance would rise considerably in general. Exports from the EU would move from a contraction of about USD 8 billion with the introduction of the CFTA plus the Pan-Arab FTA to USD 36 billion if a EUROMEDFTA is also established.

Export benefits would nearly quadruple for North Africa as a whole (in absolute terms; with the largest expansions for Morocco and Tunisia) compared to a situation where only the CFTA and the Pan-Arab FTA are in place. The greater the free trade area, the larger the export gains would be for North Africa; trade facilitation measures would further expand the benefits, with export gains in industrial products always the highest in absolute terms. But in the case of the Arab League (as seen previously) and much more pronounced under EUROMED, the share of industrial exports is considerably reduced due to the sizeable increase in North Africa's exports of food as well as energy and mining (see Figure 12).

Figure 12: Changes in North Africa's total exports by main sector, following each of the envisaged trade reforms, USD billion, 2020



Source: Authors' calculations based on the MIRAGE model

The rest of the countries that are part of EUROMED would register relatively more limited additional gains in terms of their exports (in particular, countries from the rest of the Arab League) from the benefits already derived from the CFTA and the Pan-Arab FTA.

Given size effect to this, countries outside EUROMED would witness a decline in exports compared to the CFTA and Pan-Arab FTA; following increased trade and higher competition within the EUROMED area.

Table 7: Changes in total exports by country/region, following each of the envisaged trade reforms, USD billion, 2020

	CFTA	CFTA + TF	CFTA + PanArabFTA	CFTA + PanArabFTA + TF	CFTA + PanArabFTA + EuroMedFTA	CFTA + PanArabFTA + EuroMedFTA + TF
China	-2.0	257.1	-2.7	256.3	-4.8	254.0
European Union	-6.2	158.3	-8.1	156.2	36.0	202.6
United States	-1.1	120.7	-1.4	120.3	-3.3	118.4
North Africa	8.9	20.4	12.7	24.5	49.2	62.2
<i>Algeria & Libya</i>	1.8	5.9	2.4	6.6	7.2	11.7
<i>Egypt</i>	2.7	6.2	4.9	8.7	12.7	16.7
<i>Morocco</i>	2.1	3.8	2.8	4.5	15.5	17.7
<i>Tunisia</i>	2.3	4.4	2.6	4.8	13.8	16.3
Rest of Arab League	-0.5	35.9	11.2	48.5	12.3	49.5
Rest of Africa	42.4	80.8	42.6	81.1	42.3	80.7
<i>Central Africa</i>	3.5	7.5	3.5	7.5	3.4	7.4
<i>Western Africa</i>	21.3	29.1	21.3	29.1	21.3	29.2
<i>Eastern Africa</i>	9.1	19.2	9.4	19.6	9.3	19.5
<i>Southern Africa</i>	8.6	25.0	8.5	24.9	8.2	24.7
EIE	-2.1	196.0	-3.0	195.1	-2.7	195.5
Rest of the World	-2.0	391.8	-3.6	390.1	-5.8	387.7

Source: Authors' calculations based on the MIRAGE model

As observed in other scenarios, trade facilitation would play a very positive role on trade of all countries, expanding gains for EUROMED countries and more than compensating possible trade diversions for others (see Table 7).

For North African countries, it appears that each FTA will stimulate, in relative terms, different main sectors. The breakdown by destination can help better understand these aspects (see Table 8).

If industrial products represent the largest share of North Africa's export gains to Africa (North Africa as well as the rest of Africa), mining and energy dominate North Africa's export gains to the rest of the Arab League; and food dominates North Africa's exports to the EU.

Table 8: Changes in exports from North Africa to main destinations, following each of the envisaged trade reforms, in percent, 2020

	CFTA	CFTA + TF	CFTA + PanArabFTA	CFTA + PanArabFTA + TF	CFTA + PanArabFTA + EuroMedFTA	CFTA + PanArabFTA + EuroMedFTA + TF
North Africa's exports to EU						
Agriculture	-0.1	0.1	-0.1	0.1	0.6	0.8
Food	-0.1	0.0	-0.1	0.0	14.6	15.1
Industry	-1.5	1.3	-1.3	1.6	8.2	11.9
Mining and energy	-0.6	2.9	-1.2	2.3	3.1	6.8
Services	-0.4	0.0	-0.4	0.0	0.6	1.0
Total	-2.8	4.3	-3.2	4.0	27.1	35.6
North Africa's exports to North African partners						
Agriculture	0.2	0.2	0.2	0.2	0.1	0.1
Food	1.2	1.5	1.2	1.4	0.9	1.1
Industry	4.9	5.9	4.7	5.7	2.7	3.4
Mining and energy	0.8	0.9	0.6	0.7	0.2	0.3
Services	0.0	0.0	0.0	0.0	0.0	0.0
Total	7.1	8.5	6.7	8.0	3.9	4.9
North Africa's exports to rest of Africa						
Agriculture	0.3	0.3	0.3	0.3	0.3	0.3
Food	2.5	2.6	2.5	2.6	3.2	3.3
Industry	3.2	3.7	3.2	3.7	4.3	4.9
Mining and energy	0.6	0.6	0.6	0.6	0.6	0.6
Services	0.0	0.0	0.0	0.0	0.0	0.0
Total	6.5	7.1	6.5	7.2	8.4	9.1
North Africa's exports to rest of Arab League						
Agriculture	0.0	0.0	0.0	0.0	0.0	0.0
Food	-0.1	0.0	0.3	0.3	0.4	0.5
Industry	-0.1	0.5	1.6	2.3	2.3	3.2
Mining and energy	-0.1	0.0	3.3	3.3	3.2	3.2
Services	0.0	-0.1	0.0	0.0	0.0	0.0
Total	-0.3	0.4	5.2	5.9	6.1	6.9

Source: Authors' calculations based on the MIRAGE model

3.2 Changes in tariff revenues and real income

Tariff liberalization reforms imply relatively large cuts in tariff revenues, especially for North African countries (Table 9). However, this impact differs from one country to another. While Algeria and Libya are the most negatively affected countries in case the CFTA and the Pan-Arab FTA are established, the tariff revenue impact is the most negative for Morocco and Tunisia in the case of EUROMED. The impact is more than ten times higher for the entire region if EUROMED is implemented compared to if only the CFTA is established (-58.8 percent compared to -5.6 percent); a Pan-Arab FTA would only double the fiscal impact compared to the CFTA reform alone, with a strong impact on Morocco. This is consistent with efforts to pursue this scenario, as the deeper the FTA reform, the larger the liberalization efforts, and the greater the loss in tariff revenues.

Table 9: Changes in tariff revenues by country/region, following each of the envisaged trade reforms, percent, 2020

	CFTA	CFTA + TF	CFTA + PanArabFTA	CFTA + PanArabFTA + TF	CFTA + PanArabFTA + EuroMedFTA	CFTA + PanArabFTA + EuroMedFTA + TF
European Union	-0.1	4.8	-0.1	4.7	-1.3	3.4
North Africa	-5.6	-3.8	-10.3	-8.9	-58.8	-58.2
<i>Algeria & Libya</i>	-11.5	-10.6	-15.5	-15.0	-44.6	-44.2
<i>Egypt</i>	-1.8	1.2	-6.5	-4.2	-56.7	-55.1
<i>Morocco</i>	-2.6	-1.5	-9.2	-8.2	-71.9	-72.0
<i>Tunisia</i>	-1.3	2.5	-5.1	-1.6	-74.7	-74.0
Rest of Arab League	-0.1	1.4	-7.5	-6.4	-13.7	-12.6
Rest of Africa	-25.3	-21.7	-25.6	-22.0	-26.4	-22.7
<i>Central Africa</i>	-31.5	-30.0	-31.5	-30.0	-32.0	-30.6
<i>Western Africa</i>	-33.4	-30.6	-33.4	-30.6	-34.5	-31.7
<i>Eastern Africa</i>	-29.4	-26.2	-30.5	-27.3	-30.8	-27.7
<i>Southern Africa</i>	7.2	15.4	7.1	15.3	6.4	14.5

Source: Authors' calculations based on the MIRAGE model

The implementation of trade facilitation measures will, however, reduce the relative negative tariff revenue impact in all scenarios. This is not a surprise as trade facilitation measures envisaged in the modelling exercise partly aim at improving cross-border (including customs) procedures, thus making tariff revenue collection more efficient. Indeed, if trade facilitation measures were to be implemented alone (i.e. without any tariff cut as those implied by regional integration reforms), then trade would be boosted and tariff revenues increased following the improvement of customs procedures and revenue collection. While North African countries are expected to implement liberalization reforms in the context of the CFTA, GAFTA and EUROMED, alongside the adoption of measures to facilitate trade across borders with all partners in conformity with the WTO Bali agreement, revenue collection will improve, especially *vis-à-vis* those partners that will remain outside regional trade arrangements for which North Africa will not be (immediately) granting preferential market access⁸. The reduction of the relative negative tariff revenue effect through the adoption of trade facilitation measures is particularly pronounced in the case of CFTA reforms alone as customs procedures are often less efficient within Africa than between Africa and the rest of the world.

This negative effect does not have considerable impacts on real incomes, which are either only slightly negative or slightly positive, depending on the trade reforms; but the adoption of trade facilitation measures has positive impacts on all countries' real income and even offsets the possible negative effects of liberalization reform (Table 10), thanks in particular to large trade gains, leading to improved terms of trade, re-allocation of resources towards the most efficient factors of production as well as improved tariff revenue collection.

⁸ In the case of Nepal's or Pakistan's custom reforms, annual customs revenue grew significantly following the reforms (www.wbginvestmentclimate.org), despite drastically reduced tariffs. Angola, Bangladesh, Bolivia, Ghana, Mozambique, Peru, Uganda or Jamaica experienced the same significant effect (Milner, Morrissey and Zgovu, 2008).

Table 10: Changes in real income by country/region, following each of the envisaged trade reforms, percent, 2020

	CFTA		CFTA + TF		CFTA + PanArabFTA		CFTA + PanArabFTA + TF		CFTA + PanArabFTA + EuroMedFTA		CFTA + PanArabFTA + EuroMedFTA + TF	
	%	USD bn	%	USD bn	%	USD bn	%	USD bn	%	USD bn	%	USD bn
China	0.0	-0.1	0.9	5.5	0.0	-0.1	0.9	5.4	0.0	-0.2	0.9	5.4
European Union	0.0	-0.2	0.9	16.8	0.0	-0.2	0.9	16.8	0.0	0.9	1.0	17.9
United States	0.0	0.0	0.3	5.3	0.0	0.0	0.3	5.3	0.0	0.0	0.3	5.4
North Africa	0.2	0.1	1.1	0.7	0.2	0.1	1.1	0.7	0.5	0.3	1.4	0.9
Algeria & Libya	-0.1	0.0	0.5	0.1	-0.2	0.0	0.5	0.1	-0.3	-0.1	0.3	0.1
Egypt	0.3	0.1	1.2	0.3	0.4	0.1	1.3	0.3	1.1	0.3	2.0	0.5
Morocco	0.3	0.0	1.3	0.1	0.0	0.0	1.1	0.1	-0.8	-0.1	0.3	0.0
Tunisia	1.0	0.1	3.0	0.2	0.9	0.0	2.8	0.2	2.7	0.2	4.7	0.3
Rest of Arab League	0.0	0.0	0.8	0.7	0.1	0.1	1.0	0.9	0.0	0.0	0.8	0.8
Rest of Africa	0.5	0.6	2.1	2.5	0.5	0.6	2.1	2.5	0.4	0.5	2.1	2.5
Central Africa	0.0	0.0	0.8	0.1	0.1	0.0	0.8	0.1	0.0	0.0	0.7	0.1
Western Africa	0.6	0.2	2.3	0.9	0.6	0.2	2.3	0.9	0.6	0.2	2.2	0.9
Eastern Africa	-0.1	0.0	2.0	0.5	-0.1	0.0	2.0	0.5	-0.1	0.0	1.9	0.5
Southern Africa	0.9	0.4	2.5	1.0	0.9	0.3	2.5	1.0	0.8	0.3	2.4	1.0
EIE	0.0	-0.1	1.0	7.5	0.0	-0.1	1.0	7.5	0.0	-0.2	1.0	7.4
Rest of the World	0.0	0.0	0.8	11.4	0.0	-0.1	0.8	11.4	0.0	-0.1	0.8	11.3

Source: Authors' calculations based on the MIRAGE model

Moreover, it should be highlighted that any possible and relatively limited negative effects on real incomes of North African economies can potentially be offset through other fiscal reforms made possible by an increase in trade volume and economic activity following the implementation of the various integration policies.

4. Conclusions and recommendations

Across the different phases of their economic development, North African countries have implemented voluntary policies to promote their structural transformation without significant success, particularly when their progress is compared with East Asian developing countries. Over the last decade, NACs have experienced a stagnation of the contribution of their manufacturing industries to GDP and have even faced deindustrialization to some extent during the second part of this period. Despite displaying the highest level of MVA per capita among African regions at US\$ 276, MVA accounts for one-tenth of the North African region's GDP compared to more than one-fifth in developing countries as a whole, and the growth of its manufacturing sector continues to lag behind that of its overall economy (2.64 percent compared to 2.09 percent growth of GDP and MVA during the period 2008-2013, respectively).

The North African region has failed in the last decade to significantly expand its industrial base. The region has not exploited the potential the manufacturing sector offers to sustain economic growth in the region and achieve significant structural transformation. It is worth reiterating that two distinct patterns of industrial development co-exist in the region: on the one hand, Algeria and Libya, rich in natural resources, have a meagre industrial base, calling for the urgent diversification of their economies; on the other hand, the relatively larger manufacturing base of

Tunisia, Egypt and Morocco have stagnated or declined over the last years, partly as a consequence of the political and social changes the region has undergone and among other reasons, due to their strong dependence on a limited number of markets severely affected by the recent international crisis.

Trade policy can make significant contributions, particularly to increase processing to lead to higher value-added. Regional trade agreements may constitute a key instrument to raise participation of NACs in global trade. The positive growth prospects of the African continent, related to the rapid urbanization and growth of the middle class, may convert the Continental Free Trade Agreement (CFTA) into a serious opportunity for North African economies to expand their manufactured exports. Given their traditional trade relations with Europe and to a lesser extent with the rest of the Arab countries, this assumption has been assessed as well within the context of the Great Arab Free Trade Area including the countries of the League of Arab States, and the EUROMED process with the European Union.

In this study, three sets of scenarios were empirically assessed using CGE modelling: i) establishment of the CFTA without and with trade facilitation reforms; ii) effective implementation of the GAFTA in the context of the CFTA without and with the adoption of trade facilitation measures; iii) EUROMED fully operational with the GAFTA and the CFTA also in place, without and with measures to facilitate cross-border trade.

Our findings indicate that, in absolute terms, the establishment of the CFTA would boost intra-African trade, with industrial products thereby being stimulated the most (with as much as USD 42.7 billion out of the USD 69.5 billion increase in intra-African trade found in just industrial products), generating positive perspectives for Africa's industrialization. The industrial content of intra-African trade would expand further if trade facilitation measures were improved in addition to the introduction of the CFTA. Indeed, when trade facilitation measures are adopted within the context of the CFTA reform, intra-African trade of industrial products increases further by USD 14 billion. Focusing solely on the impact on intra-North African trade, the positive effects of the CFTA and trade facilitation reforms on industrialization would be even more pronounced.

A Pan-Arab FTA established in addition to the CFTA would further increase trade of industrial products for North African countries as well as for other LAS countries. However, it is worth noting that the share of North African countries' trade gains in industrial products would be noticeably reduced compared to the CFTA reform alone due to the strong increase in intra-Arab League trade (and especially exports and imports of North African countries to/from Arab

League partners) of mining/energy, but also of food. In this case, trade facilitation measures matter tremendously for North African trade of industrial products, as it is the industry with the largest progression if trade facilitation reforms are adopted, in relative terms and compared to a situation without trade facilitation.

When a EUROMED FTA is established along with both the CFTA and Pan-Arab FTA, the additional trade generated is considerable. More precisely, exports to the EU and all other countries of the Mediterranean alliance, and especially from NACs, would generally rise tremendously; especially if costs of cross-border trade are reduced. However, as observed with the Pan-Arab FTA and although in absolute terms, North African exports of industrial products still increase most with the establishment of EUROMED in addition to that of the CFTA and GAFTA, the share of industrial products in North Africa's export gains would shrink under the strong increase of food exports from North Africa to the EU following the formation of the EUROMED FTA.

In other words, it appears that each FTA configuration will, in relative terms, stimulate North African countries' exports from different main industries most. Whereas industrial products represent the largest share of North Africa's export gains to Africa in general (North Africa as well as the rest of Africa), mining and energy dominate North Africa's export gains to the rest of the Arab League, while food dominates North Africa's exports to the EU. This is largely attributable to the currently very different trade structures between North Africa and its partners from Africa, the Arab League and the EU.

Therefore, the establishment of the CFTA, accompanied by trade facilitation measures, appears to be crucial in providing support for the industrialization of North African economies. Indeed, if the GAFTA and EUROMED were to be established without the CFTA in place, then the pro-industrialization effects would be much more marginal for North African economies.

Obviously, regional integration reforms that offer clear new market opportunities for North African nations come with a cost, as they generate tariff revenue losses which can lead to mitigated real income effects (some countries being affected more negatively than others). However, complementary policies such as the adoption of trade facilitation measures are critical to guaranteeing better distributed outcomes and real income gains for all North African countries, specifically and all African economies in general. These measures also help to considerably boost further intra-regional trade and export-led industrialization. These outcomes will of course only be possible if: i) adjustment efforts are made to tackle tariff revenue contractions at country level (including efforts to limit illicit financial outflows through trade

mispricing; see Mevel et al. 2014); ii) exemptions from trade liberalization efforts (such as so-called “sensitive products”) are prohibited or strictly limited; iii) reforms are fully implemented and effective; and, iv) coordination is improved between trade and industrial policy.

Furthermore, trade facilitation reforms will have the maximum impact if an important endeavour is simultaneously undertaken in trade infrastructure; highlighting the key importance of financial resources dedicated to these efforts. Generalizing the establishment of common funds and regional development banks to finance key infrastructure projects and other projects aiming at easing trade across borders will be of major importance, as they often benefit a large number of countries and facilitate the development of regional value chains. Against this background, the aid for trade projects in particular should focus more on the objective of boosting intra-regional trade.

References

- Abarche, J., GO, D. S and Page, J (2008), Is Africa at a turning point?, Policy Research Working Paper 4519, Africa Region, Washington, The World Bank.
- AfDB, OECD, UNDP, ECA (2013) African Economic Outlook “Structural Transformation and Natural Resources” – Regional Edition / Northern Africa, OECD publishing.
- African Union Commission (1991), “Treaty Establishing the African Economic Community”.
- Ben Hammouda, H., Oulmane, N. and Sadni Jallab, M (2009) "D'une diversification spontanée à une diversification organisée. Quelles politiques pour diversifier les économies d'Afrique du Nord ?," *Revue économique*, Presses de Sciences-Po, vol. 60(1), pages 133-155.
- Ben Hammouda, H. and P.N. Osakwe (2006), “Global Trade Models and Economic Policy Analyses: Relevance, Risks, and Repercussions for Africa”, ATPC Work in Progress No.47, UNECA
- Bigsten, A. and Söderbom M. (2011), Industrial Strategies for Economic Recovery and Long-term Growth in Africa, *African Development Review* 23:2, pp. 161-171.
- Blanchflower, D.G. and A.J. Oswald (2005), “The Wage Curve Reloaded”, Discussion Paper Series, IZA DP No. 1665.
- Bouët, A., B. Dimaranan, H. Valin (2010), “Modeling the Global Trade and Environment Impacts of Biofuel Policies”, IPFRI Discussion Paper No. 01018.
- Boumellassa, H., D. Laborde, C. Mitaritonna (2009), “A Picture of Tariff Protection Across the World in 2004: MAcMap-HS6, Version 2”, IPFRI Discussion Paper No. 00903.
- Decreux, Y., H. Valin (2007), “MIRAGE, Updated Version of the Model for Trade Policy Analysis: Focus on Agricultural and Dynamics”, CEPII, Working paper No 2007-15.
- Klinger, Bailey (2009) “Is south–south trade a testing ground for structural transformation?” Center for International Development, Harvard University.
- Lall, S. (2005) “Is African industry competing?”, Working Paper Number 121, Queen Elizabeth House, University of Oxford.
- Mevel S. and Karingi S. (2012) “Deepening Regional Integration in Africa: A Computable General Equilibrium Assessment of the Establishment of a Continental Free Trade Area followed by a Continental Customs Union”, Research paper submitted and presented at the 15th Annual Conference on Global Economic Analysis, Geneva, Switzerland.
- Mevel S. and Karingi S. (2013) “Towards a Continental Free Trade Area in Africa – A CGE Modeling Assessment with a Focus on Agriculture”, Chapter 8 in “Shared Harvests: Agriculture, Trade and Employment”. ILO-UNCTAD. Geneva.
- Mevel S., Ofa S.V. and Karingi S. (2014) “Quantifying Illicit Financial Flows from Africa through Trade Mis-Pricing and Assessing their Incidence on African Economies”. In *Regional Integration and Policy Challenges in Africa*, ed. A. Elhiraika, A. Mukungu, and W. Nyoike, 220-232. London, UK: Palgrave MacMillan.

- Milner, C., Morrissey, O. and Zgovu, E. (2008) “Trade Facilitation in Developing Countries” CREDIT research Paper 08/05.
- Minor, Peter and David Hummels(2011) “*Time as a Barrier to Trade: A GTAP Database of ad valorem Trade Time Costs*”, Latest version of the Research Report submitted to GTAP 11th Annual Conference, Helsinki, Finland
- Moll De Alba, J. (2014) “Industrial development in North African countries –A statistical profile”, UNIDO Working Paper03/2014, Vienna.
- Narayanan, G., Badri, A. Aguiar and R. McDougall, Eds. 2012. *Global Trade, Assistance, and Production: The GTAP 8 Data Base*, Center for Global Trade Analysis, Purdue University.
- Page, J. (2011) “Should Africa Industrialize?”, United Nations University, UNU-Wider Working Paper No.2011/47, Helsinki.
- Page, J. (2012) “Can Africa Industrialize?”, *Journal of African Economies*, Vol. 21, AERC Supplement 2, pp. ii86–ii125.
- Park, S-C. (2002). “Measuring tariff equivalents in cross border trade in services”, KIEP Working Paper 02-15.
- Portugal-Perez, A. and J.S. Wilson (2010)“Export performance and trade facilitation reform : hard and soft infrastructure” Policy Research Working Paper Series 5261, The World Bank.
- Szirmai, A. (2012) “Industrialisation as an engine of growth in developing countries, 1950–2005”, *Structural Change and Economic Dynamics*, 3 (4), 406-420.
- UNCTAD and UNIDO (2011), *Fostering Industrial Development in Africa in the New Global Environment*, Economic Development in Africa Report 2011, United Nations publication, New York and Geneva.
- UNCTAD (2013). *Economic Development in Africa Report 2013. Intra-African Trade: Unlocking African Private Sector Dynamism*. United Nations publication.
- UNECA, AUC, and AfDB (2010), “Assessing Regional Integration in Africa IV: Enhancing Intra-African Trade”, United Nations Publication.
- UNIDO (2009), *Breaking in and Moving up: New Industrial Challenges for the Bottom Billion and the Middle-income Countries*, Industrial Development Report 2009, Vienna, Austria.
- UNIDO (2013a), *The Industrial Competitiveness of Nations, Looking back, forging ahead, Competitive Industrial Performance Report 2012/2013*, Vienna, Austria.
- UNIDO (2013b), *Sustaining Employment Growth: The Role of Manufacturing and Structural Change*, Industrial Development Report 2013, Vienna, Austria.
- USAID (2007), “Calculating Tariff Equivalents for Time in Trade”.
- Warren, T. (2000) “The identification of impediments to trade and investment in telecommunications services”, in Findlay, C. and Warren, T. (eds) 2000, *Impediments to Trade in Services: Measurement and Policy Implications*, Routledge, London and New York, pp. 71-84.

World Bank (2005) “Global Economic Prospects 2005: Trade, Regionalism and Development”.

World Bank (2013) “*Doing Business: Trading Across Borders*”, 2013 Report.

Annex 1: Key features of the MIRAGE CGE model

On the demand side of the model, a single representative agent in each region is assumed. This agent devotes a fixed share of its income to savings and the rest is spent on the consumption of goods. A Linear Expenditure System–Constant Elasticity of Substitution (LES–CES) function is used to represent the agent’s preferences across sectors. The model makes possible horizontal (variety) and vertical (quality) differentiations in goods, for example, goods produced in developed countries are assumed to be of relatively higher quality than those produced in developing countries (i.e. Armington hypothesis).

On the supply side, the model relies on a Leontief function which assumes perfect complementarity between value-added and intermediate consumption. Unskilled and skilled labour, capital, land and natural resources are the five factors of production contributing to the value-added. Skilled labour and capital are supposed to be more substitutable between themselves than with other factors. Moreover, skilled labour is perfectly mobile between sectors. Unskilled labour, however, is imperfectly mobile between agricultural and non-agricultural sectors but perfect mobility is assumed among each group of sectors. Demographic forecast provided by the World Bank⁹ is used to exogenously set the rates of variations of the labour. Land is imperfectly mobile between sectors. Natural resources and capital are both sector-specific; with natural resources being constant and capital accumulative. Investment is the sole adjustment variable for capital stocks; the capital stock for the current year, for instance, depends on the investment made for the same year and the capital stock from the previous year, which has depreciated. Additionally, GDP growth is forecasted affecting total factor productivity¹⁰.

A full employment of factor endowments is assumed on account of flexible wages that maintain the aggregate employment constant in all regions. While such a hypothesis may appear unsatisfactory, especially in the African context, it is motivated by at least three reasons. First, unemployment rates for African economies—when available—are not necessarily reliable. Second, the alternative which assumes fixed nominal or real wages to represent unemployment in CGE models is not less disputable than the full employment hypothesis. Indeed, this assumption does not consider the wage determination process in developing countries (see Ben Hammouda and Osakwe, 2006). Third, the full employment assumption is coherent with the medium to long-term effects resulting from shocks analysed using CGE models (see Bouët et al. 2010).

⁹ See World Development Indicators from the World Bank.

¹⁰ See World Bank publication: “Global Economic Prospects 2005: Trade, Regionalism, and Development”.

The current account of each region is maintained constant and fixed to its initial value to ensure the macroeconomic closure of the MIRAGE model; any possible disequilibrium of the current account is to be offset by an adjustment of the real exchange rate. In other words, when trade is stimulated by a specific reform (e.g. liberalization involving a reduction in tariff barriers), then the real exchange rates appreciate if exports increase more than imports or depreciate when exports increase less than imports.

Annex 2: Geographic decomposition determined for the modelling exercise

#	Country/Region	Main region
1	Egypt	North Africa
2	Morocco	North Africa
3	Tunisia	North Africa
4	Rest of North Africa (i.e. Algeria & Libya)	North Africa
5	Central Africa	Rest of Africa
6	Western Africa	Rest of Africa
7	Eastern Africa	Rest of Africa
8	Southern Africa	Rest of Africa
9	Rest of Arab League	Rest of Arab League
10	European Union	European Union (28 members)
11	United States	United States
12	China	China
13	Emerging industrialized	Emerging industrialized economies
14	Rest of the world	Rest of the world

Annex 3: Sectoral decomposition determined for the modelling exercise

#	Sector	Main Sector
1	Agriculture	Agriculture
2	Dairy products	Processed food
3	Meat products	Processed food
4	Vegetable oils and fats	Processed food
5	Processed rice	Processed food
6	Sugar	Processed food
7	Other food products	Processed food
8	Beverages and tobacco	Processed food
9	Other energy	Mining and energy
10	Crude and refined oil	Mining and energy
11	Mining	Mining and energy
12	Fishing	Industry
13	Forestry	Industry
14	Textiles	Industry
15	Wearing apparel	Industry
16	Leather products	Industry
17	Wood products	Industry
18	Paper products	Industry
19	Chemicals, rubber and plastics products	Industry
20	Mineral products	Industry
21	Iron and steel	Industry
22	Other metal products	Industry
23	Motor vehicles and parts	Industry
24	Transport equipment	Industry
25	Electronic equipment	Industry
26	Machinery equipment	Industry
27	Other manufacture	Industry
28	Other services	Services
29	Transport services	Services

Annex 4: Changes in bilateral trade, following the CFTA reforms (without trade facilitation measures), percent, 2020

		Importer							
		China	European Union	United States	North Africa	Rest of Arab League	Rest of Africa	EIE	Rest of the World
Exporter	China		0.1	0.1	-0.7	0.1	-8.2	0.1	0.1
	European Union	-0.1		0.0	-0.9	0.0	-3.5	0.0	0.0
	United States	-0.1	0.0		0.4	0.0	-1.7	0.0	0.0
	North Africa	-1.5	-1.6	-0.7	73.1	-2.6	126.1	-1.3	-2.2
	<i>Algeria & Libya</i>	-0.1	0.0	0.1	33.6	2.6	146.4	0.1	0.1
	<i>Egypt</i>	-1.9	-2.7	-2.3	88.2	-2.8	77.2	-3.1	-2.7
	<i>Morocco</i>	-3.5	-2.7	-2.5	26.1	-5.2	240.8	-2.4	-2.7
	<i>Tunisia</i>	-6.8	-6.2	-6.4	116.1	-6.3	127.4	-5.9	-6.2
	Rest of Arab League	0.0	0.0	0.2	-0.5	0.1	-4.4	0.1	0.0
	Rest of Africa	-1.2	-3.6	-2.8	114.3	-2.3	72.7	-4.0	-3.9
	<i>Central Africa</i>	0.5	1.7	0.6	165.9	1.6	62.8	0.9	1.0
	<i>Western Africa</i>	-3.7	-3.2	-3.2	59.1	-3.6	126.3	-3.4	-3.3
	<i>Eastern Africa</i>	1.0	2.4	1.1	38.8	3.5	39.6	1.9	2.2
	<i>Southern Africa</i>	-6.1	-8.6	-9.5	284.6	-9.5	58.1	-10.3	-9.0
	EIE	0.0	0.1	0.1	-1.5	0.0	-6.6	0.1	0.1
	Rest of the World	-0.1	0.0	0.0	-0.6	0.0	-1.3	0.0	0.0

Source: Authors' calculations based on the MIRAGE model

Annex 5: Changes in bilateral trade, following the CFTA reforms (without trade facilitation measures), USD billion, 2020

		Importer							
		China	European Union	United States	North Africa	Rest of Arab League	Rest of Africa	EIE	Rest of the World
Exporter	China		1.1	0.8	-0.2	0.1	-5.5	0.3	1.4
	European Union	-0.2		0.2	-1.1	0.0	-5.2	-0.1	0.2
	United States	-0.2	0.0		0.1	0.0	-0.6	-0.2	-0.1
	North Africa	-0.2	-2.8	-0.3	7.1	-0.3	6.5	-0.5	-0.6
	<i>Algeria & Libya</i>	<i>0.0</i>	<i>0.0</i>	<i>0.0</i>	1.2	<i>0.0</i>	<i>0.5</i>	<i>0.0</i>	<i>0.0</i>
	<i>Egypt</i>	<i>-0.1</i>	<i>-0.9</i>	<i>-0.2</i>	2.4	<i>-0.2</i>	2.3	<i>-0.3</i>	<i>-0.3</i>
	<i>Morocco</i>	<i>-0.1</i>	<i>-0.5</i>	<i>-0.1</i>	<i>0.2</i>	<i>0.0</i>	2.9	<i>-0.1</i>	<i>-0.1</i>
	<i>Tunisia</i>	<i>0.0</i>	<i>-1.4</i>	<i>-0.1</i>	3.3	<i>0.0</i>	<i>0.8</i>	<i>-0.1</i>	<i>-0.2</i>
	Rest of Arab League	0.0	0.0	0.2	-0.1	0.0	-1.0	0.2	0.2
	Rest of Africa	-1.0	-4.5	-2.8	3.8	-0.3	52.0	-2.3	-2.7
	<i>Central Africa</i>	<i>0.2</i>	<i>0.3</i>	<i>0.2</i>	<i>0.4</i>	<i>0.0</i>	2.2	<i>0.1</i>	<i>0.1</i>
	<i>Western Africa</i>	<i>-0.4</i>	<i>-1.2</i>	<i>-1.6</i>	<i>0.7</i>	<i>-0.1</i>	25.3	<i>-1.0</i>	<i>-0.4</i>
	<i>Eastern Africa</i>	<i>0.2</i>	<i>0.6</i>	<i>0.1</i>	<i>0.5</i>	<i>0.2</i>	7.2	<i>0.1</i>	<i>0.4</i>
	<i>Southern Africa</i>	<i>-1.0</i>	<i>-4.1</i>	<i>-1.4</i>	2.3	<i>-0.4</i>	17.3	<i>-1.4</i>	<i>-2.7</i>
	EIE	0.0	0.5	0.7	-0.5	0.0	-3.5	0.1	0.5
Rest of the World	-1.0	0.0	0.3	-0.2	0.0	-1.0	-0.1	0.0	

Source: Authors' calculations based on the MIRAGE model

Annex 6: Changes in bilateral trade, following the CFTA reforms with trade facilitation measures, percent, 2020

		Importer							
		China	European Union	United States	North Africa	Rest of Arab League	Rest of Africa	EIE	Rest of the World
Exporter	China		8.9	5.6	7.0	7.2	6.0	13.9	9.7
	European Union	8.7		3.1	3.2	1.9	0.8	7.3	5.9
	United States	9.9	3.9		1.7	2.1	2.5	7.3	6.7
	North Africa	-0.6	2.5	0.8		3.1	137.9	0.2	-0.2
	<i>Algeria & Libya</i>	-3.2	2.9	1.4	38.2	10.3	151.5	4.3	-1.2
	<i>Egypt</i>	4.5	3.1	-0.9	101.8	3.3	91.5	-5.8	0.6
	<i>Morocco</i>	1.6	3.2	0.6	39.3	-3.4	247.7	-4.2	1.8
	<i>Tunisia</i>	-3.6	-0.7	-4.0	142.3	-4.2	139.5	-5.9	-4.7
	Rest of Arab League	3.5	5.4	-0.2	9.6	14.6	5.7	0.9	4.0
	Rest of Africa	2.8	3.1	0.8	131.5	3.0	95.2	-2.0	4.3
	<i>Central Africa</i>	3.1	9.5	3.9	228.4	13.4	69.4	2.1	3.5
	<i>Western Africa</i>	-0.5	3.2	-0.2	67.9	-2.3	136.7	-2.4	7.8
	<i>Eastern Africa</i>	7.0	9.0	7.3	55.5	12.6	66.6	7.7	11.3
	<i>Southern Africa</i>	0.2	-1.8	-4.6	301.7	-8.5	87.7	-7.2	-0.8
	EIE	9.9	5.9	5.8	2.6	5.3	3.1	13.6	10.6
	Rest of the World	10.2	3.7	4.9	1.4	4.2	2.7	8.9	6.2

Source: Authors' calculations based on the MIRAGE model

Annex 7: Changes in bilateral trade, following the CFTA reforms with trade facilitation measures, USD billion, 2020

		Importer							
		China	European Union	United States	North Africa	Rest of Arab League	Rest of Africa	EIE	Rest of the World
Exporter	China		63.2	41.8	2.2	5.6	4.0	42.6	97.9
	European Union	29.0		18.1	3.8	3.3	1.2	37.5	65.3
	United States	19.4	17.3		0.4	1.4	0.9	26.9	54.4
	North Africa	-0.1	4.3	0.4	8.5	0.4	7.1	0.1	-0.1
	<i>Algeria & Libya</i>	-0.2	2.8	0.5	1.3	0.1	0.5	1.0	-0.1
	<i>Egypt</i>	0.1	1.0	-0.1	2.8	0.3	2.7	-0.7	0.1
	<i>Morocco</i>	0.0	0.6	0.0	0.3	0.0	3.0	-0.2	0.1
	<i>Tunisia</i>	0.0	-0.2	-0.1	4.1	0.0	0.9	-0.1	-0.1
	Rest of Arab League	3.1	6.8	-0.2	1.5	9.1	1.3	1.3	13.2
	Rest of Africa	2.4	3.8	0.8	4.4	0.3	68.1	-1.1	3.0
	<i>Central Africa</i>	1.2	1.5	1.2	0.6	0.1	2.5	0.2	0.3
	<i>Western Africa</i>	-0.1	1.2	-0.1	0.8	0.0	27.3	-0.7	1.0
	<i>Eastern Africa</i>	1.2	2.0	0.4	0.7	0.6	12.1	0.5	1.9
	<i>Southern Africa</i>	0.0	-0.9	-0.7	2.5	-0.3	26.1	-1.0	-0.3
	EIE	30.6	29.3	33.0	0.8	4.6	1.6	36.5	59.6
	Rest of the World	146.4	47.0	50.1	0.6	5.7	2.1	51.6	88.4

Source: Authors' calculations based on the MIRAGE model

Annex 8: Distribution by main sectors of NACs' exports to selected destinations, percent, average 2010-2012

		NACs	Rest of Africa	Rest of the world
NACs	All food items	17.5	24.7	4.6
	Agricultural raw materials	1.0	2.3	0.5
	Ores and metals	3.3	3.3	2.4
	Fuels	36.0	12.2	71.4
	Manufactured goods	42.2	47.5	19.5
	Others n.e.c.	0.0	9.9	1.5
Algeria	All food items	2.7	32.1	0.4
	Agricultural raw materials	0.0	0.0	0.0
	Ores and metals	0.5	1.5	0.3
	Fuels	93.6	57.9	98.6
	Manufactured goods	3.2	8.5	0.8
	Others n.e.c.	0.0	0.0	0.0
Egypt	All food items	24.1	20.6	12.4
	Agricultural raw materials	1.5	4.0	2.1
	Ores and metals	7.0	4.4	5.9
	Fuels	4.2	3.5	39.7
	Manufactured goods	63.2	44.7	37.2
	Others n.e.c.	0.0	22.7	2.8
Libya	All food items	0.5	0.4	0.0
	Agricultural raw materials	0.6	0.7	0.0
	Ores and metals	1.1	0.2	0.1
	Fuels	63.1	0.5	97.0
	Manufactured goods	34.7	98.2	2.0
	Others n.e.c.	0.0	0.0	0.8
Morocco	All food items	16.7	32.8	17.8
	Agricultural raw materials	4.3	1.1	1.2
	Ores and metals	7.3	2.1	11.9
	Fuels	6.8	9.6	4.4
	Manufactured goods	64.4	54.3	63.7
	Others n.e.c.	0.5	0.0	0.9
Sudan	All food items	82.3	5.5	4.7
	Agricultural raw materials	14.1	0.2	1.3
	Ores and metals	0.2	0.3	0.6
	Fuels	0.0	88.6	74.5
	Manufactured goods	3.3	5.2	1.1
	Others n.e.c.	0.0	0.2	17.8
Tunisia	All food items	32.9	26.4	6.2
	Agricultural raw materials	0.3	1.4	0.5
	Ores and metals	1.4	4.7	1.6
	Fuels	1.1	0.7	17.1
	Manufactured goods	64.4	66.8	74.7
	Others n.e.c.	0.0	0.0	0.0

Source: Authors' calculations based on UNCTADStat; accessed on 01 May 2015



UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

Vienna International Centre · P.O. Box 300 9 · 1400 Vienna · Austria
Tel.: (+43-1) 26026-0 · E-mail: info@unido.org
www.unido.org