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Abstract

This paper analyzes the pattern of deindustrialization in MENA countries to emphasize its main features and impacts on economic development. Using data from 1960 to 2018, we examine deindustrialization patterns and investigate their influence on overall growth over different periods. Since the contribution of services to growth has increased in recent decades, we also investigate the role and impact of services on growth. The main results suggest that MENA countries started to deindustrialize at a low level of GDP per capita, which is a sign of premature deindustrialization. When deindustrialization occurs at an earlier stage of development, countries don't benefit from the manufacturing sector's opportunities and externalities, such as technological penetration, skill development, openness, and technological transfers. The results also suggest that manufacturing weight exerts a positive effect on overall growth over the different considered periods in Tunisia, thereby confirming its role as an engine of growth. However, manufacturing weight has shown a declining positive impact over time as it has been confined to low-technology, assembly-oriented, and outsourced operations characterized by a lack of sophistication. The results also show a persistent negative relationship between service weight and GDP per capita growth over the considered periods. In fact, the expansion of the services sector in recent decades was largely driven by low-productivity services such as trade (largely in the informal sector), government services, and (to a lesser extent) modern, highly productive services.

Keywords: Deindustrialization, economic development, MENA countries
JEL Classifications: L6, L8

ملخص

تحلل هذه الورقة نمط انعدام التصنيع في بلدان الشرق الأوسط وشمال أفريقيا للتأكيد على سماته وآثاره الرئيسية على التنمية الاقتصادية. باستخدام البيانات من عام 1960 إلى عام 2018، نقوم بفحص أنماط تراجع التصنيع والتحقيق في تأثيرها على النمو الإجمالي على مدى فترات مختلفة. ونظرًا لأن مساهمة الخدمات في النمو قد زادت في العقود الأخيرة، فإننا نبحث أيضًا في دور وأثر الخدمات على النمو. تشير النتائج الرئيسية إلى أن بلدان الشرق الأوسط وشمال أفريقيا قد بدأت في التقليل من التصنيع بمستوى منخفض من نصيب الفرد من الناتج المحلي الإجمالي، وهذا دليل على تراجع التصنيع قبل الأوان. لأنه عندما يحدث تراجع التصنيع في مرحلة مبكرة من التنمية، لا تستفيد البلدان من فرص قطاع التصنيع والآثار الخارجية، مثل الاختراق التكنولوجي وتنمية المهارات والانفتاح والتحويلات التكنولوجية. كما تشير النتائج إلى أن وزن التصنيع له تأثير إيجابي على النمو الإجمالي خلال الفترات المختلفة المدروسة في تونس، مما يؤكد دوره كمحرك للنمو. ومع ذلك، فقد أظهر وزن التصنيع تأثيرًا إيجابيًا متناقصًا بمرور الوقت حيث اقتصر على العمليات منخفضة التكنولوجيا والموجهة نحو التجميع والاستعانة بمصادر خارجية والتي تتميز بنقص التطور. تظهر النتائج أيضًا علاقة سلبية مستمرة بين وزن الخدمة ونمو الناتج المحلي الإجمالي للفرد خلال الفترات المدروسة. والواقع أن التوسع في قطاع الخدمات في العقود الأخيرة كان مدفوعا إلى حد كبير بالخدمات المنخفضة الإنتاجية مثل التجارة (في القطاع غير الرسمي إلى حد كبير)، والخدمات الحكومية، والخدمات الحديثة العالية الإنتاج (بدرجة أقل).

1. Introduction

In recent decades, MENA countries have been experiencing deindustrialization at a low level of development, marked by a shrinkage in the weight of manufacturing and industry in both value-added and employment despite low income per capita. This resulted in delayed structural transformation as well as failed economic development (Mouelhi and Ghazali, 2020). MENA countries have gotten stuck in a "middle-income trap" defined by Kirsh (2018) as a situation where the economy is squeezed "between a low-wage poor-country and an innovation based high-wage, rich-country equilibrium." The process of deindustrialization in the MENA region is relatively similar to that experienced by Latin American countries, as evidenced by the premature decline in the weight of manufacturing, reaching peak levels in the 1990s followed by a subsequent decline or stagnation (Mouelhi and Mechergui, 2023). The presence of intensive competition, the absence of an effective industrial policy, and, most importantly, the lack of competitiveness are seen as the main culprits of premature deindustrialization.

Developed and emergent countries have also experienced deindustrialization but at much higher levels of per capita income, i.e., after achieving high levels of development. Deindustrialization is seen as a natural process in mature economies, resulting from a productivity increase in the manufacturing sector and/or a structural change from industry to a more productive services sector (Beg et al., 2017). Therefore, deindustrialization is not necessarily a negative process if it reflects the emergence of other primary or tertiary sectors in which countries may have larger competitive advantages.

Historically, industrialization has been the origin of the growth and development of today's high-income countries (Rodrick, 2016). It has also played a key role in unleashing the growth potential of East Asian countries over the last two decades (Attiah, 2019). Given that industry is central to economic performance and job creation, this issue becomes of particular importance in the context of the weakened competitiveness, low economic growth rates, and steady high unemployment currently faced by MENA countries.

A large number of studies have dealt with the deindustrialization issue in developed countries by exploring its intensity, determinants, and consequences (Vu et al., 2021; Liboreiro et al., 2021; Alderson, 1999; Rowthorn et al., 1997). It appears as a natural outcome of economic development and integration into the globalization process and is generally associated with improving living standards. However, few studies have focused on developing countries (Rodrick, 2016; Naved, 2015; Kassem, 2010) and particularly on the MENA region (Kirsh, 2018) due to the lack of long-time series data.

Therefore, the first objective of this paper is to analyze the pattern of deindustrialization in a sample of MENA countries—Tunisia, Morocco, and Egypt—in order to emphasize its main features. The second objective is to explore the impacts of such premature deindustrialization on the overall growth and economic development of these countries. The paper concludes with some proposals to reindustrialize and boost growth in MENA countries.

The main research questions addressed in this paper are as follows:

- What is the scope and pattern of deindustrialization in MENA countries?
- What are the main causes of deindustrialization?
- Is manufacturing still the main driver of growth and economic development?
- What role do services play in economic development?

This paper is organized as follows. Section 2 reviews the stylized facts related to the deindustrialization process in Egypt, Morocco, and Tunisia. Section 3 presents a literature review on the determinants of deindustrialization in both developing and developed countries. Section 4 addresses the impact of deindustrialization on growth and economic development. Section 5 briefly recalls the ongoing controversial debate on the role of manufacturing versus services in economic development. Section 6 displays an empirical analysis conducted on the Tunisian case. Finally, section 7 provides the main conclusions and some recommendations.

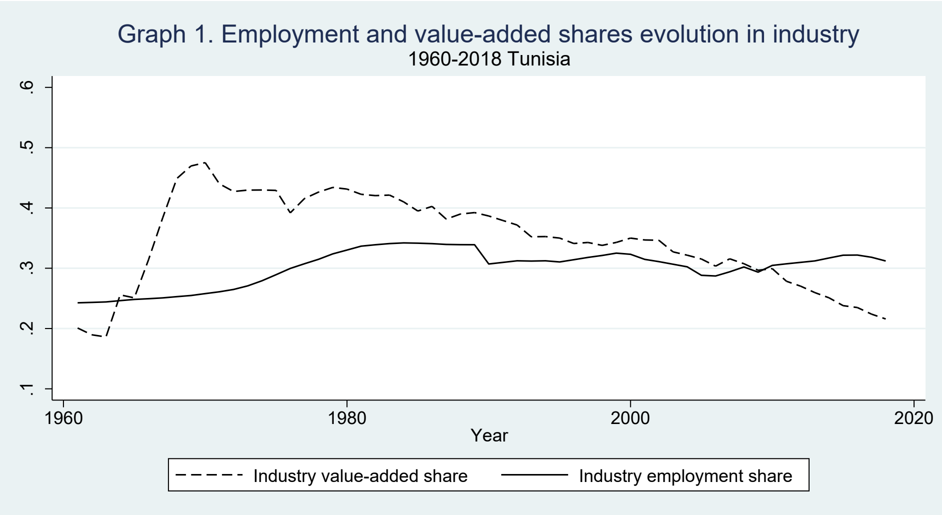
2. The patterns of deindustrialization in Tunisia, Morocco, and Egypt

Figures 1 to 6 present the evolution of the shares of industry/manufacturing in GDP and employment in Tunisia, Morocco, and Egypt. The choice of these three countries is justified by the similarity of their economic models and their industrialization/deindustrialization processes, as well as the availability of data. The three countries[3] initiated and achieved some progress in industrialization over the 1970s, 1980s, and early 1990s. The 1970-90 period witnessed the first phase of industrialization, positively contributing to structural change from the agricultural sector to the manufacturing sector (Mouelhi and Ghazali, 2020). In fact, Morocco, Tunisia, and Egypt have experienced some industrial diversification; however, this has occurred in "light industries" such as textile, agro-food, and resource-based industries[4] under relatively protectionist policies. While some efforts have been made to develop the machinery and electrical sectors, manufacturing has remained low-technology, outsourced, and assembly-oriented. Therefore, the manufacturing sector has been characterized by a lack of sophistication in the three countries (FEMISE, 2015). For decades, production has been mainly unskilled-labor-intensive (Mouelhi and Ghazali, 2020).

However, the three countries failed to move on to the next level of industrialization, which was the transition to advanced products and high-technology exports, as is the case in emergent economies. The share of high-technology exports was very low in 2010, reaching 0.9 percent in Egypt, 4.9 percent in Tunisia, and 7.7 percent in Morocco.[5] Industrialization stagnated at low-income levels and remains incomplete.

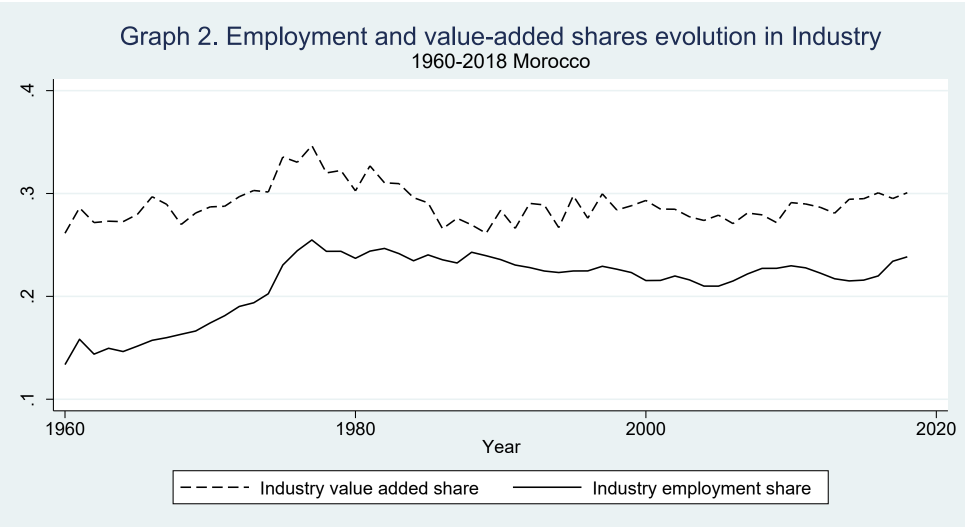
[3] The pattern of structural change as well as the different phases of development for each country are detailed in Mouelhi and Ghazali (2020).
[4] Including Egypt's chemicals and petroleum sectors.
[5] More generally, this is extremely low compared to East Asian countries, which averaged a share of 26.6 percent of high technology exports in manufactured exports in 2010 according to the WBI database. Similarly, it is low when compared to the same ratio in the Euro area (16 percent) or the world average (17 percent).

Figure 1. Employment and value-added shares evolution in industry, Tunisia



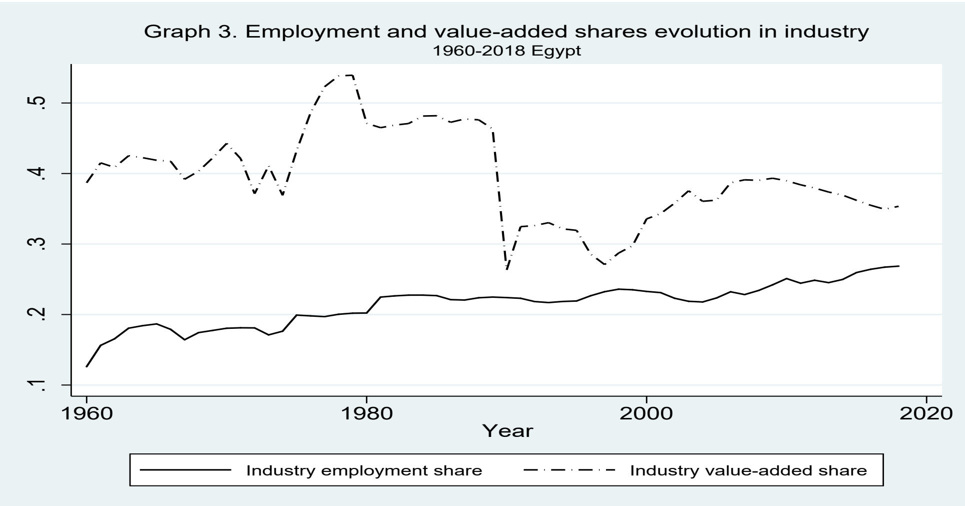
Source: Authors' computations from the Groningen database (2021).

Figure 2. Employment and value-added shares evolution in industry, Morocco



Source: Authors' computations from the Groningen database (2021).

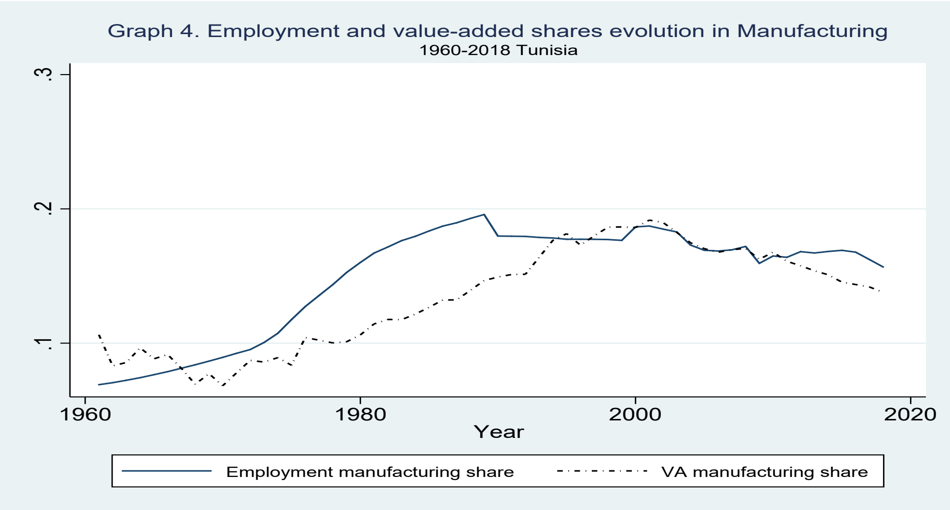
Figure 3. Employment and value-added shares evolution in industry, Egypt



Source: Authors' computations from the Groningen database (2021).

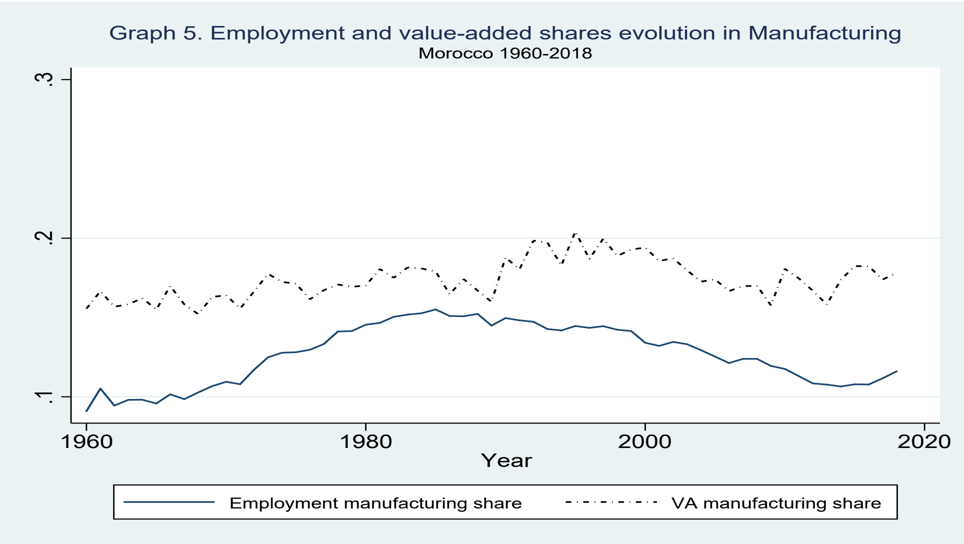
As shown in figures 4 to 6, manufacturing employment and value-added shares have slowly decreased. The share of manufacturing in GDP dropped from around 20 percent in the late 1990s to around 16 percent in the end of the observed period (2018) in Morocco and Egypt and 14 percent in Tunisia. It is worth noting that Tunisia has registered a more pronounced fall in the manufacturing value-added share than in the employment share, indicating a decline in labor productivity. In the same vein, the decline in the weight of industry as a whole began earlier, specifically in the late 1980s, driven by the shrinkage of the non-manufacturing sector and the depletion of natural resources.

Figure 4. Employment and value-added shares evolution in manufacturing, Tunisia



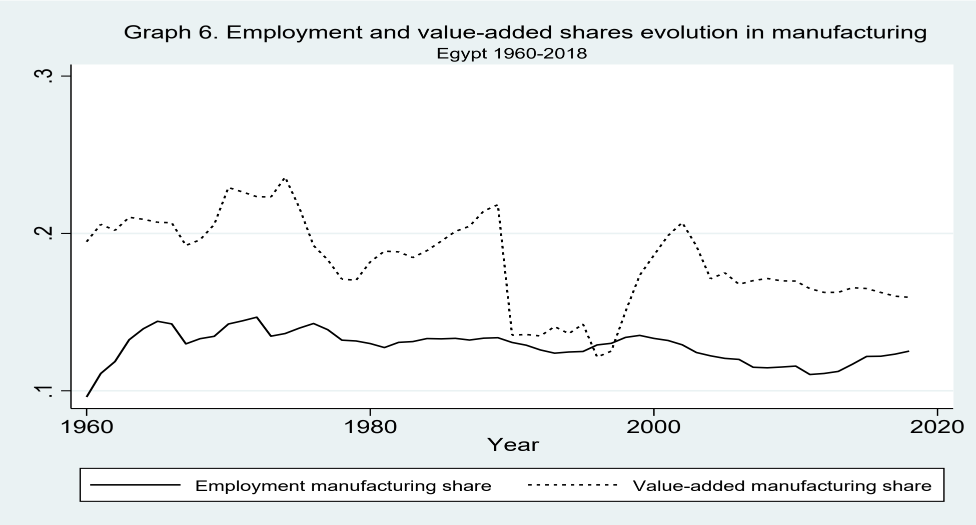
Source: Authors' computations from the Groningen database (2021).

Figure 5. Employment and value-added shares evolution in manufacturing, Morocco



Source: Authors' computations from the Groningen database (2021).

Figure 6. Employment and value-added shares evolution in manufacturing, Egypt



Source: Authors' computations from the Groningen database (2021).

At first glance, the deindustrialization trend in the three countries is likely to reflect an international trend characterized by an inverted-U relationship between manufacturing weight and income per capita (Tregenna, 2015). For most of the developed countries, productivity growth is the main factor responsible for the decrease in industry's employment share as well as the structural change leading to shifts to more productive service sectors. This is qualified as "positive deindustrialization" by Alderson (1997) and Uemura and Tahara (2015).

In contrast, deindustrialization in Tunisia, Morocco, and Egypt has occurred at lower levels of both income per capita and manufacturing weight (in terms of value-added and employment) compared to developed countries (UNIDO Report, 2015). This is classified as "premature deindustrialization" by Rodrick (2016) or "negative deindustrialization" according to Alderson (1997) and Uemura and Tahara (2015). Table 1 shows that at the turning point referring to the period at which deindustrialization began, the share of MENA countries' manufacturing sectors in GDP represented around 14 percent compared to 25 percent in developed countries. Egypt, Morocco, and Tunisia performed slightly better, with manufacturing shares of around 20 percent at the turning points. The peaks of the shares are likely to be lower than those of advanced countries.

Tunisia and Egypt experienced uprisings in 2011, further delaying their economic transition and speeding up deindustrialization. Table 2 shows that the Tunisian manufacturing sector has been witnessing a gradual decrease in its growth rate over the considered periods (from 7.9 percent in 1975-89 to 2.1 percent in 2005-18). Egypt is likely to have followed a similar trend as the manufacturing growth rate has been showing a steady decline since the deindustrialization starting point in the 1990s (Mouelhi and Ghazali, 2020).

The period following 2010 has been more promising for the manufacturing sector in Morocco. In a stable political environment, the Moroccan automotive industry has experienced strong growth, moving from 13.2 percent of total exports in 2008 to 20 percent in 2015. This is the outcome of a target-oriented industrial policy that attracts foreign direct investment (FDI) and multinational corporations through financial and tax incentives, training initiatives tailored to the particular requirements of the automotive industry, process simplification, infrastructure improvement…etc. (Vidican et al., 2017).

Tregenna's (2015) analysis offers an interesting glimpse into the worldwide deindustrialization pattern using a sample of 101 countries from 1970 to 2010, divided into five quintiles based on their income per capita. Using data on manufacturing shares in valued-added and employment, it appears that the onset occurred around 1970 for the wealthiest countries while middle-income countries (including MENA countries) witnessed a turning point between 1990 and 2000 at lower levels of GDP per capita.

Table 1. Deindustrialization turning point by country group

	Sub-Saharan Africa	**MENA**	**Tunisia**	**Morocco**	**Egypt**	**LAC**	**West Europe**	**North America**	**East Asia**
Turning point: period at which deindustrialization begins	1990's	**1990's**	1990's	1990's	1990's	1990's	1970's	1970's	2000's
Manufacturing share in GDP at the turning point	Around 11%	**Around 14%**	Around 18%	Around 20%	Around 20%	Around 21%	Around 25%	Around 23%	Around 23%
Manufacturing share in employment at the turning point	Around 5%	**Around 16%**	Around 18%	Around 16%	Around 14%	Around 16%	Around 26%	Around 23%	Around 19%
Group of Income per capita at the turning point (World Bank classification)	Low income	**Lower Middle income**	Lower Middle income	Lower Middle income	Lower Middle income	Lower middle income	High income	High income	Upper middle (South Korea) to high income (Japan)

Source: Authors' computation, World Bank classification, and Tregenna (2015).

Table 2. Average annual growth rate of manufacturing value added by time period

	1960-75	**1975-89**	**1990-2005**	**2005-18**
Tunisia	7.8%	7.9%	5.2%	2.1%
Morocco	5%	4%	2.7%	5.1%
Egypt	5.6%	7.6%	6%	3.6%

Source: Authors' calculation from Groningen data.

3. Causes of deindustrialization

As pointed out by Araujo et al. (2021), the causes of deindustrialization are complex and sensitive to the level of economic development. Therefore, this section presents a literature review of the causes of deindustrialization according to the country's degree of development.

3.1 Causes of deindustrialization in developed countries

- **"A natural outcome of the development process":** Araujo et al. (2021) emphasize that deindustrialization in already developed countries is "a normal follow-up to the course of the economic development process." According to Rowthorn and Ramaswamy (1999), this is a result of a combination of "desirable" structural change and changes in the composition of demand. In fact, during the advanced stages of development, labor productivity in the industrial sector exhibits the fastest growth compared to other sectors, leading to a reduction in manufacturing relative prices. This might stimulate the demand for manufactured goods. However, the elasticity of demand declines as the economy gains maturity, reaching a level under the unity.[6] Hence, when the per capita income increases, the demand favors the services sector rather than industry. The net effect on industrial employment and output of productivity gains turns out to be negative in the advanced economies as the demand does not sufficiently react to the fall in industrial prices. Industrial employment decreases even faster according to Rowthorn and Ramaswamy (1999), Lawrence and Edwards (2013), and Rodrik (2016).

- **Innovation and technological change:** According to Rodrik (2016), the higher rate of technological progress in manufacturing is supposed to drive a faster rate of productivity growth in that sector, resulting in advanced economies' deindustrialization, as pointed out below. However, Rodrick (2016) shows that developed countries experience more employment than output deindustrialization which shifts the focus to the "unskilled-labor saving technological change."[7]

- **Outsourcing and externalization:** The outsourcing and externalization of some manufacturing-related services activities from manufacturing to service providers could be another reason for the fall in industry weight (UNIDO Report, 2015). Rowthorn and Coutts (2004) report that one of the sources of deindustrialization is the reclassification of jobs from manufacturing toward services due to the outsourcing of some functions from manufacturing companies to specialized service providers.

- **Trade openness with developing countries:** Wood (1994) argues that "North-South trade had accelerated deindustrialization in the North." In fact, the South (particularly Asian countries) is intended to be more competitive in the production of low value-added goods. As a consequence, imports from the South are gradually replacing labor-intensive industries in developed economies, moving into more technological and sophisticated exports. Liberalization might also lead to a reallocation of output toward more productive activities and away from less productive ones in developed countries (Kucera and Milberg, 2003) due to the increased international mobility of production factors such as capital and technology (Palley, 2015). This move of the industrial plants of large companies from developed to developing countries contributes to triggering deindustrialization in the former. Araujo et al. (2021) show that the relocation of physical production and the degree of financialization reduce the manufacturing value-added in developed countries, while trade openness (measured by the sum of exports and imports in proportion to GDP) increases it.

3.2 Causes of deindustrialization in developing countries

In developing countries, deindustrialization does not result from the natural dynamism and maturation of the economy. At this stage, the income elasticity of demand is still greater than unity. Therefore, when labor productivity gains occur in the manufacturing sector and lead to

[6] The income elasticity of demand for industrial goods is greater than unity in the early stages of development, thereby helping explain the relative expansion of that sector in terms of employment and value added.

[7] Alternatively named "skill-biased technological change" and defined by Haskel and Slaughter (2002) as "any technological progress that raises relative demand of skilled workers within sectors at given relative factor prices."

price decreases, this stimulates demand for manufacturing goods and increases the weight of the sector (Araujo et al., 2021). Alternatively, other factors are likely to operate:

- **Trade openness:** According to Rodrik (2016), MENA countries are part of the developing countries that were hit twice when they initiated their trade liberalization processes. First, they faced hard competition from emergent Asian and Eastern European countries with solid comparative advantages and high FDI inflows. Small MENA firms operating in small markets have been unable to compete with emergent countries operating on large scales, with high production capacities and high competitiveness. MENA countries turned to become net importers of manufacturing goods, thereby abandoning a long process of import substitution as observed by Rodrik (2016).[8] Second, MENA countries have been pressed through trade liberalization to adopt the manufacturing price trends in advanced economies, therefore "importing" deindustrialization but without experiencing the corresponding technological change.

- **Inadequate economic policies and hampered competitiveness:** Araujo et al. (2021) suggest that the stagnation of productivity in developing countries may be attributed to the absence of a suitable industrial development strategy following the "exhaustion of the import substitution process and the shift toward a liberalizing agenda and market friendly reforms." This resulted in a decline of competitiveness as domestic companies were unable to respond to new market conditions (Alderson, 1997), hence leading to a negative structural change. As shown in Table 3, the Global Competitiveness Index (GCI) for MENA countries is low compared to developed and emerging Asian countries' standards and has stagnated over the last few years. The World Bank's Arab World Competitiveness Report (2018) identifies various factors underlying the low competitive performance, such as bad governance, poor infrastructure, corruption, political instability, insufficient workforce skills and education attainments, bureaucracy…etc. Furthermore, inadequate macroeconomic policies in the form of overvalued exchange rates and/or high interest rates both hamper exports and raise the cost of firms' access to finance.

Mouelhi and Mechergui (2023) use a long-term time series to analyze the potential factors impacting the pattern of industrialization/deindustrialization in Tunisia. Their empirical results strongly suggest that deindustrialization in Tunisia is a consequence of a lack of competitiveness, mainly illustrated by a very low growth of labor productivity. Many factors have contributed to the deterioration of Tunisia's country competitiveness, such as political instability, corruption, inefficient government bureaucracy, lack of adequate competition policies, an inequitable taxation system, skill gaps, and the rigidity of the labor market. Furthermore, openness remains a driver of industrialization. "Trade has played a key role as a source of technological spillovers via imported intermediate goods and equipment from developed countries and also via more export opportunities."

[8] The dismantling of the multifiber agreement in 2005 hampered the most dynamic manufacturing sector in the MENA region, i.e., the traditional textile sector.

Table 3. Global competitiveness index scores, 2013-17

	2013	2014	2015	2016	2017
Egypt	3,7	3,6	3,7	3,7	3,9
Morocco	4,1	4,1	4,2	4,2	4,2
Tunisia	4,1	4	3,9	3,9	3,9
MENA	**4.1**	**4.1**	**4.1**	**4.1**	**4.2**
China	4.8	4.9	4.9	5	5
East Asia and Pacific	**4.7**	**4.6**	**4.7**	**4.8**	**4.9**
Brazil	4.3	4.3	4.1	4.1	4.1
LAC	**3.9**	**4**	**4**	**4.1**	**4.2**
Germany	5.5	5.5	5.5	5.6	5.7
Turkey	4.5	4.5	4.4	4.4	4.4
Europe and Central Asia	**4.2**	**4.4**	**4.4**	**4.4**	**4.4**
USA	5.5	5.5	5.6	5.7	5.6
North America	**5.4**	**5.4**	**5.5**	**5.5**	**5.6**

Note: Region figures are median scores provided by the World Bank database.
Source: World Bank open trade and competitiveness data (TCdata360).

For both industrialized and developing countries*,* Palma (2014) defines Dutch disease as a source of drastic premature deindustrialization due to (1) the discovery of a natural resource (such as gas in the Netherlands); (2) the boom of the services exporting sector (tourism, financial services…etc.) as in Hong Kong; or (3) the radical change in the economic policy regime (e.g., Latin American countries in the 1990s).

4. Does Deindustrialization Matter for Growth and Economic Development?

Kaldor (1966) refers to manufacturing as "the engine of growth." The theoretical foundation of such an assertion stems from a long tradition of seminal papers belonging to different economic schools of thought. An exhaustive overview of the literature yields a five-channel classification regarding the impacts of manufacturing activity on economic growth (Ciarli and Dimaio, 2013):

- **Increasing returns, technology, and spillover effects:** The manufacturing sector is more likely to experience economies of scale than agriculture or services (Kassem, 2010). The technological change and innovations incorporated by the sector play an important role in economic development (Cornwall, 1977; Maddison, 1987; Collier and Venables, 2007). Ortiz et al. (2009) put forward the strong externalities that spread through manufacturing due (among other things) to the intensive application of science and technology and the continuous displacement of the technological frontier in the manufacturing sector that allows "the sector's learning potential to remain high." Tregenna (2015) sets forth the availability of skilled labor and infrastructure in generating industry-wide externalities. Therefore, when deindustrialization occurs at an earlier stage of development, countries do not benefit from the manufacturing sector's opportunities and externalities, such as technological penetration, skill development, openness, and technological transfer. Furthermore, the highly skilled and productive activities in the services sector linked to manufacturing are less likely to develop, thereby trapping the country in traditional tertiary activities (UNIDO Report, 2015).

- **Labor productivity:** Felipe et al. (2019) emphasize the high manufacturing potential for productivity catch-up. In the same vein, Rodrik (2013) confirms that national manufacturing industries experience much faster unconditional productivity growth when they are farther from the labor productivity frontier "without conditioning on variables such as domestic policies, human capital, geography or institutional quality." Furthermore, Kaldor's (1966) first law states that the growth rate of an economy is positively and strongly impacted by the growth rate of its manufacturing sector since manufacturing has effects on overall labor productivity. This is because of increasing returns to scale due to learning-by-doing processes, efficiency changes, and labor reallocation from non-manufacturing, low-productivity sectors to manufacturing (Keho, 2018).

- **Backward and forward linkages:** The manufacturing sector leads to strong forward and backward linkages across sectors by stimulating investments in subsequent banking, transportation, and insurance services, as well as preceding stages of the production process (agriculture, energy…etc.) (Hirschman, 1958; Ciarli and Dimaio, 2013). Linkages within manufacturing sub-sectors are more important than within other sectors, which makes manufacturing investments more likely to drive employment and output growth (Ciarli and Dimaio, 2013).

- **Capital accumulation:** According to Szirmai and Verspagen (2015), the manufacturing sector provides better opportunities for capital accumulation compared to agriculture because of the spatial concentration of its activities. This is reflected by a higher capital intensity than in other sectors of the economy as well as high savings rates encouraged by productive investments, fostering a virtuous cycle of growth and economic development.

- **The higher income elasticity of demand for manufactured goods:** According to Roshan (2017), manufactured goods (especially high-technology) benefit from high-income elasticities of demand, unlike primary products that follow Engel's Law. This means that "any increase in incomes would have a higher demand side effect on the price of manufactured goods than of primary products." Added to the increasing returns to scale, such an advantage unleashes a virtuous cycle according to Felipe et al. (2019), who explain that "as costs in manufacturing industries drop, the demand for manufactured goods increases, in turn causing more investment in manufacturing activity and higher incomes, which spur further demand increases and cost reductions."

- **Employment potential:** The manufacturing sector has a higher employment multiplier than agricultural and traditional services (Ciarli and Dimaio, 2013; Baker and Lee, 1993; Bivens, 2003) because of differences in returns of scale between sectors as well as its potential for the increasing division of labor. Furthermore, Dosi et al. (2021) emphasize the manufacturing role of the employment multiplier in terms of jobs indirectly created in other sectors, thus generating new revenues and reducing poverty. This works through the "supply chain" as well as the backward and forward linkages mentioned above. Moving from primary products to manufactured and higher product specialization generates higher revenues and growth (Roshan, 2017). This especially contributes to job creation for women and enhances their financial empowerment.

5. The role of manufacturing versus services in economic development: the ongoing controversial debate

The manufacturing sector represents a high share of GDP, meaning that growth in manufacturing has a significant impact on overall growth. Manufactured goods are tradable and provide multiple export opportunities that allow them to connect to best practices and technologies at the international level, thereby generating spillover effects. Manufacturing plays a key role in maintaining the equilibrium of trade balance.

However, several recent studies point out the declining role of the manufacturing sector at the expense of the modern services sector, which is taking the lead in many countries (Dadush, 2015). Modern services have contributed significantly, sometimes more than manufacturing, to the growth and development of some countries over the last decades, such as Malta, Singapore, and Hong Kong (Hauge and Shang, 2019). The information and communication technology revolution has fostered learning opportunities leading to the development of modern and tradable services with high technological content (digitalized services, finance, software, telecommunications…etc.). Services activities might embed export opportunities and are sources of productivity gains, sometimes higher than in the manufacturing sector. Some countries such as Rwanda, Tanzania, and Tunisia have been also relying on traditional tradable services, such as tourism, as the main source of foreign exchange earnings (Dadush, 2015; Chang et al., 2016).

Fagerberg and Verspagen (1999, 2002) analyzed and tested the relationship between growth and the shares of manufacturing and services using a large sample of countries with different levels of development over a long period of time. The main results confirm the key role of the manufacturing sector in development, especially for developing countries. However, the authors highlight that this contribution was more important before the 1980s as the manufacturing sector was the main technological driver and the main source of productivity gains. Yet, the contribution of services to growth has become more significant in recent decades.

Szirmai and Verspagen (2015) re-examine the relationship between growth and the shares of manufacturing and services over a long period of time for developed and developing countries. The authors find a positive and significant impact of manufacturing, especially for developing countries with an educated workforce, though it has been declining over time. The authors conclude that "it seems that since 1990, manufacturing is becoming a more difficult route to growth than before." The effect of services' shares on growth is not likely to be significant. Pandian (2017) reveals similar results regarding the declining impact of manufacturing weight on growth after the 1990s as well as for less developed countries.

In comparison to the past literature on the relationship between growth and the weight of manufacturing, recent findings point out the declining impact of the latter and the increase in services role, especially modern and high value-added activities.

6. Empirical analysis and data overview: the Tunisian case

The first subsection presents the econometric model as well as the data used. The second displays the economic results. In what follows, we focus on the Tunisian case for two reasons. The first one is that, as shown in section 2, the pattern of premature deindustrialization is more accurate in Tunisia. Morocco, however, has been triggering a reindustrialization process during the 2010s driven by the development of the automotive sector and an export-oriented industrial policy. At first glance, the deindustrialization trend in Tunisia is likely to reflect an international trend characterized by an inverted-U relationship between the manufacturing weight and the income per capita (Tregenna, 2015). A related graph is displayed in Appendix B, showing a turning point of USD 2,771 (constant 2015 USD), corresponding to a manufacturing share in total GDP of 19 percent. The second reason is the availability of a large set of data on Tunisia over the deliberately extended time frame.

6.1. The Econometric Model

$$y_t = \beta_1 m_t + \beta_2 s_t + \beta_4\ lnPop_t + \beta_5 lnPop_t^2 + \beta_5 x_t + Post\ 2011 + \varepsilon_t$$

We use long-time series data from 1961 to 2018 to investigate the impact of manufacturing and services weights on economic growth and development over different periods. Bearing in mind the role of this sector's engine of growth role emphasized in section 4, our purpose here is to assess whether its contribution to growth has remained significant over the years or declined against an increasing role of services. We also explore the impact of other control variables such as trade openness, population size, and the inflation rate.

Table 4. Description of variables

Variable	Description	Source	Period
y	Annual percentage growth rate of GDP per capita based on constant 2015 USD price.	World Bank Indicators (WBI)	1971-2018
m	The share of manufacturing in total GDP computed as the gross value-added of the manufacturing sector at constant 2015 USD price divided by total GDP.	Economic Transformation Database (2021) from Groningen Growth and Development Centre (GGDC/UNU)	1961-2018
S	The share of services in total GDP computed as the gross value-added of services at constant 2015 USD price divided by total GDP.	Economic Transformation Database (2021) from Groningen Growth and Development Centre (GGDC/UNU)	1961-2018

Table 4. Description of variables (contd.)

Variable	Description	Source	Period
Pop	Total population "based on the de facto definition of population, which counts all residents regardless of legal status or citizenship."	World Bank Indicators (WBI)	1970-2018
Trade openness	Exports of goods and services (% of GDP).	World Bank Indicators (WBI)	1965-2018
Inflation rate	The annual growth rate of the GDP implicit deflator (%). The GDP implicit deflator is the ratio of GDP in current local currency to GDP in constant local currency.	World Bank Indicators (WBI)	1966-2018
mg	The annual growth rate of manufacturing value-added at constant 2015 USD price.	Economic Transformation Database (2021) from Groningen Growth and Development Centre (GGDC/UNU)	1961-2018
Sg	The annual growth rate of services value-added at constant 2015 USD price.	Economic Transformation Database (2021) from Groningen Growth and Development Centre (GGDC/UNU)	1961-2018

We estimate the above growth model following Szirmai and Verspagen (2015) as well as Pandian (2017). The dependent variable $\boldsymbol{y_{it}}$ is measured as the growth of per capita GDP at time t. The explanatory variables $\boldsymbol{m_{it}}$ and $\boldsymbol{s_{it}}$ are, respectively, the shares of manufacturing and services in total GDP, indicating the extent to which manufacturing activities and services are prevailing. We also interact the manufacturing and services value-added shares with dummies for the pre- and post-1995 periods. This allows us to capture the trajectory of the growth effect of both sectors around the 1995 breakpoint, which has been chosen according to the stylized facts as the starting point of the Tunisian deindustrialization process. We take into account demographic movements by including terms for log population. $\boldsymbol{x}$ is a vector of other time-varying covariates: trade openness is incorporated using the ratio of exports and imports relative to GDP, while macroeconomic shocks are captured using the inflation rate. Furthermore, we include a time dummy taking the value of one for the period following the popular Tunisian uprising of 2011. This period witnessed political unrest and economic instability, accelerating the negative structural change. Table 4 sums up the variables used as well as their sources.

6.2. Empirical Results

We start by applying Dickey-Fuller and Phillips-Perron time series unit root tests due to the extended observation period we are dealing with (see Appendix A). The results reveal that the majority of series are clearly stationary, with the exception of the shares of manufacturing and services in total GDP as well as the openness indicator, all of which are integrated into order one. Therefore, these variables are incorporated into the regression equation in the first differenced form.

Table 5 below reports the estimation results using ordinary least squares (OLS) with a robust estimation of standard errors. The Durbin-Watson autocorrelation test rejects the presence of autocorrelation in most of the regressions. Columns 4 and 5 provide evidence that the manufacturing value-added share exerts a strong positive effect on overall growth over the period 1970-2018. This converges with the engine of growth hypothesis related to the theoretical and empirical literature for the developed and least developed countries (Szirmai and Verspagen, 2015; Pandian, 2017) for a similar period. On the contrary, the increase in services' weight is likely to hinder growth. The higher the weight of the service sector, the smaller the GDP per capita growth in Tunisia. One might ask whether such associations are continuously consistent over Tunisian economic history. For a meaningful answer to such a question, column 5 provides the outcome of the interaction of the manufacturing and services value-added shares with dummies for the pre- and post-1995 periods. The results show a persistent positive relationship between manufacturing weight and GDP per capita growth but with a declining trend. The results also suggest a negative relationship between services' value-added share and GDP per capita growth either before or after 1995. While these findings do not confirm the pro-services arguments being conveyed by the post-industrial society discourse (Hauge and Chang, 2019), they give an insightful reflection of the specificity of the Tunisian economic pattern.

According to Ayadi and Matoussi (2014), during the 1970s-80s, the services sector was still in the inception steps based mainly on a touristic public-led subsector. The recent period has not been more appropriate to unleash its potential as pointed out by the World Bank's 2014 report titled "The Unfinished Revolution," stating that "entry into the services sector in Tunisia is among the most restrictive in the world. Barriers to entry have created rents and privileges, and as a result services sectors in Tunisia remain highly inefficient. This undermines the competitiveness of the entire Tunisian economy."

Mouelhi and Ghazali (2020) explain that the expansion of the services sector between the 1980s and the 2000s was primarily caused by low-productivity services such as government and trade, with modern, highly productive activities playing a minor role. Regarding manufacturing, Ayadi and Matoussi (2014) argue that the semi-liberal policy adopted in the 1970s combining import substitution and export promotion was a breeding ground for the transition from an artisanal to a modern manufacturing sector that contributed to achieving an average annual GDP growth rate of about 7.5 percent. However, the World Bank Report (2014) emphasizes the unexpectedly low average productivity rate of the manufacturing sector (close to the agricultural sector performance) as it essentially relies on low value-added and unsophisticated textile and assembly activities. Column 1 reports the regression results of the GDP per capita growth rate on manufacturing and services annual growth rates over the period 1961-2018. Manufacturing does foster growth as the associated coefficient is positive and statistically significant at the one percent level. The coefficient for services growth is also positive and highly statistically significant, indicating a strong positive association with GDP growth. Interacting the manufacturing and services value-added growth rates with dummies for pre- and post-1995 periods (column 2) confirm this outcome over the entire period.

Results regarding other control variables converge with literature findings. We find a robust inverted U-shaped relationship between the population size and the growth rate of the per-capita GDP as already demonstrated by Valli and Saccone (2011). In the first stage, the fertility increase leads to a high share of young and unproductive population decelerating growth; however, these young cohorts become active and productive in the long period, thus promoting growth. Furthermore, the inflation rate as well as the 2011 Tunisian uprising are likely to have put a brake on the Tunisian development process.

Table 5. Regressions results

	(1)	(2)	(3)	(4)	(5)
VARIABLES	Growthgdpcapita y	Growthgdpcapita y	Growthgdpcapita y	Growthgdpcapita y	Growthgdpcapita y
Sg*pre1995		0.413** (0.162)			
Sg*post1995		0.569** (0.230)			
mg*pre1995		0.262*** (0.0748)			
mg*post1995		0.187 (0.145)			
tradeopenness	-0.000390 (0.000779)	-0.000272 (0.0007)			
lnPop	-6.108** (2.766)	-5.279* (2.945)	-13.29*** (4.189)	-12.61*** (3.740)	-12.49*** (3.553)
lnPop2	0.193** (0.0873)	0.167* (0.0932)	0.419*** (0.132)	0.398*** (0.118)	0.394*** (0.112)
post2011	-0.0265** (0.00985)	-0.0246** (0.0119)	-0.0441*** (0.0125)	-0.0395*** (0.0119)	-0.0435***(0.0119)
mg	0.245*** (0.0634)				
Sg	0.450*** (0.131)				
m			1.752* (0.898)	1.805** (0.830)	
S			-1.507*** (0.449)	-1.611*** (0.449)	
inflationrate				-0.00176* (0.0009)	-0.00150*(0.0008)
S*pre1995					-1.874** (0.759)
S*post1995					-1.394*** (0.383)
m*post1995					0.725 (0.794)
m*pre1995					2.678* (1.479)
Constant	48.20** (21.91)	41.71* (23.26)	105.3*** (33.26)	100.0*** (29.71)	99.03*** (28.23)
Observations	47	47	47	47	47
R-squared	0.691	0.693	0.475	0.518	0.538
DW STAT	Dw-dstat (5,47)=2.29	Dw-dstat (9,47)=2.58	Dw-dstat (6,47)=2.16	Dw-dstat (7,47)=2.26	Dw-dstat (9,47)=2.22

Robust standard errors in parentheses :*** p<0.01, ** p<0.05, * p<0.1

7. Conclusion

Our study addresses the deindustrialization issue in Tunisia, Morocco, and Egypt by exploring its intensity, path, and causes and impacts on growth. The results suggest that the three MENA countries experienced deindustrialization at lower levels of both income per capita and manufacturing weights compared to developed countries. This is qualified as "premature deindustrialization" or "negative deindustrialization."

The three countries initiated and achieved some progress in industrialization over the 1970s, the 1980s, and the early 1990s. They have seen some industrial diversification, however, in "light industries." Although there have been some attempts to improve the mechanical and electrical industry, manufacturing has been limited to low-technology, assembly-oriented, and outsourced operations.

The three nations were unable to make the transition to the next stage of industrialization, which involved the export of high-technology goods and increasingly complex items, as was the case in emerging economies.

An empirical study on the Tunisian case by Merchergui and Mouelhi (2023) suggests that the main cause of deindustrialization is the lack of competitiveness illustrated by a very low growth of labor productivity induced by several factors such as political instability, heavy and disabling bureaucracy, corruption, an unfair and inefficient tax system, labor market rigidity, and a lack of relevant industrial policies. Morocco and Egypt also experienced a decline/stabilization in competitiveness over the observed period, which could be one of the main causes of their premature deindustrialization.

Furthermore, openness remains a driver of industrialization in Tunisia. According to Merchergui and Mouelhi (2023), "Trade has played a key role as a source of technological spillovers via imported intermediate goods and equipment from developed countries and also via more export opportunities."

We also use long-term time series data from 1961 to 2018 to investigate the impact of the manufacturing and services weights on economic development over different periods in Tunisia. We estimate a growth model following Szirmai and Verspagen (2015) as well as Pandian (2017). The dependent variable $\boldsymbol{y_{it}}$ is measured as the growth of per capita gross domestic product (GDP) at time t.

On the one hand, the main results suggest that manufacturing weight exerts a positive effect on overall growth over the different considered periods, thereby confirming its role as an engine of growth. However, manufacturing weight has shown a declining positive impact over time as it has been confined to low-technology and unsophisticated assembly and outsourcing activities.

On the other hand, the results show a persistent negative relationship between services' weight and GDP per capita growth over the considered periods. The increase in the weight of the services sector in the last two decades was driven by low-productivity services such as trade (largely in the informal sector), government services, and (to a lesser extent) modern and highly productive activities.

Overall, the results suggest premature deindustrialization with a negative impact on growth and development in MENA countries. Reindustrialization and strengthening the manufacturing sector are important for MENA countries' growth and job creation. Furthermore, within these low-growth countries, it is important that all economic sectors fully contribute to wealth creation, hence maximizing the chances of winning the vital challenges of combatting unemployment and fostering development. In particular, the services sector must continue to develop and modernize in order to make a greater contribution to growth. A lot of productive and technological services linked to manufacturing could benefit from the upgrading of manufacturing.

The COVID-19 crisis reminded the world how strategic industry is for national security and how it is a priority to limit the dependence of foreign countries. This requires better quality physical and digital infrastructure as well as a higher quality educative system that prepares for innovation and provides the skills needed for an innovative and modern private sector. This also requires the implementation of effective and active policies. An efficient industrial policy that promotes and supports the manufacturing sector is needed alongside setting financial and fiscal incentives, improving the quality of the business climate, simplifying the regulatory framework, and enforcing the law. State intervention is now more important than ever to support economic modernization and the digital transformation process.

Improving labor productivity and production efficiency are required to improve competitiveness (UNIDO Report, 2015). This, in turn, helps attract "relocated" FDI inflows. In fact, the relocation of Southeast Asian-based European companies as a response to national security considerations, especially after the COVID-19 crisis, is an opportunity to seize and integrate into our strategy. The rising wages in Asian countries and the increasing transport costs have begun to erode Asia's cost advantage. Therefore, attracting mega FDIs with scale economies, job creation opportunities, and a high export capacity is crucial for MENA countries.

Both traditional and modern technological manufacturing are needed. MENA countries could benefit from their past experiences and know-how in the traditional sectors (textile, agri-food…etc.) to further develop, integrate within the global value chain, and upgrade to higher value activities (UNIDO Report, 2015). The support of governments is crucial to strengthen the competitiveness and export orientation of these traditional sectors as major employers of unskilled workers (the textile sector provides 40 percent of the industrial jobs in Morocco). Such efforts would help tackle unemployment, which is one of the major challenges in the MENA region.

Technological sectors, such as the automotive and aeronautics industries, provide significant growth potential as well. These sectors are developing in the MENA region, especially in Morocco where the automotive sector accounted for 24 percent of total exports in 2017, creating an increasing number of jobs. The electronic and pharmaceutical industries present similar upgrading opportunities.

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Appendix A: Time Series Unit Root Tests

1. GDP/Capita growth at constant prices

```
. dfuller gdpgrowthprixcons if idcountry==3, regress

Dickey-Fuller test for unit root                   Number of obs   =        56

                               ---------- Interpolated Dickey-Fuller ---------
                  Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value             Value
------------------------------------------------------------------------------
 Z(t)             -8.047            -3.572            -2.925            -2.598
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000

------------------------------------------------------------------------------------
D.                 |
gdpgrowthprixcons  |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------------+----------------------------------------------------------------
gdpgrowthprixcons  |
               L1. |  -1.079989   .1342069    -8.05   0.000    -1.349058   -.8109204
                   |
             _cons |   .0671344    .013555     4.95   0.000     .0399582    .0943105
------------------------------------------------------------------------------------

. pperron gdpgrowthprixcons if idcountry==3, regress

Phillips-Perron test for unit root                 Number of obs   =        56
                                                   Newey-West lags =         3

                               ---------- Interpolated Dickey-Fuller ---------
                  Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value             Value
------------------------------------------------------------------------------
 Z(rho)          -61.170           -19.008           -13.348           -10.736
 Z(t)             -8.039            -3.572            -2.925            -2.598
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000

------------------------------------------------------------------------------------
gdpgrowthprixcons  |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------------+----------------------------------------------------------------
gdpgrowthprixcons  |
               L1. |   -.079989   .1342069    -0.60   0.554    -.3490576    .1890796
                   |
             _cons |   .0671344    .013555     4.95   0.000     .0399582    .0943105
------------------------------------------------------------------------------------
```

2. Value-added manufacturing share

```
. dfuller constVAmanufshare if idcountry==3, regress

Dickey-Fuller test for unit root                   Number of obs   =        57

                               ---------- Interpolated Dickey-Fuller ---------
                  Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value             Value
------------------------------------------------------------------------------
 Z(t)             -0.896            -3.570            -2.924            -2.597
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.7894

----------------------------------------------------------------------------------
D.                |
constVAmanufshare |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
------------------+---------------------------------------------------------------
constVAmanufshare |
              L1. |  -.0229347   .0256065    -0.90   0.374    -.0742512    .0283819
                  |
            _cons |   .0036204   .0035575     1.02   0.313     -.003509    .0107498
----------------------------------------------------------------------------------

. pperron constVAmanufshare if idcountry==3, regress

Phillips-Perron test for unit root                 Number of obs   =        57
                                                   Newey-West lags =         3

                               ---------- Interpolated Dickey-Fuller ---------
                  Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value             Value
------------------------------------------------------------------------------
 Z(rho)           -1.434           -19.026           -13.356           -10.742
 Z(t)             -0.928            -3.570            -2.924            -2.597
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.7785

----------------------------------------------------------------------------------
constVAmanufshare |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
------------------+---------------------------------------------------------------
constVAmanufshare |
              L1. |   .9770653   .0256065    38.16   0.000     .9257488    1.028382
                  |
            _cons |   .0036204   .0035575     1.02   0.313     -.003509    .0107498
----------------------------------------------------------------------------------

. dfuller D.constVAmanufshare if idcountry==3, regress

Dickey-Fuller test for unit root                   Number of obs   =        56

                               ---------- Interpolated Dickey-Fuller ---------
                  Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value             Value
------------------------------------------------------------------------------
 Z(t)             -8.091            -3.572            -2.925            -2.598
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000

----------------------------------------------------------------------------------
D2.               |
constVAmanufshare |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
------------------+---------------------------------------------------------------
constVAmanufshare |
              LD. |  -.9930967   .1227365    -8.09   0.000    -1.239169   -.7470248
                  |
            _cons |   .0009732   .0008947     1.09   0.282    -.0008206    .0027669
----------------------------------------------------------------------------------
```

3. Value-added services share

```
Dickey-Fuller test for unit root                   Number of obs   =        57

                               ---------- Interpolated Dickey-Fuller ---------
                  Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value             Value
------------------------------------------------------------------------------
 Z(t)              0.595            -3.570            -2.924            -2.597
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.9875

-----------------------------------------------------------------------------------
D.                  |
VAconsservicesshare |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
--------------------+--------------------------------------------------------------
VAconsservicesshare |
                L1. |   .0177985   .0298949     0.60   0.554    -.0421122    .0777092
                    |
              _cons |  -.0070608   .0158453    -0.45   0.658    -.0388155    .0246939
-----------------------------------------------------------------------------------

. dfuller D.VAconsservicesshare if idcountry==3, regress

Dickey-Fuller test for unit root                   Number of obs   =        56

                               ---------- Interpolated Dickey-Fuller ---------
                  Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value             Value
------------------------------------------------------------------------------
 Z(t)             -5.746            -3.572            -2.925            -2.598
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000

-----------------------------------------------------------------------------------
D2.                 |
VAconsservicesshare |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
--------------------+--------------------------------------------------------------
VAconsservicesshare |
                LD. |  -.7206148   .1254207    -5.75   0.000    -.9720681   -.4691614
                    |
              _cons |   .0010589   .0020757     0.51   0.612    -.0031027    .0052205
-----------------------------------------------------------------------------------
```

4. Trade openness indicator

```
. dfuller xmpib if idcountry==3, regress

Dickey-Fuller test for unit root                   Number of obs   =        53

                               ---------- Interpolated Dickey-Fuller ---------
                  Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value             Value
------------------------------------------------------------------------------
 Z(t)             -2.145            -3.576            -2.928            -2.599
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.2269

------------------------------------------------------------------------------
     D.xmpib |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       xmpib |
         L1. |  -.1132873   .0528188    -2.14   0.037    -.2193255    -.007249
             |
       _cons |   4.712332   2.015147     2.34   0.023     .6667543    8.757909
------------------------------------------------------------------------------
```

```
. dfuller D.xmpib if idcountry==3, regress

Dickey-Fuller test for unit root                   Number of obs   =        52

                               ---------- Interpolated Dickey-Fuller ---------
                  Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value             Value
------------------------------------------------------------------------------
 Z(t)             -6.585            -3.577            -2.928            -2.599
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000

------------------------------------------------------------------------------
    D2.xmpib |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       xmpib |
         LD. |   -.936239    .142173    -6.59   0.000    -1.221802   -.6506762
             |
       _cons |   .4422505   .4801668     0.92   0.361    -.5221929    1.406694
------------------------------------------------------------------------------
```

5. Inflation rate

```
. dfuller inflationrategdpdeflator if idcountry==3, regress

Dickey-Fuller test for unit root                   Number of obs   =        52

                               ---------- Interpolated Dickey-Fuller ---------
                  Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value             Value
------------------------------------------------------------------------------
 Z(t)             -5.206            -3.577            -2.928            -2.599
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000

------------------------------------------------------------------------------------------
D.                       |
inflationrategdpdeflator |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------------------+----------------------------------------------------------------
inflationrategdpdeflator |
                     L1. |  -.6933616   .1331849    -5.21   0.000    -.9608713    -.425852
                         |
                   _cons |   4.297752   .9750695     4.41   0.000     2.339267    6.256236
------------------------------------------------------------------------------------------

. pperron inflationrategdpdeflator if idcountry==3, regress

Phillips-Perron test for unit root                 Number of obs   =        52
                                                   Newey-West lags =         3

                               ---------- Interpolated Dickey-Fuller ---------
                  Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value             Value
------------------------------------------------------------------------------
 Z(rho)          -36.045           -18.936           -13.316           -10.712
 Z(t)             -5.206            -3.577            -2.928            -2.599
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000

------------------------------------------------------------------------------------------
inflationrategdpdeflator |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------------------+----------------------------------------------------------------
inflationrategdpdeflator |
                     L1. |   .3066384   .1331849     2.30   0.026     .0391287     .574148
                         |
                   _cons |   4.297752   .9750695     4.41   0.000     2.339267    6.256236
------------------------------------------------------------------------------------------
```

6. Ln population

```
. dfuller lnpop if idcountry==3, regress

Dickey-Fuller test for unit root                   Number of obs   =        48

                               ---------- Interpolated Dickey-Fuller ---------
                  Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value             Value
------------------------------------------------------------------------------
 Z(t)             -9.983            -3.594            -2.936            -2.602
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000

------------------------------------------------------------------------------
     D.lnpop |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       lnpop |
         L1. |  -.0233667   .0023406    -9.98   0.000    -.0280781   -.0186553
             |
       _cons |   .3893086   .0372776    10.44   0.000     .3142727    .4643446
------------------------------------------------------------------------------
```

```
. pperron   lnpop  if idcountry==3, regress

Phillips-Perron test for unit root                   Number of obs   =        48
                                                     Newey-West lags =         3

                               ---------- Interpolated Dickey-Fuller ---------
                  Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value             Value
------------------------------------------------------------------------------
 Z(rho)          -1.137           -18.764           -13.236           -10.660
 Z(t)            -5.329            -3.594            -2.936            -2.602
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000

------------------------------------------------------------------------------
       lnpop |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       lnpop |
         L1. |   .9766333   .0023406   417.26   0.000     .9719219    .9813447
             |
       _cons |   .3893086   .0372776    10.44   0.000     .3142727    .4643446
------------------------------------------------------------------------------
```

7. Manufacturing value-added growth rate

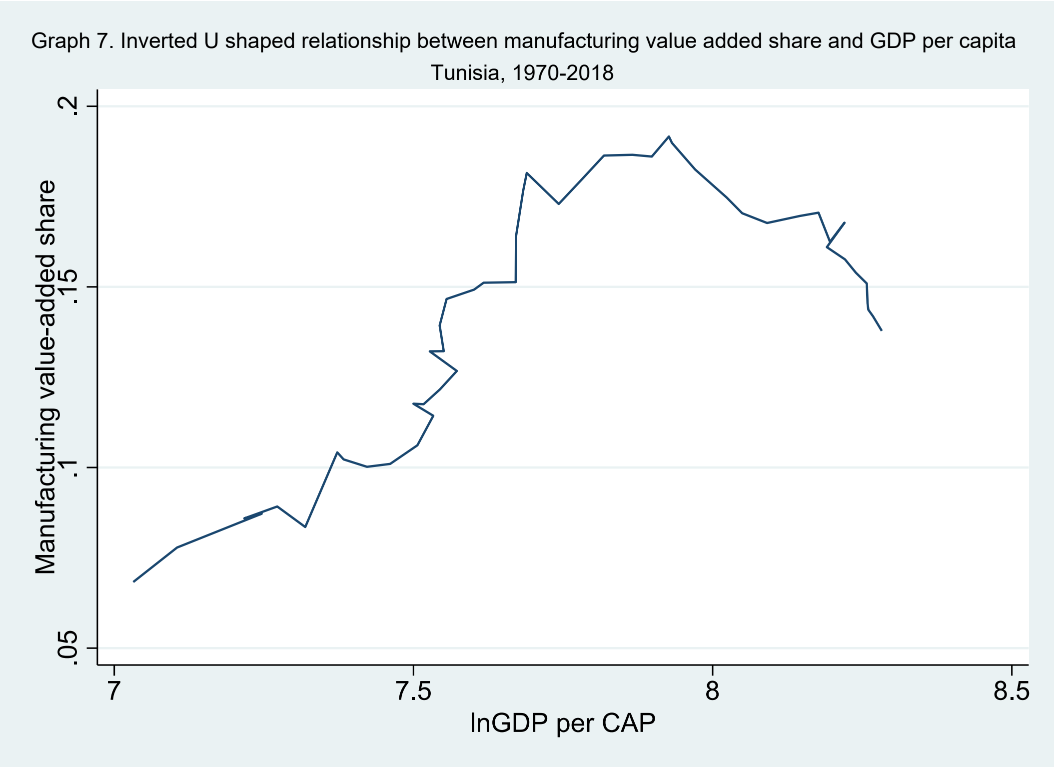
```
. dfuller manufvagrowthprixcons if idcountry==3, regress

Dickey-Fuller test for unit root                   Number of obs   =        56

                               ---------- Interpolated Dickey-Fuller ---------
                  Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value             Value
------------------------------------------------------------------------------
 Z(t)            -8.843            -3.572            -2.925            -2.598
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000

------------------------------------------------------------------------------------------
D.                     |
manufvagrowthprixcons  |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-----------------------+------------------------------------------------------------------
manufvagrowthprixcons  |
                   L1. |  -1.102777   .1247126    -8.84   0.000    -1.352811   -.8527438
                       |
                 _cons |   .0802807   .0156937     5.12   0.000     .0488167    .1117447
------------------------------------------------------------------------------------------
```

8. Services valued-added growth rate

```
. dfuller servicesvagrowthprixcons if idcountry==3, regress

Dickey-Fuller test for unit root                   Number of obs   =        56

                               ---------- Interpolated Dickey-Fuller ---------
                  Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value             Value
------------------------------------------------------------------------------
 Z(t)            -9.367            -3.572            -2.925            -2.598
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000

---------------------------------------------------------------------------------------------
D.                        |
servicesvagrowthprixcons  |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
--------------------------+------------------------------------------------------------------
servicesvagrowthprixcons  |
                      L1. |   -1.23659   .1320199    -9.37   0.000    -1.501274   -.9719062
                          |
                    _cons |   .0791253   .0116353     6.80   0.000     .0557979    .1024527
---------------------------------------------------------------------------------------------
```

Appendix B

Figure 7. Inverted u-shaped relationship between manufacturing value-added share and GDP per capita, Tunisia



Source: Authors' computations from the Groningen (2021) and WBI databases.