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Deindustrialization and Growth in MENA Countries:

A Focus on Tunisia

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Deindustrialization and growth in MENA countries: A focus on Tunisia

Monia Ghazali[1] and Rim Mouelhi[2]

1. Introduction

In recent decades, MENA countries have been experiencing a deindustrialization process at a low level of development which is characterized by a shrinkage in the weight of manufacturing and industry in terms of value added and employment at a low level of income per capita. This resulted in a delayed structural transformation as well as a failed economic development (Mouelhi and Ghazali, 2020). MENA countries have got 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." Intensive competition, the absence of an effective industrial policy and most importantly, the lack of competitiveness are seen as the main culprits of such a 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. Therefore, deindustrialization is always seen as a natural process in mature economies, resulting from a productivity increase in manufacturing sector and/or a structural change from industry to more productive sector of services, (Beg *et al.*, 2017).

Historically, industrialization has been at 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 a context of weakened competitiveness, low economic growth rates and steady high unemployment as such currently faced by MENA countries.

Many studies have addressed 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). However, few studies have focused on developing countries (Rodrick, 2016; Naved 2015; Dina, 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, namely Tunisia, Morocco and Egypt in order to emphasize its main features. The second objective is to explore the impacts of such a premature deindustrialization on the overall growth and economic development of these countries. To conclude, some

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proposals are suggested in order to reindustrialize and strengthen the manufacturing sector in MENA countries.

The main research questions this paper is addressing are as follows:

- What are the scope and the pattern of deindustrialization in MENA countries?
- What are the main causes of premature deindustrialization in MENA countries?
- Is manufacturing still the main driver of economic development and is deindustrialization partially responsible for the growth slowdown in Tunisia?
- How to reindustrialize?

This paper is organized in the following order: section 2 draws an overview of 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 displays an empirical analysis conducted on the Tunisian case. Section 6 provides the main conclusions and recommendations.

2. The patterns of deindustrialization in Tunisia and Morocco

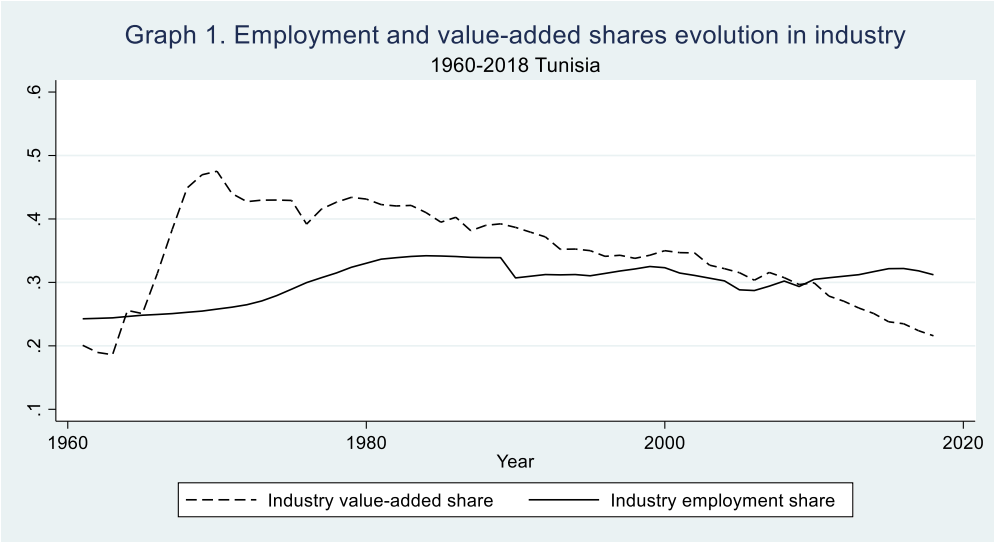
Graphs 1 to 3 present the evolution of the shares of industry in GDP and employment in Tunisia Morocco and Egypt respectively. The three countries[3] initiated and achieved some progress in industrialization over the 1970's, 1980's and early 1990's. The period 1975-1990 has inaugurated a first stage of industrialization, positively contributing to structural change from the agriculture sector to the manufacturing sector (Mouelhi and Ghazali, 2020). In fact, Morocco, Tunisia and Egypt have experienced some industrial diversification, however, in "light industries" such as textile, agro- food, and resources-based industries[4] under relatively protectionist policies. Industry has been confined to low technological, assembly and outsourcing activities despite some efforts made to develop the machinery and electrical sector. Therefore, the manufacturing sector has been basically characterized by a lack of sophistication in both countries (FEMISE 2015). The production for decades has been mainly unskilled-labor intensive, (Mouelhi and Ghazali, 2020)

However, the three countries did not achieve the transition to the next step of industrialization, i.e. to more sophisticated products and high-technology exports, as it was the case in emergent economies. The share of high-technology exports was very low in 2010: 0.9% in Egypt, 4.9% in Tunisia and 7.7% in Morocco[5]. The industrialization process has stagnated at low levels of income and remained unfinished.

[3] The pattern of structural change as well as the different phases of development for each country are detailed in appendix.

[4] Including chemicals and petroleum sectors in Egypt.

[5] More generally, this is very low in comparison to East Asian countries reaching an average share of 26.6% of high technology exports in manufactured exports, or in comparison to the same ratio in the Euro area (16%) or to the average in the world (17%) in 2010 (WBI database).



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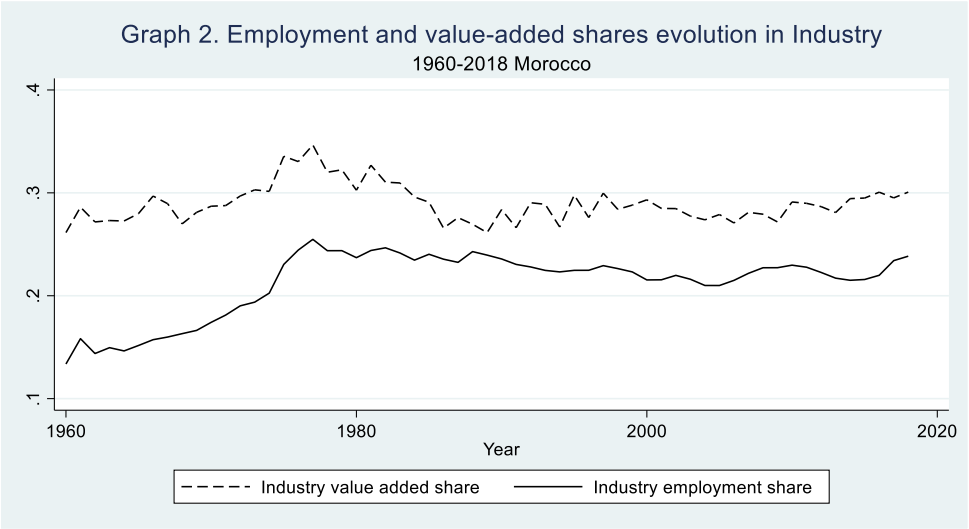

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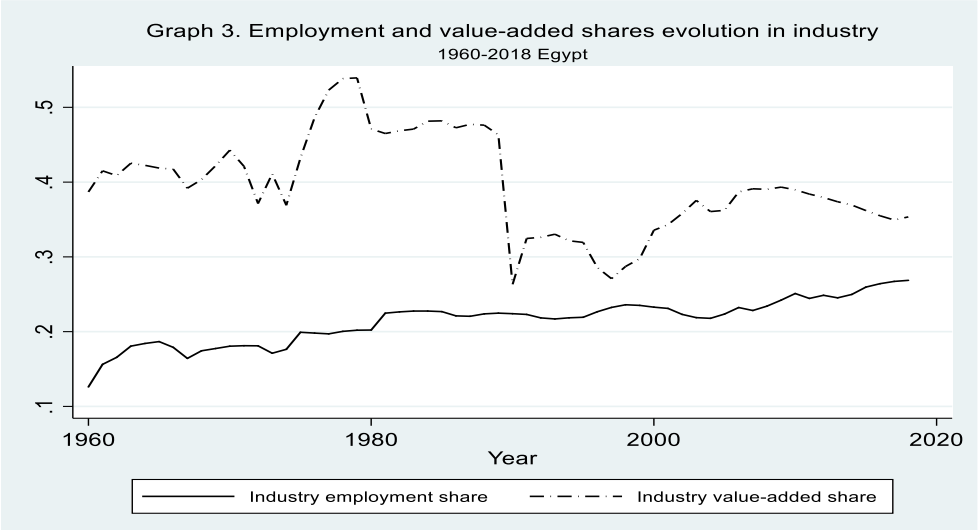

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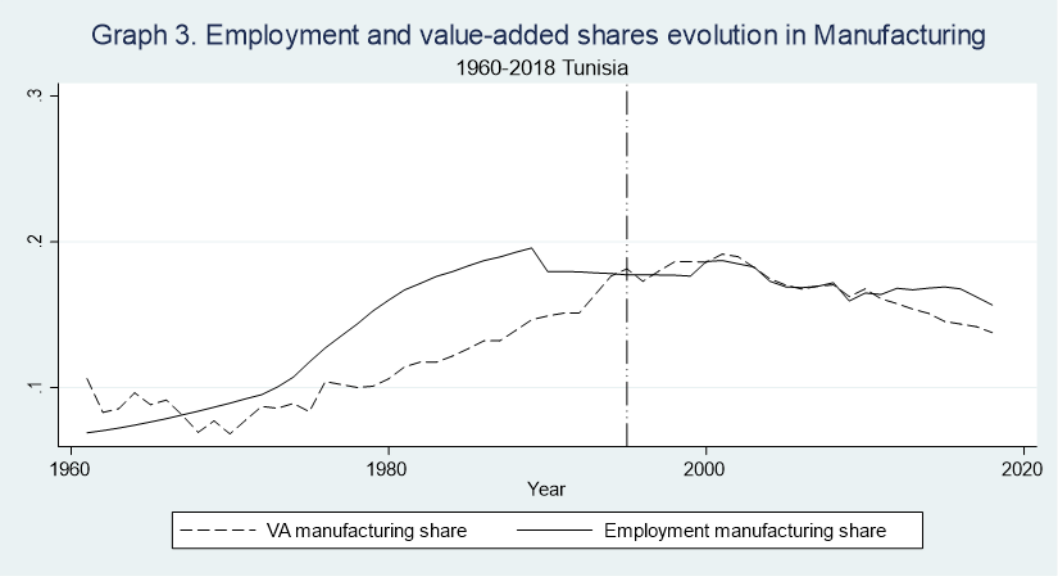
As shown in graphs 4 to 6, manufacturing employment and value-added shares have slowly decreased. The share of manufacturing in GDP dropped from around 20% in the late 1990's to around 16% in the end of the observed period in both countries. It is worth noting that Tunisia has registered a more pronounced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



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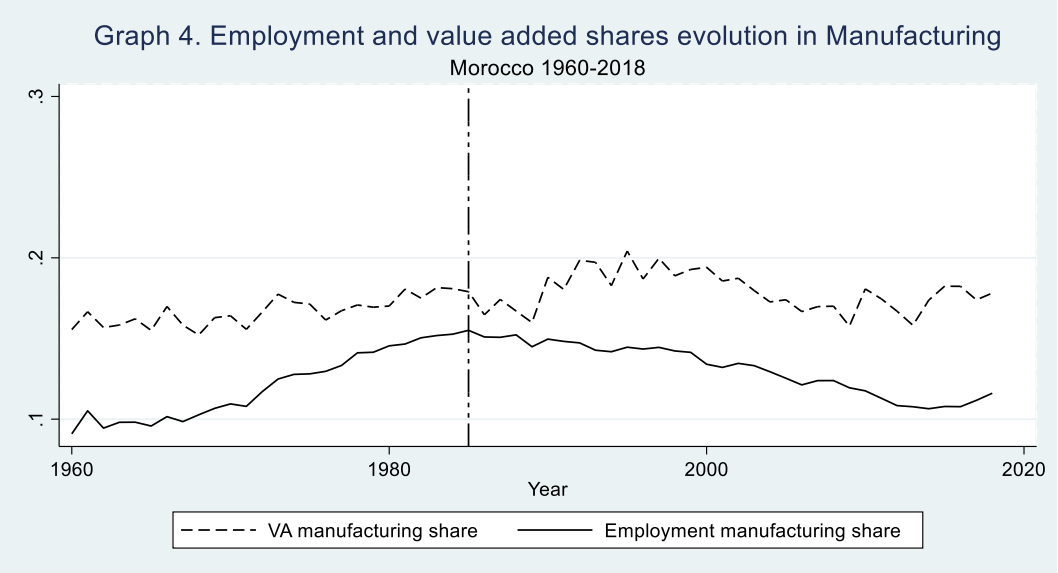

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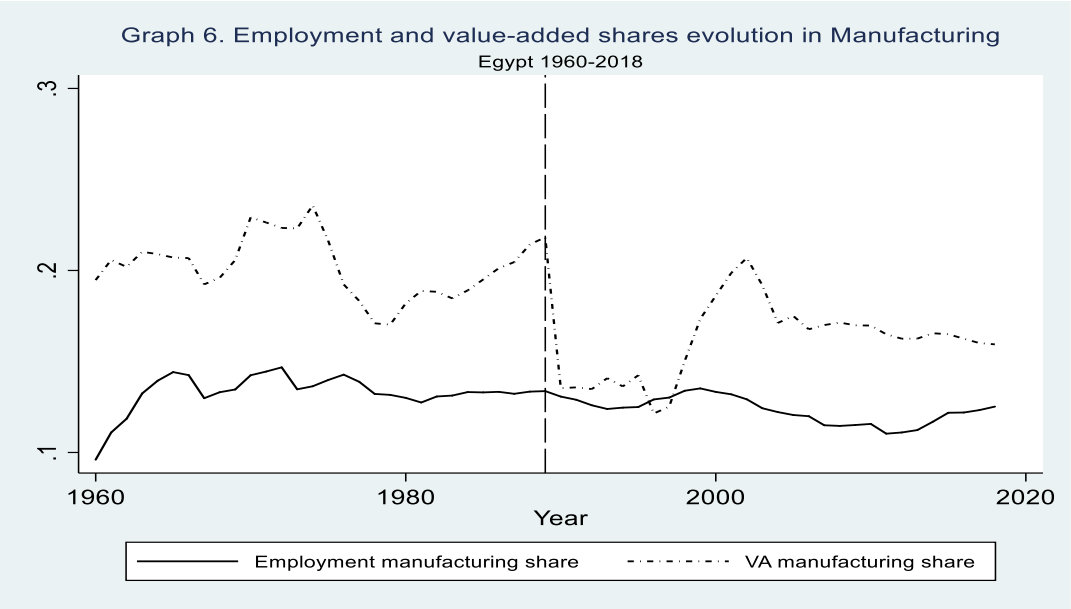

At first glance, the deindustrialization trend in the three countries is likely to reflect an international trend featured by an inverted-U relationship between the manufacturing weight and the income per capita (Tregenna, 2015). For most of the countries, productivity growth is the main responsible for the decrease in the industry employment share as well as the structural change leading to shifts to more productive services sectors. This is qualified as a "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 weights (in terms of value added and employment) comparatively to developed countries, (UNIDO Report, 2015). This is qualified 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 starts, the share of MENA countries manufacturing sector in GDP represented around 14% against 25% in developed countries. The peaks of the shares are likely to be lower than those of advanced countries.

Tunisia and Egypt experienced a revolution 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% in 1975-1989 to 2.1% in 2005-2018). 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 late 1980's, (Mouelhi and Ghazali, 2020).

The period following 2010 has been more promising for the manufacturing sector in Morocco. In fact, within a stable political environment, the Moroccan automotive industry has experienced a strong growth moving its share in total exports from 13.2% in 2008 to 20% in 2015. This is the result of a target-oriented industrial policy attracting foreign direct investment and multinationals through fiscal and financial incentives, training actions relevant to the specific needs of the automotive sector, simplification of procedures, infrastructure upgrading, etc., (Vidican et al., 2017).

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	Late 1980'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: Author' computation, World Bank (WB) classification and ONUDI Report, 2015

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

	1960-1975	1975-1989	1990-2005	2005-2018
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. Determinants of deindustrialization

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

3.1 In developed countries:

- *'A natural outcome of the development process':* Arajo et al. (2021) emphasizes that deindustrialization in already developed countries is a normal follow-up to the course of economic development process. According to Rowthorn and Ramaswamy (1999) this is a result of a combination of a "desirable" structural change and changes in the composition of demand. In fact, during the advanced stages of development, the labor productivity in the industrial sector exhibits the fastest growth comparatively to other sectors yielding to a reduction in manufacturing relative prices. This might stimulate the demand for manufactured goods.

However, the income elasticity of demand declines as the economy gains in maturity reaching a level under the unity[6]. Hence, when the per capita income increases, the demand would favour the services sector against industry.
The net effect on the industrial employment and output of productivity gains turns to be negative in the advanced economies as the demand does not sufficiently react to the fall in industrial prices. The 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), it is the higher rate of technological progress in manufacturing that is supposed to drive the faster rate of productivity growth in that sector resulting in advanced economies deindustrialization, already pointed out below. However, Rodrick (2016) considers that developed countries experience more employment than output deindustrialization which shifts the focus to the "unskilled-labor saving technological change[7]".

- *Outsourcing and externalization* of some manufacturing-related services activities from manufacturing to services providers could be another reason of 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 because of outsourcing of some functions from manufacturing companies to specialized services providers. However, even when Felipe et al. (2019) take into account UNIDO's (2015) estimate of outsourced or manufacturing-related jobs, manufacturing employment shares would increase by around 25%. This does not allow lower-income countries as well as MENA countries in the considered database to reach what Felipe et al. (2019) characterize as the "18%–20% manufacturing employment share threshold" for a "desirable" deindustrialization.

- *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. However, Araujo et al., (2021) find a positive relationship between manufacturing value added and trade openness computed as the sum of exports and imports in proportion of GDP.
Liberalization might also lead to a reallocation of output towards more productive activities and away from less productive ones in developed countries (Kucera and Milberg (2003)) due to the increased international mobility of

[6] The income elasticity of demand for industrial goods is greater than unity in the early stages of development contributing to explain the relative expansion of that sector in terms of employment and value added.
[7] Named alternatively « skill-biased technological change » defined by Haskel and Slaughter (2002) as: "any technological progress that raises relative demand of skilled workers within sectors at given relative factor prices".

production factors as capital and technology, (Palley, 2015). This move of industrial plants of large compagnies from developed to developing countries contributes to trigger deindustrialization in the former. Arajau et al. (2021) give evidence that the relocation of physical production and the degree of financialization reduce the manufacturing value added in developed countries, while trade openness increases it.

3.2 In developing countries:

In developing countries, deindustrialization is not resulting from a natural dynamism and maturation of the economy. In fact, at this stage, the income elasticity of demand is still greater than unity. Therefore, when labor productivity gains occur in the manufacturing sector yielding to prices decrease, this would stimulate the demand for manufacturing goods and increase 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 process. First, they have 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 in large scales, with high production capacities and high competitiveness. MENA countries turned to be net importers of manufacturing goods 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, "importing" therefore deindustrialization. Yet, without experiencing the corresponding technological change. Overall, through its various aspects, globalization has induced a reduced autonomy regarding national economic policy.

- *Inadequate economic policies and hampered competitiveness:* according to Arajo et al. (2021), the lack of an appropriate strategy for industrial development in developing countries after the "exhaustion of the import substitution process and the shift toward a liberalizing agenda and market friendly reforms could help explain the stagnation of productivity in these economies". This has resulted in the decline of competitiveness as domestic companies have been unable to respond to new market conditions, (Alderson, 1997) leading therefore to a negative structural change. As shown in table 3, the global competitiveness index (GCI) for the MENA countries is low compared to developed and emerging Asian countries standard and has been stagnating during the last years. The Arab world competitiveness report of the World Bank (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

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

exchange rates and/or high interest rates respectively hamper exports and raise the cost of firm's access to finance. This contributes to the financialization of the economy and hence reinforces deindustrialization.

Mouelhi and Mechergui (2023) used 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 lack of competitiveness illustrated mainly 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, the inequitable taxation system, skills gaps and the rigidity of the labor market etc…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 exports opportunities".

Table 3. Global competitiveness index scores,

	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 & 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 & 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)

Finally, for countries both industrialised and developing, Palma (2014) defines *The Dutch-disease* as a source of drastic premature deindustrialisation due to 1- the discovery of a natural resource (such as gaz in the Netherlands), 2- the boom of the services exporting sector (tourism, financial services, etc.) as in Hong Kong and Greece or 3- the radical change in the economic policy regime (e.g Latin American countries in the 1990s).

4. Does deindustrialisation matter for growth and economic development?

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

- *Increasing returns, technology and spillover effects:* the manufacturing sector is more likely to be able to experience economies of scale than agriculture or services, (Kassem, 2010). The technological change and innovations it incorporates 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 inter alia to the intensive application of sciences and technologies and the continuous displacement of the technological frontier in the manufacturing sector that allows « the sector's learning potential to remain high ». Tregenna (2015) set forth the availability of skilled industrial 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 opportunities and externalities such as: technological penetration, skills development, openness and technological transfer. Furthermore, the high skilled and productive activities in the services sector linked to manufacturing are less likely to develop leading the country to be trapped in traditional tertiary activities, (UNIDO report, 2015).

- *Backward and forward linkages:* the manufacturing sector leads to strong forward and backward linkages across sectors by inducing investment in subsequent banking, transportation and insurance services as well as preceding stages of the production process (agriculture, energy…) (Hirschman 1958, Ciarli and Dimaio 2013). Furthermore, linkages within manufacturing sub-sectors are more important than within other sectors which make 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 the other sectors of the economy as well as high savings rates encouraged by productive investments fostering a virtuous circle of growth and economic development.

- *The higher income elasticity of demand for manufactured goods:* according to Roshan (2017), manufactured goods (especially high-tech) benefit from high income elasticities of demand unlike primary products which follow the 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 according to Felipe et al. (2019) a virtuous cycle: "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".

  Labor productivity: Felipe et al. (2019) put forward the high manufacturing potential for productivity catch-up that is not reached yet by services. In the same vein, Rodrik (2013) confirms that national manufacturing industries starting away

from the labor productivity frontier experience significantly faster unconditional productivity growth (i.e. without conditioning on variables such as domestic policies, human capital, geography or institutional quality). Furthermore, according to the first law of Kaldor (1966), the growth rate of an economy is positively impacted by the growth rate of its manufacturing sector as manufacturing has effects on the overall labor productivity because of increasing returns to scale due to learning by doing processes and efficiency changes and labor reallocation movement from non-manufacturing low productivity sectors to manufacturing, (Keho, 2018).

- *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 employment multiplier in terms of jobs indirectly created in other sectors, generating thus new revenues and reducing poverty. This works through the "supply chain" as well as the backward and forward linkages stressed above. Moving from primary products to manufactured and higher products specialization generates higher revenues and growth (Roshan, 2017). This especially contributes to jobs creation for women and to enhance their financial empowerment.

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

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

However, several recent studies have pointed 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, Hong Kong, India, etc), (Hauge and Shang, 2019). The ICT 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 for development, especially for developing countries. However, the authors pointed the fact 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. The contribution of services to growth has yet 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 declining over time. The authors conclude « 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 summary, in comparison to the past literature on the relationship between growth and the weight of manufacturing, the 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. We have chosen to focus in what follows on the Tunisian case for basically two reasons. The first one is that, as shown in section II, the pattern of premature deindustrialization is more accurate in Tunisia. Morocco, however has been triggering a reindustrialization process during the 2000's driven by the development of the automotive sector and an export-oriented industrial policy. The second reason is the availability of a large set of data regarding 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 the manufacturing weight on the economic development over different periods. Bearing in mind the engine of growth role of this sector emphasized in section IV, 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 whether the impact of manufacturing on growth is driven by other factors such as trade openness, FDI inflows, investment, innovation and human capital.

Table 4. Variables description

Variables	Description	Source	Period
y	Annual percentage growth rate of GDP per capita based on constant price 2015 USD	World Bank Indicators (WBI)	1971-2018
m	The share of manufacturing in total GDP computed as the gross value added of	Economic transformation database (2021)	1961-2018

	manufacturing sector at 2015 constant price divided by total GDP	from Groningen Growth and Development Centre (GGDC/UNU)	
S	The share of services in total GDP computed as the gross value added of services at 2015 constant price divided by total GDP	Economic transformation database (2021) from Groningen Growth and Development Centre (GGDC/UNU)	1961-2018
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 2015 constant 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 2015 constant 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 gross domestic product (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 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 quadratic 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, macroeconomic shocks are captured using the inflation rate at time t (measured by the annual growth rate of the GDP implicit deflator), etc. Furthermore, we include a time dummy taking the value of 1 for the period following 2011's

popular Tunisian uprising. This period witnessed a political unrest and an economic instability accelerating the negative structural change. Table 4 below sums up the variables used as well as their sources while appendix B gives details regarding means and standard deviations.

6.2 Empirical results:

We start by applying Dickey-Fuller and Phillips-Perron time series unit root tests due to the particularly extended observation period we are dealing with (see appendix A). Results reveal that the majority of series are clearly stationary with the exception of manufacturing and services shares in total GDP as well as the openness indicator that are all integrated of order 1. Therefore, these variables are incorporated into the regression equation in first differenced form. Table 5 below reports estimation results using OLS (ordinary least squares) estimator that are robust to heteroscedasticity. Columns 4 and 5 give evidence that manufacturing value added share exerts a strong positive effect on the overall growth over the period 1970–2018. This converges with the engine of growth hypothesis related by the theoretical and empirical literature for developed as well as least developed countries ((Szirmai and Verspagen (2015), Pandian (2017)) for a similar period. On the contrary, services weight's increase is likely to hinder growth. The higher the weight of the service sector, the smaller is the GDP per capita growth in Tunisia. One might ask whether such a negative association is continuously consistent over Tunisian economic history. For a meaningful answer to such a question, we give in column 5 the outcome of the interaction of the manufacturing and services value-added shares with dummies for the pre- and post-1995 periods. Results give evidence for a persistent positive relationship between manufacturing weight and GDP per capita growth but with a declining trend. Results suggest also 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-1980s, the services sector had been 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 report published in 2014 entitled "The unfinished revolution": "Entry into 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 ». Furthermore, Mouelhi and Ghazali (2020) explain that the increase in the weight of the services sector from the 1980s to the 2000s was basically driven by low-productivity services such as trade and government services and to a lesser extent by modern and highly productive activities. Modern services were reserved for the acquaintances of the former regime. Regarding manufacturing, Ayadi and Matoussi (2014) argue that the semi-liberal policy adopted in 1970s combinating import substitution and export promotion was a breeding ground for the transition from an artisanal to a modern manufacturing sector that contributed to achieve an average annual GDP growth rate of about 7.5 per cent. 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 basically relies on low-value added and unsophisticated textiles 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 do foster growth as the associated coefficient is positive and statistically significant at 1% level in addition to

being significantly less than unity (0.245). This means that the rate of growth of the manufacturing sector is in excess of GDP per capita growth which confirms its role as a leverage effect. The coefficient for services is also positive and highly statistically significant though above the manufacturing level implying that services growth is less likely to pull GDP growth than manufacturing. Interacting the manufacturing and services value-added growth rates with dummies for pre and post 1995 periods (column 2) confirms this outcome.

Results regarding other control variables converge with literature findings. We find out 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). Furthermore, the inflation rate as well as the 2011' Tunisian uprising are likely to have put a brake to the Tunisian development process.

VARIABLES	(1) Growthgdpcapita y	(2) Growthgdpcapita y	(3) Growthgdpcapita y	(4) Growthgdpcapita y	(5) 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)			
D.trade openness	-0.000390	-0.000272			
	(0.000779)	(0.000780)			
lnPop	-6.108**	-5.279*	-13.29***	-12.61***	-12.49***
	(2.766)	(2.945)	(4.189)	(3.740)	(3.553)
lnPop2	0.193**	0.167*	0.419***	0.398***	0.394***
	(0.0873)	(0.0932)	(0.132)	(0.118)	(0.112)
post2011	-0.0265**	-0.0246**	-0.0441***	-0.0395***	-0.0435***
	(0.00985)	(0.0119)	(0.0125)	(0.0119)	(0.0119)
mg	0.245***				
	(0.0634)				
Sg	0.450***				
	(0.131)				
D.m			1.752*	1.805**	
			(0.898)	(0.830)	
D.S			-1.507***	-1.611***	
			(0.449)	(0.449)	
inflationrategdpdeflator				-0.00176*	-0.00150*
				(0.000908)	(0.000868)
D.S*pre1995					-1.874**
					(0.759)
D.S*post1995					-1.394***
					(0.383)
D.m*post1995					0.725
					(0.794)
D.m*pre1995					2.678*
					(1.479)
Constant	48.20**	41.71*	105.3***	100.0***	99.03***
	(21.91)	(23.26)	(33.26)	(29.71)	(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 MENA countries, namely Tunisia, Morocco and Egypt, by exploring its intensity, its path, its determinants and its impacts on growth. The results suggest that Tunisia, Morocco and Egypt experienced a deindustrialization at lower levels of both income per capita and manufacturing weights comparatively to developed countries. This is qualified as "premature deindustrialization" or "negative deindustrialization".

The three countries initiated and achieved some progress in industrialization over the 1970's, 1980's and early 1990's, they have experienced some industrial diversification, however, in "light industries". Manufacturing has been confined to low technological, assembly and outsourcing activities despite some efforts made to develop the machinery and electrical sector.

However, the three countries did not achieve the transition to the next step of industrialization, i.e. to more sophisticated products and high-technology exports, as it was the case in emergent economies.

An empirical study on the Tunisian case, 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, unfair and inefficient tax system, labor market rigidity, lack of a relevant industrial policy, etc. 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. "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 exports opportunities", Merchergui and Mouelhi (2023).

We also use a long-term time series data, from 1961 to 2018, to investigate the impact of the manufacturing and services weights on the 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 the overall growth over the different considered periods confirming thus its role as engine of growth. However, manufacturing weight had a declining positive impact over time as it has been confined to low technological, assembly and outsourcing activities characterized by a lack of sophistication.

On the other hand, the results give evidence for 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 basically driven by low-productivity services such as trade (largely in the informal sector) and government services and to a lesser extent by modern and highly productive activities.

Overall, results suggest a premature deindustrialization with a negative impact on growth and development in MENA countries. Reindustrialization and strengthening of the manufacturing

sector are important for MENA countries growth and jobs 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 combating 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 the industry is for national security and how it is a priority to limit the dependence of foreign countries. This requires a better physical and digital infrastructure quality, a better educative system quality, preparing for innovation and providing the skills needed for an innovative and modern private sector. This also requires to implement effective and active policies. An efficient industrial policy promoting and supporting the manufacturing sector is needed as well as the setting of financial and fiscal incentives, the improvement of the business climate quality, the simplification of the regulatory framework and the law enforcement. State intervention is more important than ever to support the economic modernization and the digital transformation process.

Improving labor productivity and production efficiency are required to improve the competitiveness, (UNIDO report, 2015). This, in turn, helps attracting "relocated" FDI inflows. In fact, the relocation of Southeast Asian-based European companies as a response to national security considerations, especially after the COVID-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 experience and know-how in the traditional sectors (textile, agrifood, etc.) to further develop, integrate within the global value chain and upgrade to higher value activities (UNIDO report, 2015). The support of governments is here crucial to strengthen the competitiveness and the export orientation of these traditional sectors. As a major unskilled-workforce employer (the textile sector provides 40% of the industrial jobs in Morocco), such an effort would enable to tackle unemployment, which is one of the major challenges in MENA region.

Technological sectors as automotive and aeronautics industries provide significant growth potential as well. These sectors are developing in MENA region, especially in Morocco where the automotive sector accounted for 24% in total exports in 2017 providing an increasing number of job creation. 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

4. 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

5. 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
------------------------------------------------------------------------------
```

6. 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

7. 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

8. 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

9. 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

Variable label	Obs	Mean	Std. Dev.	Min	Max
y	57	.0606724	.0805303	-.0278926	.5523754
mg	57	.0677258	.1056845	-.239799	.579847
sg	57	.0634796	.0608375	.0044067	.4696263
m	58	.133769	.0377698	.0683036	.1916352
s	58	.527832	.0762134	.4078877	.6905896
Inflation rate	53	6.056624	4.174955	1.329108	24.39473
Pop	49	8549168	2015787	5063809	1.16e+07
Trade openness	54	37.34647	8.575618	19.0467	55.65283