

Industrialization, Inclusive Economic Growth: Tunisia in the Era of the Current Crisis



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ABSTRACT: The consequences of the current crisis vary considerably from country to country and from sector to sector. In this paper, we examine how industrialization and inclusive economic growth of Tunisia is being affected by the current crisis. This work focuses on examine critically the importance, performance and underweighting of the industrial sector .Both theoretical and empirical evidence show somewhat unsatisfactory industrial development. The paper finally attempts to explain the way forward (beyond the impasse), by providing alternative approaches, opportunities. To conclude, on using a panel model for a samples of Tunisia covering the period (2008-2022). The results of VECM clearly show the existence of a relationship between industrialization and inclusive economic growth in Tunisia.

KEYWORDS: Inclusive growth; time series; industrialization; Tunisia.

JEL Classification: F21, O1, O43

1. INTRODUCTION

Tunisia, as other developing countries, has been also affected by the crisis which has reinforced the fragility of growth dynamics. The Tunisian economy was heavily affected by the effects of this crisis, which led to a sharp drop in growth and a rapid rise in unemployment. This crisis has reinforced the fragility of an economy hit for several years by the evils of corruption, inequality and growing unemployment, particularly among graduates. The Covid-19 crisis is simultaneously a crisis of supply and demand. Data on the evolution of the growth rate for the first quarter of 2020 published by the National Institute of Statistics show a recession of 1.7% of GDP.

Tunisia's economic performance stalled after 2011, leading to a decade of lost growth in a context further aggravated, from 2020, by the COVID-19 pandemic. Between 2011 and 2019, gross domestic product (GDP) growth fell to 1.7% on average. Then it was taken up by the World Bank Report: Excessive regulations of economic activity, less focus on foreign trade, weak investment and lack of innovation have significantly weighed on productivity growth. The economic recovery stalled in 2022. After the slight improvement in 2021 (4.4%) which followed the sharp contraction of 2020 (-8.8%), the Tunisian economy marked time, with growth of real GDP by 2.5% in 2022 (WB, 2022).

The relationships between industrialization and economic growth have been little studied in underdeveloped and developing countries, even though there is unanimous agreement on the need to know them in order to pursue effective industrial policies. This need has been amplified recently with the repeated financial crises experienced by several regions and both the development of a country's capacity to convert raw materials into new products, and it is also the system that allows production to take place. It increases the efficiency of the use of labor and capital.(Saghrouni.O. 2022a).

For Saghrouni olfa (2022a), there is a unidirectional causal relationship from the manufacturing industry to economic growth in the short and long term. This observation allows us to appreciate the role of industrialization in growth mechanisms in Africa. Progress in the manufacturing industry helps support and stimulates economic growth; however, the shortage of production in the manufacturing industry can in some cases slow down this growth. Hence the manufacturing industry can be considered as a factor which limits economic performance in the event of disruptions which may affect the different phases of the production process.

The global economic and financial crisis has had negative impacts on the economies of African countries. It also revived the debate on the conduct of macroeconomic policy in developing countries. African countries now need to know how to put

Industrialization, Inclusive Economic Growth: Tunisia in the Era of the Current Crisis

themselves in a position to benefit from the recovery and ensure that the measures taken in response to the crisis do not lead to medium-term and long-term sustainability problems of their debt. The solution for these countries would be to create strong regional markets, unlock the development potential of local businesses and entrepreneurs, and increase their resilience to shocks. In other words, to learn lessons from endogenous growth models (Saghrouni.O.2022 b).

For Saghrouni (2022c), Theoretical predictions that FDI combined with corruption control positively influence economic growth have not been verified in the case of North African countries because, as the estimates show, the coefficient associated with the variable interactive Foreign Direct Investment-Control of Corruption is positive and not significant. Indeed, almost all countries in North Africa have been striving for some time to combat corruption.

In this work, we seek to identify not only inclusive growth but to know whether inclusion is a necessary ingredient or rather a long-term result of development in the country studied. The first part deals with a theoretical framework of literature which focuses on the relationship industrialization and inclusive growth.

The second part presents the methodology to be applied to evaluate this relationship taking into account certain changes in the Tunisian economy.

2. REVIEW OF THEORETICAL LITERATURE

2.1. Theoretical framework of inclusive growth

The term inclusive growth has gradually spread to speak of growth that is not limited to that of usual monetary aggregates (OECD, 2014). It covers two ideas: that of growth that includes all the determinants of the quality of life of individuals, and that of growth that benefits everyone without leaving anyone behind. The notion of inclusion can also be extended to future generations; the increase in current well-being should not be at the expense of their future well-being. We then come closer to another, older notion, that of sustainable development, in the sense given to it by the Brundtland report, with its three economic, social and environmental pillars (Brundtland, 1987).

Inclusive growth is distributive growth if it is defined as a results-based process. This notion implies sustainable growth that creates and expands economic opportunities and ensures broader access to these opportunities so that members of society can participate in and benefit from growth (Klasen, 2010; Ali and Son, 2007; Bourguignon et al, 2007).

Rauniyar and Kanbur (2010) address conceptual issues relating to inclusive growth. Thus, inclusive growth is growth accompanied by a reduction in inequality. For Ali and Son (2007), "Inclusive growth is growth that not only creates new economic opportunities, but also guarantees equal access to the opportunities created for all groups in society, particularly the poor."

For Ali and Zhuang (2010), inclusive growth is defined as being an outcome, which guarantees access to opportunities and equality of opportunity, for access to opportunities. This translates into more participation in economic life. For Ianchavichina and Lundistoram (2012), "Inclusive growth involves accelerating the pace of growth and strengthening the economy while leveling the playing field for investment and increasing productive employment."

For Rauniyar and Kanbur (2010), inclusive growth can be achieved by emphasizing regional integration of economic growth, improving access to assets and markets and establishing opportunities for next generations. This term (year) designates equality of opportunity, economic, social and institutional. The literature also highlights that inclusive growth is accompanied by a reduction in income inequality. McKinley (2010) treats the issue of inclusive growth as economic growth, which includes human capabilities. For him, inclusive growth is a tool to improve economic results. This approach emphasizes non-income measures of well-being and the enhancement of human capabilities (health and literacy), primarily as outcomes of human development, not as a tool. to accelerate economic growth.

McKinley analyzes a conceptual framework of inclusive growth and treats a diagnostic approach through the indicators he proposed, namely productive employment and economic infrastructure; (ii) monetary poverty and equity, including gender equity; (iii) human capacities; and (iv) social protection. These indicators were used to construct an aggregate indicator of inclusive growth. This indicator constitutes a starting point for the Asian Development Bank to achieve the objectives of inclusive growth.

2.2. Agglomeration dynamics, spatial disparities and industrial policies: brief overview of the theoretical and empirical literature

The agglomeration of productive dynamics refers to positive feedback loops that the new economy geography associated with externalities: the location of an activity at one point favors the attraction of other activities, which generates a "virtuous circle" for attractive space, but in return a "vicious circle" for other spaces which see their capacity attractiveness deteriorate. We find the foundations of the model center-periphery described by Krugman (1991). In fact, the effects of spatial agglomeration are ambiguous from the point of view of territorial development. Promoting the spatial concentration of activities in certain points of the territory, most often the urban areas, these effects also have the counterpart of desertification of spaces that do not benefit from positive spatial feedback, mainly rural areas. This reinforcement of inequalities geographical therefore

Industrialization, Inclusive Economic Growth: Tunisia in the Era of the Current Crisis

leads to questions about the border in the transition from the status of a repulsive space to that of an attractive space, and reciprocally.

Local economic development is based on externalities positive, whether of financial or technological origin. In the first case, the location of an activity would generate knock-on effects on the development of complementary activities. Externalities linked to supply and demand both upstream ("backward linkages") and downstream ("forward linkages") mutually reinforce each other to create concentration phenomena. The attractiveness of businesses for urban areas is reinforced as much by the existence of a large customer base as by the availability of specialized suppliers and a qualified and diversified workforce. Venables (1996) emphasizes that companies group together because of externalities linked to the supply of labor and the demand for goods, and because of the presence of "input-output" externalities between firms.

Technological externalities, for their part, refer to interactions between productive processes that do not pass through the market. They are by nature immaterial, difficult to identify and measure. The concentration of activities in a region is a source of economies of scale external to the firm (in the Marshallian sense) and internal to the region considered (Catin et al., 2007). The role played by externalities differs depending on: i) whether agglomeration economies are internal to an industry or occur between different industries; ii) the role played by the level of local competition. Hence the distinction between two types of dynamic externalities: MAR (Marshall-Arrow-Romer) type externalities, linked to the presence of intra-industrial agglomeration economies, promote regional specialization and help explain the growth of the industry in question and the region in which it developed. Jacobs type externalities (1969, 1984) arise from the industrial diversity of a region and are sources of agglomeration economies external to the company and the sector, but internal to the region.

While based on the contributions of the theory of endogenous growth (Romer 1986; Lucas 1988), pioneering empirical work explains the growth of cities in developed countries (Glaeser et al., 1992; Henderson et al., 1995) by their industrial structure, by explicitly introducing the role of dynamic externalities. Inspired by this work, and taking into account the specificities of developing countries, certain empirical works (Catin et al., 2007; Karray and Driss, 2009; Amara and Thabet, 2012) explore this line of research to see in to what extent the industrial structure of a region determines its growth. This work was able to explain the growth of certain regions, to the detriment of others, through the role played by both pecuniary and technological externalities, without however raising the role that public authorities can play in the objective of achieving a more balanced territorial development.

Therefore, the question of territorial regulation arises, which must be in direct contact with the local industrial structure. This is what led Rodrik (2004) to consider that industrial policy is making a comeback, especially in countries where policy renewal efforts are continuing. The renewal of industrial policy must introduce at least two essential elements. On the one hand, the role of the State is less that of an omnipresent actor who sets the means and dictates actions, than that of an economic actor capable of setting up a conducive environment and institutions favoring the triggering of 'a territorial dynamic around one or more industrial activities with high growth potential for the region. Thus, according to Bourque et al. (2013), industrial policy appears more as a strategy of support and development of the potential of a region and/or an industry; it of course aims for results, but above all it seeks to make each of the economic actors better and more efficient.

On the other hand, the bases of a new industrial policy must be able to further support industrial activities with higher added value by giving priority to: i) the development of employment and qualification resources; ii) research and innovation efforts; and iii) more balanced territorial development. In this context, the OECD (2012) considers that the link, long neglected, between industrial policy and territorial development must be endogenous to any renewal of industrial strategy, in order to reduce the imbalance between a developed center and a neglected periphery. Each region has its cultural, social and historical specificities, which shape its industrial development. Also, supporting industrial development in the regions requires designing specific programs, targeting priority regions, and promoting inter-regional collaboration.

2.3. Outlook of economic and industrial sector concentration in Tunisia

GDP growth is expected to reach 3 percent in 2021, below that in the first semester. This lower growth is due to the weakening of the base effect and the worsening of the pandemic. The uptick is not large enough to return output to pre-pandemic levels of 2019. Growth is eventually expected to stabilize at a modest 3.3 % by 2023, reflecting pre-existing structural weaknesses and a gradual global recovery from the pandemic. These estimates are presented with significant downside risks. The pace of the recovery will depend on the political developments, including the nomination of a new Prime Minister and the resumption of parliamentary activities, on the evolution of the pandemic and of the financing of the public debt.

Poverty is not expected to decline to pre-COVID levels before 2023. Predicted poverty rates using the US\$3.2 PPP line are expected to reach 3.3% in 2022 and 3.1 % in 2023 using the US\$3.2 PPP line. Using the upper-middle income countries poverty line (US\$5.5 PPP), poverty is projected to decrease to 18.7 in 2022 and 17.8 % in 2023.

Industrialization, Inclusive Economic Growth: Tunisia in the Era of the Current Crisis

The current account deficit is expected to widen slightly to 6.1 % of GDP in 2021 as imports begin to recover and oil prices increase. The deficit would stabilize around 7 % of GDP by 2023 as the effects of the pandemic ease and trade flows recover. But risks to the external outlook remain high, including a sluggish export recovery, given the heavy impact of the pandemic on firm capacity and the pace of recovery amongst Tunisia's main trading partners. (TABLE 1)

The gradual decline of the fiscal deficit is expected to continue in the medium term, reaching 5-7 % of GDP in 2021-2023, as vaccination coverage and the moderately positive trajectory of expenditures and revenues. However, meeting the public financing needs will remain challenging. Even before the fall in government bonds following the July 25th events, Fitch had downgraded Tunisia's sovereign rating to "B-". This reflects increased fiscal and external liquidity risks amid further delays in agreeing a new program with the IMF. As a result, Tunisia has furthered its reliance on debt monetization with Central Bank reserves steadily declining from US\$ 8.2 billion at the end of 2020 to US\$ 7.1 billion in August 2021. This increases the risks on the monetary financial stability side, which are exacerbated by the Central Bank soaking liquidity from the banking system and the high level of Non-Performing Loans (13.6% in 2020).

In order to take into account the main components of the structure industrial sector indicating regional disparities, we consider variables relating to the industrial fabric overall, as well as variables relating to companies with foreign participation more specifically.

Indeed, since the beginning of the 1990s, Tunisia has been engaged in a process of liberalization of trade and capital movements, which has resulted, among other things, in the entry of foreign direct investments (FDI). Taking into account variables relating to the latter makes it possible to examine to what extent the establishment of foreign companies has reduced or accentuated regional disparities in Tunisia. Thus, the variables considered to calculate the concentration indices are the following: the number of industrial companies with more than 10 employees (NE), the jobs created by them (Emp); the number of companies with foreign participation (NE-IDE), the employment created by them (Emp-IDE); as well as the stock of foreign direct investment (Stock-FDI). These variables are broken down by manufacturing sector and by governorate (see appendix 1 for the list of governorates by region and the nomenclature of manufacturing sectors).

Table 1: Tunisia / Macro poverty outlook indicators (annual % change unless indicated otherwise)

	2018	2019	2020	2021 e	2022 f	2023 f
Real GDP growth, at constant market prices	2.5	1.5	-9.2	2.9	3.5	3.3
Private Consumption						
Government Consumption	2.4	1.9	-4.9	1.0	2.5	2.2
Gross Fixed Capital Investment	0.6	0.4	-2.6	-26.5	-3.2	-1.0
Exports, Goods and Services	2.1	-2.6	-	18.7	13.4	4.5
Imports, Goods and Services	4.8	-0.8	-	39.0	12.0	10.1
	2.6	-5.0	-	38.2	10.6	7.2
Real GDP growth, at constant factor prices	2.5	1.4	-9.5	3.0	3.5	3.3
Agriculture	5.9	5.7	0.4	-4.6	4.0	4.0
Industry	0.9	-1.6	9.1	8.5	3.5	3.2
Services	2.7	2.1	-	2.0	3.5	3.2
			11.1			
Inflation (Consumer Price Index)	7.3	6.7	5.6	5.6	6.0	6.0
Current Account Balance (% of GDP)	-	-	-	-	-	-
	10.4	-7.9	-6.0	-6.1	-7.6	-7.1
Fiscal Balance (% of GDP)	-4.2	-2.9	-9.4	-7.6	-5.7	-5.2
Debt (% of GDP)	72.7	66.6	81.9	85.1	84.8	85.5
Primary Balance (% of GDP)	-1.7	-0.4	-5.8	-4.3	-2.0	-0.9
International poverty rate (\$1.9 in 2011 PPP)^{a,b}	0.2	0.2	0.3	0.3	0.3	0.3
Lower middle-income poverty rate (\$3.2 in 2011 PPP)^{a,b}	2.9	2.9	3.7	3.5	3.3	3.1
Upper middle-income poverty rate (\$5.5 in 2011 PPP)^{a,b}	16.7	16.5	20.1	19.5	18.7	17.7
GHG emissions growth (mtCO₂e)	0.8	0.0	-8.2	2.5	5.2	4.6
Energy related GHG emissions (% of total)	73.9	73.8	72.3	73.0	72.4	71.8

Industrialization, Inclusive Economic Growth: Tunisia in the Era of the Current Crisis

Source: World Bank, Poverty & Equity and Macroeconomics, Trade & Investment Global Practices. Emissions data sourced from CAIT and OECD

.Notes: e = estimate, f = forecast.

(a) Calculations based on 2015-NSHBCSL. Actual data: 2015. Nowcast: 2016-2020. Forecast are from 2021 to 2023.

(b) Projection using neutral distribution (2015) with pass-through = 0.7 based on GDP per capita in constant LCU.

The data used was collected from the Agency for promotion of industry and innovation in Tunisia (APII) for this which variables relating to the industrial fabric overall, and with of the Foreign Investment Promotion Agency (Foreign Investment Promotion Agency, FIPA)¹ in terms of variables relating to FDI. The statistical analysis proposed here concerns four cuts, namely the years 2000, 2005, 2010 and 2012².

Table 2: Evolution of the geographical concentration index of employment by sector between 2000 and 2012

Secteurs	Emp				Emp-IDE			
	2000	2005	2010	2012	2000	2005	2010	2012
IAA	0,116	0,109	0,095	0,095	0,147	0,131	0,128	0,127
IMCCV	0,094	0,090	0,085	0,080	0,154	0,144	0,117	0,107
IMM	0,149	0,138	0,134	0,132	0,104	0,119	0,160	0,155
IEE	0,167	0,148	0,103	0,112	0,176	0,153	0,112	0,116
ICH	0,137	0,130	0,117	0,114	0,173	0,151	0,194	0,192
ITH	0,141	0,138	0,129	0,127	0,143	0,137	0,135	0,137
ID	0,094	0,093	0,090	0,089	0,106	0,108	0,121	0,117
ICC	0,201	0,180	0,141	0,136	0,210	0,218	0,191	0,182
Total industries	0,095	0,092	0,085	0,085		0,115	0,100	0,101

Table 2 presents the results relating to the evolution of the spatial concentration of different industrial sectors between 2000 and 2012 in terms of employment.

While considering the four sections (namely the years 2000, 2005, 2010 and 2012), Table 2 distinguishes the concentration indices relating to total employment and those relating to employment created by FDI. According to Table 2, employment in the agro-food industries (IAA) and construction materials, ceramics and glass (IMCCV) sectors is generally dispersed, while employment created by FDI in these two sectors is relatively more geographically concentrated. On the other hand, employment in the sectors of mechanical and metallurgical industries (IMM), electrical and electronic industries (IEE), chemical industries (ICH), textile and clothing industries (ITH) and leather and footwear industries (ICC) is relatively more geographically concentrated. In addition, for the different years of observation, the employment created by FDI in these sectors is also concentrated. More particularly, employment created by FDI is relatively more concentrated than overall employment in the ICH, ICC and, to a lesser extent, ITH sectors.

Improving the business climate aims to promote the competitiveness of the private sector. The results of the ITCEQ survey on the Business Climate and Competitiveness of companies for the year 2019 reveal that the macro-economic and regulatory framework, bank financing (essentially, the cost of bank financing), the judicial system (deadlines for resolving commercial disputes, application of decisions) and administrative procedures (tax administration, , business creation, authorizations,

¹ As for the FIPA data, in order to respect the API nomenclature, the plastics industry has been integrated into the miscellaneous industries sector.

² The year 2012 is quite close to the year 2010, but its inclusion will make it possible to take into account the post-revolution effects in Tunisia.

Industrialization, Inclusive Economic Growth: Tunisia in the Era of the Current Crisis

inspections,), infrastructure (Infrastructure and means of transport) are among the most severe constraints on investment in addition to structural constraints³.

Logistics infrastructure must be strengthened because the low efficiency of logistics services around port infrastructure weighs on the quality and availability of handling and shipping services. Improving import-export logistics services is essential to ensure effective participation in GVCs. It is also necessary to undertake the necessary reforms and measures to develop the financial system, diversify sources of financing, further simplify and streamline administrative procedures, improve logistics services, investing in port infrastructure and digitalization...

According to the GIZ⁴ report, most industrial infrastructures in Tunisia present serious handicaps in terms of attractiveness and functionality. The development of the latter suffers from a classic approach which takes into consideration neither the needs of the industrialists who will set up there, nor the context in which they will be developed. Thus, to make industrial zones modern and competitive, it is necessary to strengthen Industrial Infrastructure, the availability of industrial land and the resolution of land problems. This process includes the rehabilitation of industrial zones, the creation and development of new zones and the development of industrial parks in PPP mode, the acceleration of the digitalization of the administrative services of Agency Financier Industrial (AFI) to facilitate its relative procedures to development work.

To do this, it is necessary to raise the problems linked to the development and redevelopment of industrial zones and infrastructures namely:

- The slowness of procedures for changing land use and the difficulty of granting plots for investors and acquiring state land at the symbolic dinar by the AFI.

- High delays and necessary costs for the transfer of ownership

- The slowness and cumbersomeness of the procedures in force for industrial development

- Connection to electricity, natural gas and sanitation networks.

Increase in the use of advanced information and communications infrastructure and technologies in industry, government and society are some of the key features of a digitally transformed society. Cloud computing technologies, the internet of things, the internet of services and smart logistics are some of the key technologies that are increasingly becoming prominent in the digitally driven -industrial (Lom, Pribyl & Svitek, 2016).

In these same of ideas, the doing-business 2020 report ranked Tunisia 63rd in terms of "Connection to electricity" with a decline of 12 places compared to 2019. This significant decline is mainly due to , to two factors, namely the connection duration which amounts to 65 days in 2020 and the cost which reaches 719.1% of per capita income in 2020 (MENA region average (419.6%), OECD average (61.1%))

- The need for the redevelopment of several existing areas which suffer from several shortcomings (maintenance, cleanliness, road and digital infrastructure, lack of amenities, etc.)

Indeed, and as the World Bank experts underline, developing economies (asTunisia) must "act quickly and with determination to prevent the recent accumulation of public debts from leading to serial debt crises. These countries do not, in fact, have the means to cope with another lost decade."⁵ The current crisis can be an excellent opportunity to "build back better".

The mechanical and electrical industries (IME): for a role as locomotive of Tunisian industry:

The EMI sector is of particular importance for Tunisia and can be considered the locomotive of its industry and play a strategic role in supporting growth. It constitutes a promising sector with significant export potential and a basis for technological development and modernization of the industry. It ranks first not only in terms of investments, but also in terms of exports. It was able to strengthen its export positioning to remain the leading exporting sector with a share of 51.4% in manufacturing exports and 47% in goods exports in 2019.

The World Bank's⁶ revealed comparative advantages (RAC) indicator can provide information on the performance achieved by the Tunisian mechanical, electrical and electronic industries. The revealed comparative advantage of this sector is much greater in Tunisia than in other countries such as Morocco, South Africa, Egypt, India, Turkey and is close to that of the Czech Republic, one of the highest ranked economies on the scale of export complexity, diversification and sophistication⁷.

³ Zribi. Y, Dhaoui. S et Faidi. N (2016) : Op. cit

⁴ Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) (2013): Capacity building for sustainable management Industrial Zones (ReCapZI): Good conditions for a functioning industry:/ November 2013

⁵ Ayhan Kose, / World Bank / Equitable Growth, Finance and Institutions division.

⁶ The World Integrated Trade Solution (WITS)

⁷ Also, the CEPII indicator of revealed comparative advantages allows us to draw out the same findings and corroborates advanced results.

Industrialization, Inclusive Economic Growth: Tunisia in the Era of the Current Crisis

It will therefore be useful to:

- Modernization of traditional sectors
- The development of innovative sectors
- Support for innovative industrial projects and new sectors
- Specific support for certain sectors (automotive and aeronautical components, precision mechanics, technical plastics, mechatronics, etc.)

This vital importance of the EMI sector requires undertaking the necessary measures and incentives. Such a policy must attach great importance to the criteria of territorial balance and equity.

3. EMPIRICAL METHODOLOGY

3.1. Data and Model

In order to examine the presence of a possible relationship between inclusive growth and industrialization in Tunisia over the period from 2008 to 2022. We recall that the data are collected and extracted from the following bases: World Development Indicators (2023). We will test a model explaining the index of inclusive growth retained by an index of the quality of institutions and other macroeconomic variables. To detect the existence of a causal relationship between inclusive growth and industrialization, it is enough to focus on the analysis of long-term cointegration relationships. To do this, we examine a conventional neoclassical model of a country's inclusive aggregate production as a function of industrialization and several control variables. Based on the Solow model (1957), we retain the following equation:

$$ISGI_{it} = \alpha_0 + \beta_1 IND_{it} + \beta_2 X_{it} + \varepsilon_{it}$$

ISGI presents the synthetic index of inclusive growth: this index is made up of 22 variables relating to three dimensions of inclusive growth.

The IND represents the synthetic industrial sector index: the logarithm of the ratio of the added value of the industrial sector as a percentage of GDP,

X a matrix of control variables:

INVEST: the logarithm of gross fixed capital formation (GFCF);

FDI: the logarithm of net FDI inflows as a % of GDP;

EDU: the logarithm of the secondary education rate.

INF: Inflation, measured by the consumer price index;

TRN: the total logarithm of net resources in % GDP.

The main hypothesis that we seek to verify is the following: The quality of industries has a statistically significant impact on the inclusion of economic growth in the Tunisian case. Based on the literature, the expected sign of β_1 is positive, because an increase in quality promotes inclusive growth. In order to respond to this hypothesis we will present the methodological approach relating to the empirical analysis of the relationship industrialization and inclusive growth. We will apply the econometric methodology in time series.

3.2. Unit Root Tests

As a first step, we apply the ADF unit root tests of the model variables: inclusive growth (ISCI), governance (ISG), foreign direct investment (FDI), total net resources (TRN), investments (INVEST), education (EDU) and inflation (INF). Here we present the results of the ADF unit root tests.

Table 3: ADF test results

	Level variables	Variables in first differences
ISGI	-3.153672	-2.689015***
IND	-0.229253	-3.473363***
INVEST	-1.628623	-3.937509***
FDI	-0.676593	-8.344669***
EDU	-0.044672	-0.177299***
INF	-1.962083	-6.416525***
TRN	-0.683208	-4.160299***

***, **, * at 1, 5 and 10 percent significance, respectively.

Source: Authors' calculation based on ADF test results.

Industrialization, Inclusive Economic Growth: Tunisia in the Era of the Current Crisis

The results of table 3 show that the series of our study are not stationary in level and become stationary after a first differentiation, therefore they are integrated of order 1. After having established that all the series are integrated of the same order, we test the existence of a long-term stable linear relationship between these series.

3.3. Cointegration tests

In practice, the second step consists of determining the number of delays retained for the model. It is based on two techniques: Either, set a high delay in advance (P = 12 for monthly data or a P = 4 for annual or quarterly data) then proceed by trial and error, or undertake the estimation of the information criteria (Akaike and Schwarz) with different delays. We retain the number of delays which minimize these criteria. We note the existence of only one number of delays for Tunisia.

Table 4: Determination of delay

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-78.29476	NA	0.000288	8.873132	9.171376	8.923607
1	11.31351*	113.1894	1.27e-06*	3.230157*	5.317864*	3.583480*

Source: authors' calculation.

Since the result is conclusive, we move on to identifying the number of cointegration relationships during the analysis period. The results of the Johansen trace test (Table 5) indicate the existence of 4 cointegration relationships.

Table 5: Johansen test results

H0	Eigenvalue	Trace statistics	Critical Value	Prob.
r=0***	0.983815	195.3387	95.75366	0.0000
r=1***	0.902881	112.8648	69.81889	0.0000
r=2***	0.824699	66.22840	47.85613	0.0004
r=3**	0.633541	31.40342	29.79707	0.0324
r=4	0.332694	11.32602	15.49471	0.1922
r=5	0.683208	1.962083	3.230157	0.0229
r=6	0.149384	3.235892	3.841465	0.0720

***, **, * at 1, 5 and 10 percent significance, respectively.

Source: Authors' calculation based on the results of cointegration tests

3.4. Regression by VECM

The existence of cointegration relationships justifies the adoption of an error correction model, in accordance with the following representation:

$$D(\text{ISGI})_t = \beta_0 + \beta_1 D(\text{IND})_t + \beta_2 D(\text{INVEST})_t + \beta_3 D(\text{FDI})_t + \beta_4 D(\text{INF})_t + \beta_5 D(\text{EDU})_t + \beta_6 D(\text{TRN})_t + \delta(\text{ISGI})_{t-1} + \varphi_1 \text{IND} + \varphi_2 \text{INVEST} + \varphi_3 \text{FDI} + \varphi_4 \text{INF} + \varphi_5 \text{EDU} + \varphi_6 \text{TRN} + \varepsilon_{t-1}$$

The coefficients β_1 β_6 represent the short-term elasticities; the coefficient δ is the error correction term which must be negative and between -1 and 0. The latter indicates the speed of adjustment of the endogenous variable (ISGI), to return to equilibrium, following a shock long term. In other words, it corresponds to the automatic stabilizers of the economy.

Long-term elasticities are calculated according to the following formula: $-\frac{\varphi_j}{\delta}$

The results presented in Table 6 show that the error correction term associated with the restoring force δ is negative and significantly different from zero at the statistical threshold of 1%. There is therefore a process of catching up towards the equilibrium value. In other words, a long-term error correction mechanism for inclusive growth imbalances in the country. Indeed, it turned out that any imbalance between the desired and actual levels of inclusive growth is absorbed by approximately 18.18% by the different explanatory factors introduced into the equation. Such a speed of stabilization of fluctuations in economies is low, which results in a persistence of the effect of the shock, which results in the volatility of the main macroeconomic aggregates.

In addition, the hypothesis of non-correlation of errors is accepted. Indeed, if the probability of the test is greater than 5%, then we accept the null hypothesis of no dependence between the errors. We can conclude that the model errors are not correlated, and the model errors are white noise. In the same way, we note the absence of heteroskedasticity problem. Indeed, a

Industrialization, Inclusive Economic Growth: Tunisia in the Era of the Current Crisis

heteroskedasticity test according to Levin and Square (similar to the white test, but more robust in the case of a reduced number of observations) was used. According to this test, the null hypothesis of homoscedasticity.

Table 6: Error Correction Model Results

	Dependent Variable: ISGI
C	2,7464
<i>D (IND)</i>	0,1765***
<i>D (INVEST)</i>	0.1105***
<i>D (FDI)</i>	0,1622***
<i>D (INF)</i>	-0,0061***
<i>D (EDU)</i>	0,1770
<i>D (TNR)</i>	-0,1761***
δ	-0,1818***
<i>IND</i>	-0,0313**
<i>INVEST</i>	-0,2952
<i>FDI</i>	-0,0156***
<i>INF</i>	-0,0160
<i>EDU</i>	-0,0440
<i>TNR</i>	-0,0080
Khi-2	134,465
Prob (Khi-2)	(0,482)
NR ²	33,1758
Prob	(0,3035)

***, **, * at 1, 5 and 10 percent significance, respectively.

Source: authors' calculation based on VECM estimation results

This table clearly shows the short-term and long-term relationship between the dynamics of the different variables. Indeed, the result of the table clearly shows a positive long-term impact of industrialization and the Tunisian industrial sector on inclusive growth. In this context, indicators were included to monitor the role of institutions in inclusive growth such as foreign direct investment (FDI), natural resources (TRN), local investment (INVEST) and education (EDU). Corruption hinders growth through FDI, a result confirmed by Saghrouni (2022c). Furthermore, the positive effects of FDI on growth depend on available human capital. This decline does not effectively fuel growth and does not increase public revenue, although it can exacerbate inequalities when it targets capital-intensive sectors that create few new jobs.

The positive impact of industrialization entries on growth relates to the presence of a minimum level of human capital in the economy (Saghrouni.o 2022a).

4. CONCLUSION

We can conclude that industrialization has an impact statistically and economically significant on the inclusion of economic growth in Tunisia. Based on the literature. The VECM estimation, which is particularly well suited to the connection between short and long term dynamics. The coefficient of the error correction term is negative and statistically significant, thus confirming the existence of an error correction mechanism. This coefficient, which expresses the degree to which the inclusive growth variable will be recalled towards the long-term target. The coefficient of the industry index (IND) in terms of inclusive growth is positive and significant. The current crisis can be an excellent opportunity to "pay back better"

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Appendix

Appendix 1: List of governorates by region and nomenclature of industrial activity sectors

Table A1: Definition of regions in Tunisia

Regions	
Grand Tunis	Ariana, Ben Arous, Manouba, Tunis
North-East	Bizerte, Nabeul, Zaghouan
North-West	Beja, Jendouba, Le Kef, Siliana
East-Central	Mahdia, Monastir, Sfax, Sousse
Central-West	Kairouan, Kasserine, Sidi-Bouazid
South	Gabès, Gafsa, Kébili, Médenine, Tataouine, Tozeur



Table A2: List of industrial activity sectors

Sector code	Activity
IAA	Agricultural and agri-food industries
IMCCV	Construction materials, ceramics and glass industries
IMM	Mechanical, metal and metallurgical industries
IEE	Electrical and Electronic Industries
ICH	Chemical and rubber industries
ITH	Textile and clothing industries
ICC	Industries leather and shoes
ID	Miscellaneous Industries



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