INDUSTRIAL POLICY AND COMPETITIVENESS OF THE TUNISIAN MANUFACTURING SECTOR

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Abstract: *This paper aims to assess the impact of industrial policy instruments on international competitiveness and in particular on the competitiveness of the manufacturing sector in Tunisia. From a non-stationary panel model composed of 13 Tunisian manufacturing sectors during the period 1995-2016, we show the existence of a long-term cointegration relationship between manufacturing exports and its determinants. The results show that spending on research and development and tertiary education has a positive effect on exports. Hence, it is necessary for the public authorities to intervene within the framework of industrial policy to promote technological innovation and higher education.*

Keywords: *Competitiveness; industrial policy; manufacturing sector; Research and development; higher education.*

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Introduction

Globalization is one of the major developments since the First World War that has helped transform the international economy. It is defined as a process of opening all national borders to a global market. It has led to a remarkable increase in international trade and has resulted in improved welfare, increased trade and significant gains in efficiency in the allocation of resources (Hammami and Kammoun, 2008).

As a result, and following the intensification of competition and the continuous transformation of the global environment, international competitiveness has become an important concern and one of the main determining factors of economic and social development. It has become more than necessary to meet the demands of international competition, and even a priority for economic policy. So, countries must consolidate and improve their competitive position, adapt to market forces at each stage of globalization, and seek the best methods of improving their competitiveness on world markets (McFetridge and Danald, 1995; Lachaal, 1999).

Nevertheless, several efforts have been made by the public authorities to adapt to international transformations, in order to make the most of the international integration of the national economy. Hence the need for state intervention in

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industrial policy which seeks to ensure the proper functioning of the mechanisms of the market economy which leads to improved competitiveness (Buigues, 2012).

Indeed, competitiveness constitutes for the Tunisian economy a very important challenge to be taken up in order to ensure integration into the world economy, to meet the requirements of international competition. Since the last global financial crisis of 2007 (subprime crises), followed by the revolution of 2011, the situation of the Tunisian economy has accumulated a considerable deterioration in annual GDP growth and a decline in exports.

In addition, industry has an important role in the economy through its contribution to international wealth, and in exports especially of manufactured products which generate the bulk of our exports. So support for industrial development as well as the correction of the shortcomings that it involves, have become the priority objectives of the national authorities in favor of the industry since independence in 1956. For this, the Tunisian industry is registered. since the first years of independence in order to achieve these objectives. As such, Tunisia has implemented structural economic, monetary and financial reforms to facilitate the integration of the national economy into the world economy.

Furthermore, the objective of this article is to study the relationship between the instruments of industrial policy and the competitiveness of the manufacturing sector. Therefore, we will deal with the following question: by what instrument does industrial policy intervene to affect productive processes and improve international competitiveness by strengthening technology and supporting human capital?

To answer this problem, we organize our work as follows: in the first section, we will present the main theoretical and empirical work on the determinants of international competitiveness on which industrial policy could act positively. Then the data and the methodology of the research carried out will be exposed. The last section of the article will present the results of the empirical analysis of the influence of the selected factors on the exports of the manufacturing sector in Tunisia from 1995 to 2016 and the conclusions drawn from the research carried out.

2. Literature review

The notion of competitiveness is relatively broad. This explains why there is no common and unique definition of this competitiveness. Its meaning changes depending on the level of a country, company or industry.

Pascallon (1984), states that "a company will be said to be competitive for a given product if it is able to offer it on the markets at prices lower than or equal to those of actual or potential competitors".

According to Krugman (1998), a branch of activity is competitive if the level of its unit costs (average) is equal to or lower than that of its foreign competitors (the competitiveness of national (or foreign) producers is measured by their more or less great ability to have a high market share (Markusen and Horstmann, 1992).

The European Union in its Lisbon agenda in 2000 shows that the competitiveness of a country is its ability to sustainably improve the standard of living of its inhabitants and to provide them with a high level of employment and social cohesion.

Competitiveness is referred to in two different ways depending on the origin of its factors: the first form is based on prices and it depends on the levels of production costs and the levels of exchange rates for exporting firms (Paquet, 2006). The second form is based on non-price determinants and is understood indirectly through indicators such as product quality, innovation and productivity reliability (Bellone and Chiappini, 2016).

The definition of competitiveness is far from precise, it includes many aspects of economic policy making its measurement complicated. It can be measured by indicators relating to trade which are based, on the one hand, on the calculation of the market share of the products of national companies, products and industries for export and on the index of the revealed comparative advantage (RCA) proposed by Balassa (1965) and others on global competitiveness indicators where the GCI (global competitiveness index) constitutes the main index (Lautryffe, 2010; IMF, 2015).

In addition, and by being part of a policy of openness to the outside which has contributed to the transformation of the world economy, the economies of the whole world must tend to compete on the international market, to adapt to the pressures of economic openness, to maintain and improve their positions vis-à-vis other competing countries.

In these conditions of complexity and speed of changes that have affected economies, economists justify the need for public policy intervention in industry and the behavior of agents to regulate the economy and ensure the proper functioning of the mechanisms of the market economy which leads to improved competitiveness.

Industry has an important role in the economy through its contribution to international wealth, and in exports especially of manufactured products which generate the bulk of our exports. Moreover, Ricardo argued that if some nations want to progress and overtake other nations, they must derive this superiority from their industry (Postel-Vianay, 2004). Hence the interest in promoting policies adopted by the State and oriented towards the industrial sector.

In this case, we are talking about traditional industrial policy which can be conceived as a mode of intervention of the public authorities in order to protect the productive sector and facilitate the adjustment of the industry to economic changes. It pursues other multiple ends: balancing the trade balance, international and national competitiveness, economic growth and the development of new techniques. It can intervene through direct measures such as administered financing and active protectionism or indirect measures corresponding to general economic policies (Capul and Garnier, 2002). But this traditional form is purely instrumental. It was put in check because of the system of protection which is based on the subsidy of industrial firms in order to protect them against foreign competition, which has led to countries' budget deficits and high external indebtedness (Brousseau, 1995).

Therefore, a new form of industrial policy is required, which implies intervention by the public authorities on the goals justified by the presence of market failures on the goals and organizational means of the industrial strategy. It allows the productive system to adapt to the nature of the new economy, namely the knowledge economy. It aims to strengthen the technological potential in industry and improve the qualification of workers (Hammami and Kammoun, 2008; Gaffard, 2005; OECD, 2002).

Furthermore, the concept of competitiveness is closely linked to that of industrial policy. The latter aims to develop factors necessary to improve international competitiveness such as productivity, intangible capital, innovation, and foreign direct investment.

Over the past decades, different approaches have participated in these analyzes which have shown the importance of industrial policy in improving international competitiveness.

Dosi et al (2015) estimate, over an 18-year period from 1989 to 2006, a dynamic panel model composed of 15 OECD countries, the positive impact of innovation potential, defined as the number of requests of patents, on the performance of exporting companies. Moreover, the empirical verification of a positive influence of the human development index can be found in the work of Gökmen and Turen (2013) based on the FMOLS method of 15 OECD countries over the period 1995-2010.

Sekuloska (2014) seeks to show the effect of industrial policy intervention on human capital using linear regression of 19 countries of South-Eastern Europe (SEE) over a period of 4 years from 2008 to 2012. It has shown that higher education and training are essential preconditions for creating competitiveness. In the same vein, Falk and Hagsten (2015) have shown, by the conditional logit method of 72 Swedish small and medium-sized enterprises over the period 2002-2010, that the share of workers with higher education has an intensive and positive impact on initial labor productivity hence the improvement of exports.

Olczyk and Kordalska's paper (2017) aims to estimate the empirical link between the level of intensity of sectoral innovation and manufacturing exports. For this, they estimate an error correction model (ECM). From the results of this estimate, they accept the positive and significant effect of innovation on long-term exports.

Hchaichi and Ben Ghodhben (2014) presented the determinants of business development in a global geostrategic context and highlighted, using a macroeconomic model applied to the Tunisian, Moroccan and Egyptian cases, the significant effect of the variables price and not price on international competitiveness over a study period from 1995 to 2010. Several variables turn out to be important, namely innovation, human capital, foreign direct investments and official exchange rates.

Charfi and Masmoudi (2013) have shown, using an error correction model (ECM) over a period from 1980 to 2011, that Tunisia has an interest in devoting to

research and development to stimulate exports. Thus, promoting innovation and improving product quality can promote exports.

On the whole, the authors seek to analyze to what extent the level of innovation intensity and the development of human capital in a sector influence changes in the international competitiveness of Tunisian manufacturing sectors determined by foreign trade. Therefore, the interest of our work is to study this relationship by extending the study period and clarifying the importance of industrial policy as a determinant of competitiveness.

3. Methodology

Our study is based on a non-stationary panel model. Based on the work of Goldstein and Khan (1985), our equation to be estimated is of the following form:

$$EXPORT_{it} = \alpha + \beta_1 GDPEU_{it} + \beta_2 REER_{it} + \beta_3 R\&D_{it} + \beta_4 TEDU_{it} + \varepsilon_{it}$$

With, $i = 1, 2, 3, \dots, 13$ denote the manufacturing sectors: food processing, textiles, clothing, leather, footwear, electrical machinery, chemicals, transportation equipment, scientific equipment, rubber, plastics, paper, iron and steel.

t : indicate years; $t = 1, 2, \dots, 22$.

ε_{it} represent error terms.

All variables are taken from the World Bank (WDI) database except the manufacturing exports variable is taken from the United Nations Conference on Trade and Development (UNCTAD) database. We examine 13 manufacturing sub-sectors using panel data for the period 1995-2016.

Export: Value of exports of manufactured goods destined to the world as a percentage of gross national product (GDP). It is an indicator of international competitiveness.

GDPEU: GDP of importing countries (European Union which is Tunisia's main partner). We consider that foreign demand increases with increasing foreign income. We anticipate a positive coefficient associated with this variable.

REER: Real effective exchange rate quoted at certain (2010 = 100). The fall in the exchange rate results in a depreciation of the national currency which leads to a reduction in export prices and therefore an increase in the value of exports from the manufacturing sector. We therefore anticipate a negative sign of the coefficient associated with this variable.

R&D: Domestic expenditure on research and development as a percentage of GDP. It is an instrument of industrial policy and at the same time an indicator of structural competitiveness. We expect a positive coefficient associated with this variable.

TEDU: Total enrollment in tertiary education, regardless of age, expressed as a percentage of the total population of the five-year age group after secondary school. It is an instrument of industrial policy to assess the qualification of human capital. We anticipate a positive effect from this variable.

To ensure a linear shape for the estimated model, all data are taken as a logarithm.

4. Results and discussion

Our analysis begins first with the stationarity tests which make it possible to identify the presence of unit roots in a panel. For this, the Im, Pesaran and Shin (IPS) (2003) test is used.

Table 1: Results of unit root tests

<i>Variables</i>	<i>In level</i>	<i>First Differences</i>
	<i>Individual intercept and trend</i>	<i>Individual intercept and trend</i>
<i>EXPORT</i>	0.82178 (0.7944)	-11.7980*** (0.0000)
<i>GDPEU</i>	1.53850 (0.9380)	-3.64860*** (0.0000)
<i>REER</i>	2.49256 (0.9937)	-6.3719*** (0.0000)
<i>R&D</i>	3.14801 (0.9992)	-2.19485*** (0.0141)
<i>TEDU</i>	11.8903 (1.000)	-3.64860*** (0.0001)

*** significance at the 1 percent level; ** significance at the 5 percent level and * significance at 10 percent level. Source: Calculations by authors based on results of the IPS test.

The results indicate that all series are non-stationary in level. Moving on to the first difference, we see that all the series become stationary. They are therefore integrated of order one (1). It is possible to test whether these are linked by a long-term relationship. We can then consider studying the cointegration of the variables using the tests developed by Pedroni (2004).

Table 2: Result of the cointegration test

	<i>t-Statistiques</i>	<i>Prob.</i>
<i>Panel v-Statistic</i>	0.577887	0.2817
<i>Panel rho-Statistic</i>	1.295662	0.9025
<i>Panel PP-Statistic</i>	-13.23778***	0.0000
<i>Panel ADF-Statistic</i>	-7.289842***	0.0000
<i>Group rho-Statistic</i>	1.604899	0.9457
<i>Group PP-Statistic</i>	-8.599690***	0.0000
<i>Group ADF-Statistic</i>	-2.416658***	0.0078

*** signification à 1 pourcent level, ** signification à 5 pourcent level and * significance at the 10 percent level.

Source: Calculations by authors based results of the Pedroni test.

According to the simulations of Pedroni (1999), for small samples (2004), the most powerful test of the seven is that similar to the ADF (Group ADF-Statistic) test. So, we can conclude that there is a cointegration relationship between the exports of

the Tunisian manufacturing sector and the other variables. This relationship can be estimated using the Fully Modified Ordinary Least Squares (FMOLS) method.

Table 3: The results of the regression by the FMOLS method
Endogenous variable (EXPORT)

<i>Variables</i>	<i>Coefficient</i>	<i>Ecart-type</i>	<i>t-Statistiques</i>	<i>Prob.</i>
GDPEU	0.128392***	0.025622	5.010923	0.0000
REER	-1.333496***	0.050983	-26.15592	0.0000
R&D	0.107326**	0.043170	2.486157	0.0136
TEDU	0.338852***	0.032627	10.38576	0.0000

*** significance at the 1 percent level; ** significance at the 5 percent level and
* significance at 10 percent level.

Source: Calculation of authors based on regression results using the FMOLS methods.

The analysis carried out on the basis of the estimation results of a model for determining the competitiveness of the Tunisian manufacturing sector has enabled us to highlight some factors capable of explaining the impact of the instruments of industrial policy.

Indeed, the estimated model is globally significant at the 1% level. In addition, the variables used explain 95% of the variations in industrial policy instruments.

The GDP of the European Union (GDPEU) has a positive and significant effect on exports. Indeed, the 1% increase in EU GDP leads to a 0.12% long-term increase in manufacturing exports. This result is in line with theoretical expectations, ie the increase in foreign income leads to an increase in foreign demand which leads to an improvement in exports.

The real effective exchange rate (REER) is an indicator of price competitiveness. The REER coefficient is negative and statistically significant. A 1% decrease in the REER, equivalent to a 1% devaluation of the Tunisian dinar, leads to a 1.33% improvement in the competitiveness of the manufacturing sector. This result confirms the theoretical predictions of the Mundell and Fleming model, when the REER depreciates, exports increase.

Among the variables that explain industrial policy, we note domestic expenditure on research and development (R&D) which is linked to factors of technological development and tertiary education (TEDU) which is linked to human capital.

The financial resources devoted to the research sector have recorded a significant and positive effect on exports. The 1% increase in the rate of domestic R&D expenditure leads to an improvement in the international competitiveness of the manufacturing sector by 0.10%. Despite this slight increase, the contribution of R&D spending to improving exports from the Tunisian manufacturing sector remains low.

In the long term, the national effort provided in education seems to identify and determine the capacity of exporting firms to compete and gain significant market shares. This was explained by the positive and statistically significant coefficient of the TEDU variable.

At the end of this analysis, the coefficient found for tertiary education turns out to be significant: an increase of one unit of the TEDU generates an improvement of 0.33% in exports and subsequently an improvement in Tunisia's international competitiveness.

CONCLUSION

In the current context of globalization, some countries find opportunities to develop their productive systems in order to achieve economic and financial stability and make them more competitive and better prepared to face competition.

We carried out an econometric study applied to the Tunisian economy to study the impact of industrial policy instruments such as technological development, innovation and human capital on manufacturing exports which constitute a measure of the international competitiveness of the manufacturing sector. Tunisian. In this regard, the method of cointegration by the pedroni 2004 approach, followed by the method of FMOLS was used.

The results show that spending on research and development and higher education has a favorable effect on exports, hence the need to support public intervention in industrial policy to develop innovation. technology and higher education because it plays a crucial and effective role in ensuring growth and improving the competitiveness of the manufacturing sector.

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