Journal of Development and Economic Policies, Vol. 27, No. 1 (2025) 5 - 29
Arab Planning Institute

https://doi.org/10.34066/jodep.25.27.1.2

Received: 12 September 2024 | Revised: 26 December 2024 | Accepted: 5 January 2025

Determinants of Manufacturing Value Added in Morocco : An application of Bounds Testing Approach to Cointegration

Sara Labrar*
Mohammed Hassainate**

Abstract

The issue of structural transformation is understood as a process of export diversification and sophistication. In fact, a country's ability to shift its production towards more complex manufactured products largely depends on how closely its current productive capacities align with those required to produce these goods. The objective of this study is to analyze the determinants of value added in Morocco's industrial sector throughout the structural transformation process. We applied the ARDL (Autoregressive Distributed Lag) estimation method over the period from 1995 to 2022. The results confirm the decisive role of technology in the evolution of economic systems and emphasize the importance of physical capital for a high-performing manufacturing sector capable of competing globally. Furthermore, the analysis reveals that a country's level of economic complexity influences the development trajectory of its manufacturing sector. Therefore, this study is crucial for designing an industrial policy aimed at enhancing Morocco's participation in value creation within global value chains.

محددات القيمة المضافة في القطاع الصناعي المغربي: تطبيق منهجية اختبار الحدود للتكامل المشترك

ساره لبرار
محمد حسينات

ملخص

تعرف إشكالية التحول الهيكلي على أنها عملية تنويع الصادرات وتطويرها. في الواقع، تعتمد قدرة بلد ما على تحويل إنتاجه نحو منتجات مصنعة أكثر تطورا وتركيبا إلى حد كبير على مدى توافق قدراته الإنتاجية الحالية مع تلك المطلوبة لإنتاج هذه المنتجات يتمثل موضوع هذه الدراسة في تحليل محددات القيمة المضافة في القطاع الصناعي المغربي على مر مراحل مسار التحول الهيكلي لقطاع الصناعة التحويلية حيث اعتمدنا على نموذج الانحدار الذاتي للفجوات الزمنية الموزعة على مدى الفترة الممتدة من 1995 إلى 2022 تؤكد النتائج الدور المحوري للتكنولوجيا في تطور النظم الاقتصادية وتؤكد أهمية الرأسمال المادي لقطاع التصنيع العالي الأداء والقادر على المنافسة عالميا. علاوة على ذلك، يبين البحث أن مستوى التطور الاقتصادي لبلد ما يؤثر على مسار تنمية قطاع التصنيع فيه. وبالتالي، تعتبر هذه الدراسة مهمة لتصميم سياسة صناعية تهدف إلى تعزيز مشاركة المغرب في خلق القيمة ضمن سلسلة القيمة العالمية.

---

* Research Professor, Faculty of Legal, Economic and Social Sciences of Mohammedia -Hassan II University Casablanca. E-mail: labrarsara@gmail.com
**Full Professor, Faculty of Legal, Economic and Social Sciences of Agdal Rabat – Mohammed V University Rabat. E-mail: hassainate@gmail.com

1. Introduction

In many developing countries, globalization and the expansion of international markets offer their producers the opportunity to compete in emerging national and international markets. Thus, the pioneers of development economics were concerned to describe structural change as a process of labor migration from the primary sector to the manufacturing sector; they affirmed the superiority of the latter over the former as an engine of economic development. This raises the underlying question of “desirable” production, as a generator of economic development. This process is very important for growth: countries that are able to improve their exports by developing new economic activities tend to grow faster (Hausmann and Rodrik, 2003; Hausmann and al., 2007). The increase in economic complexity is associated with the structural transformation of economies: diversification of agriculture and extractive industries towards more sophisticated products. Several studies (Hausmann and al., 2007; Hidalgo and al., 2007; Abdon and Felipe, 2012; Lectard and Rougier, 2018; McMillan and al., 2019; Guneri and Yalta, 2021) over the last two decades have addressed the problem of quantifying a country's productive structure and analyzed the process that must drive these structural changes.

Although approached as a complex, dynamic social phenomenon by the pioneers of development economics, structural transformation was relegated to the status of a simple consequence of economic growth from the early 1980s onwards. Lectard and Piveteau (2020) point out that, in the development agenda, the principle of an active industrial policy conducive to structural transformation receded, until it was replaced by macro-financial stabilization objectives and “basic” institutional reforms. For the African continent, this substitution of Structural Adjustment Programs (SAPs) for structural transformation policies was unable to reverse the early deindustrialization that began in the late 1970s. SAPs favored the transfer of surplus agricultural labor to low-productivity sectors protected from international competition, and to service activities disconnected from industry (trade, construction, etc.), contrary to the objectives of structural transformation (Cadot and al., 2016).

The Moroccan economy has begun a process of structural transformation, supported by the sectoral policies implemented and the consolidation of its international position. The results can be seen in the emergence of new growth drivers in high value-added industries. In line with the trade opening, liberalization and economic reform programs of the 1990s, Morocco adopted a selective industrial strategy in 2005, focusing on seven sectors of activity and, in particular, four new global businesses for Morocco: automotive, aeronautics, electronics and offshoring. This export-oriented industrialization strategy aims to create a favorable and attractive environment for foreign direct investment, improve the competitiveness of export industries and diversify the export basket. The Industrial Emergence Program (2005-2009), followed by the National Pact for Industrial Emergence (2009-2015), the Industrial Acceleration Plan (2014-2020) and finally the Industrial Recovery Plan (2021-2023), reflect this same general drive. The structural transformation of the economy should, therefore, result in an increase in the level of value added in exported goods.

On the other hand, Moroccan economic trends reveal a number of characteristics, including a less volatile growth rate and continued dependence on the performance of the agricultural sector. In fact, the current trend in growth rates has not led to an improvement in livings standards: GDP per capita has been lower than the world average, and more particularly than that of emerging countries. Empirical work on Morocco (El Mokri, 2016; Lectard, 2017; Saidi, 2019; Haroon and François, 2019; LEA, 2021) reveals the difficulty the country is experiencing in joining the process leading to greater complexity, deploying in the high-tech products segment and thus avoiding the trap of what economists Eichengreen, Park and Shin have called “the trap of middle-income countries”.

The purpose of this study is to contribute to the knowledge base on the dynamics of economic growth and development. The authors have chosen to study these dynamics through an analysis of manufacturing value added. While the analysis of the structural transformation process through indicators such as GDP or exports has been widely explored in the literature (Lectard, 2017; Liouaeddine, 2021; Daoui and Bouzaidi, 2021), the study of this process through manufacturing value added, considering diversification and economic complexity, remains a relatively less discussed issue. In order to confirm the role that export diversification and sophistication could play in accelerating the structural transformation process, we will analyze the determinants of value added in Morocco's industrial sector throughout the structural transformation process, focusing on the changes they are undergoing in terms of economic complexity. The motivation for this research question stems, in the first instance, from the slowness of the economic development process observed, particularly in developing countries of which Morocco is a part. Despite the efforts made by these economies to open up, stabilize their macroeconomic frameworks and gradually adapt their institutional frameworks, few of them have succeeded in making the transition to the category of advanced, high-income countries. Secondly, few studies have attempted to empirically investigate the determinants of Morocco's manufacturing performance.

Our particularity here is to use manufacturing value added per capita as an indicator. To address this question, we first present an overview of the literature. Then, we describe the methodology and model adopted, and finally we focus on the analysis and interpretation of the results.

2. Literature review

Over the last two decades, interest in issues related to development and territorial competitiveness has gained momentum. This intensified attention to the development of nations (Porter, 1991, 1993), large urban centres and regions or territories has resulted in the development of models aiming to explain the reason why and how some agglomerates are more successful in developing and progressing than others (Asheim, Moodyson and Todtling, 2011; Boschma, 2004). Previously, Porter (1991) had suggested that a country could not be simultaneously competitive in all the industries of its economy. In his analysis, competitiveness is an amorphous concept, and only prosperity is relevant. In order to achieve long-term prosperity, each country must improve its productivity by employing its productive resources efficiently: this leads jointly to an increase in the level of wealth and the standard of living of its inhabitants. Thus, in order to sustain a certain level of productivity growth, each country relies on the individual capacity of its companies to improve their productivity by introducing higher-quality, technologically superior products, or by including products with highly sophisticated knowledge and productive skills.

New Theories of International Trade (Krugman, 1981; Melitz, 2003) and Geofigure Economics (Krugman, 1991; Baldwin and Okubo, 2006; Ottaviano, 2011) have enriched the theoretical field: indeed, international openness or regional integration highlight the presence of spatial inequalities in economic development between territories. This phenomenon of spatial polarization is based on the canonical center-periphery model initially developed by Krugman (1991), whose recent extensions to models with heterogeneous firms (Baldwin and Okubo, 2006) suggest that processes of agglomeration and firm selection segment economic space. In this context, the most efficient companies cluster close together, while the least efficient are pushed to the periphery: spatial development is therefore not homogeneous from one area to another. In addition to New Theories of International Trade and Geofigure Economics, the emergence of new industrial superpowers, the reconstruction of the world market following the appearance of new competitors, and the growing spatial inequalities in economic development between countries are all arguments justifying the adoption of individual strategies to re-position countries on the international stage. Each country is faced with a weakening of its competitive strengths and must adapt accordingly, even if this means abandoning old leadership positions to create new ones.

Indeed, the economic performance of countries is initially based on their natural resources, their factor endowments, their intrinsic competitive advantages in terms of, for example human capital, infrastructure and/or institutions. In that sense, Imbs and Wacziarg (2003) state that the relationship between sectoral diversification of exports and the evolution of income per capita differs according to the level of development reached by the economies. Indeed, during the early stages of a country's economic development, the specialization mechanism is guided by the exploitation of available natural resources and factor endowments. Thus, high-income countries relocate production requiring factors of production that they no longer possess in abundance and specialize in technology- and R&D-intensive activities. On the other hand, countries far from the technological frontier, having accumulated few factor endowments, have little opportunity to diversify, but have access to technologies already developed in high-income economies (Klinger and Lederman, 2011). Innovation consists of the introduction of new intermediate products into the production process and the creation of new products globally. As economies grow, they approach the technological frontier, so the innovation process will mutate from imitation to the introduction of new goods. Thus, the positioning of a country in relation to the technological frontier necessarily impacts its innovation process. Moreover, developed countries that already have a diversified productive structure have fewer opportunities for diversification than developing economies (Cadot and al. 2011). As a result, it seems that the force of diversification dominates low-income countries, where as the force of specialization dominates high-income countries.

Hausmann and al. (2007), have empirically proven that country specializations have considerable effects on the level of economic development. Some productions are therefore more promising than others. Thus, the differences between countries in terms of productivity, wealth creation and therefore in terms of GDP per capita could be explained by differences in economic complexity. Hidalgo and Hausmann (2009), then Hausmann and Hidalgo (2011) present economic complexity as a dual-component structure : country/products, within which countries are connected to the products they export. This structure is the result of an initially tripartite structure : country/productive capacities/products. In other words, the country/productive capacities pair expresses each country's endowment of productive skills, and the productive capacities/products pair designates the technological content introduced into the exported goods. The links between countries and products thus provide information on the availability of an economy's productive capacities. The approach of Hidalgo and Hausmann (2009) and Hausmann and Hidalgo (2011) builds a theory of accumulation of productive capacities through two processes. First, a process through which nations discover new products as a result of the interaction of the initial productive skills at their disposal (a very diverse stock of knowledge, know-how and capabilities within an economy, of which each individual holds a limited share). Second, a process through which nations combine new productive skills with old ones to produce new goods. This process will then depend on the interactions and complementarities between these individual capabilities that can be combined through complex organizations, particularly firms and markets. According to Hidalgo and Hausmann (2009 ; 2011), economic complexity thus explains the differences observed between countries in terms of economic development.

At the empirical level, Nagengast and Stehrer (2015) argue that analysis in value-added is a better approach since bilateral trade cannot be measured only by the flows between two partners since a third country often influences a significant portion of their trade. Second, the relationship between income and international trade flows is also affected when trade in value-added is counted. Al-Hashimi and al. (2015) estimate that external shocks may be more dangerous for trade in value-added since this trade is concentrated in durable goods sectors whose income elasticity is higher. Therefore, economies in which the manufacturing industry is heterogeneous and concentrated may be adversely affected unless trade policy measures are applied to level out the effects of adverse demand shocks. In their work, Sotomayor and Barajas-Escamilla (2020), they examine the global manufacturing production as well as the determining factors of trade in value-added for the 2003-2018 period using GMM model and they corroborate the significance of the U.S. industrial activity as a determinant of the trade in value-added. However, they found that traditional variables, such as foreign direct investment, are not significant. The empirical results of paper of Aggarwal and al. (2021) reveal that sectoral India's domestic value added in exports for manufacturing industries content over 2000–2015 is positively influenced by both domestic capital and foreign direct investment (FDI), and labour skill intensity, but negatively influenced by the presence of unskilled workers. Moreover, FDI inflows in sectors characterized by high skill-intensity and high-relative growth rate play a crucial role in influencing domestic value added content. Finally, the presence of larger and more capital-intensive firms is found to be a major driver of domestic value added. Also, Woon Shin Yee (2023) evaluate, in her study, the effects of the selected independent variables on the value-added of manufacturing in Malaysie using a multi regression analysis. Results obtained indicate that the exports of goods and services, net inflows of foreign direct investment are statistically significant in determining the manufacturing growth. To estimate determinant factors of Manufacturing Value-Added in Ethiopia (Alemnew Mekonnen, 2022), the Autoregressive Distributive Lag (ARDL) model was used for time series data. The study identified key reasons and determinants that limit manufacturing value-added share : volatile political environments, the tendency of major fabrication subsectors to decline, Total Factor Productivity remaining small and stagnant, and others. According to the empirical study, in the long run, GDP per capita and Foreign Direct Investment variables have shown a significant positive association, whereas the real exchange rate index has a negative correlation with Manufacturing Value-Added.

Regarding the empirical evidence for Morocco, several studies have examined the determinants of industrial sector, and its effects on the economic performance of the sector and on the economy in general. Hamdaoui &Bouayad (2019) show the existence of a correlation between the degree of vertical integration and market factors. Thus, the degree of integration of industries is explained, essentially, by the basic conditions and the structures of the industrial sector, particularly, the degree of concentration, the capital intensity, the level of the barriers to entry, the importance of economies of scale and the rate of sales growth. On another sudy, the results of the econometric analysis (Mouelhi & Ghazali, 2020) of three Middle East and North Africa (MENA) countries : Tunisia, Morocco and Egypt suggest a significant and positive association between investment and structural change as capital accumulation increases the future productive capacity and triggers reallocative efficiency. The human capital quality and availability has a positive and significant impact on structural change. Trade openness is also expected to boost structural transformations. However, labour market rigidity hampers structural transformation. On the other hand, John, A. (2017) has empirically assesses the key drivers of manufacturing value added in the sub-region using a time series cross-sectional data set of the countries for the period, 1990 to 2014. Two estimation techniques, the pooled panel OLS regression with year fixed effects and the IV-2SLS estimation procedure, were used. The following factors are found to exert significant positive effect on manufacturing added in North Africa: secondary education, agricultural land, domestic credit to the private sector, trade openness, inward stock of FDI, population size, and ICT infrastructure/technology. Also, the results indicate that dependence on oil, mineral and natural gas rents, domestic investment rate, political globalization, institutionalized democracy, age dependency ratio (young), and civil violence have significant negative effect on manufacturing added value in the sub-region. As a matter of fact, Morocco has chosen to develop an integrated economy in global businesses. This country relies on a long-term political vision and some modern infrastructures. The government provides a subsidy to industrial ecosystems and supervises access to bank credits.

Various international institutions recognize the model of integration of the Moroccan economy in the different Global value chains as an effective model (Policy Center For the New South, 2022).

3. Methodology and model specification

To examine the factors that may be hindering the performance of the industrial sector in Morocco, we use the following econometric approach. First, neoclassical variables controlling a country's factor endowments will be analyzed, based on the economic theories (theories of absolute and comparative advantage) of Adam Smith (1776) and David Ricardo (1817), to determine whether they explain variation in manufacturing sector performance over time. In this first set of variables, the factor endowments of countries that would appear in a standard production function are weighted by, among other things, capital per worker and total factor productivity.

On the other hand, the literature review shows that countries with higher levels of economic complexity and, consequently, more productive capacity, are more likely to have strong manufacturing sectors. Thus, the economic complexity index devised by Hausmann *et al.* (2011) and the number of firms created are included as control variables for the country's productive capabilities. Furthermore, inflation is an important determinant of production costs**,** the demand for manufactured goods, and the sector's international competitiveness (Blanchard and Johnson, 2013). Its impact can be direct (on costs and prices) or indirect (through economic expectations, monetary policy and wage adjustments).

The purpose of this section is to analyse the contribution of structural transformation to manufacturing value added in morocco and its determinants. Our study covers the period from 1995 to 2022. To this end, we employed the ARDL model, which belongs to the class of dynamic models, captures temporal effects (Auto Regressive Distributed Lag model, Pesaran and *al.* (1996); Pesaran and *al.* (2001); Pesaran (2015)). The ARDL model, is presented as follows (Y_t: endogenous variable and X_t: exogenous variables):

$$Y_t = \varphi + a_1 Y_{t-1} + \cdots + a_p Y_{t-p} + b_0 X_t + \cdots + b_q X_{t-q} + e_t$$

Thus:

$$Y_t = \varphi + \sum_{i=1}^{p} a_i Y_{t-i} + \sum_{i=0}^{q} b_i X_{t-i} + z_t + e_t$$

We note that (b_0) explains the short-term effect that (X_t) has on (Y_t). To explain the long-term effect that (X_t) has on (Y_t), we need to calculate (λ) from the long-term relationship:

$$Y_t = k + \lambda + X_t + u$$

With:

$$\lambda = \sum b_i / (1 - \sum a_i)$$

Accordingly, this model allows, on the one hand, to test long-term relationships using the "bounds test" on series that are not integrated of the same order and, on the other hand, to reach better estimates on small sample sizes as attested by Narayan (2005). Therefore, we apply this approach to analysis the determinants of the Moroccan industrial sector's performance. The model proposed in our study is based on the empirical literature on the subject, mainly the work of Haroon and al. (2019). The ARDL model is presented as follows:

$$\Delta \boldsymbol{Ln(MVA_t) = a_0 + \sum_{i=0}^{p} a_1 \Delta lnMVA_{t-i} + \sum_{i=0}^{q} a_2 \Delta lnTFP_{t-i} + \sum_{i=0}^{q} a_3 \Delta lnCAPIT_{t-i} + \sum_{i=0}^{q} a_4 \Delta lnINF_{t-i} + \sum_{i=0}^{q} a_5 \Delta lnECI_{t-i} + \sum_{i=0}^{q} a_6 \Delta lnCREAT_{t-i} + b_1 lnMVA_{t-1} + b_2 lnTFP_{t-1} + b_3 lnCAPIT_{t-1} + b_4 lnINF_{t-1} + b_5 lnECI_{t-1} + b_6 lnCREAT_{t-i} + e_t}$$

With: Δ: first difference operator, ln is the natural logarithm; a_0: constant; $a_1, \ldots, a_6$: coefficients of the short-term effects; $b_1, \ldots, b_6$: coefficients of the long-term dynamics of the model, and $e_i \sim idd(0, \sigma)$ the error term (white noise).

This equation will be estimated using cointegration methods applied to non-stationary variables (selected on the basis of the literature review). To this end, we consider annual data covering the period from 1995 to 2022, mainly from UNIDO[1], the World Bank and OMPIC[2]:

---

(1) United Nations Industrial Development Organization.
(2) Moroccan Industrial and Commercial Property Office.

Manufacturing value added *(MVA)*: It is generally accepted that manufacturing value added should be related to a scale variable such as GDP or population to reflect the importance of the manufacturing sector in an economy. Nevertheless, MVA as a share of GDP depends on the evolution of all the sectors making up the Gross Domestic Product (Goujon and Kafando, 2011; Guillaumont and al., 2018). Thus, its evolution reflects its relative share of the rest of the sectors(3). To avoid this bias, we mobilize the ratio most widely used in the literature: MVA per capita (in constant dollars).

Total Factor Productivity *(TFP)*: refers to the overall productivity of production factors over time. TFP is calculated using data on capital stock, labour input and labour income share(4).

Fixed capital per worker *(CAPIT)*: indicates the logarithm of fixed capital per worker. It is calculated based on employment and capital stock data.

Number of companies created *(CREAT)*: defined as the ability to identify and exploit business opportunities by creating new companies or expanding existing business activities. Data on new companies is provided by OMPIC.

Inflation rate *(INF)*: can indirectly have an impact on the industry in several ways. For instance, if production costs rise as a result of inflation, this can affect processing companies' profit margins, reducing their ability to invest in research and development or modernise their equipment. It can also lead to lower production or higher selling prices, which can affect the industry's competitiveness.

Economic Complexity Index (ECI): The economic complexity index measures the diversity and sophistication of national economies. Countries with a high economic complexity index are often those with more diversified and sophisticated economies. Moreover, economies with a high complexity index are often associated with high levels of innovation, as the complexity of product production requires higher levels of technical skills and knowledge.

---

(3) The use of industrial data must therefore be considered with the greatest attention, as they can incorporate data relating to the extractive industry whose activity depends on the wealth of natural resources, as well as those relating to manufacturing industry.

(4) See Feenstra and *al.* (2015) for more details.

2. Results analysis[5]

- *Stationarity tests*[6]

To study the variables' stationarity and define the cointegration order, we used the Augmented Dickey-Fuller (ADF) and phillips Perron tests for each variable (in the presence of intercept and, trend and intercept). The results are summarized in the following table:

Table (1): Stationarity test results

Variable	**p-value**		**Result**
	Augmented Dickey-Fuller	**Phillips Perron**	
MVA	0.977 I(0)	0.997 I(0)	Integrated of the 1st order
D(MVA)	0.000 I(1)	0.000 I(1)	
TFP	0.018 (0)	0.043 (0)	Stationary
CAPIT	0.869 I(0)	0.831 I(0)	Integrated of the 1st order
D(CAPIT)	0.018 I(1)	0.049 I(1)	
INF	0.023 I(0)	0.000 I(0)	Stationary
ECI	0.309 I(0)	0.310 I(0)	Integrated of the 1st order
D(ECI)	0.000 I(1)	0.000 I(1)	
CREAT	0.822 I(0)	0.932 I(0)	Integrated of the 1st order
D(CREAT)	0.001 I(1)	0.001 I(1)	

(5) The estimates are based on Eviews.

(6) We have carefully addressed the issue of multicollinearity between the variables: capital per worker and total factor productivity. A multicollinearity test was conducted, and when signs of high collinearity were detected, we used the method of transforming the variables to reduce the correlation and improve the stability of the model.

*This table presents the results of the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests for several economic variables. The "p-value" column indicates the test values, while the "Result" column specifies the stationarity status of the series: I(0) indicates the variable is integrated of order 0 (non-stationary), and I(1) means the series becomes stationary after first differencing.

Except for total factor productivity and inflation, all the studied series are non-stationary in level. However, the table 1 shows that the variables become stationary after the first difference (integrated of the first order). The results obtained therefore imply the possible existence of a cointegrating relationship between the different studied variables.

- *Determination of the optimal ARDL model*

We now proceed to study cointegration using the methods of Pesaran and *al*. (2001) and Narayan (2005) for a small sample, as the Johansen test is adopted in cases where the series are integrated of the same order, while the “bounds test to cointegration” is adopted in cases where the series are integrated of two different orders I (0) and I (1). However, this does not exclude the adoption of the “bounds test” in cases where the series are integrated in the same order. In this respect, this approach was selected given our interest in ARDL models (AutoRegressive Distributed Lag), and to overcome the Johansen test requirement concerning the same order of integration. However, this model, which serves as the basis for the staggered lag cointegration test (Pesaran and al. (2001)) generally takes the form of an error-correction model.

We will use Akaike's information criterion to select the optimal ARDL model, the one that offers statistically significant results with the least parameters (table 2). Below are the estimation results for the ARDL model selected: ARDL (2, 1, 2, 0, 1, 2).

Table (2): ARDL model estimation results

Variable	Coefficient	Prob.
MVA (-1)	0.545	0.009
MVA (-2)	-0.313	0.153
(CAPIT)	-0.459	0.062
CAPIT (-1)	0.481	0.028
CREAT	0.491	0.024
CREAT (-1)	-0.157	0.349
CREAT (-2)	0.164	0.222
ECI	-0.077	0.609
INFL	0.036	0.197
INFL (-1)	0.040	0.106
TFP	0.052	0.938
TFP (-1)	0.797	0.126
TFP (-2)	1.692	0.002
C	0.776	0.218
R^2	**0.981**	
Adjusted R^2	**0.944**	
F-statistic	**94.37**	
Prob.	**0.000**	

*The table presents the results of the Autoregressive Distributed Lag (ARDL) model estimation. The "Coefficient" column shows the estimated coefficients for each variable, and the "Prob." column provides the p-values for the corresponding coefficients. Significant variables are those with p-values less than 0.05.

- *Model validation*

The specification obtained in the ARDL model (2, 1, 2, 0, 1, 2) is globally satisfactory. Indeed, the model can explain 94.4% of the observed variability in manufacturing value added. In addition, the difference between R^2 and adjusted R^2 is close to 0, equal to 0.037). As for the robustness tests ((table 3), the null hypothesis is accepted for all the tests, so the residuals meet the model's validity conditions, namely the absence of autocorrelation, the existence of Normality and Homoscedasticity.

Table (3): Diagnostic tests on the ARDL model

Test hypothesis	Test	F-Statistic	Probability
Autocorrelation	Breusch-Godfrey Serial Correlation LM Test	4.82	0.06
Heteroskedasticity	Breusch-Pagan-Godfrey	0.74	0.70
Normality	Jarque-Berra	0.84	0.65

* This table presents the results of diagnostic tests for the ARDL model. The tests include:

Autocorrelation (Breusch-Godfrey Serial Correlation LM Test) with a p-value of 0.06, indicating no significant autocorrelation.

Heteroskedasticity (Breusch-Pagan-Godfrey test) with a p-value of 0.70, showing no heteroskedasticity.

Normality (Jarque-Bera test) with a p-value of 0.65, suggesting normally distributed residuals.

- *Testing for cointegration at the ARDL model bounds: Bounds test*

The following table shows the values of the Bounds test, which uses Fisher's test to verify the cointegration hypotheses. We test the null hypothesis of no cointegration against the alternative hypothesis of the existence of a cointegrating relationship, following the approaches of Pesaran and *al.* (2001) and Narayan (2005) for small samples. The test procedure is such that we have to compare the boundary values with the Fisher value. If the Fisher value is greater than the upper bound, we reject the null hypothesis (H_0: there are no long-term relationships), while in the opposite case, where the Fisher value is less than the lower bound, we accept the null hypothesis.

Table (4): Bounds test

F-test at bounds				
Test statistic	Value	Bounds critical values		
F-Statistic	13.72	Signif.	I (0)	I (1)
k	5	10%	2.508	3.763
		5%	3.037	4.443
		1%	4.257	6.04

*This table shows the F-statistic of 13.72 for the ARDL model and the critical values for the bounds test at significance levels of 10%, 5%, and 1%.

Table 4 on the Bounds test shows that the Fisher statistic, which takes the value of (13.72), is higher than the first upper bound, which is (6.04) at the 1% threshold. We therefore reject the null hypothesis of the inexistence of a cointegrating relationship and accept the alternative hypothesis of the existence of a cointegrating relationship between the selected variables. We can therefore proceed to estimate the long- and short-term relationships of our ARDL cointegration model.

- *Short- and long-term relationships: ARDL model*

The estimates obtained in Table 5 below show that the adjustment coefficient is negative and statistically significant, consequently implying the existence of a mechanism for returning to the equilibrium of the Manufacturing value added in the long run. The value of this coefficient is -0.768. The lower section exhibits the coefficients relating to the effects of the various selected variables on manufacturing value added in the long term. The obtained results corroborate the theoretical prerequisites. In the long term, the variable reflecting the number of companies created (CREAT) per year has a positive impact on manufacturing value added per capita. Thus, a 1% increase in the number of companies created could contribute to a 0.64% rise in value added in the processing industry. Indeed, entrepreneurship is considered to be one of the key factors for a growing economy and for any nation aiming to be competitive. Moreover, in accordance with theory, inflation (INF) has a negative effect on the industrial sector: a 1% increase in inflation can reduce its value added by 0.10% in the long term. However, following a negative external shock, an inflationary spiral can still be triggered by imported inflation, the scale of whose effect depends on the import price elasticity and/or low productivity that generally characterizes developing countries such as Morocco. The coefficient for the variable fixed capital per worker (CAPITA) is positive and statistically significant, confirming the importance of physical capital endowment in a high-performance manufacturing sector capable of facing global competition. In fact, the production process for manufactured goods requires a relatively higher level of capital per employee, so conditions of access to financing for productive investment should be less restrictive to encourage companies to improve their production. Also, increasing physical capital modifies production quantitatively through capacity investments, which make workers more efficient, thus increasing the supply of goods and services, and consequently stimulating the country's economic growth. A positive and significant sign for the variable measuring total factor productivity (TFP), reflecting the country's technological level, corroborates the decisive role of technology in the evolution of economic systems and the improvement of productivity. In general, manufacturing products require a high technological content, and those countries best able to acquire it are best placed to develop their manufacturing sector. According to our empirical findings, a 1% increase in total factor productivity boosts manufacturing value added by 0.33% in Morocco. Finally, the coefficient for the economic complexity index variable (ECI), is positive and statistically significant. This implies that the higher a country's level of economic complexity, the more likely it is to have an export portfolio of diversified and highly sophisticated products. The analysis confirms Hausmann and Hidalgo's results (2014), who argue that the level of economic complexity of a country influences its future growth path. Moreover, these results suggest that the development gaps observed between countries can be explained by the differences in their economic complexity. Then, Economic complexity therefore illustrates the need for a structural transformation of countries' productive activities (Lectard, 2017). More specifically, this trajectory is based on oriented diversification, i.e. diversification into products that are closely related to one another, and which contribute to the creation of new productive activities whose foundations are interwoven with the countries' initial specializations. As a result, Morocco needs to move towards new paths of prosperity, based on the accumulation of present knowledge and productive skills as a foundation for the structure of future exports.

Table (5): Short- and long-term relationships estimate

Variable	Manufacturing value added per capita	
	Short-term relationship	
	Coefficient	**Prob.**
C	**0.775**	0.000
D(MVA(-1))	**0.313**	0.009
D(CAPIT)	**-0.459**	0.000
D(CREAT)	**0.491**	0.000
D(CREAT (-1))	**-1.163**	0.069
D(INFL)	**0.036**	0.001
D(TFP)	**0.051**	0.842
D(TFP (-1))	**-1.692**	0.001
Adjustment coefficient	**-0,768**	0.000
Long-term relationship		
	Coefficient	**Prob.**
CREAT	**0.649**	0.005
CAPIT	**0.028**	0.007
TFP	**0.330**	0.015
ECI	**0.115**	0.046
INF	**-0.100**	0.050
$\mathbf{CointEq} = \boldsymbol{MVA} - (\mathbf{0.649} * \boldsymbol{CREAT} + \mathbf{0.028} * \boldsymbol{CAPIT} + \mathbf{0.330} * \mathbf{TFP} + \mathbf{0.115} * \boldsymbol{ECI} - \mathbf{0.100} * \mathbf{INF})$		

*This table presents the estimated coefficients and probabilities for both short-term and long-term relationships between the manufacturing value added per capita (MVA) and other economic variables. The cointegrating equation is provided, where MVA is expressed as a function of the long-term relationship with CREAT, CAPIT, TFP, ECI, and INF. The short-term coefficients are reported for the first differences of the variables.

4. Conclusion

The aim of this work is to study the process of structural transformation in Morocco by analyzing the determinants of industrial value added. Firstly, we presented an overview of the theoretical and empirical literature dealing with this issue. Then, we applied an autoregressive Autoregressive Distributed Lag model over the period 1995-2022. The results obtained were consistent with the conclusions found in the theoretical and empirical literature, as a matter of fact, our dynamic model confirms the importance of creation of new firms, and the fixed capital per worker in a high-performance manufacturing sector. Also, the variable measuring total factor productivity, corroborates the decisive role of technology in the evolution of economic systems and the improvement of productivity. Moreover, in accordance with theory, inflation has a negative effect on the industrial sector. Regarding the link between economic complexity index and the performance of the manufacturing sector, the results show that the complexity and sophistication of an economy's export structures is positively related to its manufacturing performance. We conclude that a country's productive capacity, as reflected in its current export portfolio, is a major constraint on the value added of its industrial sector.

The results essentially suggest that, the structural transformation of the Moroccan economic structure mainly involves the constant diversification of a domestic economy towards new, increasingly sophisticated forms of manufacturing activity and production. More specifically, the latter is based on oriented diversification, *i.e.* diversification into products that are close to one another, and which contribute to the creation of new productive activities whose foundations are interwoven with the country's initial specializations. In this case. This diversification in complementary activities leads, ultimately, to an increase in long-term economic performance. This refers to the principle of "smart specialization[7]", which makes it possible to identify the specializations that are most conducive to economic growth, in which an economy has comparative advantages over its competitors, through a process of self-discovery. Indeed, the slow transition of developing countries to higher levels of complexity is partly attributable to the uncertainties and higher discovery costs faced by entrepreneurs in developing countries when trying to diversify into more complex and sophisticated products. Similarly, an increase in manufacturing value added implies that the economy in question must combine all the factors likely to allow it to move from a level of technological development based on the imitation and adaptation of existing foreign technologies, to a phase where industrialization is essentially driven by creative knowledge. Building on the results presented in this study and insights from the experiences of successful countries, several proposals have been outlined to

[7] This concept has been defined in the context of European regional policies to support economic growth up to 2020, against a backdrop of increasing disparities in economic development and wealth levels between European regions.

accelerate the structural transformation process. These proposals are articulated around two points:

Seizing Opportunities Across All Sectors: Harnessing new growth opportunities would help expand national wealth and create sustainable employment. In the primary sector, industries such as agri-food could serve as key growth drivers, improving the living standards of rural populations. Strengthening the integration of the agri-food industry into global production networks and aligning with international market standards would enhance export performance. In the industrial sector, improving competitiveness and broadening the production base would provide new momentum, further diversifying the export portfolio.

Enhancing Investment in Research and Development (R&D) and Innovation: The quality of human capital is crucial for the structural transformation of the national economy and its long-term sustainability. To achieve this, it is essential to promote both initial and ongoing technical training, support research and innovation, and foster partnerships between the private sector and academic institutions. Additionally, discovering new products requires significant resources, which can be challenging for small and medium-sized enterprises. These resources are necessary to explore new markets, acquire advanced technologies, and strengthen human capital, allowing companies to adapt their workforce to new and emerging sectors.

In terms of future research directions, it seems relevant to analyze the factors that could enhance a country's level of complexity. The analysis conducted has shown that the peripheral nature of a country's export portfolio affects its ability to undergo a successful structural transformation. Identifying the factors that facilitate the transition from a stage of technological development based on the imitation and adaptation of existing foreign technologies to one where progress is primarily driven by innovation seems valuable. This could therefore be the subject of future complementary research. This reasoning is supported by two key arguments. First, the economic literature lacks a comprehensive list of the theoretical determinants of economic complexity. Second, there are very few empirical studies addressing the determinants of economic complexity (Hidalgo and Hausmann, 2009; Daude et al., 2014; Blyde, 2014). Thus, this issue could bring attention to the challenges related to the phenomenon of economic complexity in countries.

References

Aggarwal, S., Chakraborty, D., and Bhattacharyya, R. (2021). "Determinants of Domestic Value Added in Exports : Empirical Evidence from India's Manufacturing Sectors". Global Business Review, *0*(0).

Alemnew Mekonnen Wolde (2022). "Manufacturing Value-Added (MVA) Share Development in Ethiopia : Causes and Determinants". China-USA Business Review, Vol. 21, No. 2, 70 – 88.

Al-Hashimi, A., F. Skudelny, E. Vaccarino, and J. Wörz. (2015). "The Trade and Demand Nexus : Do Global Value Chains Matter," In Amador, J. and di Mauro, F. (edited by). The Age of Global Value Chains: Maps and Policy Issues. CEPR Press, 132-147.

Amachraa, A. and Quelin, B. (2022). "Morocco Emergence in Global Value Chains: Four exemplary industries". Policy Center For the New South, 2022. PP - 07/22.

Asheim, B., Moodysson, J. and Tödtling, F. (2011). "Constructing regional advantage: Platform policies based on related variety and differentiated knowledge bases", Regional Studies, 45(7), 893-904.

Baldwin, R. E. and Okubo, T. (2006). "Heterogeneous firms, agglomeration and economic geography : Spatial selection and sorting". Journal of Economic Geography, (6(3)).

Blanchard, O. and Johnson, D. (2013). *Macroeconomics: global edition* (6th. ed). harlow : pearson.

Blyde, J. (2014). " Synchronized Factories: Latin America and the Caribbean in the Era of Global Value Chains". Washington: Inter-American Development Bank.

Boschma, R. (2004). "Competitive regions: Introduction to the special issue." Regional Studies, 38(9), 1001-1004.

Cadot, O., Carrère, C. and Strauss-Kahn, V. (2011). ″Export diversification : What's behind the hump ?″. The Review of Economics and Statistics, (93(2)).

Cadot, O., de Melo, J., Plane, P., Wagner, L. and Woldemichael, M.T. (2016). "Industrialisation et transformation structurelle : l'Afrique subsaharienne peut-elle se développer sans usines ? " Revue d'économie du développement, 24(2), PP: 19-49.

Daoui, F. and Bouzaidi, T. D. (2021). "La convergence dans les pays africains: une approche par la complexité économique ". Laboratoire d'Economie Appliquée (LEA). Université Mohammed V de Rabat.

Daude, C., Nagengast, A. and Perea, J. R. (2014). "Productive Capabilities: An Empirical Investigation of their Determinants". Working Paper 321. Paris. France: OECD Development Centre.

Diao, X., McMillan, M., Rodrik, D. (2019). "The Recent Growth Boom in Developing Economies: A Structural-Change Perspective". In: Nissanke, M., Ocampo, J.A. (eds) *The Palgrave Handbook of Development Economics*. Palgrave Macmillan, Cham.

El Mokri, K. (2016). "Le défi de la transformation économique structurelle : une analyse par la complexité économique," Research papers & Policy papers on Economic Trends and Policies 1624, Policy Center for the New South.

Feenstra, R. C., Inklaar. R. and Timmer, M.P. (2015). "The Next Generation of the Penn World Table". American Economic Review, 105(10), 3150-3182.

Felipe, J., Abdon, A. et Kumar, U. (2012). "Tracking the middle-income trap: What is it, who is in it, and why? ", Working Paper 715. Levy Economics Institute of Bard College. Asian Development Bank.

Goujon, M. and Kafando. C. (2011). " Caractéristiques structurelles and industrialisation en Afrique : une première exploration", Études et Documents CERDI, 33.

Guillaumont, J. S. and Hua, P. (2018). " Taux de change réel et production manufacturière en Afrique : quels impacts ? ", Revue d'économie du développement, 2018/2 Vol. 26. 83 à 112.

Güneri, B. & Yasemin Yalta, A. (2021). "Does economic complexity reduce output volatility in developing countries?," Bulletin of Economic Research, Wiley Blackwell, vol. 73(3), pages 411-431, July.

Hamdaoui, M. and Bouayad, B. (2019). "Determinants and Effects of Vertical Integration on the Performance of Moroccan Manufacturing". Athens Journal of Mediterranean Studies- Volume 5, Issue 1 – Pages 57-78.

Haroon, B., François, S. and Christopher, R. 2019. " Comprendre les déterminants du malaise du secteur manufacturier en Afrique", *in : Inégalités de revenus en Afrique subsaharienne*, sous la direction de Haroon Borhat et François Steenkamp. United Nations, pp : 110-135.

Hausmann, R and Hidalgo, C. A. (2011). "The network structure of economic output". Journal of Economic Growth, (16(4)).

Hausmann, R. and D. Rodrik. (2003). ″Economic Development as Self Discovery″. Journal of Development Economics.

Hausmann, R. Hwang, J. and Rodrik, D. (2007). ″What you export matters″. Journal of Economic Growth, (12(1)).

Hausmann, R., Hidalgo, C. A., Bustos, S., Coscia, M., Simoes, A., and Yildirim, M. A. (2014). "The atlas of economic complexity: Mapping paths to prosperity". *MIT Press.*

Hausmann, R., Hidalgo, C.A., Bustos, S., Coscia. M., Chung, S., Jimenez, J., Simoes, A. and Yildirim, M. A. (2011). "The atlas of economic complexity: Mapping paths to prosperity". New Hampshire, Puritan Press.

Hidalgo, C. A. and Hausmann, R. (2009). ″The building blocks of economic complexity″.
proceedings in the National Academy of Sciences of the United States of America, (106(26)).

Hidalgo, C.A., Klinger, B, Barabási, A.-L. and Hausmann, R. (2007). "The product space conditions the development of nations". Science, New Series, 317(5837), pp : 482–487.

Imbs, J. and Wacziarg, R. (2003). ″Stages of diversification″. American Economic Review, (93(1)).

John, C., A. (2017). "Manufacturing value added development in north africa: analysis of key drivers". Asian Development Policy Review ISSN(e). Vol. 5, No. 4, 281-298.

Klinger, B. and Lederman. D. (2011). ″Export discoveries, diversification and barriers to entry″. Economic Systems, 35(1), PP : 64–83.

Krugman, P. R. (1981). "Intraindustry specialization and the gains from trade″. Journal of Political Economy, (89(5)).

Krugman, P. R. (1991). "Increasing returns and economic geography". Journal of Political Economy, (99(3)).

Laboratoire d'Economie Appliquée (2021). *Complexité, transformations structurelles et convergence économique.* Ouvrage collectif. Université Mohammed V de Rabat.

Labrar, S., Zouiri, L. and Allali, I. (2023). "Structural Transformation and Economic Growth in Africa: An Economic Complexity Approach". Review of Economics and Finance, 21, 1946-1955.

Lectard, P. & Rougier, E. (2018). "Can Developing Countries Gain from Defying Comparative Advantage ? Distance to Comparative Advantage, Export Diversification and Sophistication, and the Dynamics of Specialization," World Development, Elsevier, vol. 102(C), pages 90-110.

Lectard, P. (2017). " Chaines de valeur et Transformation structurelle soutenable". Document de travail, n°292, Banque africaine de développement.

Lectard, P. and Piveteau, A. (2020). ″ Sortir de l'impasse exportatrice. Les enseignements de l'analyse du profil des exportations marocaines". Noureddine El Aoufi ; Bernard Billaudot. *Made in Maroc - Made in Monde. Industrialisation et développement, 1, Economie Critique*, pp.175-204, 978-9920-38- 211-3.

Liouaeddine, M. and Moussir, C.E. (2021). " Complexité économique comme levier de transformation structurelle des pays en développement: Convergence ou divergence". Laboratoire d'Economie Appliquée (LEA). Université Mohammed V de Rabat.

Maritza Sotomayor Sotomayor and María del Rosío Barajas-Escamilla. (2020). "Global Manufacturing Production : An Analysis and Determinants for Mexico's Trade in Value-Added". International Journal of Applied Economics, 17(2), 30-49

Melitz, M. (2003). "The impact of trade on intra-industry reallocations and aggregate industry productivity". Econometrica, (71(6)).

Mouelhi, R. and Ghazali, M. (2020). "Structural transformation in Egypt, Morocco and Tunisia: Patterns, drivers and constraints". Econ Transit Institut Change. 35–61.

Nagengast, A. J., and R. Stehrer. (2015). "Global Value Chains and the Great Collapse in Value Added Trade," In Amador, J. & di Mauro, F. (edited by). The Age of Global Value Chains: Maps and Policy Issues. CEPR Press, 121- 130.

Narayan, P. K. (2005). "Reformulating critical values for the bounds F-statistics approach to cointegration: an application to the tourism demand model for Fiji", Discussion Papers 02/04-Department of Economics Monash University; p 21.

Ottaviano, G. I. P. (2011). "New new economic geography : Firm heterogeneity and agglomeration economics". Journal of Economic Geography, (11(2)).

Pesaran, M. H. (2015). "Time series and panel data econometrics". Oxford University Press.

Pesaran, M. H., and Shin, Y. (1996). "Cointegration and speed of convergence to equilibrium". Journal of econometrics, 71(1-2), 117-143

Pesaran, M. H., Shin, Y. and Smith, R. J. (2001). " Bounds testing approaches to the analysis of level relationships". Journal of Applied Econometrics. 16(3), 289-326.

Porter, M. (1991). "Towards a dynamic theory of strategy". Strategic Management Journal, (12(2)).

Porter, M. (1993). " L’avantage concurrentiel des nations". Paris : Éditions du Renouveau pédagogique.

Ricardo, D. (1817). "On the principles of political economy and taxation". Londres, John Murray, Albermale Street.

Saidi, A. (2019). "Complexité économique et développement : stratégies pour la diversification structurelle de l’économie marocaine". DEPF. Ministère de l’Economie et des finances.

Smith, A. 1776. *Recherches sur la nature et les causes de la richesse des nations*. Paris, GF Flammarion, 1776.

Woon Shin Yee and Nor Aznin Abu Bakar (2023). "Determinants of Manufacturing Sector Growth in Malaysia". Glob Acad J Econ Buss, 5(6), 151-156.

Appendix (1): Description of variables and data sources

Variable	Description	Source
Manufacturing value added	Manufacturing value added, in constant dollars / total population.	United Nations Industrial Development Organization
Fixed capital per worker	The variable capital per worker is calculated from employment and capital stock data (in 2017 US dollars PPP).	Penn World Table, Version 10.1 (Feenstra et al., 2015)
Total Factor Productivity	TFP is calculated in PPP US dollars, using data on capital stock, labor input and labor income share.	
Number of companies created	It covers the different types of companies created each year, namely: Public limited company, Limited liability company, Simplified public limited company, Economic interest group, General partnership, Limited partnership, Partnership limited by shares, Joint partnership.	Moroccan Industrial and Commercial Property Office
Inflation rate	Inflation as measured by the consumer price index reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly.	The World Bank data
Economic Complexity Index	It measures the distance between the production capacities inherent in a country's current export structure and the production capacities associated with products it is not yet exporting.	The Atlas of Economic Complexity (Hidalgo et *al*., 2011) ;