Modeling innovation and competitiveness of small and medium enterprises in Algeria: A standard analytical study using the dynamic analysis model VAR during the period 2003-2019

نمذجة الإبتكار والتنافسية بالمؤسسات الصغيرة والمتوسطة في الجزائر: دراسة تحليلية قياسية بإستخدام نموذج التحليل الديناميكي VAR خلال الفترة: 2003–2019

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Abstract: This study aimed to analyze and measure levels of innovation and competitiveness in small and medium enterprises in Algeria, through the factors of time and growth in the number of investments in this sector. The descriptive and experimental methods were used, using the VAR dynamic analysis model, during the period 2003-2019. And results have shown that investments cease completely in the SME sector due to the weak level of competitiveness of these enterprises. As for the return of some investments to its activity in other cases, the study demonstrated an increase in the size of its competitiveness due to field experience gained by its failure previously in other sectors, and the increase in the volume of new investments in small and medium enterprises leads to a relative increase in the levels of innovation in Algeria.
Keywords: SMEs; Business Failure; Innovation; Competitiveness; VAR.

ملخص: هدفت هذه الدراسة إلى تحليل وقياس مستويات الإبتكار والتنافسية بالمؤسسات الصغيرة والمتوسطة بالجزائر، من خلال عاملي الزمن والنمو في عدد الاستثمارات بهذا القطاع. ولقد تم الاعتماد على منهجين الوصفي والتجريبي، وذلك باستخدام نموذج التحليل الديناميكي VAR، خلال الفترة: 2003–2019. ولقد أثبتت نتائج بأن توقف الاستثمارات عن النشاط نهائيا في قطاع المؤسسات الصغيرة والمتوسطة يعود إلى ضعف مستوى تنافسية تلك المؤسسات. أما بالنسبة لإعادة بعض الاستثمارات لنشاطها في حالات أخرى فلقد أثبتت النتائج بزيادة حجم تنافسيتها بفعل الخبرة الميدانية أكتسبتها بفشلها سابقا في قطاعات أخرى، كما أن زيادة حجم الاستثمارات الجديدة بالمؤسسات الصغيرة والمتوسطة يأدي إلى زيادة نسبية في مستويات الإبتكار بالجزائر.
الكلمات المفتاح: المؤسسات الصغيرة والمتوسطة؛ فشل الأعمال؛ الإبتكار؛ التنافسية؛ VAR.

I- Introduction:

In light of the various economic changes taking place in the world, which are characterized by instability in many areas, especially the challenge of globalization and innovation and facing competition, which led many investors, especially in the sector of small and medium enterprises and emerging ones, to their failure through stopping their investment activities, by facing them to many problems, including what are Financial as a result of high investment costs, and other economic problems through the loss of those enterprises to their competitiveness in many markets, the latter is a major determinant of the continuation of the institution's activity.

In view of the various economic problems faced by investment in small and medium enterprises in Algeria, especially the lower levels of competitiveness and innovation in them, which led to the expansion of the circle of social problems, especially unemployment and a failure to meet the local demand for products, so that there is an urgent need to solve the problems of those enterprises aiming to improve and develop their level of product performance, which will enhance

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the competitiveness of small and medium enterprises at the local and international levels, in addition to activating their performance levels in in Algeria's economic activity

-The problem of the study: In this study, we tried to work on linking the competitiveness of small and medium enterprises and the level of innovation in them, by highlighting the relationship that exists between them, so that determining the degree of influence of each variable on the other and in varying proportions determines for us the true reality of the level of competitiveness and innovation in Algerian SMEs, and the extent of their impact on Investment levels in this sector. From this standpoint, we have emerged the following major problem:

What is the impact of the levels of innovation and competitiveness of small and medium enterprises in the development of investment in this sector in Algeria?

Through the general problem of the research topic, a set of the following sub-questions were developed:

-What is the nature of the relationship between the variables under study?

-What is the reality of innovation and competitiveness in the SME sector in Algeria?

-Is the low cost-effectiveness of the investment contribution of the Algerian small and medium enterprise sector in economic activity due to the weak levels of competitiveness and innovation in them?

-Study hypotheses:

-The investments in the small and medium enterprise sector cease to be active or return some of their investments to other activities due to the weak level of competitiveness of these institutions in Algeria;

-The increase in the volume of new investments in small and medium enterprises, which leads to a relative increase in the level of innovation in Algeria;

-The weak contribution of the investment in the Algerian SME sector to economic activity is due to weak competitiveness and innovation.

-Objectives of the study: This study aimed to analyze and determine the type of relationship that exists between the variables of innovation and competitiveness, through two variables that stop the investments of small and medium enterprises from activities and return it in the same year, and the variable of the evolution of the number of new annual investments. This is in addition to defining the trends of that relationship by explaining the various causes and economic interpretations of the role of innovation and competitiveness in the success of investment in this sector.

-The importance of studying: The importance of the study lies in analyzing the nature of the relationship between the variables of the study, so that the phenomenon of investment failure in the sector of small and medium enterprises and emerging institutions in many sectors in Algeria is one of the current common phenomena, so that the increase in the percentage of stopping the investments altogether with the resumption of some investments of existing institutions at rates Faster than the increase in new investments annually, inevitably will lead to widening the gap between demand and supply, which will lead to an increase in the volume of inflation in it, and a weak contribution to the Algerian economic activity.

-Study methodology and tools used: The data of the study were collected through the Annual Reports**(**)** of the Algerian Ministry of Industry and Mines during the period 2003-2019 related to the number of investments of small and medium enterprises. We have adopted in this study two basic approaches, the first is the descriptive and analytical approach through analyzing several economic indicators for investment in this sector, in addition to the use of the quantitative approach, through preparing a standard model in which to explain the dynamic relationship related to the

variables of the study, using the help of With a VAR dynamic analysis model, using of the STATA.15 statistical program.

- Previous studies:

Study (M. Mohd Rosli and Syamsuriana Sidek, 2013,P.1) titled "The Impact of Innovation on the Performance of Small and Medium Manufacturing Enterprises: Evidence from Malaysia": This paper aimed to assess the impact of the various dimensions of innovation on the performance of small and medium enterprises, as a total of 284 samples were collected from small and medium-sized companies in the field of food, beverages, textiles, clothing and sub-industries based on wood throughout Malaysia, so that the data was analyzed using hierarchical regression analysis. The results confirmed the hypotheses that product innovation and process innovation greatly affect enterprise performance levels, as the impact of the former was stronger than the latter. Besides consolidating the current theory about the importance of innovation to explain variation in company performance, results also urge SMEs and policymakers that innovation is a critical factor in current entrepreneurial activities, so additional studies should examine how this type of organization can calculate the cost-benefit ratio of Innovation and how they can choose internal or external sources of innovation before actual innovation takes place.

Study (Mile Terziovski, 2010, P.892) under the title: "Innovation practice and its performance implications in small and medium enterprises (smes) in the manufacturing sector: a resource-based view": This study identifies the motives for innovation and its effects on manufacturing in small and medium enterprises, so that a sample of 600 Australian SMEs was surveyed, and found that those institutions resemble large companies with regard to the way in which the innovation strategy and the formal structure constitute the main drivers of their performance, but it does not seem to be The culture of innovation is used in a strategic and organized manner. Consequently, this study concludes that the performance of small and medium enterprises is likely to improve because they increase the degree of their reflection on the major manufacturing companies in terms of strategy and formal structure, which understands that the culture of innovation and its strategy are closely aligned in all stages of the innovation process.

I.1- Theoretical framework:

I.1.1- General concepts of Innovation and Competitiveness in SMEs:

-Innovation and its role in supporting competitive products: This study reviewed the literature relating to innovation in manufacturing SMEs in order to identify relevant constructs to form the basis for the development of a theoretical model.

Uses the resource-based view (RBV) of the firm to explain the manner in which manufacturing SMEs develop competitive advantage compared to the manner in which large firms do (Barney, 1991). The RBV focuses on the link between strategy and firms' internal resources through the VRIO framework. This consists of value (V), or whether it provides competitive advantage, rareness (R), or whether competitors possess it, instability (I), or whether it is costly for competitors to imitate, and organization (O), or whether the firm is organized to exploit the resource. SMEs in the manufacturing sector develop competitive advantage through their staffs' creative potential to develop differentiated products for niche markets. Large manufacturing firms, however, develop competitive advantage based on cost efficiencies gained through formalized structures and systems. The discussion about the manner in which SMEs and large companies compete is consistent with Schumpeter's innovation theory noted earlier. Several innovation-related constructs have emerged as potential independent variables for inclusion in the theoretical model. These are knowledge, routines, strategy, technology, structure, and culture (Mile Terziovski, 2010, pp.894-895).

According to Chesbrough and Crowther (2006), open innovation has two dimensions (Pooran Wynarczyk, Panagiotis Piperopoulos and Maura Mcadam, 2013, pp.241-242):

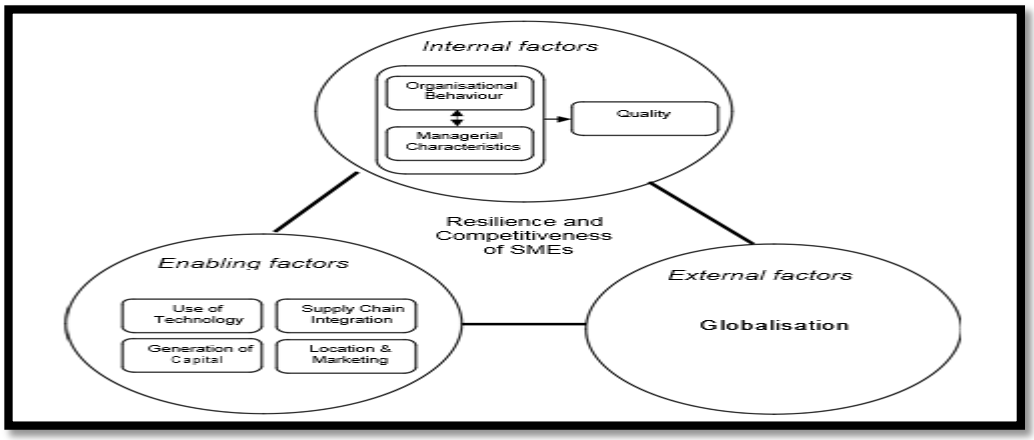
-Inbound open innovation – the acquisition and transfer of external technologies, ideas and knowledge into the firm through, for example, R&D contracts, university collaborations, in licensing, mergers and acquisitions; and
-Outbound open innovation – the transfer of technology, ideas and knowledge to external firms and their commercial exploitation through, for example, out-licensing, joint ventures, venture spin-outs, etc.
-Enkel et al. (2009) argue that this form of open innovation enables firms to garner the benefits and rewards of their innovative ideas at the conception stage, as opposed to attempting to advance them into new products. Subsequently, Enkel have suggested a third dimension to open innovation activities: namely, the 'coupled process'. According to Enkel et al., firms establish this process by combining inbound activities (the use of externally available knowledge and resources to supplement their internal R&D capabilities) with outbound activities (e.g. the use of out-licensing) in order to co-develop, commercialize and co-capitalise on innovation.
Recent theoretical investigation suggests that innovation capabilities evolve over time and that several organizational and environmental levers contribute to their initiation, development, maturation and alteration. Recent research has relied heavily on the concept of DCs to analyse change in organizational capabilities. The DCs of the firm consist of the knowledge and processes needed in order to recognize new business opportunities and to reconfigure internal and external organizational skills, resources and competences to match the requirements of a changing environment. DCs underpin an organization's ability to achieve new forms of competitive advantages. Recently, Teece (2007) has grouped the main DCs of the firm into three categories: sensing, seizing and reconfiguring. Sensing capabilities are linked to the firm's activities in scanning and monitoring changes in environments, assessing customers' preferences, capturing ideas internally from a wide range of employees and identifying new business opportunities. To seize capabilities, firms have to both invest in technology and complementary assets and be able to exploit new opportunities as they present themselves. Reconfiguring capabilities relate to what may be termed asset 'orchestration', which refers to an organization's ability to reconfigure itself effectively in order to address rapidly changing, dynamic and turbulent environments. It is not enough to have developed the necessary dynamic capabilities; they must be seamlessly combined and expressed through specific organizational structures, managerial processes, incentive schemes, organizational routines and others (Michele Grimaldi, Ivana Quinto and Pierluigi Rippa, 2013, p.201).
-SME competitiveness: A small firm is not a scaled-down version of larger firms. Larger and smaller firms differ from each other in terms of their organizational structures, responses to the environment, managerial styles and, more importantly, the ways in which they compete with other firms. As a result, the competitiveness studies focusing on large corporations may not be applied directly to the SME level. In fact, studies of0competitiveness with a focus on SMEs have increased substantially in recent years, with a number of studies devoted to identifying the various factors of competitiveness described below. For example, the framework proposed by Horne et al. (1992) stressed that competitiveness for small firms should be the interaction of the scope for action or growth in the business environment, the degree of access to capital resources, and the intrinsic ability of the firm to act as represented in entrepreneurship. This framework corresponds to our review of the recent literature, which distinguishes between three key aspects leading to an SME's competitiveness, including the internal firm factors, external environment and, unique to SMEs, the influence of the entrepreneur. These factors in turn affect the performance of the firm (Thomas W.Y. Man, Theresa Lau, K.F. Chan , 2002, p.129).

Figure (1): The world competitiveness formula.

Source: Thomas W.Y. Man, Theresa Lau, K.F. Chan, 2002, P.127.

-Resilience and competitiveness of SMEs: Storey (1994) argued that there is no single, distinct and uniformly acceptable definition of a small firm. However, the Small Business Survey, UK (2004) defines businesses according to the number of employees, annual turnover and annual balance sheet total. However, most of the SMEs face common problems and challenges in the global market and operations. Resilience could be viewed as adaptability, responsiveness, sustainability and competitiveness in evolving markets. It is critical for SMEs to succeed in the so-called twenty-first century global market. Jorgensen and Knudsen (2006) discuss the resilience and competitiveness of SMEs in global markets. As markets for semi-manufactured goods become more global, SMEs are increasingly integrated into global value chains. If SMEs lack the ability to perform functions effectively in relation to sustainable supply chain management, then they may in time face rising barriers to entry into global value chains. SMEs are important as change agents in global value chains in order to ensure the pervasiveness of sustainability standards. Increasing numbers of SMEs trade in global business-to-business markets for semi-manufactured goods, it is therefore important that SMEs are able to perform governance functions associated with sustainable production in global value chains. Singh et al. (2008) present the importance of SMEs in selected countries in terms of industrial output, employment, export and GDP. SMEs are regularly facing new challenges with reference to cost, quality, delivery, flexibility and human resource development for their survival and growth in the context of a dynamic market scenario. A firm's competitive strategy specifies the potential products and markets, long-term objectives and policies for achieving the objectives. Organizations should continuously review their manufacturing strategies to identify the aspects of market priority, product structure, manufacturing configuration and investment. Moreover, SMEs have started outsourcing activities such as legal representation and consultation, accounting, tax consultation, business and financial consultation, market research survey, training and compilation of loan applications, etc. This highlights the challenges of physically distributed enterprise environments and operations, and their integration through IT/IS with SMEs and in turn the significance of resilient SMEs (Angappa Gunasekaran , Bharatendra K. Rai & Michael Griffin, 2011, pp.5491-5492).

Figure (2): Framework for SME resilience and competitiveness.



Source: Angappa Gunasekaran, Bharatendra K. Rai & Michael Griffin, 2011, P.5494.

-Governmental support: In order to develop performance levels by promoting innovation and competitiveness in small and medium enterprises and emerging institutions, Algeria worked to develop the legislative system for this sector through several stages starting from the directive law for small and medium enterprises for the year 2001 until its updating in January 2017. It came that Legislation and laws in order to try to resurrect and activate the role of this sector through (Algerian Official Gazette, 2017, Law n°02-17):

-Bringing economic growth; Improving the environment for small and medium enterprises; Encouraging the establishment and maintenance of small and medium-sized enterprises, especially the innovative ones; Improving the competitiveness of small and medium-sized enterprises and their export capabilities; Promotion of entrepreneurial culture; Improving the rate of national integration and promotion of handling. Despite these measures, however, they were not sufficient to curb the failure rates of small and medium enterprises through the stopping and reactivating variables.

I.1.2- Standard Approach (VAR):

The VAR model was proposed by Sims (Sims C. A., 1981, p.1-49) in 1981, as he sees that the traditional method for building real-time standard models adopts an interpretative viewpoint, as it includes many untested assumptions such as: excluding some variables from some equations in order to arrive at an acceptable identification of the model The same applies to the selection of external variables (Exogenous), the shape of the distribution of slowdown times. Sims proposes in his model the treatment of all variables in the same way without any preconditions (excluding or counting them external), and inserting them all in the equations with the same number of slowdown periods.

The VAR model can be written as a set of equations as follows (Shumway R.H. and Stoffer D.S., 2006, pp.303-304):

$$y_{1t} = \phi^{(1)}{}_{11} y_{1,t-1} + \cdots + \phi^{(p)}{}_{11} y_{1,t-p} + \cdots \phi^{(1)}{}_{1n} y_{n,t-1} + \cdots \phi^{(p)}{}_{1n} y_{1,t-p} + \varepsilon_{1,t}$$

$$y_{nt} = \phi^{(1)}{}_{n1} y_{1,t-1} + \cdots + \phi^{(p)}{}_{n1} y_{1,t-p} + \cdots \phi^{(1)}{}_{nn} y_{n,t-1} + \cdots \phi^{(p)}{}_{nn} y_{1,t-p} + \varepsilon_{n,t}$$

The most important stages of applying the dynamic analysis models represented by the self-regression beam model (VAR) can be summarized by following the following steps: First, the study of time series stability; Secondly, the causal study of Granger; Third, the Johansen or Angel and Granger test to determine the relationships of integration; Fourth, determine the degrees Fifth: VAR model delay; model estimation; sixth; model validity test; seventh, Wold test eighth, shock analysis; ninth, contrast analysis table .

II– Methods and Materials:

The nature of the study and the specificity of the topic that came under the framework of macroeconomic studies required the use of multiple scientific approaches, which helped us in

analyzing and interpreting the axes that constitute the study, where the descriptive approach was relied upon by setting theoretical foundations and concepts related to industrial clusters and their effects on the level of performance of economic activity. The analytical method used in our explanation and interpretation of the development of some economic indicators related to the study variables. Finally, the experimental approach was used to build a standard model in which it determines the mutual effects between the competition factor represented in the annual development of the number of investments that ceased its activity and other investments that reinvigorated it, in addition to the growth factor of innovation through the evolution of the number of new investments in the SME sector in Algeria, The outputs of the STATA.15 statistical program were used in the modeling and analysis process.

Among the research tools used also in this study, various mathematical and standard methods were used, through the use of mathematical equations, in order to carry out in-depth analyzes and interpretation of the phenomenon studied.

In order to address the problem of the study, its general time frame and spatial extent and research limits are defined as follows:

-Time limits: The standard analytical study was associated with the use of data of the variables under study during the period from 2003 to 2018, as this period was characterized by a set of economic reforms, especially in the field of supporting and developing investment in the small and medium enterprise sector in Algeria through improving levels of Innovation and competitiveness. The determination of the time period under study is due to considerations related to the availability of statistical data, and the provision of a sufficient number of information and observations, which enabled us to analyze and estimate a standard model that meets the objectives of the study.

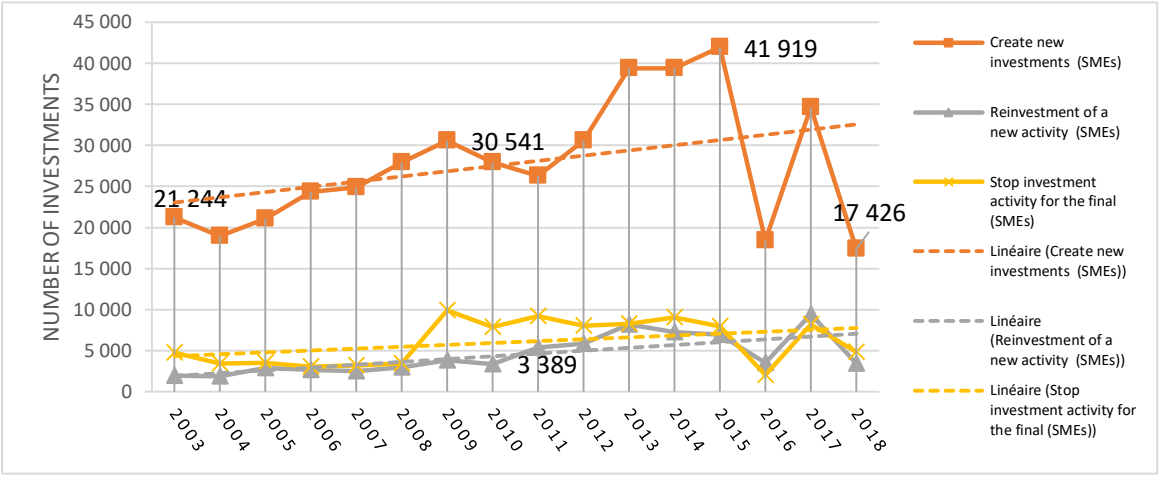
-Spatial boundaries: The spatial field chosen for the field study was shortened to forty-eight states (48).

III- Results and discussion :

III.1- The reality of innovation and competitiveness in the sector of small and medium enterprises in Algeria:

The development of levels of investment in the sector of small and medium enterprises in Algeria, which was marked by a significant increase in the number of investments in this sector, which exceeded the number of one million enterprises, has gone through many stages, in which these institutions were distinguished from growth and in other stages by complete stagnation, as the reasons for the dependence of those institutions on government support the directive, which prevented the development of its performance levels by increasing the volume of innovation and competitiveness in it, which led to its failure in many cases, and the following figure summarizes the dynamics of investment in this sector.

Figure (3): Dynamics of investment in SMEs during the period 2003-2018.



Source: Prepared by the two researchers, based on the annual reports of the Ministry of Industry and Mines 2003-2018.

III.1.1-The reality of innovation: Investment through the establishment of new small and medium enterprises is considered one of the most important indicators of innovation, as the creation of new institutions leads to the creation of new products or other development, which leads to the development of levels of innovation in the SME sector in Algeria, which is one of the most important pillars in Economic development at the local level in Algeria, by supporting innovation to the competitive levels of these institutions in the national market and meeting their increasing needs due to the economic changes that have occurred as a result of entering globalization and modern technologies during the production stages of institutions.

Through Figure N°03, we note that the investment in small and medium-sized enterprises has witnessed a remarkable development throughout the study period, so that in 2003 we recorded a creation rate of 21,244 thousand new institutions in the year, bringing this number to the establishment of 34,642 thousand new institutions in 2017 by 61%, this ratio It is explained by Algeria's adoption of new policies and strategies aimed at creating a new economic alternative outside the hydrocarbon sector, so that this policy allows supporting investment in the small and medium enterprise sector by activating and developing levels of innovation and achieving competitiveness in its products in Algeria.

III.1.2-The reality of competitiveness: The increase in the number of unsuccessful investments through the cessation of the activity of some small and medium enterprises or the revitalization of others combined, which constitutes a third of the institutions in Algeria that have failed in their investments annually, due to the weakness of the competitiveness of this sector, so that the competitiveness of small and medium enterprises is a major determinant For continued investment or business in this area.

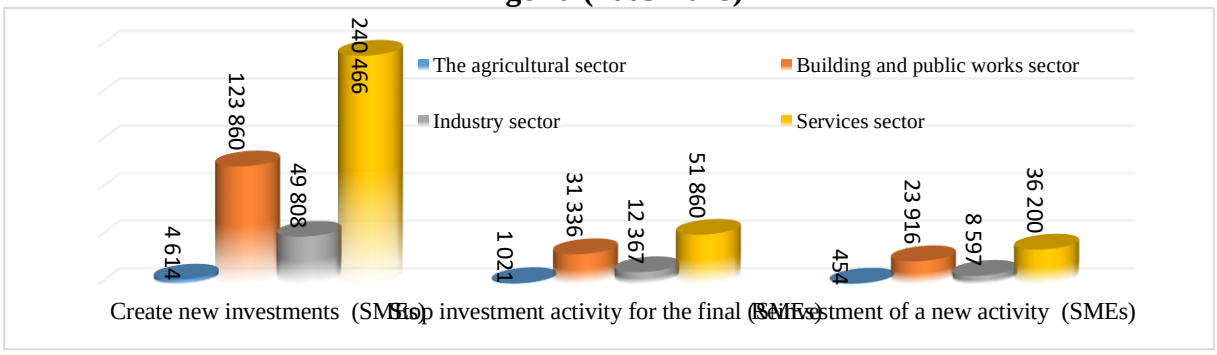
During the analysis process (Figure N°3), we found that each of the institutions that stopped the activity permanently or that returned it is constantly increasing throughout the study period, where in 2003 we recorded 4.789 thousand investments, which stopped the activity completely and 1,942 investments that restored its activity to activities Other more successful, On the other hand, at the beginning of the year 2018, a failure of 4,870 thousand institutions was recorded, which completely ceased activity, and 9,432 thousand other institutions resumed their activity, i.e. an increase rate exceeding 100%. We also found that as the number of new enterprises increases annually, the number of enterprises whose investments have failed in the country has increased, which is explained by the weakness of competition or competitiveness factor among many SMEs in

Algeria. This makes it necessary for the government to take new measures toward this sector to Hussein's levels of performance in the economic activity in general.

When comparing the number of new investments through the annual establishment of new enterprises (as a determinant of innovation) with activity ceasing or a return to another activity in the same year (competitive determinants), we have found that the growth rates of each of these variables were balanced throughout the period under study. Where we found that the mortality rate of small and medium enterprises in Algeria in 2003 reached 23% of new enterprises, which corresponds to 27% in 2018. As for the restoration of activity for some small and medium enterprises, it reached 10% of new enterprises in 2003, and that corresponds to nearly 18% in 2018. As it was revealed through the statistics mentioned above that each of the institutions that were suspended from the activity and returned to their activities collectively, constituted a third of the small and medium enterprises that failed to invest annually in Algeria, which is evidence of weak investment in this sector, through its high sensitivity to competition and innovation, which is something that It negatively affected the activity of these enterprises in the market due to the weakness registered in this field.

III.1.3- Sectoral investment movement in small and medium enterprises in Algeria: Investment in the sector of small and medium enterprises in Algeria faces many challenges imposed by modern economic changes, which are characterized by development and prosperity, and other times of crisis, which require those in charge of this sector to make profound adjustments at the level of many strategies in this field, in order to develop investment in this sector and develop its competitiveness. Especially what is related to supporting innovation and competitiveness in small and medium enterprises and emerging ones, considering that Algeria has the capabilities to enable it to support the activation of the role of these institutions in the economic activity as a whole.

Figure (4): Distribution of Investments of Small and Medium Enterprises by Sectors in Algeria (2003-2018)



Source: Prepared by the two researchers, based on the annual reports of the Ministry of Industry and Mines 2003-2018.

Through the sectoral analysis of the investments of small and medium enterprises in Algeria during the study period, we found that the development of the proportion of new investment in the services sector compared to the industrial sectors, which is the main pillar of innovation and agriculture, did not change throughout the research period, where the values ranged between 78% and 83%, which confirms Weak profitability of investment in small and medium enterprises in Algeria, especially in the industrial field, this is due to the fact that the Algerian economy is an entire economy in which it relies on hydrocarbons in general. As for the definitive stopping of investments and the return of some investments to other areas of activity, we obtained rates ranging between 76% and 81% for the services sector from the total number of stalled and returned investments in some of them. The orientation of SME investors towards the various services sectors

of activity has negatively affected the development of other productive sectors, especially in the industrial field.

III.2- Standard analytical study of the relationship of levels of innovation and competitiveness of SMEs in Algeria using the dynamic analysis model "VAR" during the period: 2003-2019.

III.2.1- Estimation of the study model (VAR): The standard model for this study comes to explain and analyze the existing theoretical relationship innovation and competitiveness of small and medium enterprises and their role in the sustainability of investment in this sector in Algeria, where the weakness of competitiveness and innovation in these institutions negatively affects the survival of many institutions in the market.

The model of the study is based on the variable number of new investments made in the small and medium enterprise sector (ICSME), the number of investments that are finally inactive (IRASME), and the number of reactive investments (IMREME) on the other hand. This study was based on the following main equation:

$$\mathrm{IRASME}_t = \quad f \quad (\mathrm{ICSME}_t,\ \mathrm{IRESME}_t\ ,\ \varepsilon_t\ )$$

Whereas:

-ICSME t: The number of new investments in SMEs in the period T, as a determinant of innovation;

-IRASME t: The number of investments that are permanently inactive in the T period, as a determinant of competitiveness;

-IRESME t: The number of reactive investments in T period, as a determinant of competitiveness;

-ε_t : represents the unobserved effects or variables in the T period.

III.2.2- Presentation and discussion of the study results: In this axis, we tried to analyze and explain the impact of innovation and competitiveness variables of small and medium enterprises on the stalling of investments in this sector in Algeria, where the results of the assessment were divided into the following stages:

III.2.2.1-Time Series Stability Study: In order to investigate the stillness of the study variables, the extended Dickey–Fuller unit root test and the Philippe-Pierron test (PP, ADF) were used, as the results were as shown in the following table (Table (1)).

After applying the unit wall test for each variable, the results clearly indicate that the time series of all study variables were not static in their levels, as both the Dickey–Fuller Extended Test (ADF) and the Philippe-Pierron Test (PP) indicated that the test values calculated for each variable by value Absolute is less than the tabular values in its absolute value, at the level of statistical significance of 5%, and accordingly, the null hypothesis is accepted. As for taking the first difference of these variables, all the variables became static, where the values of Dicky-Fuller and Philippe-Pierron test calculated by the absolute value of all the variables were greater than the tabular values at the level of significance of 5%, that is, they are integrated from the first degree I (1).

Through the results of the study of stability, and after ensuring that all the variables included in the study are integrated from the same degree, there is a possibility for a common integration between those variables, i.e. we can find a long-term balanced of-investment relationship between the evolution of the number of investments that are permanently inactive and the levels of innovation and competitiveness of SMEs through the variable creation of new and changing reactivity of some investments during the period under study.

III.2.2.2-Cointegration Test: By performing the Johansen test to determine the relationship of joint integration, the results demonstrated the absence of a balanced relationship in the long run (Rank=0), and therefore the appropriate model for this study includes the VAR model (Table (2)).

III.2.2.3-Determination of delay degrees VAR model: By estimation results, Var (2) model was chosen where the second-order Var model is the preferred model, because it has the smallest value between HQIC, AIC, SBIC, and FPE (Table (3)).

III.2.2.4-Estimate the Var Model: The following table summarizes the Var (2) estimation of the relationship between study variables, with two time delays only (Table (4)).

Table (4): Estimation Results for Var (2) Form

Number of new investments D. IRASME	Estimate a model VAR
(LD) IRASME	-0. 039 (0.254)
(L2D)	-0. 073 (0.848)
(LD) ICSME	-0. 247 (0.183)
(L2D)	0. 058 (0.742)
(LD) IRESME	0. 874 (0.403)
(L2D)	0. 413 (0.573)
Constant	-2.948 (0.997)
The number of investments returned to their activities D.ICSME	Estimate a model VAR
(LD) IRASME	-1. 024 (0.147)
(L2D)	-1. 229 (0.111)
(LD) ICSME	-1. 265 (0.001)
(L2D)	0. 274 (0.447)
(LD) IRESME	5. 432 (0.010)
(L2D)	5. 212 (0.000)
Constant	-2639.378 (0.096)
The number of investments permanently discontinued from the activity D.IRESME	Estimate a model VAR
(LD) ICSME	-0. 030 (0.058)
(L2D)	-0. 117 (0.501)
(LD) IRASME	-0. 316 (0.000)
(L2D)	0. 072 (0.375)
(LD) IRESME	1. 068 (0.025)
(L2D)	0. 526 (0.116)
Constant	-195.417 (0.586)

Source: Prepared by the two researchers, based on the results of the STATA.15 program.

Table (04) shows the e of the study model, in which the values of the number of investments created annually by the SME sector as defined for innovation, and the eventual reactivation or cessation of certain investments by some emerging institutions as determinants of competitiveness (ICSME, IRESME, IRAME) together with the first two time delays. So that they are included as internal variables in the VAR model.

The results of the VAR (2) model estimate proved that the model was statistically significant for the model variable of reactive investments IRESME and variable of new investments ICSME in general only, through the very high significativity that links all study variables with their time delays. So that the late values of all variables were 5% or 10%. While the model equation for the IRASME variable was statistically insignificant.

Through the results of the estimate, we choose two equitions: the first about the re-investment iRESME in the small and medium-sized enterprise sector in Algeria; the second about the new investment in the small and medium-sized enterprise sector (ICSME), with two time-delayed. The test results for the VAR estimate (2) can be summarized as follows:

$$\text{IRESME}_{t} = -195.417 - 0.316\ \text{ICSME}_{t-1} - 0.303\ \text{RAPME}_{t-1} + 1.068\ \text{IRESME}_{t-1} + 0.072\ \text{ICSME}_{t-2} + 0.117\ \text{RAPME}_{t-2} + 0.526\ \text{IRESME}_{t-2}$$

-The IRESME variable positively correlated with the same variable for the previous year IRESME_{t-1} with the flexibility of 1.068 units (significant) and 0.526 units in the previous two years (non-significant).

-The IRESME variable is negatively correlated to the variable creation of new SMEs for the past year ICSME_{t-1} with a flexibility of 0.316 units (significant), which proves the impact of new investments on the traditional small company existing in the market previously, by increasing the new emerging enterprises to market competitiveness due to new innovations in their products during the early stages of their work that are highly profitable in production, while the impact of the new two-year ICSME_{t-2} investments has been weak and statistically non-significant with the number of reactive IRESME investments.

-The change in one unit of the variable stopped investments of SMEs for the last year IRASME_{t-1}, and for the previous 2years IRASME_{t-2}, leads to a decrease in the number of investments returned to its activity IRESME by 0.303 units for the previous year (Significant)), and an increase of 0.117 units for the previous two years (non-significant). The negative relationship explains that the numbers of failed enterprises in their investments the markets are trying to change their strategy by resurrecting their activity by changing and developing the type of their products, which limits their permanent cessation of activity and increases their chances of remaining in the markets by sending them to a new, more successful activity.

For the variant of the self-regression model Var (2) of the variable of new investments (ICSME), it is as follows:

$$\text{ICSME}_{t} = -2639.378 - 1.256\ \text{ICSME}_{t-1} - 1.024\ \text{IRASME}_{t-1} + 5.432\ \text{IRESME}_{t-1} + 0.274\ \text{ICSME}_{t-2} - 1.229\ \text{IRASME}_{t-2} + 5.212\ \text{IRESME}_{t-2}$$

-The ICSME variable positively correlated with the same variable for the previous year IRESME_{t-1} with flexibility of 1.068 units (significant) and 0.526 units for the previous two years IRESME_{t-2} (non-significant).

-The number of investments that are permanently inactive in SMEs due to competition for the past year is associated with a negative flexibility estimated at 1,024 units (non-significant) with the number of new investments created annually (innovation determinant). These results demonstrate the low competitiveness of investments in the small and medium-sized enterprise sector in Algeria.

-The variable of returning some investments IRESME_{t-1} to its activity for the past year is positively related to the new investments in new SMEs, with very large flexibility estimated at 5,432 units (significant), and by flexibility of 5,212 units for the previous two year (significant). This demonstrates the impact of the creation of new enterprises, many of which are innovative, on the competitiveness of investment in this sector, which in many of these enterprises is changing their activity due to their low levels of competition, especially in local markets.

III.2.2.5-Study of causality: Through the results of the test, a two-way causal relationship was established between the evolution of new investment creation in SMEs and the changing

development of reactive investment (IRESME). The results can be summarized in the table (Table(5)).

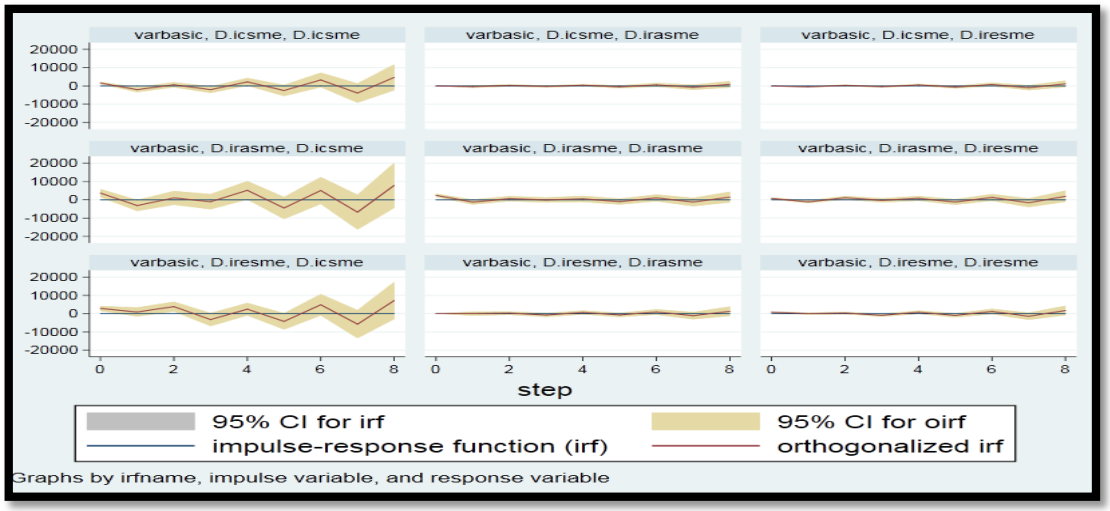
III.2.2.6-Study the validity of the study form Var (2):

-Stability of the model: Before estimating the functions of the impulse response, and analyzes of variance in prediction error, it is necessary to verify the stability of the car model. Through Fig.(5), We found that most of the reciprocal roots of a polynomial within a single circle, including the model Var(2), are stable, as the graph of self-values shows that the estimate is stable. (Figure(5)).

-The normal distribution test: Through the test results, we found that the Var (2) study model follows the normal distribution and Table (6) summarizes the results of the normal distribution test (see Table (6)).

III.2.2.7-Analysis of response functions: For self-regression models Var(2) is characterized by the analysis of random shocks by measuring the effect of a sudden change that may occur in a variation on the rest of the variables (see Figure (6)).

Figure (6): Shock Analysis of Study Variables



Source: Prepared by the two researchers, based on the results of the STATA.15 program.

The dynamic study of Var(2) model allowed us to analyze the impact of the economic policy in Algeria for the development of investment in the SME sector, and the reality of innovation and competitiveness in these companies, through the random renewal. And according to the estimates of the immediate response function (8 years), as shown in the figure (Figure (6)). The impact of shocks on variables can be summarized in the study model as follows:

-In the case of a negative or positive shock or boom estimated at one unit in the first year in all study variables, namely, the innovation variable represented in the number of new investments in the small and medium enterprise sector in Algeria, and the competitive variables represented in the number of reactive and permanently inactive investments. This creates a strong response in some variables and is very weak in others.

-After a period of shock in the variety of returning some investments to its activities during the time t =1 and after the beginning of the decrease in the impact of the boom, we noticed an immediate and strong response in the variable of the number of new investments only, while it was weak in relation to the variable to stop the activity for some investments and with the same variable as well. It can be explained by the effects of investments of small and medium-sized enterprises resuming their activities, which are characterized by coherence in the production process through their previous experiences that failed, this factor directly affects the improvement of levels of competitiveness, which helps to increase the volume of investments in this sector.

-As for a shock in the variable creation of new investments and the irrevocable cessation of investments, the response has been very weak for other variables. For the first variable, there was an immediate and strong response to the same variable only, while the other variables had only a slight, if not an absence, response. As for the second variable on the cessation of certain investment activities, there has been a strong and immediate response with the new investment creation variable, which is explained by the increase in the amount of innovation for the construction variable and the weak competitiveness for the inactivity variable.

VI-Conclusion:

Statistical analysis depends on economic measurement tools such as testing the quality of the model by comparing the results of statistical tests with economic theory, and making sure whether they agree or contradict it and interpret it. Also, the estimated model is statistically acceptable, in addition to all the parameters of the variables being significant and indicated in line with economic theory, this indicates that the model is able to explain the changes that occur in the levels of innovation and competitiveness in small and medium enterprises, which are characterized by weakness in this field in Algeria, and the ability of internal variables on the explanation of the change taking place and the effects between them. Also, the results of the study proved the validity of the study hypotheses.

Based on the results of the study, we found that it corresponds to the reality of levels of competitiveness and innovation in the Algerian SME sector, so that the dynamics of investments in the SME sector is not due to the dynamic of innovation and competitiveness in it, but rather returns to the state through unsystematic government support.

When we studied the distribution of investments in small and medium enterprises, according to sectors of activity, we found that most of the investments in small and medium enterprises were directed towards the services sector (more competitive and more innovative) and this is due to the availability of all the factors that will help these institutions to succeed and integrate into the markets, whether local or even international. This has led to a weakness in the levels of innovation and competitiveness of Algerian SMEs.

Through the results of the study, solutions have been proposed to develop levels of innovation and competitiveness in the sector of small and medium enterprises in order to activate their role in the Algerian economic activity, through the accompaniment and follow-up to these institutions and financial support, especially for innovative institutions that require special support. Also, the distribution of investments must be balanced sectors, in order to integrate those institutions in all stages of their work (raw materials, production, marketing, distribution, etc....), which is the factor that increases the size of the competitiveness of these institutions.

IV-Appendices:

Table (1): Summary of Unit Root Test results

	Test type:	At the level : I(0)	At the level and Trend: I(0)	At the level : I(1)	At the level and trend : I(1)
The number of investments discontinued from the activity IRASME	ADF	-2.577 (0.097)	-2.905 (0.160)	-6.623 (0.000)	-6.411 (0.000)
	PP	-2.585 (0.096)	-2.969 (0.140)	-6.750 (0.000)	-6.627 (0.000)
Number of new investments	ADF	-3.161 (0.022)	-3.368 (0.055)	-7.937 (0.000)	-8.157 (0.000)

ICSME	PP	-3.182 (0.021)	-3.415 (0.052)	-7.542 (0.000)	-8.194 (0.000)
The number of investments returned to their activities IRESME	ADF	-2.623 (0.008)	-4.533 (0.0013)	-9.726 (0.000)	-9.722 (0.000)
	PP	-2.599 (0.0932)	-4.491 (0.0016)	-10.035 (0.000)	-10.259 (0.000)

Source: Prepared by the two researchers, based on the results of the STATA.15 program.

Table (2): The Johansen test results to determine joint integration

```
. vecrank irasme icsme iresme, trend(constant)

                       Johansen tests for cointegration
Trend: constant                                         Number of obs =      15
Sample:  2005 - 2019                                             Lags =       2
-------------------------------------------------------------------------------
                                                        5%
maximum                                     trace    critical
  rank    parms       LL        eigenvalue  statistic    value
    0      12    -408.19218          .       27.9074*    29.68
    1      17    -398.21113     0.73574       7.9453     15.41
    2      20    -395.49179     0.30412       2.5066      3.76
    3      21    -394.23848     0.15389
-------------------------------------------------------------------------------
```

Source: Prepared by the two researchers, based on the results of the STATA.15 program.

Table (3): Delay Degrees for Var Model

. varsoc d.irasme d.icsme d.iresme, maxlag(6)

Selection-order criteria
Sample: 2010 - 2019 Number of obs = 10

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-280.943				9.3e+20	56.7885	56.6889	56.8793
1	-270.622	20.641	9	0.014	8.2e+20	56.5244	56.1261	56.8875
2	-245.429	50.386	9	0.000	7.6e+19*	53.2858	52.5888	53.9213
3	663.678	1818.2	9	0.000	.	-126.736	-127.731	-125.828
4	742.717	158.08	9	0.000	.	-142.543	-143.539	-141.636
5	759.856	34.278*	9	0.000	.	-145.971	-146.967	-145.063
6	760.14	.56833	9	1.000	.	-146.028*	-147.024*	-145.12*

Endogenous: D.irasme D.icsme D.iresme
Exogenous: _cons

Source: Prepared by the two researchers, based on the results of the STATA.15 program.

Table (05): The results of causality test

. vargranger

Granger causality Wald tests

Equation	Excluded	chi2	df	Prob > chi2
D_irasme	D.iresme	.77195	2	0.680
D_irasme	D.icsme	1.7888	2	0.409
D_irasme	ALL	2.4042	4	0.662
D_iresme	D.irasme	4.5215	2	0.104
D_iresme	D.icsme	14.108	2	0.001
D_iresme	ALL	20.322	4	0.000
D_icsme	D.irasme	4.0481	2	0.132
D_icsme	D.iresme	14.249	2	0.001
D_icsme	ALL	15.991	4	0.003

Source: Prepared by the two researchers, based on the results of the STATA.15 program.

Table (6): Results of the normal distribution test.

varnorm, jbera

Jarque-Bera test

Equation	chi2	df	Prob > chi2
D_irasme	7.139	2	0.02817
D_iresme	1.254	2	0.53418
D_icsme	1.191	2	0.55127
ALL	9.584	6	0.14329

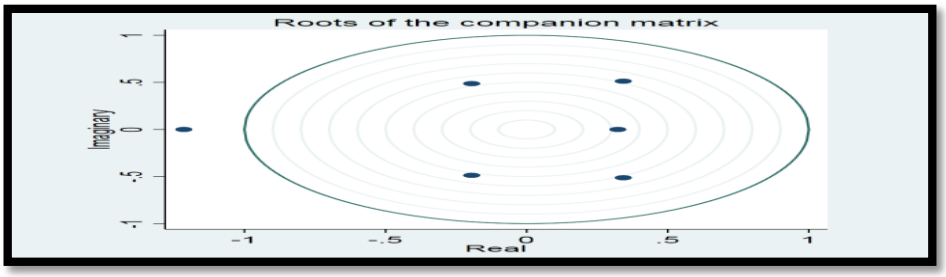
Source: Prepared by the two researchers, based on the results of the STATA.15 program.

Table (7): variables time series

Years	**Create new investments (SMEs)**	**Reinvestment of a new activity (SMEs)**	**Stop investment activity for the final (SMEs)**
2 003	21 244	1 942	4 789
2 004	18 987	1 920	3 407
2 005	21 018	2 863	3 488
2 006	24 352	2 702	3 090
2 007	24 835	2 481	3 176
2 008	27 950	2 966	3 475
2 009	30 541	3 866	9 892
2 010	27 943	3 389	7 915
2 011	26 239	5 392	9 189
2 012	30 530	5 876	8 050
2 013	39 355	8 191	8 249
2 014	39 343	7 286	9 054
2 015	41 919	6 949	7 956
2 016	18 411	3 544	2 051
2 017	34 642	9 432	8 228
2 018	17 426	3 421	4 870
2 019	31 194	7 100	8 195

Source: Prepared by the two researchers, based on the annual reports of the Ministry of Industry and Mines.

Figure (05): Results of a stability study with the rest of the model



Source: Prepared by the two researchers, based on the results of the STATA.15 program.

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