

How to Cite:

Chelabi, O., & Moussaoui, W. (2025). An econometric study on the impact of innovation on the growth of small and medium-sized enterprises in Algeria (1999-2023). *International Journal of Economic Perspectives*, 19(4), 1507–1520. Retrieved from <https://ijeponline.org/index.php/journal/article/view/956>

An econometric study on the impact of innovation on the growth of small and medium-sized enterprises in Algeria (1999-2023)

Chelabi Ouafa

University of Medea, Algeria, Laboratory of Applied Economics in Development
Email: Chelabi.oufa@univ-medea.dz

Moussaoui Warda

University of Medea, Algeria, Laboratory of Applied Economics in Development
Email: moussaoui.warda@univ-medea.dz

Abstract---Innovation is at the heart of SMEs and as one of the driving factors of their economies, survival and growth, this paper aims to study the impact of innovation on the growth of SMEs in Algeria during the period 2022-2019, to contribute and add value to economic development, using the standard method The autoregressive model of lagged distributed lags (ARDL) was used to study the impact between variables, where we found a long-run relationship between the innovation index and the growth of SMEs. There is a positive relationship between them. The study concluded that innovation in SMEs must be embraced to preserve and grow the organizations and create added value in the Algerian economy.

Keywords---Startups, Innovation, SME growth, ARDL model.

Introduction

Knowledge-based economies depend on the efficient and effective use of human intellectual resources in creativity and innovation. In the progressive phases encountered by advanced economies, these economies attained heightened levels of added value—value produced by converting inputs or resources into commodities or services. The most significant gains were first recorded in information technology economies and subsequently in knowledge economies. The latter incorporates human talents to foster innovative capabilities, which are essential for creating and producing competitive goods and efficient manufacturing techniques. Innovation is a crucial avenue for cost reduction,

quality enhancement, and differentiation, making it one of the most significant competitive strategies for institutional sustainability and continuity.

Innovation is mostly propelled by small and medium-sized organizations (SMEs), often exceeding bigger corporations in the volume of ideas generated. Therefore, it is crucial to comprehend the components and importance of innovation and its influence on the expansion and advancement of SMEs. This expansion is crucial in promoting economic and social development, enhancing value, decreasing unemployment, and increasing employment opportunities. Consequently, the survival and persistence of SMEs in a swiftly evolving and competitive landscape need the adoption of innovation as a strategic necessity to secure competitive advantages, fulfil goals, and foster their growth and development (Hussein Abdilahi et al., 2017a).

Similar to other emerging nations, Algeria has progressively prioritized small and medium-sized enterprises in recent years. This emphasis has been shown by the creation of regulatory frameworks, governmental organizations, and policies designed to promote and advance these companies. Significant emphasis has been placed on research and development initiatives and establishing regulatory frameworks that foster creativity and innovation. These initiatives seek to foster the expansion of SMEs, therefore influencing economic growth, fulfilling Algeria's developmental objectives, and generating additional value. The main objectives of this study are to analyze the impact of innovation on the growth of small and medium-sized enterprises (SMEs) in Algeria during the period 1999–2022. The study aims to identify key determinants of SME development, such as unemployment rates, research and development (R&D) activities, and innovation indicators. Additionally, it seeks to evaluate the nature of the relationship, both in the short and long term, between innovation (measured by patent applications) and SME growth in Algeria. By employing the Autoregressive Distributed Lag (ARDL) methodology, the study will quantify the contribution of innovation-related variables, such as R&D growth and patent applications, to SME development. Ultimately, this research aims to provide policymakers with actionable recommendations to enhance innovation strategies, support SME growth, and contribute to Algeria's economic development.

This has led to the following research question:

What is the impact of innovation on the growth of small and medium-sized enterprises (SMEs) in Algeria during the period 1999–2023?

Based on the main research question, the following sub-questions are formulated:
 What is the role of small and medium enterprises in economic growth in Algeria?
 What is the Is there a relationship between the innovation index and small and medium enterprises in Algeria?

To answer the main research question and the sub-questions, the following research hypotheses will be formulated:

The innovation index had a positive impact on and a positive relationship with the growth of small and medium-sized enterprises (SMEs) in Algeria from 1999 to 2023.

There is a long-term relationship between innovation and the number of small and medium-sized enterprises.

1. Literature Review

In his study on innovation in small and medium-sized enterprises (SMEs), (Yassin Mimouni, 2015) emphasized that innovation is one of the most critical components for the continuous development and growth of enterprises in the current era. He highlighted various mechanisms recently adopted by public authorities to create a favorable environment for SMEs to foster creativity and innovation, ultimately contributing to comprehensive economic development. Among the determinants influencing SME growth, (GOUDJIL, 2024) identified the encouragement of innovation within enterprises as a key factor for economic growth.

(Haroush Salma., 2019) and (Beray Hadi, 2020) emphasized Algeria's efforts to enhance the SME sector through rehabilitation programs, financial support institutions, and diverse accompanying structures. These initiatives provide investors with opportunities to establish SMEs, receive support and training, and ultimately become competitive in the market. They also underlined the need to direct SMEs toward fundamental economic sectors (such as industry and agriculture) rather than limiting them to traditional crafts and trades. This perspective aligns with (Fatiha Ben Azouz, 2018), who highlighted similar observations.

(Bilal Othman & Ibn Al-Dab Abdullah., 2022) further explored Algeria's legislative approach to supporting SMEs. They discussed the establishment of several agencies aimed at promoting innovation, particularly through the creation of startup support structures in 2019. These structures focus on fostering the establishment and sustainability of SMEs.

Through their study, (Rkrak Monia et al., 2022) developed an econometric model to measure the contribution of SMEs to Algeria's economic growth between 2001 and 2018. They found an inverse relationship between unemployment rates and economic growth, alongside a statistically significant positive relationship between the number of SMEs established, the jobs they created, and economic growth.

Similarly, (Belghith Madani & Dawis Mohammed Al-Tayeb, 2014) stressed the importance of supporting innovation in SMEs by allocating financial and human resources to serve innovation. Unlike other studies, he highlighted the role of universities in leveraging scientific research outcomes to encourage the adoption of research and development policies that ensure successful support mechanisms. However, he noted the near absence—or ineffectiveness—of partnerships between universities, research centers, and SMEs, raising questions about the impact of national research policies on Algeria's innovation system.

The study by (Hussein Abdilahi et al., 2017b) explored the impact of innovation on SMEs in Somaliland, targeting approximately 6,930 SMEs in Hargeisa. Using descriptive and regression analyses, the study found that innovation significantly influences SME performance. It also identified

statistically significant effects of product, marketing, and organizational innovation on SME performance.

(Raqiq Abdul Malik & Mokhtari Malouka, 2023) investigated the impact of creativity and innovation on the internal growth of SMEs in Algeria, studying 22 enterprises that rely on creativity and innovation. The study found a strong correlation between SME growth and innovation, demonstrating that innovation enables enterprises to expand globally, achieve sustainability, and positively impact economic growth through renewal, change, and development.

In his study, (Walid Charara, 2019) examined both the theoretical aspects of factors influencing innovation in SMEs and the practical aspects by analyzing 66 innovative SMEs in Algeria. Similarly, (Zouiouch Bilal, 2017) investigated the innovative activities of SMEs, focusing on the determinants and drivers of innovation and their relationship with innovative behavior in active enterprises. Zou ouch's study emphasized the need for internal R&D activities and collaboration between enterprises to enhance innovation and R&D efforts in SMEs.

Finally, (Budianto et al., 2023) conducted a bibliometric analysis of technological innovation in SMEs to understand their development in the digital age. Using Scopus data from 1990 to 2023, he analyzed published articles and categorized fields to explore innovation and R&D trends. The study revealed fluctuations in publications on technological innovation in SMEs but noted a general upward trend. It highlighted the importance of technological innovation for SMEs and its impact on economic development.

2. Development of Small and Medium Enterprises in Algeria during The Period 1990-2023

The Figure I shows a remarkable increase in the number of small and medium-sized enterprises (SMEs) in Algeria from 1999 to 2022. Starting with 159,507 SMEs in 1999, their numbers steadily grew to 410,959 by 2007, reflecting an average annual growth rate of approximately 12.7%. This steady rise indicates a supportive environment for SMEs during the early years, potentially driven by economic reforms and initiatives to promote private sector development.

From 2008 to 2015, SME growth accelerated significantly, with their numbers climbing from 519,526 to 934,569. This phase witnessed an average annual growth rate of 10.9%, likely bolstered by targeted government efforts to encourage entrepreneurship, reduce unemployment, and diversify the economy. The notable increase during 2012–2015 highlights the impact of strategic measures such as financial support programs, business development initiatives, and infrastructure improvements tailored to SMEs.

Between 2016 and 2022, growth continued but at a more moderate pace, with SME numbers rising from 1,022,621 to 1,359,803. This period saw fluctuations, potentially influenced by external factors such as the COVID-19 pandemic in 2020, which may have temporarily slowed SME growth. Despite these challenges, SMEs demonstrated resilience, with the sector showing a strong recovery post-pandemic and achieving consistent growth by 2022.

Over the 24 years, the number of SMEs increased by approximately 752%, underscoring their critical role in Algeria's economy. Factors driving this growth include supportive government policies, economic diversification efforts, and a growing entrepreneurial culture. Government initiatives such as funding schemes, business incubators, and SME promotion agencies were pivotal in fostering this growth, particularly during times of economic transition.

While the growth of SMEs in Algeria has been remarkable, challenges remain. Issues such as access to finance, bureaucratic barriers, and the need for technological advancement are key areas that require attention. SMEs' resilience and adaptability, coupled with the adoption of innovation and modernization strategies, will be vital for sustaining their growth. As a driving force for job creation, innovation, and economic diversification, the continued support and enhancement of SMEs will play a central role in Algeria's long-term economic development.

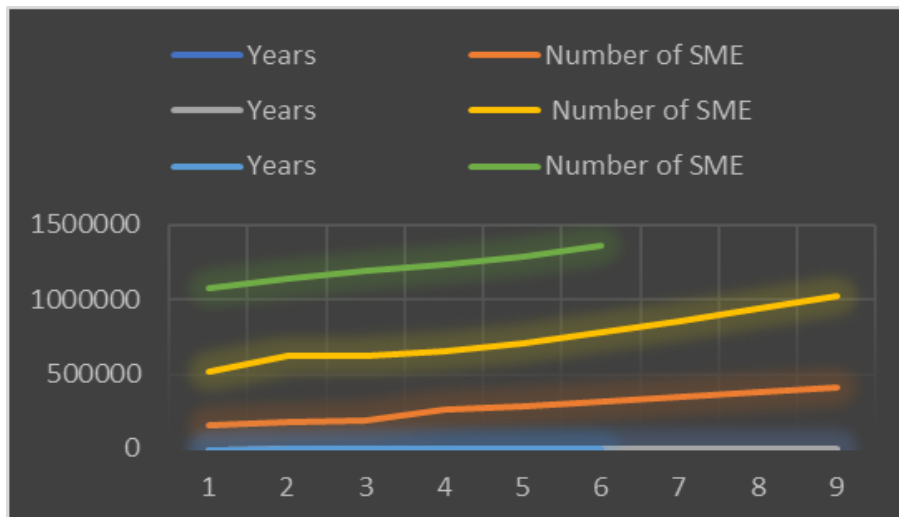


Figure 1. Development SME in Algeria (1990-2023)

Source: Prepared by the researcher based on World Bank Group statistics.

3. Methodology and Tools

We will use the statistical software EViews to conduct an econometric study to analyze the impact of encouraging innovation in small and

medium enterprises (SMEs) on economic growth in Algeria from 1999 to 2022.

3.1. Model Presentation

3.1.1. Sample and Study Period

The study focuses on Algeria as the sample, while the study period (1999–2022) was selected based on the availability of data for the variables under investigation. Data sources include the World Bank (WDI), the National Office of Statistics (ONS), and the statistical bulletins of the Ministry of Industry and Pharmaceutical Production.

3.2.1. Model Description and Study Variables

The selection of variables influencing the phenomenon under study is aligned with previous research:

Dependent Variable:

- PME: Represents the development of small and medium enterprises (SMEs) in Algeria. Data were obtained from the statistical reports and bulletins of the Ministry of Industry and Pharmaceutical Production for the period 1999–2023. Previous studies, such as those by (Charara Walid, 2019), (Budianto et al., 2023), (Hussein Abdilahi et al., 2017b), and (GOUDJIL, 2024), have considered the development of SMEs as a dependent variable.

Independent Variables:

- CHO: This refers to the logarithm of the unemployment rate. Data were sourced from the World Bank and used in studies such as (Charara Walid, 2019) and (Raqiq Abdul Malik & Mokhtari Malouka, 2023). The unemployment rate was treated as an independent variable in studies like (Rakrak Monia et al., 2022).
- AR: Denotes research and development growth, expressed by the number of published articles. (Budianto et al., 2023) utilized data sourced from the World Bank in their study.
- PA: Innovation index, measured by the total number of patent applications by residents and non-residents. This variable was also considered an independent variable in (Budianto et al., 2022) study.

Based on previous studies, we constructed the study model as specified in Equation (1):

$$LPME = C(1)*LPA + C(2)*LCHO + C(3)*LAR.....(1)$$

1. Estimation Methodology

To study the impact of the innovation index on the growth of small and medium enterprises (SMEs) in Algeria during the period 1990–2022, the study adopts the Autoregressive Distributed Lag (ARDL) model. This methodology was developed in studies by (Pesaran et al., n.d.), (Pesaran et al., n.d.) and (Pesaran et al., 2001). It enables us to identify the cointegration relationship between variables in both the short and long term, as well as to measure the magnitude of the effect of independent variables on the dependent variable.

One key advantage of this test, compared to other cointegration tests, is that it does not require the variables to be integrated of the same order, provided they are not integrated of order two (Pesaran et al., 2001).

The ARDL model is expressed as shown in Equation (2):

$$\begin{aligned} \Delta LGDP_t = & c + \alpha_1 LGDP_{t-1} + \alpha_2 LMCS_{t-1} + \alpha_3 LINT_{t-1} + \alpha_4 LL_{t-1} + \alpha_5 LK_{t-1} \\ & + \sum_{i=1}^p \beta_1 \Delta GDP_{t-i} + \sum_{i=0}^{q1} \beta_2 \Delta LMCS_{t-i} + \sum_{i=0}^{q2} \beta_3 \Delta LINT_{t-i} \\ & + \sum_{i=0}^{q3} \beta_4 \Delta LL_{t-i} + \sum_{i=0}^{q4} \beta_5 \Delta LK_{t-i} + e_t \dots \dots \dots (2) \end{aligned}$$

4. Results and Discussion

4.1. Stationarity Tests

As an initial step, we examined the stationarity of the time series under study using the Augmented (Dickey & Fuller, 1981) test and the (Perron, 1988) test to determine their order of integration. The results indicated that all the time series were non-stationary at their levels. Consequently, we retested the first differences of the series, which confirmed that they became stationary at the first difference, meaning they are integrated of order I(1). See Appendix (01) for detailed results.

Table 03: Results of the Unit Root Test for the Variables Under Study

Decision	At the first differences			At the level			Variables	
	Without a fixed and without a general direction	Fixed and general trend	fixed	Without a fixed and without a general direction	Fixed and general trend	fixed		
I(1)	-4.7940	-	-6.806	2.6951	-	0.6806	t-Statistic	LPA
	6.3124	6.3124		4.2524	4.2524		Prob	
	0.0000 ***	0.0002 ***	0.0000 ***	0.9969	0.0147 **	0.9885		
I(1)	-2.1930	-	-	5.9840	-	-	t-Statistic	LPME
	5.2224	5.2224	4.1857	1.1446	1.1446	2.5217	Prob	
	0.0302 ***	0.0030 ***	0.0040 ***	1.0000	0.8984	0.1236		
I(1)	-3.8460	-	-	-1.9855	-	-	t-Statistic	LCHO
	5.6074	5.6074	4.2683	0.9830	0.9830	2.1028	Prob	
	0.0005	0.0009	0.0033	0.0470	0.9261	0.2453		

	***	***	***	**				
I(1)	-0.2936	- 4.6746	- 4.7021	6.0443	- 2.0255	- 1.9573	t- Statistic	LAR
	0.5672	0.0062 ***	0.0012 ***	1.000	0.5575	0.3018	Prob	

*** Significant at 1% significance level, ** Significant at 5% significance level, * Significant at 10% significance level.

4.2. Cointegration Test (Using the Bounds Test Approach)

After confirming the stationarity of the model at first differences, we proceeded to conduct the cointegration test using the Bounds Test approach (refer to Appendix 02). By determining the optimal lag length for the model based on the majority of selection criteria (LR, FPE, AIC, HQIC), the following results were observed:

- The calculated F-statistic is 7.4303, which is greater than the upper bound of the critical value at the 1% significance level. Therefore, we reject the null hypothesis and accept the alternative hypothesis.
- The calculated t-statistic is -1.23, which is smaller than the upper bound of the critical value at the 5% significance level. Accordingly, we reject the null hypothesis and accept the alternative hypothesis.

4.3. ARDL Model Estimation (Long-Run and Short-Run Cointegration Relationship)

4.3.1. Long-Run Relationship Estimation

To select the optimal lag lengths for the variables included in the model estimation, we relied on the HQIC criterion. Based on Appendix 02, the appropriate model is ARDL (3, 2, 2, 2). The estimation results are presented as follows:

$$EC = LPME - (-0.0494*LCHO + 0.5917*LAR01 + 0.0190*LPA + 9.0837)$$

Table 04: Estimation Results of the Long-Run Cointegration Relationship

Levels Equation Case 2: Restricted Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LCHO	-0.049434	0.010019	-4.933776	0.1273
LAR01	0.591650	0.010655	55.52612	0.0115
LPA	0.019027	0.014710	1.293490	0.4190
C	9.083680	0.065848	137.9490	0.0046

EC = LPME - (-0.0494*LCHO + 0.5917*LAR01 + 0.0190*LPA + 9.0837)

Based on the Long-Run Estimation Results Presented Above, We Find:

- **Positive and Significant Impact of the Innovation Index on SMEs Growth:**
An increase of one unit in the number of patent applications (by residents and non-residents) corresponds to a 1.9% increase in the growth of SMEs. The positive sign of the coefficient aligns with findings from most previous studies, such as (Hussein Abdilahi et al., 2017b), (GOUDJIL, 2024), (Sutrisno et al., 2024) and (Budianto et al., 2023).
- **Negative Impact of Unemployment Rates on SMEs Growth:**
A one-unit increase in unemployment rates results in a 4% decrease in the growth rate of SMEs. This is because the growth in the number of SMEs creates more job opportunities and reduces unemployment. Consequently, the higher the number of SMEs, the lower the unemployment rate. This result is consistent with studies by (Raqiq Abdul Malik & Mokhtari Malouka, 2023) and (Rakrak Monia et al., 2022).
- **Significant Positive Impact of Research and Development (R&D) on SMEs Growth:**
A one-unit increase in the number of published scientific articles results in a 59.16% increase in the growth and development of SMEs. This finding aligns with the results of (Budianto et al., 2023)

4.3.2. Short-Run Equation Estimation Using the Error Correction Model (ECM):

The short-run relationship is estimated using the ECM, which represents the variables in their differenced form along with the error correction term. The error correction term measures the speed at which short-term disequilibria adjust to long-term equilibrium. If the error correction term is negative and statistically significant, it confirms the presence of a long-run relationship between the variables.

From the results in Appendix (04), the error correction term, $CointEq(-1)$, is found to be negative and significant (-1.16). This confirms the existence of a long-term equilibrium relationship between the studied variables. The value of the error correction term indicates that approximately 11.6% of the short-term disequilibrium in SME growth can be corrected annually towards the long-term equilibrium when any change or shock occurs in the explanatory variables. The delay in adjustment reflects structural factors slowing the return to equilibrium.

4.3.3. Validity of the ARDL Model:

To confirm the validity of the model, diagnostic tests were conducted to ensure the study model is free from serial correlation issues, heteroscedasticity problems, and non-normality of residuals. The results are presented in Table 05 (Appendix05).

Table 05: Diagnostic Test Results for the ARDL(3, 2, 2, 2) Model

Value	Statistics	Test name	Test
0.2853	0.99	Breusch-Godfrey LM Lags(2)	Self-association
0.88	0.47	ARCH	heterogeneity of variance
0.07	5.14	Jarque-Bera	Normal distribution
0.8	0.05	Ramsey test	Functional Form Adequacy Test

From the table, we observe the issue of **self-association**. The LM test, based on the Fisher test or the Lagrange Multiplier test, shows that **LM = 0.99**. Additionally, the associated p-value of the **F-statistic** is **0.2853**, which is greater than 0.05. Therefore, we accept the null hypothesis (H_0) that there is no serial correlation in the residuals.

We also observe the issue of **heteroscedasticity**, where the variance of the random error term changes with variations in the values of the explanatory variable. The relationship between them may be linear or nonlinear. The **BP statistic** is **0.47**, and since the associated p-value is **0.88**, which is greater than 0.05, we accept the null hypothesis (H_0) that there is no issue of heteroscedasticity in the model.

Looking at the Jarque-Bera statistic, we find that the associated p-value is 0.07, which is greater than the 5% significance level. Therefore, we accept the null hypothesis (H_0) that the residual series follow a normal distribution.

As for the Ramsey Reset test for model specification, we observe that the associated p-value is 0.8, which is greater than the 5% significance level. Thus, we accept the null hypothesis that the functional form is appropriate for estimation.

4.4. Model Stability Test

To ensure that no structural changes exist in the model and that the estimated parameters are stable, we use the CUSUM test for the cumulative sum of residuals and the CUSUM of Squares test for the cumulative sum of squared residuals. Structural stability in the ARDL model is confirmed if the plotted curve stays within the critical bounds. As shown in the figure, both the CUSUM and CUSUM of Squares tests indicate that the curve remains within the critical bounds, suggesting the model's stability at the 5% significance level. These results indicate that the model is stable and consistent, both in the long run and short run.

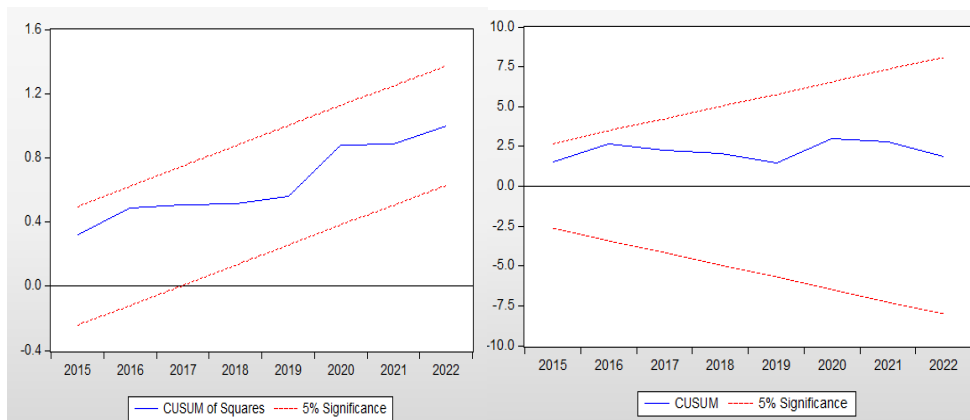


Figure 02: Results of the Model Stability Test (CUSUM and CUSUM of Squares)

Conclusion

Small and medium-sized enterprises (SMEs) have gained significant importance both locally and internationally, owing to the vital role they play in driving economic development and increasing job opportunities. Innovation has become a necessity for managing and sustaining these enterprises, as discussed earlier. Based on our econometric study of the impact of innovation on the growth of SMEs in Algeria,

- As for the validity of the hypotheses, we note that the first hypothesis is true, as innovation positively and significantly affects the growth of SMEs.
- As for the second hypothesis, there is a long-run balanced relationship between the innovation index and the growth of SMEs, which indicates the validity of the hypothesis

We have arrived at several key findings:

- Innovation as a Result of Accumulated Experience: Innovation is the result of accumulated experiences within SMEs, as well as historical knowledge accumulation, which fosters an innovative spirit in the entrepreneur running the business.
- Positive Impact of Innovation on SME Growth: The study revealed a positive and significant effect of the innovation index on the growth of SMEs in Algeria. For every increase in the number of patents, both resident and non-resident, by one unit, there is a corresponding 1.9% increase in SME growth. This positive impact influences economic growth through the relationship between the number of SMEs and economic growth. However, these effects may be more visible or stronger in the long run than in short-term economic analyses. Thus, economic policies should consider longer time periods to better understand the deeper relationship.

- **Negative Relationship Between Unemployment and SME Growth:** There is a negative effect between unemployment rates and SME growth. For every one-unit increase in the unemployment rate, the growth rate of SMEs decreases by 4%. This is because as the number of SMEs increases, more job opportunities are created, leading to a reduction in unemployment rates.
- **Positive Impact of Research and Development (R&D):** There is a significant positive effect between the number of publications and SME growth. For every one-unit increase in the number of scientific publications and articles, SME growth increases by 59.16%.
- **Necessity of Innovation for SME Survival:** SMEs must innovate to face competitive pressures and avoid stagnation. By reducing costs and introducing innovative products, they can ensure their survival and growth.

In conclusion, the study emphasizes the importance of integrating innovation into the policies and practices of SMEs, as this can open various doors for them globally, increase competition, and enhance overall performance. It is crucial for Algerian entrepreneurs and policymakers to embrace creative and innovative thinking in planning and management to support and foster the growth of SMEs.

Recommendations:

- **Encouragement of Innovation in SMEs:** It is essential to focus on all types of innovation within SMEs due to its significant impact on improving their performance and sustainability.
- **Government Support:** The study recommends that the government should provide support to SMEs, particularly in terms of innovation, both financial and non-financial.
- **Entrepreneurial Action on Innovation:** SME entrepreneurs should activate their approach towards innovation if they want to improve productivity and enhance overall performance.
- **Follow-up and Support Post-Innovation:** Regulatory bodies should closely monitor SMEs, particularly regarding the commercialization of their innovative outputs, and provide support after innovation processes to ensure their success.

References

- Belghith Madani, & Dawis Mohammed Al-Tayeb. (2014). The Importance of Supporting Innovation in Small and Medium Enterprises - What Role and Contribution Does the University Have? *Enterprise*, 3(3), 5–27.
- Beray Hadi. (2020). Factors for developing the small and medium-sized enterprises sector in Algeria. *Journal of Economics and Sustainable Development*, 3(2), 80–94.
- Bilal Othman, & Bilal Othman. Ibn Al-Dab Abdullah. (2022). The Role Of The Agency For Small And Medium Enterprises Development And Innovation Promotion In Supporting Startups. *Araa Journal of Economic and Administrative Studies*, 4(2), 223–235.

- Budianto, R., Praptapa, A., Herwiyanti, E., Puji, P., Suyono, E., & Rusmana, O. (2023). Technological innovation in Small and Medium Enterprises: A bibliometric analysis. *Journal of Sustainable Tourism and Entrepreneurship*, 4(1), 55–69. <https://doi.org/10.35912/joste.v4i1.1707>
- Budianto, R., Praptapa, A., Herwiyanti, E., Puji, P., Suyono, E., Rusmana, O., & History, A. (2022). Technological innovation in Small and Medium Enterprises: A bibliometric analysis. *Goodwoodpub.ComR Budianto, A Praptapa, E Herwiyanti, P Puji, E Suyono, O RusmanaJournal of Sustainable Tourism and Entrepreneurship*, 2022•goodwoodpub.Com, 6480(1), 55–69. <https://doi.org/10.35912/joste.v4i1.1707>
- Charara Walid. (2019). *Determinants of innovation in small and medium-sized enterprises (A study of a sample of innovative small and medium-sized enterprises in Algeria)*. University of Telemcen.
- Dickey, D. A., & Fuller, W. A. (1981). Likelihood Ratio Statistics for Autoregressive Time Series with a Unit Root. *Econometrica*, 49(4), 1057. <https://doi.org/10.2307/1912517>
- Fatiha Ben Azouz. (2018). Framework For Supporting Small And Medium Enterprises In Algeria. *Journal of Legal Studies and Research*, 3(3), 241–259.
- GOUDJIL, M. (2024). Determinants of Growth in Algeria Small and Medium Enterprises. *Algerian Review of Economic Development*, 11, 257–274. <http://dspace.univ-ouargla.dz/jspui/handle/123456789/36325>
- Haroush Salma. (2019). Algeria's efforts to promote the small and medium-sized enterprises sector. *Afaq Journal for Research and Studies*, 2(2), 110–126.
- Hussein Abdilahi, M., Adan Hassan, A., & Mohamed Muhumed, M. (2017a). The Impact of Innovation on Small and Medium Enterprises Performance: Empirical Evidence from Hargeisa, Somaliland. *International Journal of Academic Research in Business and Social Sciences*, 7(8), 2222–6990. <https://doi.org/10.6007/IJARBSS/v7-i8/3202>
- Hussein Abdilahi, M., Adan Hassan, A., & Mohamed Muhumed, M. (2017b). The impact of innovation on small and medium enterprises performance: Empirical evidence from Hargeisa, Somaliland. *Academia.EduMH Abdilahi, AA Hassan, MM MuhumedInternational Journal of Academic Research in Business and Social Sciences*, 2017•academia.Edu, 7(8), 2222–6990. <https://doi.org/10.6007/IJARBSS/v7-i8/3202>
- Perron, P. (1988). Trends and random walks in macroeconomic time series: Further evidence from a new approach. *Journal of Economic Dynamics and Control*, 12(2–3), 297–332. [https://doi.org/10.1016/0165-1889\(88\)90043-7](https://doi.org/10.1016/0165-1889(88)90043-7)
- Pesaran, M., Shin, Y., applied, R. S.-J. of, & 2001, undefined. (2001). Bounds testing approaches to the analysis of level relationships. *Wiley Online LibraryMH Pesaran, Y Shin, RJ SmithJournal of Applied Econometrics*, 2001•Wiley Online Library, 16(3), 289–326. <https://doi.org/10.1002/jae.616>
- Pesaran, M., Shin, Y., & Smith, R. (n.d.). Pooled estimation of long-run relationships in dynamic heterogeneous panels. 1997. Retrieved January 9, 2025, from <https://www.econ.cam.ac.uk/people-files/emeritus/mhp1/jasaold.pdf>
- Rakrak Monia, Al-Absi Ali, & Slali Boubaker. (2022). Contribution of small and medium enterprises to Algerian economic growth: a quantitative study 200–20181. *Journal of Economic Sciences*, 17(1), 1–16.
- Raqiq Abdul Malik, & Mokhtari Malouka. (2023). The role of creativity and innovation in achieving internal growth for small and medium enterprises in

- Algeria (a study of a sample of small and medium enterprises). *Review of Financial, Banking and Management Economics*, 12(1), 497–513.
- Rkrak Monia, Al-Absi Ali, & Slali Boubaker. (2022). The Contribution of Small and Medium Enterprises to Algerian Economic Growth: A Criterion Study 2001-2018. *Journal of Economic Sciences*, 17(1), 1–16.
- Sutrisno, Diawati, P., Muhamad, L. F., Permana, R. M., & Suparwata, D. O. (2024). Innovative Strategies of SMEs in Alignment with Community Needs. *Jurnal Terobosan Peduli Masyarakat (TIRAKAT)*, 1(1), 30–38. <https://doi.org/10.61100/J.TIRAKAT.V1I1.103>
- Walid Charara. (2019). *Determinants of Innovation in Small and Medium Enterprises: A Study of a Sample of Innovative Small and Medium Enterprises in Algeria* [Thesis]. Economicfaculty.
- Yassin Mimouni. (2015). Innovation in small and medium-sized enterprises: reality and challenges - the case of Algeria. *Al-Hikma Journal of Economic Studies*, 3(6), 176–194.
- Zouiouch Bilal. (2017). *Innovative Behavior of Small and Medium-sized Enterprises: Motivations and Determinants: A Study of a Sample from the Manufacturing Sector in Constantine Province* [PHD]. Faculty of Economics, Business, and Management Sciences, Larbi Ben M'hidi University, Oum El Bouaghi.