

The Impact of Small and Medium-Sized Enterprises on Gross Domestic Product in Algeria: An Econometric Study between (2002-2022)

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Abstract:

This paper quantifies the relationship between the expansion of small and medium enterprises (SMEs) and Gross Domestic Product (GDP) in Algeria over the period 2002–2022. The analysis is motivated by the country's objective of diversifying economic activity beyond hydrocarbons and by the policy emphasis placed on SME promotion through dedicated institutions and support schemes. Using annual data compiled from different institution, the study estimates a log-linear model by ordinary least squares (OLS) in EVIEWS. The preferred specification indicates a positive and statistically significant elasticity of GDP with respect to the number of SMEs ($\beta \approx 0.304$). In practical terms, a 1% increase in the number of SMEs is associated with an average increase of about 0.30% in GDP. Model fit is high ($R^2 \approx 0.971$). Residual diagnostics suggest no serial correlation at the 5% level, homoscedasticity, and approximate normality. The findings support the view that strengthening the SME ecosystem can contribute to aggregate output, provided that policy focuses not only on increasing the number of firms but also on improving their survival, productivity, and access to finance and markets.

Keywords: SMEs; GDP; Algeria; Econometrics; OLS; Diversification.

JEL Classification: C01; C13; C51; C22; O11; O42; O47; L25; L26.

Introduction

Small and medium-sized enterprises (SMEs) are widely considered an essential component of modern economic systems. In many countries they contribute significantly to employment creation, entrepreneurial dynamism, and the diversification of productive activities. For economies seeking to reduce dependence on a limited number of sectors, SME development is frequently promoted as a strategic policy tool to stimulate private investment and broaden the productive base.

In Algeria, the promotion of SMEs has become a central element of economic policy over the last two decades. Successive reforms, institutional support mechanisms, and programs aimed at facilitating business creation and improving access to finance have contributed to a steady increase in the number of SMEs. Official statistics indicate that the SME population expanded considerably between 2002 and 2022, reflecting sustained efforts by public authorities to encourage private sector development. Despite this expansion, the Algerian economy remains structurally dependent on hydrocarbon revenues and highly sensitive to fluctuations in external conditions and public spending cycles.

This context raises an important analytical question: **To what extent has the expansion of SMEs contributed to economic growth in Algeria?** While SMEs are generally expected to support economic growth by generating employment, increasing production capacity, and stimulating competition, their actual contribution may be constrained by structural factors such as informality, limited productivity, technological gaps, administrative barriers, and financing constraints. As a result, the relationship between SME development and aggregate economic growth remains an open empirical issue.

The central research problem of this study is therefore to assess whether the observed growth in the number of SMEs has been associated with measurable changes in Algeria's gross domestic product (GDP) during the period under analysis. More specifically, the study seeks to determine whether the relationship between SME expansion and GDP is statistically significant and economically meaningful when examined through a time-series econometric framework.

The main objective of the research is to empirically estimate the relationship between SMEs and GDP in Algeria. A first operational objective is to measure the magnitude and direction of the association between the number of SMEs and GDP using econometric estimation. A second objective is to assess the statistical robustness of this relationship through appropriate diagnostic tests. A third objective is to situate the empirical results within the

broader academic debate on SMEs and economic growth, particularly in the Algerian context where empirical time-series evidence remains relatively limited.

Based on the theoretical expectation that a more developed SME sector can expand production, employment, and value creation, the study formulates the following central hypothesis: the development of SMEs has a positive effect on Algeria's GDP. In empirical terms, this hypothesis implies that increases in the number of SMEs are associated with increases in GDP during the period under study. A complementary hypothesis concerns the magnitude of this relationship: the estimated effect should not only be statistically significant but also economically meaningful.

To test these hypotheses, the study adopts a quantitative methodology based on econometric analysis of time-series data for Algeria covering the period 2002–2022. The dependent variable is GDP, while the key explanatory variable is the number of SMEs. The empirical strategy relies on a log-linear specification estimated using ordinary least squares (OLS). Diagnostic tests are conducted to evaluate the reliability of the estimation and ensure that the main assumptions of the model are not violated.

By providing an updated empirical assessment of the SME–growth relationship in Algeria, the study contributes to ongoing policy discussions regarding the effectiveness of SME promotion as a driver of economic development.

I. The theoretical framework of the study.

The literature review situates this research within the main theoretical and empirical debates on how small and medium-sized enterprises (SMEs) influence economic growth. It synthesizes prior studies that examine the channels through which SMEs may affect GDP such as job creation, productivity, innovation, and financial constraints and highlights the mixed evidence regarding the strength and direction of this relationship across countries and time periods. By identifying what has been established, where results diverge, and which gaps remain (especially in time-series evidence for Algeria), the review provides the foundation for the study's hypotheses and justifies the methodological approach adopted in the empirical analysis.

I.1 Literature review:

In Growth and Development economics, SMEs are typically framed as a large segment of the private sector that can influence aggregate performance through employment creation, productivity dynamics, innovation diffusion, and market competition. Policy discussions often assume that a larger or more dynamic SME sector strengthens “business

dynamism” and can raise long-run growth by improving the allocation of resources and encouraging firm entry and experimentation. The OECD’s *SME and Entrepreneurship Outlook* synthesizes evidence that SMEs matter for business dynamism, productivity growth patterns, wage gaps, and export performance, while also stressing that SMEs face persistent disadvantages in finance, skills, and technology adoption. (OCDE , 2019)

A core mechanism is that SMEs contribute to growth by expanding employment and household income, which raises demand and can increase output. However, the evidence is nuanced: research on job creation shows that firm age (young firms) often explains job creation more than firm size itself. In the U.S. data, Haltiwanger, Jarmin, and Miranda (2013) show that once one properly accounts for firm age, there is no systematic relationship between firm size and growth; instead, startups and young firms play a crucial role in job creation. (Haltiwanger, Jarmin, & miranda, 2013) Cross-country evidence also finds that small firms can have high job creation rates, but productivity growth may be higher among large firms, underscoring a trade-off between job creation and productivity growth across the firm-size distribution. (World Bank, 2011)

A major reference in this literature is Beck, Demirgüç-Kunt, and Levine (2005), who examine the relationship between the size of the SME sector and GDP per capita growth using cross-country data. They find a strong positive association between SME importance and growth; however, they also emphasize that the data do not allow confident claims of a causal impact from SMEs to growth. (Beck, Demirguk-kunt, & Levine, 2005)

1.2 Algerian previous studies:

The Algerian literature on SMEs spans descriptive and econometric strands. Descriptive studies and theses document SMEs’ role in employment and local value added while highlighting persistent constraints related to financing and the business environment ((Dardish, 2018); (Ben Ramdan, S , 2018))

Recent contributions provide additional insights into the factors influencing SME development and economic performance. (Mehar, 2025) found that firm size positively affects the financial performance of Algerian SMEs, while excessive indebtedness may limit their growth potential. Furthermore, Laouamri and Chalour (2025) highlighted the importance of financial inclusion and digital banking in improving access to financial services and supporting private-sector development (Laouamri & Chalour , 2025). Belloum and Khemili (2024) emphasized the role of entrepreneurial incubators in fostering innovation, business sustainability, and the successful development of entrepreneurial ventures. These findings suggest that the contribution of SMEs to economic growth depends not only

on the number of firms created but also on the availability of financial resources, institutional support mechanisms, and the overall entrepreneurial ecosystem (Belloum & Khemili, 2024).

Other works focus on SMEs and sustainable development ((Belamiri, 2020); (Loukriz, 2021)) or managerial and performance aspects such as strategy and performance measurement ((Ahsan, 2017); (Bouleryah, 2007)).

Econometric evidence is mixed. Some studies find a positive association between SME activity and development outcomes ((Zarrou & Karkoudi, 2018); (Khaddawi, 2021)), while others report weak or insignificant effects on GDP growth depending on model specification and variables included. Amimer et Kezzar provide a statistical assessment of SME contribution to Algeria's development over 2002–2020, emphasizing institutional context (Amimer & Kezzar, 2022).

Finally, macro-level determinants of GDP in Algeria have been examined using dynamic approaches such as ARDL, suggesting that GDP dynamics depend on a broader set of macro variables (Bouazza, Chaib Erras, & Ratia, 2017). This motivates caution when interpreting single-variable models.

I.3.SMEs dynamics in Algeria.

Official statistics indicate that the number of SMEs increased from 261,863 in 2002 to 1,359,803 in 2022—an expansion of 1,097,940 firms, or roughly a 5.19-fold increase. This sustained rise suggests a broadening of the enterprise base, although the pace of growth varies across years ((Ministry of Industry and Mines, 2011-2020)

The highest annual SME growth rate is observed in 2008 (about 26.42%), while the lowest is recorded in 2020 (about 1.35%), likely reflecting the combined effects of the COVID-19 shock and broader economic disruption (Ministry of Industry and Mines, 2011-2020).

Table 1. SMEs and annual growth (2002–2022)

Year	SMEs (PME)	Change	Growth rate %
2002	261863.0	Nan	Nan
2003	288587.0	26724.0	10.21
2004	312959.0	24372.0	8.45
2005	342788.0	29829.0	9.53
2006	376767.0	33979.0	9.91
2007	410959.0	34192.0	9.08
2008	519526.0	108567.0	26.42

2009	570838.0	51312.0	13.08
2010	607297.0	36459.0	5.38
2011	659309.0	52012.0	6.5
2012	711832.0	52523.0	7.97
2013	777818.0	65986.0	9.27
2014	852052.0	74234.0	9.54
2015	943569.0	91517.0	9.68
2016	1022621.0	79052.0	9.42
2017	1074503.0	51882.0	5.07
2018	1141863.0	67360.0	6.27
2019	1193339.0	51476.0	4.51
2020	1209491.0	16152.0	1.35
2021	1286365.0	76874.0	6.36
2022	1359803.0	73438.0	5.71

Source: SME's ministry (2002-2022)

I.4.SME Employment :

SME-related employment also rose substantially from 731,082 jobs in 2002 to 3,307,821 jobs in 2022 an increase of 2,576,739 jobs. This reinforces the socio-economic relevance of SME promotion as a channel for non-public employment creation (Ministry of Industry and Mines, 2011-2020).

The strongest annual employment growth is reported in 2005 (about 38.09%), whereas growth is very limited in some years such as 2009 (about 0.41%), illustrating the sensitivity of employment dynamics to the business cycle (Ministry of Industry and Mines, 2011-2020)

Table 2. SME employment and annual growth (2002–2022)

Year	SME jobs	Change	Growth rate %
2002	731082.0	Nan	Nan
2003	735705.0	4623.0	0.63
2004	838504.0	102799.0	13.97
2005	1157856.0	319352.0	38.09
2006	1252647.0	94791.0	8.19
2007	1355399.0	102752.0	8.2
2008	1540209.0	184810.0	13.64
2009	1546584.0	6375.0	0.41
2010	1625686.0	79102.0	3.17
2011	1724197.0	98511.0	6.06
2012	1848117.0	123920.0	7.19

The Impact of Small and Medium-Sized Enterprises on Gross Domestic Product in Algeria: An Econometric Study between (2002-2022)

2013	2001892.0	153775.0	8.32
2014	2157232.0	155340.0	7.76
2015	2371020.0	213788.0	9.91
2016	2487914.0	116894.0	4.93
2017	2601958.0	114044.0	4.58
2018	2724264.0	122306.0	4.7
2019	2818736.0	94472.0	3.47
2020	2989516.0	170780.0	6.06
2021	3134968.0	145452.0	4.87
2022	3307821.0	172853.0	5.51

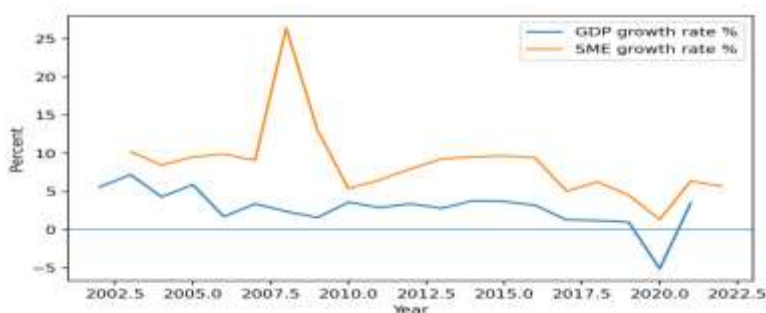
Source: SME's ministry(2002-2022)

I.5. GDP Growth Dynamics :

GDP growth rates show noticeable volatility. The maximum growth rate in the series occurs in 2003 (about 7.2%), while the minimum is the contraction in 2020 (about -5.1%). This underscores the impact of shocks and external conditions on macroeconomic performance (World Bank, 2022).

These dynamics highlight why diversification policies where SMEs are expected to play a larger role in private investment and job creation remain central to the policy agenda ((Khaddawi, 2021); (Dardish, 2018)).

Figure 1. Comparing GDP growth and SME growth (2002–2022).



source :Generated by the author

II.Data and Methodology.

In this part we will specify the data, the model specification and the estimation steps.

II.1. Data

The analysis uses annual observations for 2002–2022. The dependent variable is Algeria's GDP (PIB) and the key explanatory variable is the number of SMEs (PME). Data are compiled from international databases (IMF and World Bank) and Algerian official SME statistical bulletins (Ministry of Industry and Mines, 2011-2020).

II.2. Model specification.

To interpret the relationship in elasticity terms and reduce scale effects, variables are expressed in natural logarithms. The baseline model is:

$$\ln(GDP_t) = \alpha + \beta \ln(SME_t) + \varepsilon_t$$

Where:

Ln GDP: is the logarithm of the series Gross Domestic Product.

α : the intercept.

β : the coefficient of ln (SME) series.

Ln (SME) is the logarithm of the number of Small and Medium Enterprises series.

ε : is the errors term.

II.3. Estimation steps. The empirical strategy includes:

- Log transformation;
- Stationarity checks using augmented Dickey–Fuller (ADF) tests;
- OLS estimation with an optional deterministic trend, which is dropped when insignificant;
- Diagnostic tests on residuals (Breusch–Godfrey for serial correlation, White test for heteroskedasticity, and Jarque–Bera for normality).

Because macro time series may display trends and non-stationarity, regressions in levels can be vulnerable to spurious relationships and omitted-variable bias. The present model should therefore be interpreted as an informative association consistent with economic intuition rather than a definitive causal estimate. Future work can expand the set of controls (e.g., exchange rate dynamics and non-hydrocarbon sector indicators) and apply dynamic models such as ARDL or error-correction frameworks (Bouazza, Chaib Erras, & Ratia, 2017).

III. Empirical results:

Descriptive analysis indicates a positive correlation between log (GDP) and log (SME). The dissertation-based analysis reported a correlation coefficient around 0.41 at the 5% significance level.

For the stationarity, ADF tests suggest that ln (GDP) is integrated of order one, I (1), while ln (SME) is integrated of order two, I (2). This reinforces the need for cautious interpretation and for robustness checks in future research.

After checking for the stationnarity we estimate the model using the Ordinary Least Square method. After including and then removing an insignificant time trend ($p=0.7787$), the preferred OLS specification is:

$$\ln(GDP) = 26.2403 + 0.3040 \ln(SME)$$

Table: Model estimation

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LPME	0.303960	0.012461	24.39371	0.0000
C	26.24028	0.166865	157.2545	0.0000
R-squared	0.970639	Mean dependent var	30.30775	
Adjusted R-squared	0.969008	S.D. dependent var	0.162558	
S.E. of regression	0.028618	Akaike info criterion	-4.174942	
Sum squared resid	0.014742	Schwarz criterion	-4.075369	
Log likelihood	43.74942	F-statistic	595.0530	
Durbin-Watson stat	0.883947	Prob(F-statistic)	0.000000	

Source: EVIEWS output

The SME coefficient is positive and highly significant ($t=24.39$; $p<0.001$). Model fit is strong ($R^2 \approx 0.9706$) and the overall F-test confirms joint significance ($F \approx 595$; $p<0.001$).

In a log model, the slope coefficient can be interpreted as an elasticity. The estimate $\beta \approx 0.304$ suggests that proportional increases in the number of SMEs are associated with smaller but economically meaningful proportional increases in GDP. The result is compatible with a mechanism whereby SME creation and expansion widen the productive base, raise employment, and generate additional value added—while acknowledging that the GDP response also depends on productivity and firm quality.

3.1. Residual diagnostics.

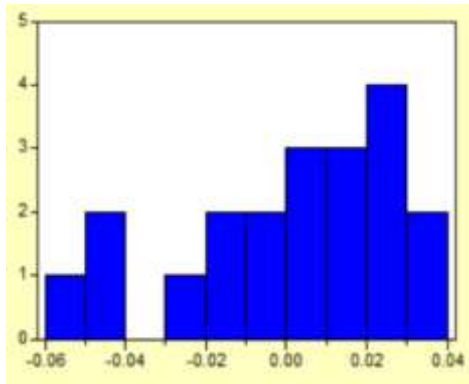
The Breusch–Godfrey LM test does not reject the null of no serial correlation at the 5% level ($p \approx 0.0627 > 0.05$).

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	3.063328	Probability	0.074754
Obs*R-squared	5.537805	Probability	0.062731

The White test suggests homoscedasticity ($p \approx 0.5063 > 0.05$).

White Heteroskedasticity Test:			
F-statistic	0.620674	Probability	0.549328
Obs*R-squared	1.361026	Probability	0.506357

The Jarque–Bera statistic supports approximate normality ($p \approx 0.4127$).



Mean	3.02E-15
Median	0.006152
Maximum	0.038353
Minimum	-0.054858
Std. Dev.	0.027854
Skewness	-0.659110
Kurtosis	2.378384
Jarque-Bera	1.770094
Probability	0.412695

$P=0.4127 > 0.05$ so the residuals are normal.

Table 1. OLS estimates (log model)

Variable	Coefficient	Std. Error	t-Statistic	p-value
Ln (SME)	0.303960	0.012461	24.39371	0.0000
Constant	26.24028	0.166865	157.2545	0.0000

Source: Eviews output.

Model fit: $R^2=0.970639$; Adjusted $R^2=0.969008$; $F=595.053$ ($p=0.0000$); DurbinWatson=0.883947.

Our model is statistically accepted; we will discuss the the economical significant in the discussion part.

IV. Discussion

The empirical results indicate a positive and statistically significant relationship between the expansion of SMEs and GDP in Algeria. The estimated elasticity of approximately **0.30** suggests that increases in the number of SMEs are associated with measurable increases in aggregate output. In practical terms, this implies that a 1% increase in the number of SMEs corresponds to an approximate 0.30% increase in GDP, within the limits of the estimated model.

This finding is consistent with strands of the Algerian literature that emphasize the role of SMEs as a lever of economic development through employment creation and value-added generation ((RAHMOUNI, 2011); (KHABABA, 2013); (Khaddawi, 2021); (Shbouty, 2015)). It also aligns with international empirical evidence highlighting a positive association between the importance of SMEs and economic growth. These results support the idea that the expansion of the SME sector can contribute to strengthening the productive fabric and broadening the base of economic activity.

However, the estimated elasticity suggests that the contribution of SMEs to economic growth, although statistically significant, remains moderate in magnitude. This observation indicates that SME expansion alone cannot fully account for macroeconomic growth dynamics in Algeria. Structural factors such as the economy's dependence on hydrocarbon revenues, productivity gaps across sectors, and broader macroeconomic conditions likely play an important role in shaping GDP performance.

Moreover, relying solely on the number of SMEs as an indicator of SME development may conceal important differences among firms in terms of productivity, technological capabilities, and innovation potential. Performance-oriented research emphasizes that the economic contribution of SMEs depends not only on firm creation but also on factors such as survival rates, the ability to scale up, and improvements in productivity ((Bouleryah, 2007); (Loukriz, 2021)). In this sense, the quantitative expansion of the SME sector does not automatically translate into proportional increases in economic output.

The differences observed across empirical studies may also reflect variations in methodological approaches, sample periods, and model specifications. Some studies report weaker or statistically insignificant relationships between SMEs and GDP when additional explanatory variables are included in the analysis. Similarly, research emphasizing the institutional environment suggests that the economic contribution of SMEs may depend on factors such as financing conditions, governance frameworks, and

regulatory quality (Amimer & Kezzar, 2022). In multi-variable models, these broader structural factors may absorb part of the explanatory power attributed to SME indicators.

From a policy perspective, the results suggest that policies aimed at encouraging the creation of SMEs can have macroeconomic relevance, particularly through their potential contribution to employment and value-added generation. However, the effectiveness of such policies depends on addressing the structural constraints that limit SME performance. Several studies on the Algerian context highlight persistent challenges related to financing constraints and limited access to suitable financial instruments ((Al-Ayeb, 2017); (Hijab, Bousdira, & Boukhers, 2019); (LEDRA, 2013)). These constraints can hinder firm growth, reduce survival rates, and limit the productivity gains associated with SME expansion.

Overall, the findings of this study reinforce the view that SMEs represent an important component of economic development strategies in Algeria. At the same time, they underline that the qualitative characteristics of SMEs such as productivity, innovation, and integration into value chains are crucial determinants of their actual contribution to economic growth. Policies focused exclusively on increasing the number of firms may therefore have limited impact if they are not accompanied by measures aimed at improving the business environment, strengthening access to finance, and supporting technological upgrading.

V. Conclusion:

This study set out to examine the relationship between the expansion of small and medium-sized enterprises (SMEs) and economic growth in Algeria over the period 2002–2022 using a time-series econometric framework. The central hypothesis of the research was that the development of SMEs contributes positively to Algeria's GDP. The empirical results obtained from the log-linear OLS model support this hypothesis: the coefficient associated with the SME variable is positive and statistically significant, with an estimated elasticity of approximately 0.30. This finding indicates that increases in the number of SMEs are associated with measurable increases in aggregate output during the study period.

From an empirical perspective, the study contributes to the literature on SMEs and economic growth in Algeria by providing quantitative evidence of the macroeconomic relevance of SME expansion. While several Algerian studies have emphasized the role of SMEs in employment creation and local development ((RAHMOUNI, 2011); (KHABABA, 2013); (Khaddawi, 2021); (Shbouty, 2015)), fewer analyses have estimated the relationship using a transparent time-series econometric approach. By combining descriptive

evidence, econometric estimation, and diagnostic testing, the present study offers an updated empirical assessment of the association between SME dynamics and GDP in the Algerian context. The results also resonate with international research that reports a positive link between SME development and economic growth.

At the same time, the estimated elasticity suggests that the contribution of SMEs, although statistically significant, remains moderate in magnitude. This observation reinforces the idea that SME expansion alone cannot fully explain macroeconomic growth dynamics in Algeria. The broader structural characteristics of the economy—including dependence on hydrocarbon revenues, productivity gaps, and institutional constraints—continue to play a central role in shaping economic performance. In this sense, the findings support the view that SME promotion policies can contribute to growth, but their effectiveness depends on complementary improvements in the business environment and the productive capacity of firms.

In terms of policy implications, the results highlight several directions consistent with the Algerian literature. Strengthening financial access mechanisms, including credit-guarantee schemes such as FGAR, and diversifying financing instruments including venture capital and Islamic finance solutions could facilitate SME development (LEDRA, 2013). Reducing administrative burdens through digitalization and improving transparency in access to support programs may also improve the business climate. Furthermore, enhancing entrepreneurial training and post-creation support can help increase firm survival and managerial capacity (Bquat & Halem, 2018); (Salhi, 2021)). Policies that promote SME integration into value chains and encourage export orientation may also strengthen their contribution to economic diversification. More broadly, policy design should gradually shift from a focus on the quantity of firm creation toward the quality and performance of SMEs, encouraging innovation, productivity improvements, and scalable business models.

Despite these contributions, the study has several limitations that should be acknowledged. First, the empirical model relies on a single explanatory variable, which limits the ability to capture the broader macroeconomic determinants of GDP. Second, the analysis uses the number of SMEs as the main indicator of SME development, which does not reflect differences in productivity, technological capability, or export performance among firms. Third, the static OLS framework does not fully account for

potential dynamic relationships or long-run equilibrium mechanisms that may exist between SMEs and economic growth.

These limitations open several avenues for future research. Subsequent studies could incorporate additional macroeconomic variables such as investment, exchange rates, or sectoral indicators in order to better isolate the specific contribution of SMEs to economic growth. The use of dynamic econometric techniques, including ARDL models or error-correction frameworks, would also allow a more refined analysis of short-run and long-run relationships. Moreover, future research could move beyond firm counts and use indicators such as SME value added, productivity, employment quality, and export performance to better capture the qualitative contribution of SMEs to economic development (Lueung & al, 2011).

In conclusion, the findings of this study support the initial hypothesis that SME expansion is positively associated with economic growth in Algeria. At the same time, they suggest that the effectiveness of SME promotion policies depends not only on increasing the number of firms but also on improving the productivity, resilience, and competitiveness of the SME sector. Strengthening these qualitative dimensions remains essential for ensuring that SME development translates into sustained and diversified economic growth.

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The Impact of Small and Medium-Sized Enterprises on Gross Domestic Product in Algeria: An Econometric Study between (2002-2022)

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