THE CONTRIBUTION OF SMALL AND MEDIUM-SIZED ENTERPRISES IN THE ALGERIAN ECONOMY: AN ENTROPY INDEX APPROACH

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ABSTRACT

The role of small and medium enterprises in the economic development of nations cannot be overstated. These businesses, ranging from small family-owned bakeries to medium-sized manufacturing plants, play a vital role in job creation, innovation, and overall economic growth. Numerous studies have established the crucial significance of SMEs to economic success and the development of regions. Our research aims to investigate the extent to which SMEs in Algeria contribute to the country's economic development and diversification. Considering the economic status of Algeria as a developing nation heavily reliant on oil revenues, it presents a unique case for study. To achieve our research objectives, over 120 official government reports published between 2001 and 2022 are analysed. Descriptive data analysis was conducted, and the Entropy index was calculated to address the problematics and verify the hypotheses. The results reveal that SMEs in Algeria make considerable contributions to employment rates and GDP values. However, their numbers in export operations are very low. The study found that SMEs in Algeria are potent locally, but their performance in global markets is very poor.

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1. INTRODUCTION

There are quite abundant studies on the topic of small and medium enterprises and their substantial contributions to economic growth and job creation. Research has focused on various aspects of SMEs, including skill supply, training, and development (Hendry, Jones & Arthur 1991), information internalisation and hurdle rates in internationalisation (Liesch and Knight 1999), financing challenges in developing countries like Ghana (Quartey 2003),

and risk management practices in South Africa (Yolande, 2012). Studies have also explored the dynamics of SMEs in different countries, such as Indonesia, where technology diffusion through foreign buyers and subcontracting has been identified as key mechanisms for SME development (Berry, Rodriguez & Sandee, 2001). Additionally, research has examined the impact of bank size, credit discretion, competition, and the institutional environment on SME lending in countries like China (Shen et al., 2009). Efforts have been made to fill gaps in SME data landscape, with new datasets introduced to provide a better understanding of SMEs across different countries (Ardic, Mylenko & Saltane, 2011). Furthermore, difficulties in capitalising on open innovation's full potential in industries like food, particularly for SMEs, have been highlighted, with recommendations for collaboration, new innovation ecosystems, and revised curricula promoting innovation (Saguy & Sirotinskaya, 2014). The adoption of business process management (BPM) in micro, small, and medium-sized firms has also been studied, emphasising the importance of defining and structuring BPM activities within these organisations (Dobrosavljević & Urošević, 2019). Additionally, frameworks for implementing enterprise resource planning (ERP) systems in SMEs have been developed to enhance operational efficiency and competitiveness (Alaskari, Pinedo-Cuenca & Ahmad, 2021).

Overall, the literature on SMEs covers a wide range of topics, from human resource development and internationalisation to financing, risk management, innovation, and technology adoption. These studies provide useful grasp of the challenges and opportunities faced by SMEs in different contexts, facilitating a better understanding of their role in the economy, and helping oil-reliant nations to achieve economic security.

The objective of our research is to investigate the extent to which small and medium-sized businesses in Algeria contribute to the country's economic development and diversification.

We have conducted the study analysing over 120 quarterly and annual government reports from four official national institutions (Ministry of Industry and Pharmaceutical Production/ The National Office for Statistics/ Bank of Algeria/ The General Directorate of Customs) over the period of 22 years (2001-2022). Our research is based on analysing the performance of SMEs in three macroeconomic indicators (employment/ gross domestic product/ exports). We have implemented descriptive statistics and calculations of the Entropy index to verify the research hypotheses and determine the magnitude to which SMEs in Algeria contribute to economic development and diversification.

We have found that SMEs in Algeria are potent locally, but very fragile externally. They provide significant new job opportunities, and help contribute

to the country's overall GDP. However, their contribution to the nation's exports is very poor, as exports operations are dominated by oil companies and bigger firms.

We have contributed to the existent research in many ways. First, we have provided additional evidence supporting SMEs' positive impact on employment rates and GDP in developing countries. Second, we have provided new evidence on how adopting SMEs in an oil-reliant nation will not always improve the country's export values. Thirdly, we have contributed to the research on SMEs' impact on the economy in an African developing country which relies heavily on hydrocarbon revenues, as there are abundant studies on SMEs in developed countries.

The paper is presented in a structured manner: first, we provide a literature review on the challenge of defining SMEs, a theoretical perspective on SMEs and economic development, and discuss the literature on the aspects of innovation and entrepreneurship in SMEs. Then we determine the research gap, hypotheses, and present the research plan to address the problematics in the methodology section. Later, we report the results, discuss and compare them with the previous ones. Lastly, we present the conclusions.

2. LITERATURE REVIEW

2.1 The challenge of defining SMEs

The definition of small and medium enterprises has been a topic of discussion in various research studies. According to J.E.Bolton (Bolton, 1982), small businesses are defined using three criteria: firstly, by having a small share of the market. Secondly, it is managed in a personalised manner by its owners or part-owners, rather than through a formal management structure. Lastly, it is independent and not associated with a bigger company, allowing owner-managers to make decisions without outside control. Leone (1991) highlights the challenges faced in defining SMEs and emphasises the importance of finding a homogeneous criterion to precisely distinguish between small and medium enterprises. Soriano (2005) explores the relationship between the size of an enterprise, its corporate strategy, and functional strategies such as marketing, technology, human resources, and finance. Ardic, Mylenko & Saltane (2011) introduce a new dataset to analyse SMEs across different countries, noting that while there is no world-wide definition of SMEs, variations in definitions do not significantly impact lending volumes. Kurdgelia (2021) discusses comparative analysis of SME standards in the EU and Georgia, highlighting the importance

of standardization in defining SMEs. Economic Research Institute Bulgarian Academy of Sciences and Angelova (2020) analyses the challenges in defining SMEs, considering international definitions and the differences in economies and legal systems.

2.2 SMEs' traits and characteristics

Small and medium enterprises are distinguished by their size, number of employees, productivity, legal form, number of managers, form of production, foreign country activities, and strategy (Vaněček and Fára 2013). In the food industry, they are known for their specialty, flexible mechanisms, and scientific research, but also face challenges in sales and training (Mei, 2012). SMEs are small in scale, have little pledged assets, high market risk, and indefinite benefits, but have potential for growth (Youfeng, 2007). The relationship between SMEs' traits and performance, including owner demographics, business acquisition, and resource investments, is a key area of study (Heileman, Pett & Mayer, 2016).

2.3 SMEs and economic development: theoretical perspective

The question of whether SMEs contribute to economic expansion necessitates an exploration from multiple angles. An increasing volume of empirical research substantiates the significance of SMEs as key contributors to overall employment and the generation of jobs, both in developed and developing economies. Birch's seminal work in 1979 presented initial evidence that reinforced the idea of SMEs serving as the primary drivers of job expansion. His study revealed that substantial 81.5% of all newly created jobs in the US between 1969 and 1976 stemmed from businesses with 100 or fewer workers (Birch, 1987). Kirchhoff and Phillips conducted a study in 1988 to scrutinise how small and large enterprises contribute to job growth in the US. Their research revealed that businesses with fewer than 100 employees emerge as the primary generators of net new job opportunities. Conversely, enterprises with over 1,000 employees, despite constituting 37% of total employment, contributed merely 13% of all new jobs (Kirchhoff & Phillips 1988). In accordance with Schreyer's insights from 1996, SMEs hold significant importance for nearly all global economies. This is especially true for developing nations, where they play a crucial role in addressing substantial labor and income dispersion obstacles. When viewed from a "static" perspective, SMEs contribute to economic output and the generation of "adequate" employment opportunities. On the other hand, from a "dynamic" standpoint, they serve as a breeding ground for future larger firms, make direct and frequently substantial contributions to overall savings and investment, and actively participate in the development

of relevant technologies (Schreyer, 1996). As highlighted by Romijn in 2001, SMEs take center stage as the primary players in the evolving landscape of a knowledge-driven revolution. This shift signifies a transition from an economy that primarily relies on physical and tangible resources to one in which knowledge reigns supreme. Essential characteristics such as an entrepreneurial mindset, strong interpersonal connections, a high degree of group cohesion, adaptability, and dynamic organisational structures are fundamental aspects of a knowledge-based economy. These qualities are typically associated with small, agile entities. Consequently, there is a significant alignment between small enterprises and a knowledge-driven economy (Romijn, 2001).

Taking a contrasting perspective, Schumpeter (1934) highlighted a particular aspect of large companies in terms of their ability to secure capital. He foresaw that this capability could potentially supplant entrepreneurial functions in the course of economic progress. Nevertheless, he underscored the significance of entrepreneurship in driving economic expansion and characterized an entrepreneur as someone who introduces innovation and assumes the pivotal position in achieving economic advancement through inventive contributions (Croitoru, 2012).

In more recent points of view, SMEs tend to use more labor-intensive production operations, which boosts employment and leads to more equitable income distribution. Additionally, SMEs provide livelihood opportunities through simple, value-adding processing activities, particularly in agriculturally based economies (Ayandibu & Houghton, 2017). In emerging economies, SMEs address socio-economic challenges by employing a substantial portion of the workforce - about 70 % in the case of Ghana - and contributing maximally to the GDP. Governments are encouraged to support SMEs with tailor-made policies to help unleash their full potential for enhancing economic growth (Amoah et al., 2022). Furthermore, SMEs contribute to sustainable economic development by affecting the structure of production, income distribution, and the ecological environment. They play a critical role in developed and developing countries, with government programs aimed at encouraging the SME sector to increase its contribution to sustainable development (Elkhalek, 2019). Regionally, SMEs have shown positive impacts on gross value added through the count of workers and their productivity, emphasising the relevance of government policy in supporting an advantageous SME environment (Glonti, Manvelidze & Surmanidze, 2021). Thus, SMEs are key for a competitive and competent market and are vital for poverty reduction, especially in developing countries where they dominate economically active enterprises and significantly influence job creation and economic growth (Ayandibu & Houghton, 2017).

Considerable effort has been expended in assessing the contributions of SMEs to economic development. The findings indicate that SMEs are indispensable for economic well-being, both in affluent and less affluent economies worldwide.

2.4 Innovation and entrepreneurship in SMEs

A range of theories have been proposed to explain the connection amid innovation, entrepreneurship, and performance in SMEs. Dushime, Muathe & Kavindah (2021) emphasise the resource-based view theory and dynamic capability theory, while Chaldun, Yudoko & Prasetio (2022) identify the Uppsala theory, Network theory, Resource-based theory, international entrepreneurship theory, and institutional theory as key theories in the globalisation process of SMEs. Ramdani, Raja & Kayumova (2022) highlight the role of digital innovation in SMEs, impelled by a configuration of antecedents and resulting in improvements in the performance of organisational and business processes. Zeb & Ihsan (2020) further explore the influence of entrepreneurship and innovation on the performance of women-owned SMEs in Pakistan, emphasising the intermediate role of innovation in this relationship. These studies collectively underscore the importance of innovation and entrepreneurship in driving performance in SMEs, with specific theories providing valuable insights into the mechanisms and processes involved.

Entrepreneurship certainly influences the dynamic capabilities of firms, which in turn enhances their innovation performance. This relationship is mediated by the organisational innovation environment, suggesting that fostering a supportive innovation environment is crucial for SMEs to translate entrepreneurial activities into tangible innovation outcomes (Cui & Song, 2022). Furthermore, the inter-organisational collaboration (IOC) among SMEs also plays a critical role in fostering innovation. Collaborative efforts between organisations can lead to a more profound innovation impact, as these collaborations provide access to diverse resources and knowledge, which are essential for innovation (Zahoor & Al-Tabbaa, 2020).

In the context of women-owned SMEs in Pakistan, entrepreneurship and innovation are directly linked to improved entrepreneurial performance. Attributes that are associated with risk-taking and accomplishments among women entrepreneurs significantly boost innovation and, consequently, the performance of their enterprises. Innovation not only has a direct relationship with performance but also mediates the relationship amid entrepreneurship and performance, highlighting the central role of innovative practices in realising the benefits of entrepreneurial activities (Zeb & Ihsan, 2020). In Nigeria, the linkage

between disruptive innovation and sustainable entrepreneurship illustrates that innovation, particularly disruptive types, can significantly contribute to the sustainability and long-term success of SMEs. This relationship is crucial for transitioning economies that are diversifying their economic activities beyond traditional sectors (Ibidunni, Ufua & Opute, 2022).

Overall, innovation and entrepreneurship significantly impact the performance and competitive advantage of SMEs across various contexts and regions, and are intertwined processes that significantly enhance the performance, sustainability, and competitive positioning of SMEs in various economic and cultural contexts.

2.5 Research gap

Upon examining previous studies, there is a lack of research on the following points:

- **Understudied areas:** there is limited research on SMEs' impact in some sectors or regions, particularly in oil-reliant countries.
- **Regional and Rural Development:** there is limited research on the role of small and medium firms in promoting regional and rural economic development, especially in underdeveloped areas, as insights into regional impacts can help in designing localised support mechanisms.
- **Lack of long-term studies:** few longitudinal studies track the long-term impact of SMEs on economic development, as these types of studies are essential for understanding sustainable development and growth patterns.

Building on the previous studies in this field and research gaps mentioned above, the next hypotheses can be formulated:

H0: SMEs in Algeria do not contribute to economic development;

H1: SMEs in Algeria significantly contribute to economic development;

H2: SMEs in Algeria contribute poorly to economic development.

The justification for the hypotheses is that SMEs have huge capability to deal with the economic issues that nascent economies face, and these expectations could or could not be true in reality when studying some macro indicators in Algeria, in addition to the findings of Amoah et al. (2022) and Kurdgelia (2021). We believe that, despite the unique characteristics and flexibility of SMEs that distinguish them from larger firms and help them cope better with economic crises and the success they have had in developed countries, this could not be the case in an underdeveloped country, such as Algeria, that has been known to rely on hydrocarbon income since its discovery in the 1950s.

3. DATA AND METHODOLOGY

Our study plan involves several steps. The first step is to adopt the way SMEs are defined officially in Algeria and other formal global institutions. Next, we present the data collected, and measure the level of economic diversification and development using the Entropy index to verify the hypotheses.

3.1 SMEs in Algeria and other formal institutions

There is no universally accepted, standardised concept of SMEs. Several experts and associations have defined SMEs differently, leading to variations in their categorisation be-tween countries and even within the same country over time. These diverse definitions often consider variables like overall assets, the number of individuals employed, annual turnover, and capital investments. Additionally, officials from different multilateral development institutions have their own unique interpretations of what constitutes an SME, reflecting their respective institutional definition (Gibson and H.J 2008), as illustrated in Table 1.

Table 1. SMEs according to multilateral institutions and countries

Institution (region or country)	Max # of employees	Max revenue or turnover	Max assets
European Union	10-250	40 million EUR	-
World Bank	300	15 million USD	15 millions USD
MIF-IADB	100	3 million USD	-
African Development Bank	50	-	-
Asian Development Bank	No official definition. Uses only definitions of various national Governments.		
UNDP	200	-	-
OECD	20-500	-	-
Algeria	10-250	>20 million EUR	-
China	>2000	300 million CNY	400 million CNY

Source: prepared by the authors using (Gibson and H.J 2008)

In accordance with the guiding law for the development of SMEs, dated December 2001, SMEs are defined without regard to their legal status, based on certain characteristics delineated in Table 2.

Table 02. SMEs in Algeria according to law n° 01-18

Enterprises	Employees	Annual turnover (D.A)	Annual revenue (D.A)
Micro	01-09	< 20 million	< 10 million
Small	10-49	< 200 million	< 100 million
Medium	50-250	200 million- 2 billion	100- 500 million

Source: prepared by the authors according to (Official Gazette of the Algerian Republic 2001)

The prior legislation underwent a revision with the issuance of law n° 17-02 in 2017, leading to adjustments in the maximum annual turnover and annual revenue thresholds. These thresholds were raised to 4 billion Algerian dinars and 1 billion Algerian dinars respectively from their previous figures of 2 billion Algerian dinars and 500 million Algerian dinars in 2001. Notably, the criteria concerning the number of employees remained consistent in both laws as illustrated in Table 3.

Table 3. SMEs in Algeria according to law n° 17-02

Enterprises	Employees	Annual turnover (dinars)	Annual revenue (dinars)
Micro	01-09	< 40 million	< 20 million
Small	10-49	< 400 million	< 200 million
Medium	50-250	400 million- 04 billion	200- 01 billion

Source: prepared by the authors according to (Official Gazette of the Algerian Republic 2017)

3.2 Variables

Table 4 presents the set of variables used to measure economic development and diversification in the study.

Table 4. The set of variables used in the study and their formula

Variable	Formula	Unit
Entropy index	$ENT = -\sum_{i=1}^{N} S_i log_2(S_i)$	From 0 to $Max\ ENT = log_2(N)$ In which (N) represents the number of sectors.
Employment	The amount of newly created jobs in a given period	Number of created jobs
Gross domestic product	The total market value of all final goods and services produced by a state in a given period	Billion Algerian dinars
Exports	Goods and services that are produced in one country and sold to buyers in another	Million USD

Source: Based on the authors' elaboration.

3.3 Methods

To measure the degree of economic development and diversification and verify the hypotheses, we use the Entropy index. The index was first used by Horowitz & Horowitz (1968) to measure the competitiveness of the brewing industry in the United States back then, relying on the market shares of the firms active in the market, in addition to the degree of the industrial concentration of this market between 1944 and 1964.

The formula for the index is given as follows:

$$ENT = -\sum_{l=1}^{N} S_i log_2(S_i)$$

In which:

(N): The number of sectors in a given economy or market;
(Si): The contribution of each sector to the whole contribution value;
(Log2): Logarithm to the base of 2.

The higher the index values are, the closer they are to the maximum values; this means better diversification and a higher contribution of many sectors in a given economy. The lower the index values are, the closer they are to zero; the lower the efficiency of a given economy or market.

The maximum value of index is obtained by calculating the logarithm of the number of sectors (N) to the base of 2, where:

$$Max\ ENT = log_2(N)$$

To help measure the extent to which SMEs can help the economy reach maximum output, Relative Entropy will be calculated using Horowitz and Horowitz (1968: 199):

$$R = ENT / log_2(N)$$

Relative Entropy values ranges between zero and 1, the closer its value to 1, the closer we are to a perfect economy state and vice versa.

3.4 Data gathering and source

The study covers a period of 21 years: from 2001 to 2022. We include the year in which the first law regarding SMEs in Algeria was issued -n° 01-18-, and the years to come to cover the financial crisis in 2008, the crash of oil prices in 2014-2017, and the Covid 19 pandemic 2020-2022. We think this timeframe is sufficient to study SMEs contribution to economic development and verify the hypotheses.

The data gathered is obtained scanning through multiple annual reports from (The National Office for Statistics 2022), periodic reports from (General Directorate of Customs 2022), statistical bulletins from (Ministry of Industry

and Pharmaceutical Production 2022) and (Bank of Algeria 2022). The reports are analysed using the inductive approach (Prince and Felder 2006) to have a clear view on SMEs' impact on economic development and diversification and verify the hypotheses.

4. RESULTS

The results section comprises three distinct components: an examination of the growth rates of SMEs during the period of study; a comprehensive analysis of the influences of SMEs on employment rates, GDP, and export levels; and a presentation of the computed values of the entropy index.

4.1 A census of SMEs in Algeria

Table 5. SMEs' growth since 2001

Year	Number of private SMEs	Number of public SMEs	Density of SMEs/1000 inhabitants
2001	244560	788	8
2003	287805	782	9
2005	341953	835	10
2006	375998	769	11
2008	518901	625	15
2010	618515	557	17
2012	711275	557	20
2014	851511	542	21
2016	1022231	390	17
2018	1141602	261	27
2019	1193096	243	28
2020	1230844	229	28
2021	1286140	225	28
2022	1359580	223	30

Source: prepared by the authors using (Ministry of Industry and Pharmaceutical Production 2022)

There is a positive trend in SMEs creation. The count of SMEs increased from 245,348 in 2001 to 342,788 enterprises by 2005, representing the establishment of nearly 100,000 new SMEs over a five-year span. This momentum persisted into the 2nd half of the decade (2006-2010), which saw a doubling in the count of SMEs between the 1st and 2nd stages. Furthermore, this growth trajectory continued into the second decade culminating in 1,359,803 SMEs by the end of 2022.

Compared to the count of private SMEs that were registered during the same period, the number of public SMEs that were registered since 2001 has been steadily declining and is extremely small, barely exceeding 900 firms.

The metric denoted as "SME Density per 1,000 residents" as computed in Table 5 using the formula (Ministry of Industry and Pharmaceutical Production 2022: 11-12):

$$Density\ of\ SMEs = \frac{The\ number\ of\ SMEs}{The\ country's\ population\ /\ 1000}$$

The values presented above distinctly underscores the limited presence of SMEs within the national economy. To be specific, a density of 30 SMEs per 1,000 inhabitants in 2022 falls notably short of the figures observed in OECD countries (OECD 2023), where the average SME density typically ranges from 45 to 50 SMEs per 1,000 inhabitants.

4.2 Analytical study

Impact of SMEs on the country's workforce

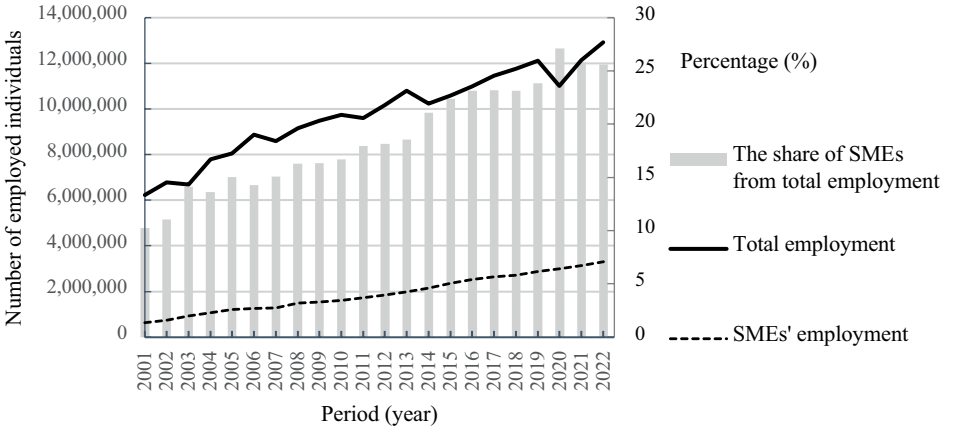

Figure 1. SMEs' contribution to employment since 2001
Source: compiled by the authors based on (The National Office for Statistics 2022) and (Ministry of Industry and Pharmaceutical Production 2022).

Figure 1 illustrates the growing role of SMEs in overall employment, displaying an escalation from just over 639,000 jobs in 2001 to surpassing 3,307 million jobs in 2022. Nevertheless, it is essential to acknowledge that despite this progress, contribution of SMEs to total employment remains relatively modest standing at 25.6% in 2022.

SMEs' impact on GDP

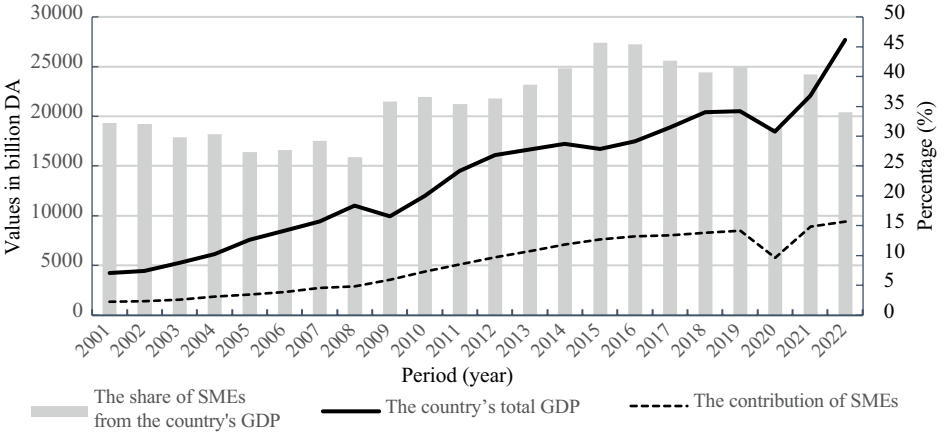

Figure 2. SMEs' contribution to GDP since 2001
Source: compiled by the authors based on (Ministry of Industry and Pharmaceutical Production 2022) and (Bank of Algeria 2022).

As depicted in Figure 2, Algeria's GDP has consistently expanded, with SMEs playing a modest role. In 2001, SMEs contributed with 32,22% to the GDP, which rose to 34,04% by 2022, accounting for a total of 9,425,05 billion Algerian dinars. This underscores the significance of SMEs, especially considering the economic reforms aimed at optimising its role in the nation's development.

SMEs' impact on exports

Table 6. SMEs' contribution to exports since 2001
Unit: million USD

Year	Overall exports	SMEs' exports	Percentage of total exports (%)
2001	19091	107,4	0,56
2003	24465	95,42	0,39
2005	46495	190,57	0,4
2006	54792	236,8	0,43
2008	79120	385,6	0,48
2010	57762	239,61	0,41
2012	72620	430,48	0,59
2014	61172	523,18	0,85
2016	29698	350,89	1,18
2018	41115	421,42	1,02
2019	35312	289,59	0,82
2020	21925	76,36	0,34
2021	38632	494,45	1,27
2022	65716	1337,8	2,03

Source: compiled by the authors based on (Bank of Algeria 2022), (Ministry of Industry and Pharmaceutical Production 2022), and (General Directorate of Customs 2022)

Looking at the broader pattern from 2001 to 2014, there is a clear upward trajectory in exports from sectors other than hydrocarbons. Nevertheless, in post-2014 period, the values exhibit some fluctuations due to the decline in oil prices during this period reaching 69,84 USD and 43,67 USD per barrel in December 2014 and January 2016 respectively (OPEC 2014) and (OPEC 2016), then there was a more notable decrease in 2020 followed by a substantial rise in both 2021 and 2022.

Exports from SMEs in sectors other than oil have exhibited steady growth over time, increasing from 107,4 million USD in 2001 to 1337,8 million USD in 2022. This development highlights the growing impact of SMEs on promoting non-oil exports in the country.

4.3 Entropy index calculations

For SMEs' impact on employment

Table 7. Entropy index results for employment

Year	ENT
2001	0.477196932
2003	0.587084516
2005	0.610574209
2006	0.591276349
2008	0.64074145
2010	0.6507728
2012	0.68378887
2014	0.742807245
2016	0.78064965
2018	0.78081432
2019	0.79681473
2020	0.84331102
2021	0.82420677
2022	0.8206352

Source: calculated by the authors based on the data from Figure 1

The ENTROPY values for SMEs' impact on employment show an overall increasing trend from 2001 to 2022, indicating a growing diversity or complexity over the years. While there is a general upward trend, there are some fluctuations in the values: the ENT values decrease slightly from 2005 (0.610574209) to 2006 (0.591276349) and again from 2020 (0.84331102) to 2021 (0.82420677) and 2022 (0.8206352). Significant increases are observed in certain periods, such

as from 2008 (0.64074145) to 2010 (0.6507728) and from 2016 (0.78064965) to 2019 (0.79681473).

The ENT values from 2018 onwards show a period of relative stability, with values remaining high and showing smaller changes year to year compared to earlier periods.

For SMEs' impact on GDP

Table 8. Entropy index results for GDP

Year	ENT
2001	0.90678838
2003	0.8788578
2005	0.84617164
2006	0.85582164
2008	0.83684574
2010	0.94780667
2012	0.94120827
2014	0.97833032
2016	0.9937916
2018	0.97503076
2019	0.9795488
2020	0.8976722
2021	0.97279024
2022	0.92517776

Source: calculated by the authors based on data from figure 02

The ENT values show both increasing and decreasing trends over the years, suggesting fluctuations in the contribution of SMEs in GDP. There is a noticeable decline in ENT values from 2001 (0.90678838) to 2008 (0.83684574), indicating a decrease in the contribution of SMEs during this period. A substantial increase occurs from 2008 (0.83684574) to 2010 (0.94780667), followed by relatively high values in subsequent years as from 2010 onwards, ENT values remain high, often above 0.94, with a peak in 2016 (0.9937916) and consistently high values through 2021 (0.97279024). In the last few years, there are fluctuations, with a notable drop in 2020 (0.8976722) and some recovery in 2021 (0.97279024) and 2022 (0.92517776).

The high ENT values from 2010 to 2022 suggest a stable state of high involvement from SMEs in Algeria's GDP. The sector seems to have maintained a high level of diversity, which could indicate robustness, adaptability, or a mature state.

For SMEs' impact on exports

Table 9. Entropy index results for exports

Year	ENT
2001	0.0499446288
2003	0.0368238118
2005	0.037622872
2006	0,0399925669
2008	0.0438830784
2010	0.0384156993
2012	0.0521761317
2014	0.0706733225
2016	0.092501925
2018	0.082112142
2019	0.068608584
2020	0.0327772924
2021	0.098203112
2022	0.143115923

Source: calculated by the authors based on data from table 06

The ENT values reveal a low level of contribution from SMEs to the Algeria's exports throughout the analysed period. From 2001 to 2010, the ENT values fluctuated slightly, but remained fairly stable, with minor fluctuations around a low baseline. From 2010 onwards, there was a gradual increase in ENT values, indicating a positive improvement in SMEs' contribution to exports, despite the low level. The values peaked significantly in certain years, including 2014 (0.0706733225), 2016 (0.092501925), 2021 (0.098203112), and 2022 (0.143115923). There was a notable drop in the ENT value in 2020 (0.0327772924), followed by a sharp increase in the subsequent years.

5. DISCUSSIONS

The data presented in Table 7 and Table 8 offers evidence to support the assertion of H1, as the index values, particularly in recent years, are close to 1, which suggests that SMEs in Algeria significantly contribute to economic development. However, the findings in Table 9 show that the index values are consistently low and do not exceed 0.1, except for the year 2022. This implies that H2 is true with regards to SMEs' contribution to exports. These findings are consistent with the rejection of H0, assuming that SMEs in Algeria contribute to economic development, whether to a significant or negligible extent. This conflict of results indicates that Algerian SMEs are potent in local economy, but they suffer internationally.

The results found on SMEs' contribution to job creation, provides support for the findings of Birch (1987), Kirchhoff & Phillips (1988), Schreyer (1996), and Amoah et al. (2022) who also confirmed that the majority of newly created jobs in developed and developing economies stem from small and medium firms with a low labor force, unlike larger firms that may have a bigger number of workers but offer very few new job opportunities.

In addition, the findings on SMEs' impact on GDP support the notion that Amoah et al. (2022) discuss, especially in developing nations, such as Ghana and Algeria. Small and medium-sized enterprises act as engines for generating wealth, maintaining social stability, and generating tax revenues. Additionally, they are capable of effectively distributing economic activities in remote areas, thereby promoting local prosperity and facilitating the convergence and integration of domestic regions.

Moreover, the results from Table 5 pertaining to the growth of SMEs in Algeria indicate a notable increase in the number of SMEs, which underscores the proactive measures taken by the Algerian state to support this sector. This trend reflects the growing entrepreneurial culture in Algeria since the enactment of law n° 01-18, as this shift in mentality can facilitate a change in the Algerian individual's mindset from communism to capitalism, ultimately leading to economic development and diversification. These findings align with the outcomes of Croitoru (2012), Ayandibu & Houghton (2017) and Cui & Song (2022).

Nevertheless, the data presented in Table 6 and Table 9 indicate that the contribution of SMEs to exportation activities is relatively minimal compared with the nation's hydrocarbon exports. As of the end of the 2022 fiscal year, the aggregate value of non-hydrocarbon exports was approximately 4606 billion USD, representing a mere fraction below 10% of the total export revenue. When considering only the exports that exclude those conducted by Sonatrach (the state oil company) and other prominent firms such as the currently inactive Fertial, along with Somiphost and Cevital, this percentage diminishes further to about 1.1% (Bank of Algeria, 2022).

6. CONCLUSIONS

Our research purpose is to examine the extent to which SMEs contribute to the economic growth and diversification in Algeria, by examining their performance across various macroeconomic indicators, including employment, gross domestic product, and exports, using annual statistical government reports since 2001. Our findings reveal that SMEs have had a positive influence on employment in

Algeria, particularly in the past ten years of the research period. Furthermore, SMEs have exhibited a consistent and substantial positive effect on GDP throughout the entire study period. However, our analysis indicates that SMEs have a limited impact on Algerian exports. This suggests that SMEs in Algeria are highly effective in the local market, but may be fragile and vulnerable in the global market.

We assert that our findings hold practical significance, as they provide a unique perspective on the effect of SMEs in an African developing nation that heavily depends on hydrocarbon revenue to sustain its economy.

Our research is constrained by several limitations. First, it is limited to a single country, which restricts its generalisability. Second, acquiring recent financial statements of active SMEs in the sector, as stated by official authorities, poses a significant challenge, leading to delayed government reports and a loss of relevance in our research. Most importantly, many SMEs in Algeria, particularly micro and small enterprises, resort to fiscal fraud to evade taxes, which undermines the credibility of their financial statements and produces less-than-accurate government reports.

The aforementioned limitations present a solid foundation for future research. Conducting a comprehensive examination of the influence of SMEs on additional macroeconomic indicators, including nations exhibiting similar economic characteristics, in a single study, could yield more definitive and convincing findings.

Conflict of interests

The authors declare there is no conflict of interest.

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ДОПРИНОС МАЛИХ И СРЕДЊИХ ПРЕДУЗЕЋА АЛЖИРСКОЈ ЕКОНОМИЈУ: ПРИСТУП ИНДЕКСА ЕНТРОПИЈЕ

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САЖЕТАК

Улога малих и средњих предузећа у економском развоју економија не може се прецијенити. Ова предузећа, од малих породичних пекара до средњих производних погона, играју кључну улогу у стварању радних мјеста, иновацијама и укупном економском расту. Бројне студије су утврдиле кључни значај МСП за економски успјех и развој региона. Наше истраживање, које има за циљ да истражи у којој мјери МСП у Алжиру доприносе економском развоју и диверзификацији земље, узимајући у обзир економски статус Алжира као земље у развоју која се у великој мјери ослања на приходе од нафте, представља јединствен случај за проучавање. Да бисмо постигли циљеве нашег истраживања, анализирано је преко 120 званичних владиних извјештаја објављених између 2001. и 2022. године. Спроведена је дескриптивна анализа података и израчунат је ентропијски индекс да би се ријешио проблем и потврдиле хипотезе. Резултати откривају да МСП у Алжиру дају значајан допринос стопама запослености и висини БДП-а. Међутим, њихов број у извозним операцијама је веома низак. Студија је показала да су мала и средња предузећа у Алжиру моћна на локалном нивоу, али је њихов учинак на глобалним тржиштима веома лош.

Кључне ријечи: *мала и средња предузећа, запослење, бруто домаћи производ, извоз, Алжир.*