Navigating Profitability Challenges in the UK Energy Sector: Evidence from Industry SMEs

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***Abstract*—Small and medium-sized enterprises (SMEs) play a crucial role in the United Kingdom's energy sector, contributing to innovation, employment, and economic development. However, they face significant challenges in maintaining profitability due to market volatility, regulatory pressures, and the transition toward decarbonization. This study explores key determinants of profitability in UK energy-sector enterprises, utilizing a panel dataset from 2012 to 2021 covering 120 firms in the energy sector. Employing panel data estimation techniques, the study examines firm-specific and macroeconomic variables impacting profitability. Findings identify equity, short-term borrowings, networking capital, capital expenditure, long-term borrowings, number of employees and current ratio as key profitability determinants. The study also finds that GDP growth significantly impacts SME profitability, enhancing consumer purchasing power, demand, and business opportunities. However, other macroeconomic variables such as the Bank of England base rate, inflation, and unemployment showed no significant effects. This research underscores the necessity of strategic financial management and investment in innovation to sustain profitability in an evolving energy market.**

***Index Terms*-- COVID-19, Energy Sector, Financial Management, Profitability, United Kingdom.**

I. INTRODUCTION

The UK energy sector is undergoing a transformative shift driven by decarbonization, regulatory changes, and economic uncertainties. SMEs[1] constitute a significant portion of this industry, yet they struggle to remain profitable amid fluctuating energy prices, increasing regulatory burdens, and market competition. While previous studies have explored profitability drivers in other sectors, limited research has focused on energy SMEs. This study aims to bridge this gap by analysing profitability determinants and providing actionable insights for industry stakeholders.

SMEs are the backbone of the global economy and create substantial contributions to employment and revenue generation [1]. SMEs play a significant role in economic growth, particularly in developed economies, by fostering innovation, productivity, and employment opportunities [2]. They constitute most businesses worldwide and contribute significantly to GDP, employment, and economic stability [3]. Over the decades, SMEs have demonstrated their uniqueness, dispelling earlier beliefs that they were merely "mini versions" of larger corporations [4]. SMEs are formally defined by various international bodies, governments, and institutions. According to the European Commission, SMEs are categorised based on the number of employees and either balance sheet total or turnover [5]. For financial and policy support, institutions such as the World Bank and IMF (International Monetary Fund) have emphasized the importance of a standardized SME definition to facilitate access to credit, funding programs, and economic development initiatives [6]. The UK Department for Business, Energy & Industrial Strategy defines SMEs as companies with fewer than 250 employees, which aligns with the broader EU classification [7].

In the UK, SMEs are crucial to economic growth, accounting for over 5.5 million businesses. They contribute to innovation, employment, and GDP, comprising 99% of all businesses and 60% of total private sector employment [7]. UK SMEs also support international trade networks, provide aid to vulnerable communities, and create diverse employment opportunities [8]. The energy sector is a critical segment of SMEs in the UK, encompassing renewable energy, utilities, and energy services. Identifying factors that impact the profitability of UK energy SMEs is imperative to safeguard this vital segment of the economy [7].

Despite the prominence of Energy sector SMEs in the UK and globally, their sustainability remains a challenge. The number of new energy SMEs exceeds the actual increase in SME population due to high failure rates, particularly among young enterprises [9]. Understanding the factors that influence energy SME profitability is crucial for maintaining sustainable businesses and reducing failure rates. However, research on SMEs and specifically in energy sector profitability remains limited due to the complexity of performance evaluation, diverse success factors, and different interpretations of success among business owners, policymakers, and researchers [10].

[1] In this research article, the term "SMEs" primarily refers to SMEs in the United Kingdom's energy sector.

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This study aims to identify key factors affecting SME profitability in the UK energy sector by analysing firm-specific and macroeconomic determinants. Using panel data covering 120 energy SMEs from 2012 to 2021, the research examines liquidity management, working capital management, cash flow management, capital structure, human resource management, capital enhancement, and innovation strategies. The study also evaluates the impact of the COVID-19 pandemic on Energy SMEs, providing valuable insights for SMEs, policymakers, and investors to enhance financial resilience and long-term sustainability.

Previous studies have explored SME profitability and success factors, but many focus on qualitative analysis or limited time series data. Research on UK SMEs are restricted due to data accessibility, time constraints, and costs, leading to fragmented findings. Most studies analyze only one or two industries or factors, leaving a gap in comprehensive research on SME profitability [11]. This study addresses this gap by utilizing a large dataset covering 120 SMEs across multiple energy sub-sectors. It applies dynamic panel data estimation techniques to examine firm-specific and macroeconomic factors affecting profitability. Additionally, this research contributes to theoretical development by constructing a conceptual framework based on empirical evidence.

SME profitability is crucial for long-term sustainability, as many businesses failures stem from a lack of awareness of profitability factors [12]. Managerial weaknesses, poor financial decision-making, and inadequate crisis preparedness contribute to these failures, highlighting the importance of understanding the drivers of profitability to prevent financial distress and improve business resilience [13,14]. This study aims to provide empirical insights into these drivers, helping firms implement effective financial strategies. The Department for Business, Energy and Industrial Strategy (DBEI) in the UK has set a 5% annual SME growth target, yet national data shows irregular growth with periods of negative growth, particularly in 2017, 2019, and 2020 [15]. UK energy SMEs including energy sector only exceeded this target in 2013, while other years saw lower or negative growth and the COVID-19 pandemic further exacerbated SME failures, emphasizing the need for improved financial resilience and strategic planning [15].

This study seeks to identify factors affecting SME profitability in the UK energy sector, emphasizing sustainable financial strategies during crises. By examining industry-specific profitability determinants and COVID-19 impacts, the research provides insights for SMEs to enhance financial resilience. Findings will help new startups develop robust business plans and assist policymakers in designing supportive policies for SME sustainability.

A. Research Questions

1. What firm-specific factors influence SMEs profitability in the UK energy sector?

2. What macroeconomic factors affect energy SMEs financial performance?

3. What was the effect of COVID-19 on energy SME profitability?

4. How do firm-specific factors interact with macroeconomic conditions to influence energy SME profitability?

II. LITERATURE REVIEW

A. Introductory Background

The examination of profitability within the energy sector requires a comprehensive understanding of internal and external determinants that influence financial performance. Businesses operating in this industry must strategically manage resources, market positioning, and financial structures to achieve long-term sustainability [16]. As profitability is a crucial indicator of business success, understanding the specific factors that drive profitability enables firms to improve financial efficiency and competitiveness [17]. It is widely recognized that profitability directly impacts stockholder wealth and serves as a primary driver for continued investment [18]. However, limited research specifically addresses the profitability determinants of energy-sector enterprises [18].

B. Determinants of Profitability in the Energy Sector

The financial sustainability of energy-sector enterprises is contingent on both internal firm-specific factors and external macroeconomic influences. Research suggests that companies with strong working capital management, effective liquidity controls, and optimized financial structures tend to experience greater profitability [20]. Empirical studies have demonstrated that factors such as company size, leverage, liquidity, and investment in research and development significantly influence firm profitability [21-22]. Additionally, regulatory and market conditions play a crucial role in shaping business performance and financial outcomes. Considering that effective working capital management (WCM) plays a fundamental role in determining financial stability and profitability. Studies indicate that enterprises that efficiently manage their cash conversion cycles can significantly enhance financial performance [23]. Firms that balance receivables, payables, and inventory turnover cycles tend to experience better liquidity and improved profitability [23-24]. However, excessive working capital investment can lead to financial inefficiencies, highlighting the importance of strategic working capital policies [25]. Furthermore, liquidity management is another critical determinant of profitability in energy enterprises. Firms with insufficient liquidity face heightened insolvency risks, whereas excessive liquidity results in underutilized financial resources, limiting growth potential [26]. Empirical research supports the assertion that maintaining an optimal balance of liquid assets is crucial for ensuring financial stability and operational efficiency [27]. Excessive liquidity may indicate a failure to invest in growth opportunities, while liquidity constraints can hinder operational continuity and expansion efforts [26].

In addition to that, the composition of a firm's capital structure significantly impacts its profitability. Theories such as the trade-off theory, pecking order theory, and agency cost theory provide frameworks for understanding how leverage influences financial performance [28-30]. Research has indicated that moderate debt levels can enhance profitability due to the tax benefits associated with interest payments.

However, excessive leverage increases financial risk and interest costs [31-32]. In the UK energy sector, firms often rely on a combination of debt and equity financing to balance financial stability and growth. On the other hand, external macroeconomic factors, such as GDP growth, inflation rates, and regulatory policies, significantly influence profitability in the energy sector. Studies have shown that stable economic conditions foster business expansion, while economic downturn introduces financial volatility [33]. Energy enterprises operating in highly regulated markets must adapt to evolving policy frameworks and compliance requirements to sustain profitability [34]. Additionally, fluctuating inflation rates impact business costs and pricing strategies, necessitating effective financial planning to mitigate risks [35]. Furthermore, the COVID-19 pandemic has had a profound impact on global economic activities, with energy enterprises facing significant disruptions in demand and supply chains [36]. The UK energy sector witnessed a sharp decline in profitability due to reduced industrial activity and fluctuating energy consumption patterns [37]. Research indicates that enterprises with strong financial resilience, diversified revenue streams, and robust crisis management strategies were better equipped to withstand economic shocks [38]. Post-pandemic recovery efforts have emphasized the need for enhanced digitalization, operational efficiency, and strategic investment to ensure long-term sustainability.

In summary, the literature review highlights the complex interplay between internal financial management practices and external macroeconomic influences in determining profitability within the UK energy sector. Key determinants include working capital management, liquidity, capital structure, macroeconomic stability, and regulatory compliance. Empirical evidence underscores the necessity of strategic financial planning, investment in innovation, and adaptation to economic shifts to sustain long-term profitability. The impact of the COVID-19 pandemic further emphasizes the importance of financial resilience and agility in mitigating economic shocks. This study builds upon existing literature by providing a sector-specific analysis of profitability determinants in UK energy enterprises, contributing valuable insights for policymakers, industry stakeholders, and business owners.

III. Methodology

This research employs a quantitative methodology to examine the profitability determinants of SMEs in the UK energy sector. The study follows an inductive research approach, identifying key factors influencing SME profitability through secondary data analysis. The dataset, covering 120 UK energy SMEs from 2012 to 2021, was obtained from the Bloomberg Financial Database and macroeconomic data from the Bank of England publicly available data.

The research utilizes a panel data regression model to establish the relationship between firm-specific and macroeconomic variables with profitability. A fixed effects model was applied after performing the Hausman test to confirm model suitability. Multiple regression techniques, including ordinary least squares (OLS) and interaction term testing, were used to assess profitability determinants and the impact of the COVID-19 pandemic on energy SMEs. Data was cleaned and processed to ensure robustness, with diagnostic tests such as multicollinearity, heteroscedasticity, and autocorrelation checks performed to validate the regression results.

Financial reports, macroeconomic indicators, and policy documents were analysed to ensure comprehensive coverage. A panel data regression model was used to examine the relationship between firm-specific variables and profitability. The model specification included:

- Dependent Variable ($Profitability_{i,t}$): Profitability measured by return on assets (ROA).
- Independent Variables: Financial variables($\beta_k X_{k,it}$) such as equity, short-term borrowings, working capital, capital expenditure, firm size and macroeconomic factors ($\beta_{macro} X_t$) such as GDP growth, inflation, exchange rates, and energy market trends.

To test the hypotheses developed in this study, the following regression equation was employed:

A. The Key Regression Models Tested in the Research.

$$ROA_{i,t} = \alpha_1 + \beta_k X_{k,it} + \beta_{macro} X_t + \beta_{covid} Covid_t + \varepsilon_{i,t} \quad (1)$$

IV. Findings and Discussion

A. Descriptive Statistics

The summary statistics provide insights into key financial and macroeconomic variables. The average earnings before interest and tax (EBIT) is approximately GBP 0.477 million, with a high standard deviation (SD) of 16.22, suggesting significant variation in firm profitability. SMEs maintain an average of GBP 10.86 million in net working capital (NWC), with a median of GBP 4.78 million, highlighting a skewed distribution. Both long-term (LTB) and short-term borrowings (STB) have close mean values of GBP 5.42 million and GBP 4.86 million, respectively, indicating that SMEs balance their capital financing through similar proportions of debt. The average equity position stands at GBP 25.27 million, with a substantial SD of 40.83, implying a widely dispersed equity distribution among SMEs. The mean total asset value is GBP 54.89 million, which is more than double the average equity value. The mean current ratio is 2.32, indicating that SMEs generally maintain high liquidity, though this could result in idle assets negatively impacting profitability. The average cash conversion cycle (CCC) is 116 days, much higher than the benchmark of 60 days for larger UK firms (Prachi, 2020). This suggests extended stock turnover, longer debtor collection periods, and short creditor payment periods. SMEs allocate minimal resources to R&D (mean equal to GBP 1.27 million), reflecting a limited focus on innovation. Similarly, capital expansion costs remain low at a mean of GBP 1.6 million. The average SME employs 48 individuals, with a relatively low employee turnover rate (mean equal to 0.001), suggesting stability in workforce retention. Macroeconomic indicators such as GDP growth, unemployment rates, inflation, and exchange rates show normally distributed values with stable means and SD. The data indicates a mean value of 0.20 for

COVID-19 impact, suggesting that around 20% of SMEs in the sample were significantly affected. The descriptive statistics analysis highlights significant variations in financial performance, capital structure, and operational efficiency across SMEs. Key takeaways include the high liquidity position of SMEs, prolonged CCCs, limited R&D and capital expenditure investments, and stable employment trends. These insights provide a comprehensive understanding of SME financial and operational characteristics, serving as a valuable foundation for further research.

B. The empirical findings

Table 1: Key findings

Variable	Coefficient and probability
Net working capital	0.305***
Long-term borrowings	-0.584***
Short-term borrowings	0.050
Equity	0.143***
Total assets	-0.037
Current ratio	-0.588***
Cash Conv. Cycle	-0.002
R&D expenses	-0.058
Capital expansion cost	0.790***
Number of employees	-0.010***
Employee turnover	6.844
GDP Growth	1.816**
Inflation	-32.408
Bank rate	-0.021
Unemployment rate	22.163
Covid-19	-1.747**
Constant	-0.6040
Adj R-squared	0.511
Company FE	Yes

Significance levels are indicated by *** p<0.01, ** p<0.05, * p<0.1

The empirical findings based on the fixed effect model estimation highlight several factors significantly impacting UK energy SMEs' profitability. Table 1 provides key insights, showing both firm-specific and macroeconomic factors that have positive and negative influences on energy SME profitability. A highly significant positive relationship (β = 0.305, $p < 0.01$) was found between net working capital and profitability, indicating that increased working capital improves liquidity, leading to enhanced sales and profitability [23,39,40]. Similarly, total equity (β = 0.143, $p < 0.01$) contributes positively to SME profitability, as per ACCA, equity financing lowers financial costs [41]. Capital expansion (β = 0.790, $p < 0.01$) is another major positive factor, emphasizing that investments in fixed assets enhance SME profitability [42]. Furthermore, GDP growth (β = 1.816, $p < 0.05$) significantly enhances SME revenues, aligning with previous research [33].

Conversely, some factors negatively affect SME profitability. Long-term borrowings (β = -0.584, $p < 0.01$) adversely impact profitability due to financial expenses, contradicting the trade-off theory [28]. Similarly, the current ratio (β = -0.588, $p < 0.01$) exhibits a strong negative relationship, suggesting that excessive liquidity leads to inefficiencies, confirming prior research on liquidity-profitability trade-offs [24]. Additionally, the number of employees (β = -0.010, $p < 0.01$) negatively affects profitability, indicating that overstaffing leads to increased labor costs and reduced financial efficiency [43]. The Covid-19 pandemic (β = -1.747, $p < 0.05$) also had a significant negative effect on SME profitability, consistent with findings from Bloom et al. (2021) [44] and the BoE Financial Stability Report (2020) [15].

Several variables showed no significant relationship with SME profitability, including the cash conversion cycle, total assets, R&D expenses, short-term borrowings, employee turnover, inflation, bank rate, and unemployment rate. This aligns with mixed findings in previous literature, indicating that these factors may have context-dependent influences. The full sample analysis covering 120 UK SMEs reinforces these results, with an adjusted R-squared of 0.511, confirming a moderate explanatory power of the model. Table 2 summarizes the relationships and coefficients of significant factors.

Net working capital and profitability are positively linked, as increased investment in working capital enhances liquidity, enabling firms to leverage debtor-creditor relationships and increase profitability [39-40]. In contrast, excessive liquidity results in unproductive assets, affirming the negative profitability impact of the current ratio [40]. Regarding capital structure, equity financing reduces costs and positively impacts profitability, while long-term borrowings increase financial burdens [28,41]. The number of employees negatively correlates with profitability, as overstaffing incurs additional costs, supporting findings by [43,45]. Capital expansion significantly enhances both current operations and future growth potential, suggesting that capital expenditure is a vital driver of SME profitability [42]. GDP growth fosters economic opportunities and business expansion, aligning with competitive strategy theories [33]. Lastly, the Covid-19 pandemic significantly disrupted SME revenues, consistent with global research on pandemic-induced financial disruptions [44].

Table 2: Summary findings

Factors have a significant positive relationship with UK SMEs' profitability	Factors have a significant negative relationship with UK SMEs' profitability	Factors have no significant relationship with UK SMEs
Net working capital Total equity, Capital expansion, GDP growth rate	Long-term borrowings, Current ratio, Number of employees, Covid-19	Cash conversion cycle. Total assets, Inflation R&D, Short-term borrowing, Employee turnover, Bank rate, Unemployment rate

In conclusion, the findings provide critical insights into SME profitability determinants in the UK. While net working capital, equity, capital expansion, and GDP growth positively influence profitability, long-term borrowings, the current ratio, number of employees, and the Covid-19 pandemic have negative effects. The research offers valuable implications for SME financial management, emphasizing optimal liquidity control, strategic workforce planning, and capital structure decisions to enhance profitability.

V. Conclusion and Recommendations

A. Research Questions and Summary of Achievements

SMEs in the energy sector is a crucial pillar of the UK economy, and understanding the factors that influence profitability is vital for the sustainability of these enterprises. This study employs a fixed-effects regression model to assess the impact of various firm-specific and macroeconomic factors on energy SME profitability. The findings confirm the significance of several internal and external factors, including capital structure, liquidity, working capital management, and macroeconomic conditions, such as GDP growth. Moreover, the study highlights the profound effect of the COVID-19 pandemic on SME profitability, both directly and through its interaction with firm-specific characteristics.

B. Firm-Specific Factors Affecting SME Profitability

The research identifies several firm-specific factors that significantly impact profitability. Among these, capital structure plays a pivotal role. Specifically, the study finds that equity financing and short-term borrowings are positively correlated with profitability, while long-term borrowings negatively affect it due to higher interest expenses. SMEs should, therefore, prioritize low-cost financing options, such as equity and STB, over more expensive long-term debt financing.

Investment in working capital is another crucial factor that positively influences profitability. By managing stock levels and extending credit sales, SMEs can enhance competitiveness and sales growth. However, excessive liquidity reflected in a high current ratio was found to be detrimental to profitability, as it leads to idle funds that could be better used for income generation. The study also found that human resource management has a considerable impact on profitability, with an increase in employees being linked to higher salary expenses, which can reduce profitability. In contrast, capital expenditure, such as investments in machinery and market expansion, was found to have a positive impact on profitability by improving sales potential and long-term business opportunities.

C. Macroeconomic Factors Affecting SME Profitability

When examining macroeconomic influences, the study primarily finds that GDP growth has a statistically significant impact on SME profitability. Economic expansion boosts consumer purchasing power, demand, and overall business opportunities, which ultimately enhances profitability. On the other hand, other macroeconomic variables such as the Bank of England base rate, inflation, and unemployment did not have significant effects during the period of study, likely due to their relative stability.

D. Impact of COVID-19 on SME Profitability

The COVID-19 pandemic had a severe adverse effect on the profitability of UK SMEs. Disruptions in supply chains, reduced demand, and increased liquidity requirements significantly hindered business performance during the crisis. This aligns with previous research that has documented the challenges faced by SMEs during the pandemic. The study confirms a significant negative relationship between COVID-19 and SME profitability, underscoring the importance of addressing crisis management for future resilience.

E. Recommendations for SMEs, Startups, and Policymakers

The findings of this study offer several key recommendations aimed at enhancing profitability and ensuring the resilience of SMEs.

For existing energy SMEs, effective financial management is crucial. SMEs should prioritize low-cost financing, like equity and short-term borrowings, and avoid high-cost long-term debt. Maintaining an optimal current ratio is essential to avoid excessive liquidity that can hurt profitability. Increased investment in working capital, along with improved strategies for managing supplier payments, credit facilities, and debtor collections, is recommended. Controlling employee-related costs, such as unnecessary hiring and overtime, can further boost profitability. Additionally, capital expenditure decisions should focus on investments in machinery, market expansion, and product innovation to support long-term profitability.

For policymakers, fostering GDP growth is crucial as it positively impacts SME profitability. They should create an environment that supports SME growth and stability, especially during crises like the COVID-19 pandemic, by prioritizing liquidity financing through government-backed credit schemes and financial relief programs. As profitability drivers vary by industry, policies should be tailored to the specific needs of SMEs in different sectors. Encouraging investment in R&D and innovation will further strengthen the resilience and profitability of energy SMEs. For startups, the focus should be on equity financing in the early stages, avoiding debt until the business is well-established. Implementing strong liquidity and working capital management strategies from the outset is key to long-term sustainability. Reinvesting profits during the early growth phase helps build financial stability and positions the startup for future success.

F. Research Contributions, Future Directions, and Limitations

This study contributes to the limited literature on SME profitability, particularly in the UK energy sector, by identifying key factors that drive profitability. Future research could broaden the scope by examining other industries or investigating the impact of digital transformation and innovation. However, the study's reliance on secondary data and its specific timeframe may limit the generalizability of its findings. Future studies could use more dynamic datasets or include qualitative analyses. Overall, the research highlights the complex relationship between firm-specific and macroeconomic factors influencing SME profitability and offers recommendations to enhance resilience and profitability, especially during economic uncertainty. Policymakers can play a crucial role in creating a supportive environment for SMEs.

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