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Gender and Regional Dynamics in the SME Sector in Bangladesh

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Abstract

Small and Medium Enterprise (SME) sector is not only the most influential contributor to the economy of Bangladesh but also a medium of livelihood for millions of people. Despite the SME sector's central role in economic transformation, the interplay between gender and regional dynamics within entrepreneurial participation remains poorly understood. This study provides the first longitudinal, data-driven analysis of SME engagement across 64 districts and 20 business clusters, based on the SME Foundation database from 2019 to 2024. Employing exploratory analysis, time-series modelling, regression, and hierarchical clustering, the study uncovers distinct spatial inequalities, revealing that economically dominant districts such as Dhaka, Narayanganj, and Rajshahi attract disproportionately high entrepreneurial participation. At the same time, peripheral regions remain marginalized with narrow cluster representation. Gender-based patterns show that women constitute the majority of SME participants (62.6%), yet their dominance is sector-specific and increasingly volatile over time, with a declining trend after 2019 in contrast to a steady rise in male participation. Sectoral decomposition further indicates that female entrepreneurship is concentrated in creative and craft-based clusters, whereas male participation is structurally aligned with technology-driven and engineering domains. Thus, this study recommends regionally tailored, gender-responsive policy interventions to reduce spatial inequities, strengthen entrepreneurial ecosystems, and foster inclusive SME development in Bangladesh.

Keywords: SME Foundation; SME Product Fair; Gender Dynamics; Regional Disparities; Bangladesh

1. Introduction

1.1 SME Sector in Bangladesh

Small and Medium Enterprises (SMEs) are widely recognised as a cornerstone of Bangladesh's economic development, contributing to employment generation,

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industrial diversification, and poverty reduction. SMEs have emerged as a pivotal force in Bangladesh's economic landscape, contributing significantly to its socioeconomic development (Chowdhury et al., 2013). Their sustainable growth is instrumental in alleviating poverty and unemployment (Alauddin & Chowdhury, 2015). Scholars emphasise the crucial role of SMEs in fostering economic independence, particularly for developing nations like Bangladesh. Recognising the efficiency of SMEs, particularly in manufacturing (Hoque, 2017), the Government of Bangladesh has prioritised their development (Hoque, 2018). However, numerous constraints and challenges have hindered their optimal performance and contribution to GDP (Islam & Hossain, 2018; Khan et al., 2012). These challenges have led to the closure of some SMEs, limiting their potential impact (Awang & Hoque, 2017). As highlighted by Ayyagari, Beck, & Demirguc-Kunt (2007), the contribution of SMEs to total employment and GDP is substantial. SMEs are crucial for creating job opportunities and continuing economic progress, particularly in Bangladesh. Abdin (2014) noted the significant contribution of industries, including SMEs, to Bangladesh's GDP, which has been steadily increasing. However, challenges such as unemployment and low productivity in the agricultural sector persist, as discussed by Abdin (2014). Policy support and effective institutional management are essential for the development and growth of SMEs, as argued by Gibb (1993). MacGregor, Bunker, & Kartiwi (2010) highlighted the differing perceptions of e-commerce adoption barriers among SMEs in developed and developing economies.

SMEs are experiencing robust growth, expanding at a rate of approximately 6% or more annually (Hossen & Uddin, 2024). Beyond their direct contributions to the economy, SMEs play a crucial role as a backward linkage industry, supporting larger enterprises by providing essential inputs and services. Recent trends indicate a growing diversity in Bangladesh's entrepreneurship landscape, with individuals of varying genders and geographic backgrounds increasingly choosing SMEs as their primary livelihood (Hossain, Azam, & Hossain, 2023). Another study has investigated the dynamics of SMEs based on the gender of the entrepreneurs (Hoque & Awang, 2019) and their respective locations.

However, despite their recognised importance, the SME sector in Bangladesh is not developing uniformly across regions, nor is its growth experienced equally by male and female entrepreneurs. Existing national strategies and policy discourses tend to treat SMEs as a homogeneous sector, overlooking structural inequalities shaped by geography and gender. As a result, the uneven distribution of opportunities, resources, and market exposure across districts, as well as persistent gendered segmentation in entrepreneurial participation, remains largely unaddressed.

For this, the Small and Medium Enterprise Foundation was established in 2007 under the Companies Act to serve as the central organisation for SME development, capacity building, financing, consulting services and assistance, awareness-raising, evaluation, and representation (Foundation, 2024). The foundation has 11 strategic objectives that support all work plans. The work plans are implemented through 8 sub-divisions. One of the main objectives of all plans is to reflect the government's medium- to long-term strategies. The Small and Medium Enterprise Foundation has served nearly 2 million entrepreneurs directly and indirectly since its inception. Through a total of 4,283 programs, approximately 250,000 entrepreneurs have been directly reached, of whom the majority are women entrepreneurs (about 55%). As the scope of activities has expanded each year, so too has the number of beneficiaries, particularly women entrepreneurs at the grassroots level. To ensure the inclusion of women in all areas, the foundation has implemented specialized training programs for women entrepreneurs, provided financial assistance, launched programs to help women start businesses, improved the quality of women's products, created markets, and facilitated connections to domestic and international markets.

Notably, one of the foundation's largest initiatives is the National SME Product Fair, held annually on a large scale. The SME Foundation has been organising the National SME Product Fair since 2012 to promote, market, sell, and expand the reach of products made by small and medium-sized entrepreneurs (Foundation, 2024). The fair is held at the divisional SME product fairs across the country and at the national level in Dhaka. The Prime Minister of Bangladesh inaugurates the National SME Product Fair and encourages entrepreneurs. Ministers and dignitaries from the Ministry of Industry also attend the fair. Objectives of the SME product fair are as follows:

- To promote, market, sell, and expand the reach of products made by small and medium-sized entrepreneurs at local and international levels.
- To facilitate networking, communication, and bridge-building among SME entrepreneurs.
- To establish connections between consumers and SME entrepreneurs.
- To promote entrepreneur-banker matchmaking (financial literacy and loan assessment).
- To organise seminars and discussion forums to gather creative opinions and suggestions from consumers and various stakeholders regarding product production and service creation.

The eleven fairs held to date, have demonstrated increasing sales and purchase orders year after year, indicating growing demand and acceptance for domestic products among the public. The National SME Entrepreneur Award has become a

source of inspiration for SMEs. The foundation is always aware of the financing challenges in the SME sector and has implemented various programs to address this issue. The foundation was the first in the country to introduce a specialized program called Credit Wholesaling to provide single-digit, collateral-free loans to SMEs, including women entrepreneurs and those in priority sectors across the country.

1.2 Rationale

In the Bangladeshi economy, the SME sector is a major source of employment. The SME sector contributes 25% to the GDP, while in India it is 60%, and in China and Japan it is 50%. According to the SME Policy 2019, the government aims to increase the SME sector's contribution to the economy to 32% by 2024. According to the 2013 Economic Survey conducted by the Statistics Bureau, of the country's 78.13 million economic units, more than 99% are cottage, micro, small, and medium-sized enterprises (CMSMEs). To develop the CMSME sector and enhance the capabilities of the SME Foundation, there is a need for specific budget allocations each year and policy support for the protection of domestic industries. This will undoubtedly contribute to the development of the country's SME sector and the government's development vision. The development programs of the SME Foundation are not limited to the development of a few business establishments in specific geographic areas. Rather, it aims to create local employment opportunities in remote areas of the country, reduce poverty, transform unemployed people into skilled human resources, create dignified job opportunities to meet people's basic needs, build a beautiful future for the next generation, and transform Bangladesh into a developed country by 2041.

In an economy where regional disparities and gender inequality persist, understanding how male and female entrepreneurs navigate these challenges is crucial for crafting policies that promote inclusive growth. The study seeks to answer critical questions: How do regional conditions influence the success of male versus female entrepreneurs? What role do competitive events like SME product fairs play in shaping business trajectories? And how do these factors intersect to either empower or hinder entrepreneurs in different regions? This research is not only timely but also essential for informing policy decisions that can support the sustainable growth of SMEs, ensuring that both male and female entrepreneurs have equal opportunities to thrive, regardless of their geographic location. By illuminating these gender dynamics, the study tries to inform discussions on regional development and gender equality in Bangladesh's SME sector, offering actionable strategies for stakeholders.

1.3 Novelty of this research

This study offers a novel perspective by exploring the under-researched intersections of gender, regional factors, and entrepreneurship within the context of Bangladesh's SME sector. Unlike previous studies that often address gender and regional factors in isolation, this research uniquely combines these dimensions to provide a holistic understanding of how they interact to influence business expansion strategies. Key aspects of the novelty include:

- **Longitudinal Analysis of Gender and Regional Dynamics:** This research employs a longitudinal approach to track changes in business expansion strategies over time, considering both gender and regional factors. This temporal analysis allows for a deeper understanding of how entrepreneurial strategies evolve in response to shifting economic, social, and regional conditions.
- **Intersectional Approach:** By simultaneously examining the roles of gender and regional dynamics, the study offers a more nuanced perspective on the challenges and opportunities faced by entrepreneurs. This intersectional approach is relatively unexplored in the context of Bangladesh's SMEs, making it a novel contribution to the field.
- **Policy-Relevant Insights:** The research is expected to yield actionable recommendations to inform the development of more inclusive and supportive policies for SMEs. By highlighting the specific needs and challenges of male and female entrepreneurs across different regions, the paper will offer novel recommendations for targeted interventions.

1.4 Structure of this study

In Bangladesh, the SME sector continues to experience unequal distribution of entrepreneurial opportunities across both gender and geography. National reports from the SME Foundation indicate that although women constitute a growing proportion of SME beneficiaries, they remain largely concentrated in low-capital and informal sectors due to barriers in mobility, finance, and market access. At the same time, SME activity is heavily concentrated in economically advanced divisional districts such as Dhaka, Rajshahi, and Chattogram, while many peripheral districts exhibit low enterprise density and limited diversification. These persistent disparities reflect the structural reality that SME participation is shaped not only by individual capacity but by gendered norms and uneven regional development conditions (Iglebaek & Matin, 2004). This imbalance highlights the need for systematic research examining how gender and geography intersect to influence entrepreneurial participation, sectoral orientation, and access to institutional support within Bangladesh's SME ecosystem (Zaman & Islam, 2011).

1.5 Limitations of this study

This study was carried out based on the SME database from the annual reports of the official website of the SME Foundation Bangladesh. However, detailed participant information was not available until 2018. Consequently, historical data prior to 2018 could not be included in the analysis. Historical data is crucial for identifying trends and making accurate predictions. Due to this limitation, a comprehensive statistical analysis was not possible, preventing a deeper understanding of SME dynamics and trends.

2. Literature Review

The concepts of gender dynamics and regional dynamics are central to understanding variations in entrepreneurial participation within the SME sector. Gender dynamics refer to how societal norms, roles, and structural barriers shape the opportunities, constraints, and sectoral choices available to male and female entrepreneurs. Prior research in Bangladesh indicates that women entrepreneurs remain disproportionately concentrated in low-capital, craft-based, and home-centered enterprises, while men dominate technologically driven, capital-intensive sectors (e.g., engineering, ICT, manufacturing). This reflects not only differences in resource access but also broader gendered expectations embedded in social, cultural, and institutional settings.

Women entrepreneurs in Bangladesh face unique challenges, as discussed by Parvin and Rahman (2012). The literature on women's entrepreneurship development in Bangladesh identifies major obstacles hindering their progress and emphasises the need for government and financial intermediaries' support. (Nasr & Rostom, 2013) analysed the contributions of SMEs to employment, job creation, and economic growth in the Arab world, while highlighting the key challenges they face. To address the challenges faced by SMEs in Bangladesh, innovative approaches are necessary. Viswanathan & Telukdarie (2021) proposed the use of System Dynamics (SD) modelling to provide strategic business support to small businesses, focusing on skills development and digitalisation through an innovation hub.

In contrast, regional dynamics relate to the spatial distribution of SMEs across districts, shaped by variations in market access, infrastructure, local industrial ecosystems, resource availability, and policy support. Studies on regional entrepreneurship in Bangladesh identify significant spatial inequalities: economically central districts such as Dhaka, Narayanganj, and Chattogram attract a high concentration of SMEs, whereas many northern and southern districts remain peripheral, with weak enterprise density and limited diversification. These

disparities indicate that entrepreneurial success is not only an individual-level outcome, but a geographically conditioned one.

SMEs are vital to alleviating poverty, creating jobs, and fostering sustainable economic growth in developing countries like Bangladesh (Rahman & Khondkar, 2020). Education, particularly in customer care, plays a significant role in enhancing customer satisfaction and improving SME survival (Rahman & Khondkar, 2020). Digitalisation is a key factor influencing SME performance, with resource availability positively correlated with digital adoption (Radicic & Petković, 2023). The COVID-19 pandemic highlighted the need for resilient business models to ensure the survival of SMEs during crises (Lestari et al., 2024). Environmental management practices can also positively impact SME performance, with sustainable practices potentially leading to better financial outcomes (Boakye et al., 2021). Perceptions of business success among SME owners vary across countries, with factors such as market development and financial results being viewed differently (Tehseen et al., 2023). Innovation in SMEs is influenced by internal and external factors, including research and development, collaboration, and location-specific drivers (Hervás-Oliver et al., 2021; Wellalage & Fernandez, 2019). Green entrepreneurial orientation has been shown to positively impact green innovations and sustainable business performance, particularly in industries like automotive parts manufacturing (Ameer & Khan, 2023). Financial inclusion and access to financing are crucial for SME growth (Lu, Wu, & Nguyen, 2022). Industry 4.0 technologies offer opportunities to enhance collaboration among SMEs, with data science platforms proposed to systematise big data and extract valuable information for collaboration solutions (Häring, Pimentel, & Teixeira, 2023). Additionally, the impact of interest rates on loans in the industrial sector, including SMEs, has been examined to assess its influence on total business production in Bangladesh (Chowdhury et al., 2024).

Addressing the multifaceted challenges faced by SMEs in Bangladesh requires a comprehensive understanding. Access to finance is a major obstacle for entrepreneurial firms in emerging markets like Bangladesh (Scheela, Isidro, & Jittrapanun, 2012). Financial sector liberalisation policies have also had a significant impact on SME financial management in countries like Ghana, emphasising the importance of understanding their implications (Tagoe, Nyarko, & Anuwa-Amarh, 2005). Beyond financial challenges, SMEs in Bangladesh face obstacles related to strategic risk management. (Ariful, Tedford, & Haemmerle, 2006) presented a theoretical framework for strategic risk management in SMEs, emphasising the importance of identifying and addressing operational, occupational, and financial risks. (O'Reilly, Kumar, & Adam, 2015) highlighted the role of hierarchical production planning in food manufacturing SMEs, focusing on their readiness to adopt formalised planning approaches.

2.1 Potential research gaps

Although both gender and regional factors have been studied independently, the intersection of these two dimensions remains largely unexplored. Existing research either focuses on women's entrepreneurship without accounting for how outcomes vary by location, or examines regional SME performance without disaggregating by gender. As a result, current literature does not explain how gendered patterns of participation shift across different geographical contexts, nor how spatial inequalities may reinforce or reshape gender-based barriers in entrepreneurship. Moreover, competitive market platforms such as SME Product Fairs, designed to provide equal exposure to entrepreneurs nationwide, have received almost no empirical attention, despite being one of the largest state-supported interventions in SME development. The lack of longitudinal, intersectional analysis leaves a critical gap in understanding how gender and regional conditions jointly influence SME trajectories in Bangladesh, and what policy mechanisms are required to bridge these structural divides.

3. Research Methodology and Data

3.1 Study area and Data collection

This research focuses on entrepreneurs from all 64 districts of Bangladesh who participated in the annual SME fairs organised by the SME Foundation between 2019 and 2024 (inclusive). Data on participating entrepreneurs was obtained from the SME Foundation's official website (https://smef.gov.bd/). Specifically, participant lists were obtained for fairs held between 2019 and 2024, excluding 2023 due to the cancellation of that year's event. The study encompasses data from the 7th SME Product Fair (2019) through the 11th iteration held in 2024.

3.2 Statistical Methods

This research employed three statistical methodologies to explore the dynamics of gender-based regional entrepreneurial activities from 2019 to 2024. Initially, an exploratory data analysis was conducted to ascertain the overall data patterns and distributions. Subsequently, a time-series analysis was performed to identify temporal trends in variables for gender, locations within Bangladesh, and locations in Dhaka. Additionally, a regression analysis was undertaken to examine the relationship between gender and entrepreneurial activities. Finally, hierarchical clustering was applied to identify the most and least prevalent SME businesses using a cluster dendrogram.

4. Analysis and Findings

4.1 Dynamics of SMEs in Bangladesh

4.1.1 SME cluster-based analysis

The dataset provided comprises 1,435 entrepreneurs distributed across 20 business clusters (Figure 1). On average, each cluster hosts approximately 71.75 entrepreneurs. However, the distribution of entrepreneurs across these clusters is highly uneven, leading to a skewed dataset. The median number of entrepreneurs per cluster is 13.5, indicating that half of the clusters have 13.5 or fewer entrepreneurs, while the other half have more. The mode, or the most frequently occurring number of entrepreneurs in a cluster, is 1, which appears in four clusters. This highlights the prevalence of clusters with minimal representation.

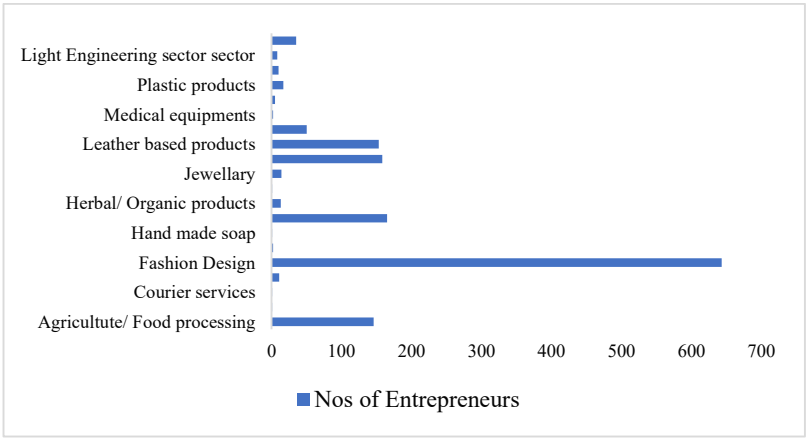


Figure 1. SMEs and their corresponding number of entrepreneurs from 2019 to 2024

The range of the dataset, which measures the difference between the maximum and minimum values, is 642, with the cluster "Fashion Design" having the highest number of entrepreneurs at 643. In contrast, clusters like "Cosmetics," "Courier services," "Hand-made soap," and "Holography" have the lowest representation, each with only one entrepreneur. This vast range further emphasises the skewed nature of the distribution. Notably, the dataset reveals that entrepreneurial activity is concentrated in a few clusters. For instance, "Fashion Design" is the dominant sector with 643 entrepreneurs, followed by "Handicrafts items" with 165 entrepreneurs, "Jute-based products" with 158 entrepreneurs, and "Leather-based products" with 153 entrepreneurs. In contrast, the majority of clusters have significantly fewer entrepreneurs, with many having fewer than 10 participants.

4.1.2 Gender-based analysis

Between 2019 and 2024, the dataset of 1,435 entrepreneurs shows a significant gender disparity. Female entrepreneurs make up the majority, accounting for 62.60% of the total (Figure 2).

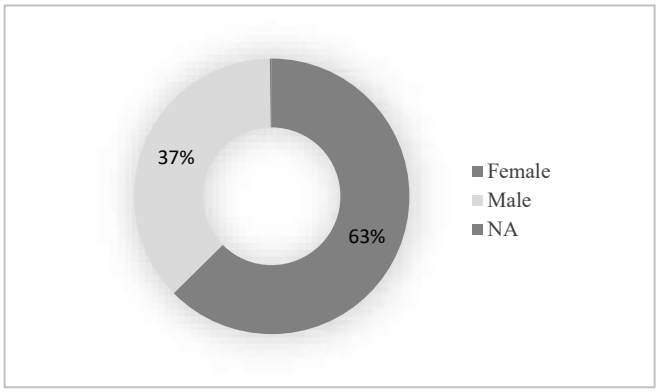


Figure 2. Gender participation in the SMEs from 2019 to 2024

This indicates that 899 of the entrepreneurs are women, highlighting a strong female presence in the entrepreneurial landscape during this period. In contrast, male entrepreneurs constitute 37.20% of the total, which equates to 534 individuals. The remaining 0.20%, or about 2 entrepreneurs, have unreported or unspecified gender data. This distribution accentuates the increasing participation of women in entrepreneurship, which could be reflective of targeted efforts to empower women in business and the growing recognition of female-led enterprises. The data also suggests that male entrepreneurs are less represented compared to their female counterparts, although they still form a significant portion of the entrepreneurial community. The small percentage of non-reported gender data points to the importance of complete data collection for more accurate gender analysis in the future.

4.1.3 Geographical distribution

Figure 3 provides a snapshot of entrepreneurial activity across various districts, highlighting significant regional variations. The analysis reveals that Rajshahi stands out as the district with the highest concentration of entrepreneurs, boasting 72 individuals involved in business activities. Narayanganj follows closely with 47 entrepreneurs, and Jesshore also shows a considerable number with 37. Dhaka has 966 entrepreneurs from 2019 to 2024.

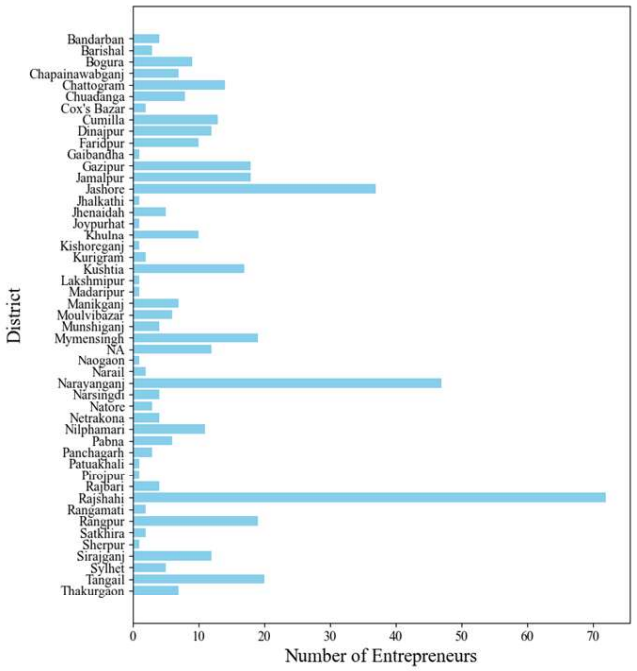


Figure 3. Geographical distribution of the SME entrepreneurs from 2019 to 2024

These figures suggest that these regions are prominent hubs for entrepreneurial endeavours, potentially due to more favourable business conditions or greater economic opportunities. Conversely, several districts report minimal entrepreneurial presence. Gaibandha, Jhalkathi, Joypurhat, Lakshmipur, Madaripur, Kishoreganj, Naogaon, Narail, Patuakhali, Pirojpur, Rangamati, Satkhira, and Sherpur each have only one entrepreneur. This sparse representation suggests that these areas may face challenges such as limited access to resources, lower economic activity, or fewer support structures for startups, hindering entrepreneurial growth.

The dataset also highlights districts with a moderate number of entrepreneurs. Mymensingh and Rangamati, with 19 and 20 entrepreneurs respectively, along with Gazipur and Jamalpur, both hosting 18 entrepreneurs, reflect a balanced level of entrepreneurial activity. These districts might offer a more stable business environment than lower-performing districts, though not at the high levels seen in the leading districts. Geographically, the data suggests notable patterns. Central and northern districts like Rajshahi, Sirajganj, and Bogura exhibit higher entrepreneurial activity, indicating a concentration of business ventures in these regions. On the contrary, the southern districts, including Barishal, Khulna, and Satkhira, show relatively lower numbers of entrepreneurs. This distribution might

point to regional economic disparities or varying levels of entrepreneurial support across different areas.

4.2 Cross-analysis

4.2.1 Gender and SMEs

Figure 4 provides insights into the distribution of entrepreneurs by gender across various business clusters, revealing distinct patterns and trends. In the Fashion Design cluster, there is a clear female dominance, with 531 female entrepreneurs compared to 111 males. This results in a female-to-male ratio of approximately 4.78, highlighting a significant gender skew.

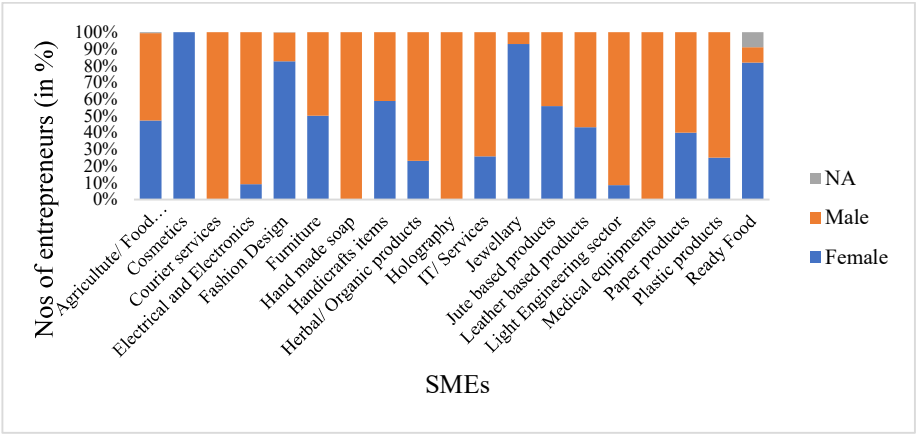


Figure 4. Gender participation in different SMEs from 2019 to 2024

The high female participation suggests that fashion design is a sector where women are particularly active. In contrast, the Light Engineering Sector shows a strong male presence, with only 3 female entrepreneurs out of 50 total, resulting in a male-to-female ratio of about 15.67. This indicates a sector where men are predominantly involved, reflecting broader industry trends where engineering and technical fields are often male-dominated. Similarly, the IT/Services sector also exhibits a male skew, with 26 males compared to 9 females, yielding a male-to-female ratio of 2.89. This suggests a trend in which men are more likely to be involved in technology- and service-oriented fields. Clusters such as Handicrafts Items and Jute-Based Products show a more balanced distribution, but still with a female majority.

In Handicrafts Items, females constitute about 58.8% of the total, with a female-to-male ratio of 1.43. For Jute-Based Products, females make up approximately 55.6% of the total, with a ratio of 1.26. These clusters reflect sectors where women

are more actively engaged but with less pronounced dominance compared to Fashion Design. The Leather-Based Products cluster has a male majority, with 87 male entrepreneurs and 66 female entrepreneurs, resulting in a male-to-female ratio of 1.32. This indicates a slight male dominance in this sector. Conversely, Jewellery and Paper Products display more balanced or slightly skewed gender representation. Jewellery has 13 female and 1 male entrepreneur, and Paper Products has 2 female and 3 male entrepreneurs, reflecting varied levels of gender participation. Clusters like Courier Services, Electrical and Electronics, and Hand-Made Soap show minimal entries or a dominant gender, with few or no female entries in some cases. This suggests that these sectors may be less attractive or accessible to one gender, potentially due to industry norms or barriers.

4.2.2 Geographical locations and Gender

Figure 5 provides valuable insights into the distribution of female and male entrepreneurs across various districts, revealing distinct geographical and gender-based patterns. In major urban centres, such as Dhaka, the distribution of entrepreneurs is notably high, with 562 females and 401 males. This reflects Dhaka's status as a significant economic hub, with a relatively balanced gender representation in the entrepreneurial landscape, as evidenced by a male-to-female ratio of approximately 0.71. Chattogram also shows substantial entrepreneurial activity with 5 females and 9 males. However, the male-to-female ratio in Chattogram is 1.80, indicating a higher presence of males compared to females. This trend suggests that, despite the city's economic importance, male dominance persists in certain sectors.

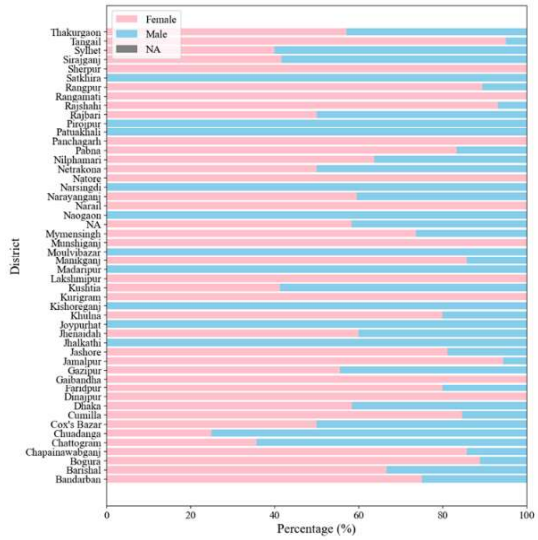


Figure 5. Geographical locations and their corresponding gender participation from 2019 to 2024

In contrast, smaller, rural districts like Bandarban and Cox's Bazar have lower numbers of entrepreneurs, with Bandarban reporting 3 females and 1 male, and Cox's Bazar reporting 1 female and 1 male. These figures highlight a more limited entrepreneurial activity in these areas, potentially due to geographic or economic constraints. Some districts exhibit a balanced gender distribution. For example, Netrakona has 2 females and 2 males, demonstrating an equal representation of entrepreneurs. Similarly, Narail has 2 females and no males, suggesting a slight female dominance despite the small sample size. However, certain districts show notable gender imbalances.

Moulvibazar, with 6 males and no females, and Sirajganj, with 5 females and 7 males, reflect areas where one gender predominates. In Moulvibazar, the absence of female entrepreneurs indicates a significant gender disparity, while Sirajganj shows a slight male dominance with a male-to-female ratio of 1.40. Moderate representation is observed in districts like Kushtia and Sylhet. Kushtia has 7 females and 10 males, resulting in a male-to-female ratio of 1.43, while Sylhet shows 2 females and 3 males, with a ratio of 1.50. These districts exhibit a moderate male predominance, but not to the extent of the more skewed regions. The dataset also includes entries labelled NA, which indicate 7 females and 5 males. These unspecified entries suggest minor issues in data classification or reporting, though they do not significantly impact the overall gender distribution analysis.

4.2.3 SMEs and geographical locations

Figure 6 illustrates a cluster dendrogram where length of the branches Figure 6 illustrates a cluster dendrogram in which the branch lengths (shown on the horizontal axis) correspond to the "distance" or dissimilarity between the clusters, which in this context is based on the difference in the number of entrepreneurs. Locations with similar entrepreneurial activity are grouped into clusters, with shorter branches indicating closer similarity.

- *Blue Cluster (Distinct Urban Districts)*

Dhaka, Narayanganj, and Gazipur form a distinct cluster, characterised by a long horizontal distance from the other districts. This separation suggests that these areas have significantly different economic or entrepreneurial profiles. Dhaka, being the capital, is the economic and administrative hub of the country, with a high concentration of businesses, infrastructure, and resources. Narayanganj and Gazipur are adjacent to Dhaka and are also highly industrialised, with numerous factories and commercial activities. The distinct clustering reflects their urban nature, advanced economic development, and possibly a higher number of entrepreneurs compared to other regions.

- *Orange Cluster (Broadly Similar Districts)*

Jhalkathi, Gaibandha, Patuakhali, Narail, Netrakona, Madaripur, Kishoreganj, Rangamati, Kurigram, Pirojpur, Joypurhat, Sherpur, Panchagarh, Munshiganj, Pabna, Chapainawabganj, Satkhira, Rajbari, and Lakshmipur are grouped very closely within the dendrogram, indicating a high level of similarity in their economic or entrepreneurial characteristics. Many of these districts are primarily rural or semi-urban, with lower levels of industrial development compared to urban centres. The close clustering suggests that these regions share similar economic conditions, such as limited access to capital, markets, or infrastructure. These shared conditions might contribute to similar levels of entrepreneurial activity, reflecting broader regional trends and challenges.

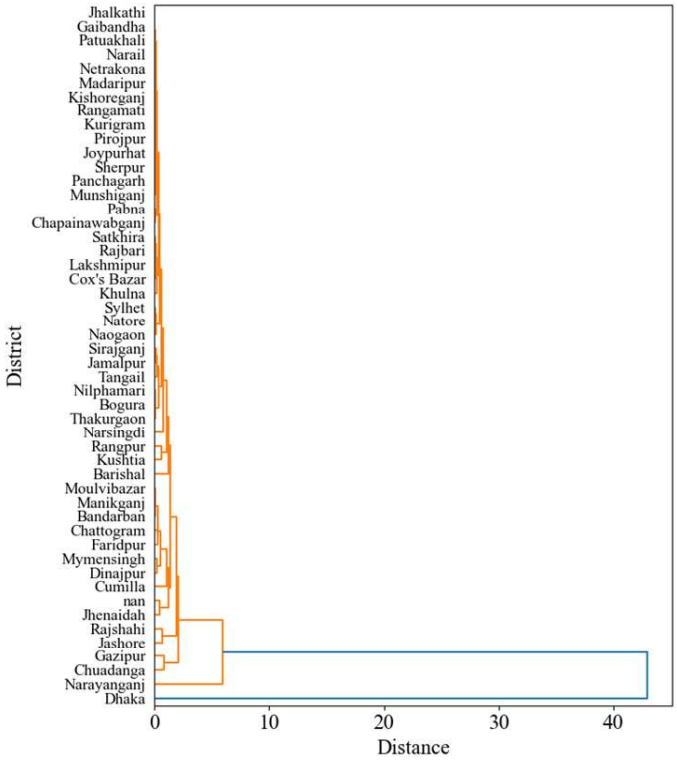


Figure 6. Cluster analysis for different districts based on the number of entrepreneurs from 2019 to 2024

Cox's Bazar, Khulna, Sylhet, Natore, Naogaon, Sirajganj, Jamalpur, Tangail, Nilphamari, Bogura, Thakurgaon, Narsingdi, Rangpur, Kushtia, Barishal form a subgroup which is somewhat more varied but still reflects significant similarity within the orange cluster. Districts in this subgroup, such as Cox's Bazar (known for tourism) and Sylhet (influenced by remittances), have unique economic activities. However, their inclusion in this cluster suggests that, despite some diversity, they share comparable levels of entrepreneurial activity or other socioeconomic factors with the rest of the group. This indicates a balance between unique local industries and broader regional economic characteristics.

Moreover, Moulvibazar, Manikganj, Bandarban, Chattogram, Fardipur, Mymensingh, Dinajpur, Cumilla, Feni, Jashore, Jhenaidah, and Rajshahi form another closely related cluster within the orange group. This subgroup includes a mix of economically diverse regions. For instance, Chattogram (Chittagong) is a major port and commercial city, while Bandarban is known for its tourism. Despite these distinctions, the clustering suggests that entrepreneurial activity in these districts is similar to that in other districts in the group, potentially due to common factors such as regional infrastructure or market access. Rajshahi, Jashore, and Chuadanga are somewhat distinct but still fall within the broader orange cluster. Rajshahi, known for its agricultural productivity, and Jashore, a key commercial hub, are economically significant. Their positioning within the dendrogram reflects a degree of similarity with other rural or semi-urban districts, indicating that, despite their unique industries, their overall economic or entrepreneurial activity aligns with broader regional patterns.

4.3 Trend Analysis

4.3.1 Gender-based participation

From 2012 to 2024, the total number of participants increased consistently, growing from 85 in 2012 to 277 in 2024. This upward trend highlights a general rise in engagement over time. The R-squared value of approximately 0.82 indicates a strong correlation between the year and the total number of participants. This high value suggests that 82% of the variability in total participation can be explained by changes over time, highlighting a robust and consistent trend in participation.

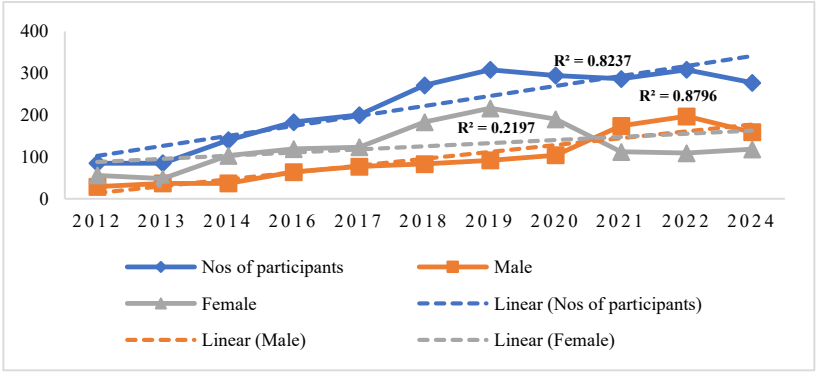


Figure 7. Trend of participation from 2012 to 2024

Specifically, male participation saw a significant and steady increase from 29 in 2012 to 159 in 2024. The growth in male participation is evident, with a notable peak of 197 males in 2022. The R-squared value for male participation, approximately 0.88, suggests a strong correlation between the year and the number of male participants. This high R-squared value indicates that 88% of the variability in male participation can be attributed to changes over time, reflecting a robust and consistent trend in male involvement. Female participation also showed an overall upward trend, rising from 56 in 2012 to 118 in 2024. Despite this general increase, female participation peaked at 216 in 2019 before experiencing a decline in the following years. The R-squared value for female participation is about 0.23, suggesting a moderate correlation with the year. This value indicates that 23% of the variance in female participation can be explained by year, suggesting a significant but less consistent relationship than for males. The decline in female participation in recent years, despite the overall growth in total participants, points to possible external factors affecting female engagement.

In detail, from 2012 to 2014, participation among both males and females increased, with the total number of participants rising from 85 to 140. The period from 2014 to 2018 saw a substantial rise in total participants, from 140 to 271, with female participation growing more rapidly than male participation. However, the growth in female participation, although significant, did not match the pace of male growth. From 2018 to 2022, total participation peaked at 308 in 2019 before declining to 277 in 2024. During this time, while male participation continued to rise, female participation peaked in 2019 and then declined, reflecting a shift in gender dynamics.

4.3.2 Development of SME clusters

1. Overview of Data Trends

Figure 8 reveals the evolution of SME cluster participation from 2019 to 2024. In 2019, the total number of participants was 257. This figure rose to 292 in 2020, representing a 13.6% increase. However, this positive trend was followed by a decrease in 2021, with total participants falling to 221, a decline of 24.3%.

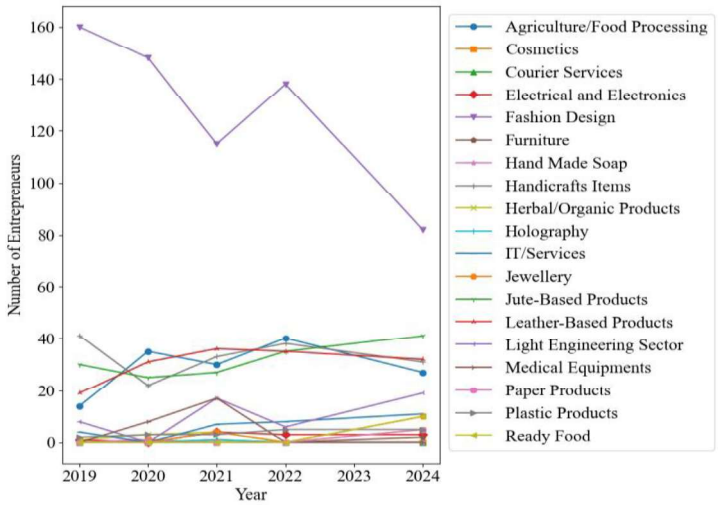


Figure 8. Trend of SMEs based on the number of entrepreneurs from 2019 to 2024

The numbers remained relatively stable in 2022 at 220 but dropped significantly to 168 in 2024, a 23.6% decline from 2022. This trend indicates fluctuations in overall engagement, with a notable decline in recent years. Table 1 explains Figure 8 for each SME category.

Table 1. Trend of the SMEs from 2019 to 2024

Trend	Category	Trend Description
Increasing Trends	Agriculture/Food Processing	Consistent increase from 14 in 2019 to 27 in 2024, reflecting growing interest or investment in this sector.
	Herbal/Organic Products	Positive trend, increasing from 1 in 2019 to 5 in 2024, indicating rising demand for natural and organic products.
	IT/Services	Steady increase from 4 in 2019 to 11 in 2024, highlighting a growing emphasis on technology and digital services.
	Jewellery	Increased from 0 in 2019 to 10 in 2024, showing heightened market activity in this sector.
	Jute-Based Products	Upward trend, increasing from 30 in 2019 to 41 in 2024, suggesting sustained or growing interest in jute products.
	Leather-Based Products	Increased from 19 in 2019 to 32 in 2024, indicating growth in this sector.

Trend	Category	Trend Description
	Plastic Products	Slight increase from 2 in 2019 to 5 in 2024, suggesting modest growth in this sector.
	Ready Food	Notable increase from 0 in 2019 to 10 in 2024, reflecting growing market demand for ready-to-eat food items.
Decreasing Trends	Fashion Design	Significant decline from 160 in 2019 to 82 in 2024, indicating reduced focus or market activity.
	Furniture	Minimal presence with a decrease from 0 in 2019 to 2 in 2024, suggesting limited growth or interest.
	Medical Equipment	Brief increase in 2021, but downward trend with a return to 0 in 2024, reflecting reduced market or production activities.
Stable or Mixed Trends	Cosmetics	Remained mostly at 0 with a slight increase in 2020, indicating minimal activity or growth.
	Courier Services	Consistently low with a slight increase in 2021, showing limited market expansion.
	Electrical and Electronics	Shows minimal changes with a slight presence, indicating a relatively stable market.
	Handicrafts Items	Fluctuated slightly but remained stable, suggesting consistent interest in handicrafts.
	Holography	Very minimal presence, indicating a niche market.
	Paper Products	Slight increase to 5 in 2024, reflecting a minor growth trend.
	Light Engineering Sector	Varied trend with an initial increase but a significant drop to 0 in 2024, indicating possible sectoral shifts or declines.

5. Interpretation of the key findings of this study

The analysis reveals several key insights into SME participation and the factors influencing it. Geographical disparities are prominent, with major economic hubs like Dhaka and Narayanganj displaying high engagement across various sectors, whereas less prominent districts show lower and more specialised SME activity. This suggests that the level of economic infrastructure and local market dynamics significantly influences regional SME participation. Areas with robust economic support systems tend to attract more diverse and active SME engagement compared to regions with limited resources. Temporal fluctuations in participation are evident from the data, with a noticeable peak in engagement in 2019 and 2020 followed by a decline towards 2024. These fluctuations reflect changes in overall participation levels, likely influenced by external factors such as economic conditions, policy changes, or shifts in market demand. The decrease in total participants in recent years indicates a possible reduction in engagement or market saturation.

Sector-specific engagement also varies significantly over time. Clusters like Fashion Design and Agriculture/Food Processing have shown consistent high engagement, although recent years have seen a decline, particularly in the Fashion

Design sector. This suggests that certain sectors may be experiencing saturation or evolving market conditions that affect participation levels. The steady presence of some sectors, despite overall fluctuations, highlights the persistence of key industries in the SME landscape. Gender distribution trends reveal that female participants generally outnumber male participants, although this balance fluctuates from year to year. For example, 2021 saw a significant increase in male participants, indicating dynamic shifts in gender engagement. These variations point to changing gender dynamics in SME participation and underscore the importance of ongoing analysis to understand the underlying factors influencing these trends.

Competitive events such as SME product fairs play a crucial role in shaping business trajectories. These events provide essential exposure and networking opportunities, enabling entrepreneurs to showcase their products, connect with potential customers, and receive valuable feedback. For female entrepreneurs, these fairs offer a platform to overcome traditional barriers and gain market visibility, which can significantly impact their business success. However, the effectiveness of these events may vary based on regional support structures and market conditions.

The intersection of regional conditions and gender dynamics reveals that supportive environments can enhance opportunities for both male and female entrepreneurs, while less favourable conditions can exacerbate challenges, particularly for women. Regions with strong economic infrastructure and support systems are better positioned to offer equitable opportunities, whereas areas with fewer resources may see more pronounced disparities. This highlights the need for targeted policies and interventions to ensure fair access and success for entrepreneurs across different regions and genders.

6. Conclusion: Recommendations and Policy Implications

This study makes a substantial contribution to understanding the interaction between gender and regional dynamics in Bangladesh's SME sector. By integrating both gender and geographic factors, it provides a nuanced perspective on how these dimensions jointly shape entrepreneurial behaviour, participation, and expansion strategies. Unlike prior research, which often examines gender or location independently, this study's longitudinal approach captures temporal changes over six years, revealing previously undocumented trends and shifts in SME activity. Additionally, the focus on SME product fairs as growth platforms offers novel insights into how such events facilitate networking, market exposure, and capacity building, particularly for female entrepreneurs who often face structural barriers. Through robust data analysis, the study also identifies regional disparities and

sectoral clustering, providing empirical evidence that can guide targeted interventions.

The implications of these findings are significant for policymakers, development practitioners, and SME stakeholders. Regionally tailored and gender-responsive strategies are essential to address the inequalities highlighted in this study. For instance, female entrepreneurs in male-dominated sectors require specific support to overcome barriers related to access to finance, technology, and market linkages, while peripheral regions with low SME participation need infrastructure development and resource allocation. Moreover, by highlighting the role of SME fairs in promoting business growth, the paper suggests that such platforms can serve as practical tools for policy implementation and entrepreneurial development. The analytical insights also emphasise the need for evidence-based decision-making, highlighting areas where interventions can most effectively enhance SME sustainability and inclusivity.

Based on these contributions and implications, several actionable recommendations emerge. First, targeted regional interventions should be prioritised, focusing on districts with low SME activity through financial incentives, skill development, and infrastructure support. Second, gender-sensitive measures are necessary to empower female entrepreneurs and reduce occupational segregation across sectors. Third, expansion and accessibility of SME fairs and market platforms can provide equal opportunities for entrepreneurs from diverse backgrounds, fostering collaboration and knowledge sharing. Finally, the establishment of a comprehensive SME database and ongoing monitoring mechanisms is recommended to track performance, evaluate policy effectiveness, and inform future strategies. Collectively, these recommendations aim to strengthen SME development, promote equitable growth, and ensure that both gender and regional disparities are systematically addressed.

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Contribution of the authors
The conceptual framework, theoretical underpinnings, and research design were developed by Khuku and Saleh. Saleh collected data from the SME Foundation's website and prepared it for analysis. Saleh and Khuku conducted the statistical analysis using Python and jointly interpreted the results, offering significant recommendations and discussions. Saleh supervised the entire study, providing

guidance and conducting multiple evaluations to enhance the scholarly quality of the final paper.

Declaration of the conflict of interest
We declare that the research presented in this manuscript was conducted with the utmost transparency and integrity, free from any conflicts of interest. At no time during the study or at the time of submission were there any financial, professional, or personal relationships that could have influenced the findings or their interpretation. The research was conducted in accordance with the highest ethical standards.

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Data availability
The analysis relied on publicly available data from the SME Foundation's website. The data was extracted and organised prior to analysis. This dataset can be provided upon request.

Declaration of Generative AI and AI-assisted Technologies in the Writing Process
During the preparation of this manuscript, the author(s) used [Chat GPT] to assist in improving language clarity and grammar. The author(s) reviewed, edited, and revised the content. All ideas, analysis, and conclusions are entirely the author's own, and the author(s) take full responsibility for the integrity and accuracy of the manuscript.

References

Abdin, M. J. (2014, Novemver 22). Transformation of Bangladesh economy: Problems and prospects. The Financial Express. https://doi.org/10.2139/ssrn.2530337

Alauddin, M., & Chowdhury, M. (2015). Small and medium enterprise in Bangladesh - Prospects and challenges. Global Journal of Management and Business Research, 15(7), 1-9.

Ameer, F., & Khan, N. R. (2023). Green entrepreneurial orientation and corporate environmental performance: A systematic literature review. European Management Journal, 41(5), 755–778. https://doi.org/10.1016/j.emj.2022.04.003

Ariful, I. M., Tedford, J. D., & Haemmerle, E. (2006, June). Strategic Risk Management Approach for Small and Medium-Sized Manufacturing Enterprises (SMEs)--- A Theoretical Framework. In 2006 IEEE International Conference on Management of Innovation and Technology, 2, 694–698. https://doi.org/10.1109/ICMIT.2006.262309

Awang, Z., & Hoque, A. S. M. M. (2017). Social Business Efficiency: Instrument Development and Validation Procedure using Structural Equation Modeling. International Business Management, 11(1), 222–231.

Ayyagari, M., Beck, T., & Demirguc-Kunt, A. (2007). Small and medium enterprises across the globe. Small Business Economics, 29(4), 415–434. https://doi.org/10.1007/s11187-006-9002-5

Khalily, M. B., Uddin, M. J., & Tareq, M. (2020). Development of SMEs in Bangladesh: Lessons from the German experience. Friedrich-Ebert-Stiftung (FES) Bangladesh. https://library.fes.de/pdf-files/bueros/bangladesch/17895.pdf

Boakye, D. J., Tingbani, I., Ahinful, G. S., & Nsor-Ambala, R. (2021). The relationship between environmental management performance and financial performance of firms listed in the Alternative Investment Market (AIM) in the UK. Journal of Cleaner Production, 278, 124034. https://doi.org/https://doi.org/10.1016/j.jclepro.2020.124034

Chowdhury, A., Ratna, T. S., Akhter, T., & Hossain, S. F. A. (2024). Rise of inflation and formation of interest rate on loans in industrial sector: A VECM approach to assess the impact on total industrial production from evidence of Bangladesh. Heliyon, 10(3), e24976. https://doi.org/https://doi.org/10.1016/j.heliyon.2024.e24976

Chowdhury, M. S. A., Azam, M. K. G., & Islam, S. (2013). Problems and prospects of SME financing in Bangladesh. Asian Business Review, 2(2 SE-Articles), 109–116. https://doi.org/10.18034/abr.v2i2.111

Foundation, S. (2024). 15 Years of SME Foundation's journey of progress. SME Foundation. https://smef.gov.bd/

Gibb, A. A. (1993). Key factors in the design of policy support for the small and medium enterprise (SME) development process: An overview. Entrepreneurship &

Regional Development, 5(1), 1–24. https://doi.org/10.1080/08985629300000001

Häring, K., Pimentel, C., & Teixeira, L. (2023). Industry 4.0 Implementation in Small- and Medium-Sized Enterprises: Recommendations extracted from a systematic literature review with a focus on maturity models. Logistics, 7(4), 99. https://doi.org/10.3390/logistics7040099

Hervás-Oliver, J.-L., Parrilli, M. D., Rodríguez-Pose, A., & Sempere-Ripoll, F. (2021). The drivers of SME innovation in the regions of the EU. Research Policy, 50(9), 104316. https://doi.org/https://doi.org/10.1016/j.respol.2021.104316

Hoque, A. S. M. M. (2017). Corporate entrepreneurship upshot on innovation performance: The mediation of employee engagement. Journal of Humanities, Language, Culture and Business, 1(6), 54–67.

Hoque, A. S. M. M. (2018). Does government support policy moderate the relationship between entrepreneurial orientation and Bangladeshi SME performance? A SEM approach. International Journal of Business Economics and Management Studies, 6(3), 37–59.

Hoque, A. S. M. M., & Awang, Z. (2019). Does gender difference play moderating role in the relationship between entrepreneurial marketing and Bangladeshi SME performance? Accounting, 5, 35–52. https://doi.org/10.5267/j.ac.2018.6.001

Hossen, A., & Uddin, M. M. (2024, May 17). A brief overview of SMEs in Bangladesh: Challenges and the way forward. Friedrich Naumann Foundation. https://www.freiheit.org/bangladesh/brief-overview-smes-bangladesh-challenges-and-way-forward

Hossain, M., Azam, M., & Hossain, M. S. (2023). Understanding the concept of SMEs in driving economic growth and development in Bangladesh. International Journal of Finance, Economics and Business, 2(3), 195–204. https://doi.org/10.56225/ijfeb.v2i3.147

Iglebaek, M., & Matin, I. (2004). Eighteen months of operation: Exploring geographical poverty outreach and employment creation of BRAC Bank SME Unit. (Issue March). https://bigd.bracu.ac.bd/wp-content/uploads/2020/03/Eighteen-months-of-operation_Exploring-geographical-poverty-outreach-and-employment-creation-of-BRAC-Bank-SME-Unit.pdf

Islam, S., & Hossain, F. (2018). Constraints to small and medium-sized enterprises development in Bangladesh: Results from a cross-sectional study. The European Journal of Applied Economics, 15(2), 58–73. https://doi.org/10.5937/ejae15-17015

Khan, J. H., Nazmul, A. K., Hossain, M. F., & Rahmatullah, M. (2012). Perception of SME growth constraints in Bangladesh: An empirical examination from institutional perspective. European Journal of Business and Management, 4(7), 256-27

Lestari, E. D., Abd Hamid, N., Shamsuddin, R., Kurniasari, F., & Yaacob, Z. (2024). Investigating the factors of SMEs' business resilience in the post-pandemic crisis of COVID-19 with technology adoption as a quasi-moderator: A multigroup

analysis of Indonesian and Malaysian SMEs. Cogent Business & Management, 11(1), 2301135. https://doi.org/10.1080/23311975.2023.2301135

Lu, Z., Wu, J., Li, H., & Nguyen, D. K. (2022). Local bank, digital financial inclusion and SME financing constraints: Empirical evidence from China. Emerging Markets Finance and Trade, 58(6), 1712–1725. https://doi.org/10.1080/1540496X.2021.1923477

MacGregor, R. C., Bunker, D., & Kartiwi, M. (2010). The perception of barriers to E-commerce adoption by SMEs: A comparison of three countries. In Global Perspectives on Small and Medium Enterprises and Strategic Information Systems: International Approaches (pp. 145–168). https://doi.org/10.4018/978-1-61520-627-8.ch008

Nasr, S., & Rostom, A. M. (2013). SME contributions to employment, job creation, and growth in the Arab world. SSRN Electronic Journal, October. https://doi.org/10.2139/ssrn.2361164

O'Reilly, S., Kumar, A., & Adam, F. (2015). The role of hierarchical production planning in food manufacturing SMEs. International Journal of Operations & Production Management, 35(10), 1362–1385. https://doi.org/10.1108/IJOPM-04-2014-0157

Parvin, L., & Rahman, W. (2012). Determinates of women micro-entrepreneurship development: An empirical investigation in rural Bangladesh. International Journal of Economics and Finance, 4(5), 254–260. https://doi.org/10.5539/ijef.v4n5p254

Radicic, D., & Petković, S. (2023). Impact of digitalization on technological innovations in small and medium-sized enterprises (SMEs). Technological Forecasting and Social Change, 191, 122474. https://doi.org/https://doi.org/10.1016/j.techfore.2023.122474

Rahman, M., & Khondkar, M. (2020). Small and medium enterprises (SME) development and economic growth of Bangladesh: A narrative of the glorious 50 Years. Barishal University Journal of Business Studies, 7(1), 9–24.

Scheela, W., Isidro, E., & Jittrapanun, T. (2012). Private equity in Southeast Asian emerging economies: An institutional perspective. In D. Klonowski (Ed.), Private Equity in Emerging Markets (pp. 163–172). Palgrave Macmillan US. https://doi.org/10.1057/9781137309433_15

Tagoe, N., Nyarko, E., & Anuwa-Amarh, E. (2005). Financial challenges facing urban SMEs under financial sector liberalization in Ghana. Journal of Small Business Management, 43(3), 331–343. https://doi.org/10.1111/j.1540-627X.2005.00140.x

Tehseen, S., Johara, F., Halbusi, H. Al, Islam, M. A., & Fattah, F. A. M. A. (2023). Measuring dimensions of perceived business success among Malaysian and Bangladeshi SME owners. Rajagiri Management Journal, 17(2), 102–124. https://doi.org/10.1108/RAMJ-05-2021-0045

Viswanathan, R., & Telukdarie, A. (2021). A systems dynamics approach to SME digitalization. Procedia Computer Science, 180, 816–824. https://doi.org/https://doi.org/10.1016/j.procs.2021.01.331

Wellalage, N. H., & Fernandez, V. (2019). Innovation and SME finance: Evidence from developing countries. International Review of Financial Analysis, 66, 101370. https://doi.org/https://doi.org/10.1016/j.irfa.2019.06.009

Zaman, A. K. M. H. uz, & Islam, M. J. (2011). Small and medium enterprises development in Bangladesh: Problems and prospects. SA University Review, 5(1), 145–160.