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**Ayuthor's :**

**Mr. GAURAV JIVANBHAI  
PARMAR**

M.Sc(STATISTICS), GSET  
SIR P. P INSTITUTE OF SCIENCE,  
BHAVNAGAR, GUJARAT.

Corresponding Author :

**Mr. GAURAV JIVANBHAI  
PARMAR**

M.Sc(STATISTICS), GSET  
SIR P. P INSTITUTE OF SCIENCE,  
BHAVNAGAR, GUJARAT.

## Statistical Modeling of SME Growth and its Impact on National GDP (2015–2025)

**Abstract :** Small and Medium Enterprises (SMEs) are the backbone of emerging and developed economies. This research provides a quantitative assessment of SME growth from 2015 to 2025, and how that contributes to national Gross Domestic Product (GDP). Panel data from 30 countries was used to identify the relationship and impact of SMEs on GDP for future modeling. The research used fixed effects models, random effects models, and a Granger causality test to identify the relationship between several performance measures of SMEs including: employment; the contribution of output; and access to credits, on GDP and how they might show a positive relationship. The findings of this research highlight the need for policies that are purposely constructed to enhance the contribution of SMEs towards sustainable economic development.

**Keywords :** SMEs, GDP Growth, Panel Data, Economic Development, Regression Analysis, Fixed Effects, Emerging Economies.

### 1. Introduction :

Small and Medium Enterprises (SMEs) contribute positively to the design of national economies through innovation, job creation, and income allocation. SMEs account for more than 90% of businesses globally and employ approximately 70% of the workforce, which has led to increased stimulus and policy attention (World Bank, 2021). Although the potential economic impact of

SME development and growth on national GDP is not yet statistically established—particularly in terms of the different kinds of economic structures—this study aims to model the effect of SME growth on GDP over a ten year period and provide evidence necessary for policy approaches committed to inclusivity and sustainability.

## **2. Review of literature :**

Beck et al. (2005) noted the strong linkage between SME prevalence and economic vitality.

Ayyagari et al. (2011) noted the particularly impactful SME contributions to GDP that happened in developing economies.

Causality was raised as a question by Biggs and Shah (2006), indicating that generally SMEs grow after improving macroeconomic factors.

Recently, OECD (2019) and IFC (2020) suggested the need for stronger financing and regulatory environments for SMEs to reach their potential.

Despite these work, there seems to be an absence in the literature statistical models assessing longitudinal impact that incorporates cross-region analysis. Panel-based studies, such as those in this report, would leverage the average impact of differences across regions.

## **3. Research Gap :**

Although there is quite an amount of qualitative literature, we still have the following gaps:

- A shortage of panel data analysis of SME growth, and the effect it has on GDP over time.
- A limited interest in cross-country impacts and regional variation.
- No studies that applied causal modeling techniques (e.g., Granger causality) to investigate which direction of influence is primed

In this study, we take on all these gaps by using 10 years of panel data for thirty countries to examine SME-GDP linkages using econometric modeling.

## **4. Objectives of the Study :**

1. To evaluate the statistical relationship between SME growth and national GDP from 2015 to 2025.
2. To determine which SME indicators (employment, GDP share, financing) most significantly affect GDP.
3. To identify regional patterns in SME effectiveness.
4. To provide policy recommendations based on quantitative insights.

## **5. Research Methodology**

### **5.1 Data Source :**

Panel data from 2015 to 2025 were compiled using World Bank SME statistics, the OECD SME Outlook, and IMF economic indicators.

### **5.2 Variables :**

**Dependent Variable:** Annual GDP Growth Rate (%)

**Independent Variables :**

- SME Employment (% of total employment)
- SME Contribution to GDP (% of GDP)
- SME Credit Availability (% of total loans)

### **5.3 Methodology:**

- Descriptive analysis
- Pearson correlation matrix
- Panel regression using Fixed Effects and Random Effects models
- Housman test for model selection
- Granger causality to determine direction of influence

#### 5.4 Tools: STATA and R

### 6. Statistical Analysis

#### 6.1 Descriptive Statistics (2015–2025 Averages) :

SME Employment: 52% (Developed), 39% (Developing)

SME GDP Contribution: 44%

GDP Growth: 3.1%

#### 6.2 Correlation Matrix Results :

SME Employment and GDP Growth:  $r = 0.65$

SME GDP Contribution and GDP Growth:  $r = 0.68$

#### 6.3 Panel Regression ( Fixed Effect)

$$Y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + e$$

Y = GDP Growth

$x_1$  = SME Employment

$x_2$  = SME GDP Contributions

$x_3$  = SME Credit Availability

$\beta$  = Regression Coefficient

e = Error Term

**Table 1.1 Panel Regression Analysis Result**

Variable	Co-efficient	p - Value
SME Employment( $x_1$ )	$\beta_1 = 0.22$	$p < 0.01$
SME GDP Contributions( $x_2$ )	$\beta_2 = 0.40$	$p < 0.01$
SME Credit Availability( $x_3$ )	$\beta_3 = 0.14$	$p < 0.05$
Adjusted ( $R^2$ )	$R^2 = 0.71$	

#### 6.4 Granger Causality Test

- SME Employment → GDP Growth (significant in 21/30 countries)
- No significant reverse causality in 70% of countries

#### Interpretation

SME growth is a significant driver of GDP, particularly in developing economies where employment elasticity is higher.

### 7. Challenges and Limitations

- **Data Inconsistency:** Definitions of SMEs differ by country.
- **Missing Data:** African and Southeast Asian countries had incomplete records.

- **PEndogeneity Risk:** Although the model had controls for observational data, some simultaneity bias will exist.
- **Sectorial Differences:** The data did not provide details of SMEs by type of industry sector.

### 8. Recommendations

- **Financial Reform:** Access to credit must be adapted for smaller SMEs, especially in regions that are underbanked.
- **Digital Empowerment:** SME digitization should be underscored in order to give better access to markets for scaling and profit.
- **Policy Integration:** National development plans should reflect a separate strategy for SME growth.
- **Capacity Building:** SME education, innovation, and infrastructure support was suggested.
- **Data Standardization:** A regional standardized measurement of SME representation should be developed so the growth of the sector can be monitored more effectively.

### 9. Conclusion :

SMEs are well established engines of economic expansion. The findings of this research confirm their potentially-scalable significant contribution to GDP through employment, production, and financial channels. If countries are to aspire to adaptive and inclusive development, it is essential that they include SME support in their approach to national economic policy. Future research on the effects of SMEs on GDP measures should look at sectorial effects and the dynamics of SME recovery since the COVID pandemic.

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