# THE INTERRELATIONSHIP BETWEEN MSME GROWTH, INVESTMENT, AND EMPLOYMENT: A STATISTICAL ANALYSIS IN ASSAM, INDIA

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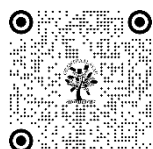
ABSTRACT

The Micro, Small, and Medium Enterprises (MSMEs) sector is a vital pillar of the Indian economy, significantly contributing to gross domestic product (GDP), industrial output, employment, and exports. This study explores MSME growth and its impact on employment generation in Assam from 2010 to 2020, using secondary data from MSME annual reports, the Assam Statistical Handbook, and other sources. The analysis examines trends in MSMEs, jobs, and investments, employing forecasting, regression analysis, and confidence intervals to assess growth patterns. Results reveal fluctuating trends in MSMEs, employment, and investments, with notable peaks in 2020-2021. The compound annual growth rate (CAGR) for MSMEs and jobs was 16.23% and 16.39%, respectively, indicating strong growth despite occasional declines. Regression analysis shows a significant positive correlation between MSMEs and job creation, while investment had a lesser impact. The findings emphasize MSMEs as key drivers of employment in Assam, offering valuable insights for policymakers.

Keywords: MSME, Assam, Forecasting, CAGR and Regression

1. INTRODUCTION

The MSME sector is often seen as the "engine of growth" for developing economies due to its essential role in driving economic development, creating jobs, and supporting regional inclusivity. In India, MSMEs make a significant impact, contributing 8% to the GDP, 45% to industrial production, and 40% to the country's exports. Furthermore, the sector employs over 60 million people and manufactures over 6,000 diverse products yearly (Tiwari, 2011). The sector has been recognised for its ability to address socio-economic disparities and generate more jobs per unit of production than larger enterprises, making it instrumental in achieving balanced regional development (Gade, 2018). MSMEs are currently on the verge of global growth, driven by their competitiveness and product quality (Gaikwad & Dhokare, 2020). Their significance goes beyond economic growth, closely aligning with the sustainable development goals (SDGs) by

promoting innovation, ensuring decent working conditions, and reducing negative socio-economic and environmental impacts (Arifin et al., 2021). The MSME sector is growing rapidly across different areas of the economy, offering various products and services to satisfy domestic and international market needs (Vinila, 2022). A combination of financial and non-financial factors, including personal satisfaction, independence, and flexibility, often drives the ownership of small businesses in this sector. These motivations contribute to the resilience and adaptability of the sector (Walker & Brown, 2004). The role of MSMEs in driving innovation is also well-documented, with their contribution to developing and producing new ideas and technologies being particularly significant (Markatou, 2012).

In India, the MSME sector comprises approximately 26 million units. It has the potential to create about 1.3 million jobs annually, making it a critical driver of balanced and inclusive growth that addresses regional disparities (Tiwari, 2011). However, sustaining this contribution requires an explicit focus on encouraging the uniqueness of MSMEs and overcoming systemic challenges (Gade, 2018). To support MSMEs under the Aatma Nirbhar Bharat initiative, the Government of India revised their classifications in 2020. Micro-enterprises now include those with investments up to ₹1 crore and turnovers up to ₹5 crores. Small enterprises cover investments up to ₹10 crores and turnovers up to ₹50 crores, while medium enterprises are defined by investments up to ₹50 crores and turnovers up to ₹250 crores.

MSMEs have demonstrated their potential to address socio-economic challenges while driving economic growth and employment. Adviento (2022) analysed the impact on employment, income inequality, and poverty in the Philippines, highlighting opportunities and negative associations while recommending policy interventions to address these issues. In Indonesia, Purwaningsih et al. (2022) emphasised the importance of improving supply chains, adopting digital tools, and providing training for MSME sustainability. Similarly, Amoah et al. (2022) underscored the role of SMEs in Ghana in reducing unemployment and poverty through job creation and income generation. Studies from Pakistan, Nigeria, and the MENA region (Manzoor et al., 2021; Taiwo et al., 2012; Ajiuwon et al., 2017; Mouelhi et al., 2021) have highlighted the significant role of MSMEs in promoting innovation, economic growth, and job creation. However, these studies also identify common challenges MSMEs face, including limited access to finance, inadequate infrastructure, and poor management practices. Prasetyo (2021) examined the relationship between Schumpeter's economic theory and unemployment in Indonesia, concluding that MSME growth is essential for reducing unemployment through innovation. Maziku et al. (2014) examined the effects of socio-cultural factors on women-owned SMEs in Tanzania, finding that immobility and lack of support hinder business performance, while education and family roles improve it.

MSMEs face similar challenges in India, including funding constraints, marketing inefficiencies, and limited technological access (Khatri, 2019). Despite these barriers, initiatives such as enhanced training programs, government support, and improved innovation capabilities have significantly enhanced the competitiveness of Indian MSMEs (Raghuvanshi & Garg, 2018). Barriers such as licensing issues, energy shortages, and restricted access to credit, particularly in regions like northern Malabar, highlight the need for interventions to unlock the full potential of MSMEs (Premavalli, 2012).

In Assam, the MSME sector is critical for addressing unemployment and fostering economic development in a state characterised by socio-economic challenges and geographic isolation. Despite its potential, the growth trajectory of MSMEs in Assam has been inconsistent, constrained by infrastructure deficits, market access challenges, and skill shortages. This study examines the growth of MSMEs in Assam from 2010 to 2020, focusing on their interrelationship with employment generation and investment. The research uses statistical tools such as regression analysis and forecasting to uncover trends, assess correlations, and provide actionable insights for policymakers and stakeholders. This study addresses significant gaps in the current literature through an integrated analysis of MSME growth, investment, and employment in Assam. It offers evidence-based recommendations to strengthen the sector's contribution to sustainable regional development.

2. METHODOLOGY AND ANALYSIS

The present study is based on registered MSMEs that function in nature. Secondary data is obtained from MSME annual reports from 2010 to 2020, Statistical Handbook of Assam from 2010 to 2020, Commissioner of Industries and Commerce (CIC), Assam, District Industries, and various journals have been consulted. Data is processed in MS Excel 2410 and SPSS 23 (IBM Corp., Armonk, NY, USA). Secondary data was analysed to address the objective of this study, covering the period from 2010 to 2020. This comprehensive analysis includes forecasting techniques and regression analysis to explore the growth of MSMEs in Assam and examine their impact on job creation in the state.

3. RESULTS
3.1. MSME GROWTH TRENDS

The growth trends of MSMEs in Assam from 2010 to 2026 are analysed to highlight annual variations, fluctuations, and long-term patterns. Table 1 presents the data, including observed values from 2010 to 2020 and forecasted values from 2021 to 2026. Annual Growth Rates (AGR) and confidence bounds are included to understand the trends comprehensively.

The data reveal significant volatility between 2010 and 2020. MSMEs declined by 10% in 2011 and decreased by 19% in 2012. However, growth resumed in 2013 (19%) and continued through 2014 (28%) and 2015 (41%), marking a robust period of expansion. A sharp decline occurred in 2016 (-28%), followed by a moderate recovery in 2017 (15%) and subsequent declines in 2018 (-29%) and 2019 (-27%).

In 2020, the sector experienced an extraordinary surge, with MSMEs increasing to 12,661, reflecting a 1,027% growth rate. This significant rise indicates exceptional circumstances, such as policy changes or economic incentives. Growth continued in 2021 with a 62% increase to 20,484 MSMEs.

The forecasted period from 2022 to 2026 shows stabilisation, with a projected decline in 2022 (-25%) followed by consistent annual growth of 5% from 2023 to 2026. Confidence intervals provide a range for forecasted values, with the lower and upper bounds for 2022 being 6,924.88 and 23,824.58, respectively.

The mean number of MSMEs across the entire period is approximately 7,951.495, with the minimum recorded in 2010 (1,678) and the maximum projected for 2026 (18,605.84). Despite periodic fluctuations, the CAGR of 16.23% reflects strong overall growth.

The variability in confidence bounds, especially for forecasted years, underscores the uncertainty and potential external influences. For instance, the wide range for 2022 reflects possible deviations due to unforeseen economic or policy changes. These bounds offer critical insights for policymakers in planning and resource allocation.

3.2. MSME JOB TRENDS IN ASSAM

The trends in MSME-generated jobs in Assam from 2010 to 2026 demonstrate significant fluctuations and overall growth. Table 2 summarises the observed and forecasted job numbers, including AGR and confidence bounds for forecasted values.

The above chart shows that the number of jobs increased steadily from 12787 in 2010 to 20,496 in 2015, reflecting consistent growth. The AGR during this period varied but generally remained positive, with the highest AGR in 2015 at 34%. There was a significant drop in the number of jobs in 2016 to 14,069, resulting in a negative AGR of -31%. The number of jobs rebounded from 14,069 in 2016 to 19,355 in 2017 and then declined to 8,618 in 2019. The AGR during these years fluctuated but was generally negative, indicating a job decline.

There was a remarkable surge in the number of jobs in 2020, reaching 86,072, driven by a significant AGR of 899%. This may arise from various factors, including policy changes, economic conditions, or data anomalies. The number of jobs continued to grow substantially, reaching 230,821 in 2021. The AGR for this year was 168%. While there was a decline in 2022 (-51% AGR), the subsequent years (2023 to 2026) saw positive AGRs ranging from 6% to 7%. Confidence intervals for these years also provide a range of possible values for job counts.

The mean job count over the entire period is 59,309.03. The minimum count is 12787, while the maximum count is 230,821. The CAGR over the entire period is approximately 16.39%, indicating significant growth in the number of jobs on average each year.

3.3. TRENDS IN MSME INVESTMENT IN ASSAM

Table 3 presents the trends in MSME investments in Assam from 2010 to 2026, illustrating observed and forecasted investment amounts, AGR, and confidence bounds for forecasted values. The analysis highlights significant investment fluctuations, including years of sharp growth and steep declines.

In 2011, there was a 7% decline in investment, dropping to 27,662.92 lakh. The negative trend continued in 2012, with a 2% decrease in investment, resulting in a total of 27,000.63 lakh. A slight 1% increase in investment was observed in 2013, bringing the total to 27,397.45 lakh. Significant growth returned in 2014, with a 14% increase in investment, reaching 31,099.08 lakh. Nonetheless, 2015 saw a 13% decline in investment, falling to 26,923.29 lakh. This downward trend continued into 2016, with a 5% decrease in investment, totalling 25,597.96 lakh. In stark contrast, 2017 experienced a remarkable 137% growth in investment, reaching 60,687.42 lakh. However, this was followed by a 22% decline in 2018, with the investment amount at 47,452.20 lakh.

The downward trend continued in 2019, with a substantial 58% decrease in investment, totalling 20,081.26 lahks. A significant turning point occurred in 2020 when there was an extraordinary surge in investment, with a growth rate of 1,029%, reaching 226,670 lakhs. This trend of substantial growth persisted into 2021, with a 73% increase, resulting in an investment amount of 392,933.95 lakh. Unfortunately, in 2022, there was a sharp 44% decline in investment, bringing the total to 219,126.47 lakh. However, a positive trend resumed in 2023, with a 7% increase, resulting in an investment of 234,301.32 lakh. This positive momentum continued in 2024, with a 6% growth rate and an investment amount of 249,476.17 lakh. Likewise, in 2025, investment increased by 6% to reach 264,651.02 lakh. The trend persisted in 2026, with another 6% increase in investment, bringing the total to 279,825.88 lakh.

The overall mean investment amount over the entire period was 118,937.39 lakh. The minimum investment amount observed was 29901.68 lakh in 2010, while the maximum occurred in 2021 at 392,933.95 lakh. The CAGR over the entire period averaged approximately 11.07%, indicating an average annual investment growth rate.

The investment amount continued to grow substantially, reaching 392,933.95 lakh in 2021. The AGR for this year was 73%. The data for these years show fluctuations in investment amounts. While there was a decline in 2022 (-44% AGR), the subsequent years (2023 to 2026) saw positive AGRs ranging from 6% to 7%. Confidence intervals for these years also provide a range of possible values for investment amounts.

3.4. MULTIPLE LINEAR REGRESSION ANALYSIS

The MSME, Investment, and Jobs datasets were transformed into logarithmic values to ensure uniformity in the regression analysis. Jobs were designated the dependent variable, while MSME and Investment were the independent variables. The null hypothesis (H0) stated that MSMEs and investments do not significantly affect job creation in Assam, whereas the alternative hypothesis (Ha) proposed that they do.

The correlation analysis indicated a significant positive association between Jobs and MSME, with a correlation coefficient of 0.874. A moderate positive link between Jobs and Investment was identified, reflected by a coefficient of 0.598. A relatively weaker yet positive correlation (r = 0.403) was found between MSMEs and Investment, suggesting that while investment tends to grow with the number of MSMEs, the relationship is less pronounced than the others.

Regression analysis yielded an R-value of 0.915, suggesting a strong positive linear relationship between the predictors (MSME and Investment) and Jobs. The R-squared value of 0.836 indicated that MSME and Investment explain 83.6% of the variability in job creation, while the adjusted R-squared value of 0.790 confirmed the robustness of the model. The low standard error (0.05218) further validated the accuracy of the model's predictions.

The p-value from the F-statistic (p = 0.002) confirmed that the regression model was statistically significant overall, emphasising the combined effect of MSMEs and investment on job creation. The analysis showed that a one-unit increase in MSMEs resulted in a 0.768-unit rise in jobs (p = 0.003), indicating a strong positive relationship. In contrast, the coefficient for investment (0.240) was not statistically significant (p = 0.122), suggesting a minimal and non-significant influence on job creation.

In conclusion, the findings underscore that MSMEs play a significant role in job creation in Assam, while the contribution of Investment, although positive, is not statistically significant at the 0.05 level. The model demonstrates strong predictive power, with MSMEs emerging as the dominant predictor of employment growth.

4. DISCUSSION

The findings of this study highlight the dynamic interrelationship between MSME growth, investment, and employment in Assam, presenting important implications for policymakers and stakeholders. The following discussion elaborates on these insights and situates them within the broader literature. The CAGR of 16.23% underscores the robust

expansion of MSMEs in Assam over the study period. However, the pronounced fluctuations, such as the sharp decline in 2016 (-28%) and the extraordinary growth in 2020 (1027%), suggest that external factors, including policy interventions and economic stimuli, significantly impact MSME growth. These findings align with Prakash et al. (2023) and Singh (2022), who emphasise the sensitivity of MSMEs to policy and market dynamics.

The forecasted stabilisation in growth from 2023 to 2026, with a projected annual growth rate of 5%, indicates the potential for sustained expansion if supported by consistent policy measures. This aligns with global trends observed by Adviento et al. (2022), who identified the importance of policy consistency in fostering MSME resilience. Employment growth mirrored MSME trends but exhibited greater volatility. The CAGR of 16.39% for job creation highlights MSMEs' critical role in employment generation, with significant peaks such as the 899% increase in jobs in 2020. This remarkable surge may reflect targeted interventions, such as government incentives or economic recovery measures, as Adjabeng (2022) suggested in their study of SMEs in Ghana.

However, the steep decline in employment in 2019 (-40%) and subsequent fluctuations reveal underlying structural vulnerabilities, including dependency on market conditions and infrastructural constraints. These trends are consistent with the findings of Sarmah et al. (2021), who highlighted the fragility of MSME-driven employment in the face of systemic inefficiencies. Investment trends were characterised by extreme variability, with a CAGR of 15% over the study period. While significant growth was observed in 2020 (1029%) and 2021 (73%), these were preceded by periods of sharp decline, such as in 2019 (-58%). The weaker correlation between investment and job creation (0.598) compared to the strong correlation between MSME growth and job creation (0.874) underscores the need for more targeted investment strategies.

The findings suggest that while investment is supportive, its effectiveness is contingent on addressing infrastructural and operational bottlenecks within the MSME ecosystem. This aligns with Taiwo et al. (2012), who argue that investment alone cannot drive sustainable employment unless complemented by capacity-building and market access initiatives. The results have significant policy implications. First, the strong correlation between MSME growth and employment reinforces the need for policies that directly support MSME expansion, such as simplified regulatory frameworks, access to affordable credit, digitalisation initiatives, and measures to enhance innovation capability, as emphasised by Raghuvanshi & Garg (2018). Second, the volatility in investment and employment trends highlights the need for a more stable and predictable policy environment. Globally, the findings resonate with studies from similar regions Supriadi et al., (2023) and Mouelhi and Ghazali (2021), emphasising the importance of comprehensive MSME support strategies integrating investment with innovation, training, and infrastructure development.

While the study provides valuable insights, its reliance on secondary data limits the granularity of the analysis. Future research could explore sector-specific trends within the MSME ecosystem or employ qualitative methods to capture the perspectives of entrepreneurs and stakeholders. Additionally, investigating the long-term effects of digital transformation on MSME performance could yield actionable insights for fostering resilience in the sector. Bordoloi (2023) highlighted that the MSME sector in Assam has low technological capabilities and innovation. This suggests that future research should also focus on strategies to enhance technological adoption and innovation within MSMEs to improve their competitiveness.

5. CONCLUSION

The analysis confirms that MSMEs are a key driver of employment in Assam, India. Although investment also plays a role, its influence on job creation is weaker than that of MSME growth. Policymakers and stakeholders should focus on fostering MSME development in the region to ensure sustainable job growth. The fluctuations in investment and job creation indicate the need for targeted interventions to stabilise and enhance the growth trajectory of MSMEs and their contribution to employment. This study provides valuable insights for shaping regional development strategies in Assam and other similar regions in India.

CONFLICT OF INTERESTS

None.

ACKNOWLEDGMENTS

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Table 1 Growth Trends of MSMEs in Assam (2010–2026)

Year	MSME	AGR	Lower confidence bound (MSME)	Upper confidence bound (MSME)
2010	1678	-		
2011	1506	-10%		
2012	1218	-19%		
2013	1451	19%		
2014	1860	28%		
2015	2629	41%		
2016	1898	-28%		
2017	2177	15%		
2018	1539	-29%		
2019	1123	-27%		
2020	12661	1027%		
*2021	20484	62%	20484	20484
*2022	15374.73	-25%	6924.88	23824.58
*2023	16182.51	5%	6731.5	25633.51
*2024	16990.28	5%	6631.01	27349.56
*2025	17798.06	5%	6600.76	28995.35
*2026	18605.84	5%	6626.01	30585.66
Mean	7951.495			
Minimum	1678			
Maximum	18605.84			
CAGR	16.23%			

Notes: * Indicates Forecasted Values. The Data was Sourced from CIC, Assam.

Calculations were Performed by the Author using MS Excel 2016.

Figure 1
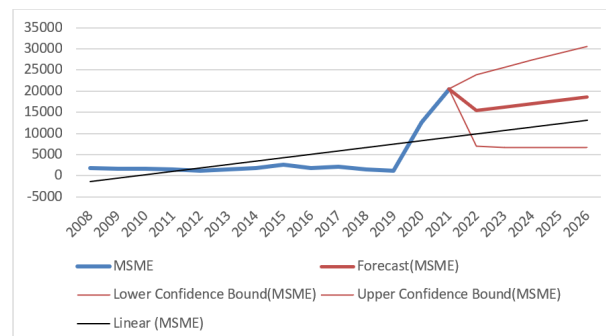
Figure 1 MSME Growth Trends in Assam (2010–2026)

Table 2 Trends of MSMEs Jobs in Assam (2010-2026)

Year	Jobs	AGR	Lower confidence bound (Jobs)	Upper confidence bound (Jobs)
2010	12787			
2011	10458	-18%		
2012	13203	26%		
2013	11671	-12%		
2014	15352	32%		
2015	20496	34%		
2016	14069	-31%		
2017	19355	38%		
2018	14442	-25%		
2019	8618	-40%		
2020	86072	899%		
*2021	230821	168%	230821	230821
*2022	112775.9499	-51%	12710.09	212841.8
*2023	120824.141	7%	17654.3	223993.98
*2024	128872.332	7%	22665.5	235079.17
*2025	136920.523	6%	27737.99	246103.06
*2026	144968.7141	6%	32866.82	257070.61
Mean	64806.22			
Minimum	12787			
Maximum	144968.7141			
CAGR	16.39%			

Notes: * Indicates Forecasted Values. The Data was Sourced From CIC, Assam.

Calculations were Performed by the Author Using MS Excel 2016.

Figure 2

Figure 2 MSME Job Trends in Assam (2010-2026)

Table 3 Trends of MSME investment in Assam (2010 to 2026)

Year	Investment (in lakh)	AGR	Lower confidence bound (Investment)	Upper confidence bound (Investment)
2010	29901.68			
2011	27662.92	-7%		
2012	27000.63	-2%		
2013	27397.45	1%		
2014	31099.08	14%		
2015	26923.29	-13%		
2016	25597.96	-5%		
2017	60687.42	137%		
2018	47452.2	-22%		
2019	20081.26	-58%		
2020	226670	1029%		
*2021	392933.95	73%	392933.95	392933.95
*2022	219126.4682	-44%	46649.46	391603.47
*2023	234301.32	7%	56474.18	412128.46
*2024	249476.1718	6%	66414.36	432537.99
*2025	264651.0236	6%	76460.19	452841.85
*2026	279825.8754	6%	86603.13	473048.62
Mean	128869.9			
Minimum	29901.68			
Maximum	279825.8754			
CAGR	15%			

Notes: * indicates forecasted values. The data was sourced from CIC, Assam. Calculations were performed by the author using MS Excel 2016.
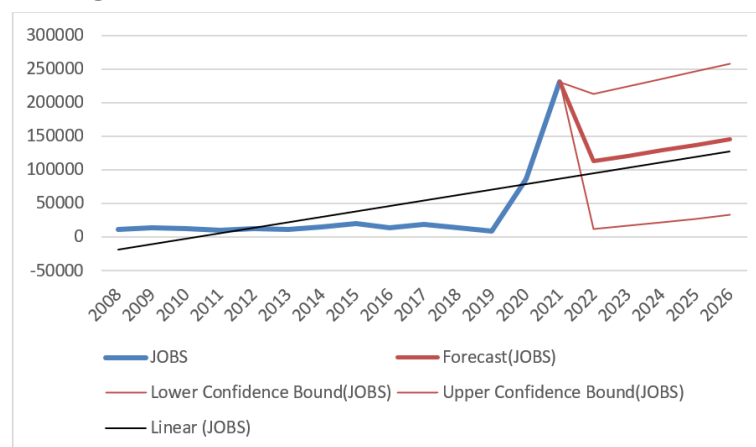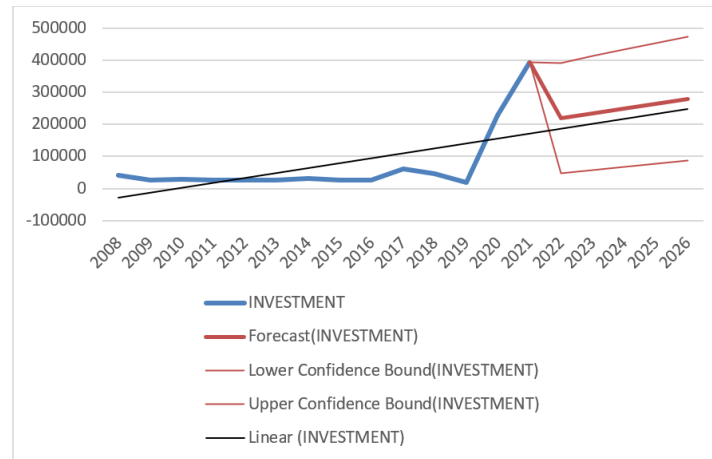
Figure 3

Figure 3 MSME Investment Trends in Assam (2010-2026)

Table 4 Yearly Total MSMEs, Investment, and Job Creation (2010-2019)

Year	MSME	Investment	Jobs
2010	1678	29901.68	12787
2011	1506	27662.92	10458
2012	1218	27000.63	13203
2013	1451	27397.45	11671
2014	1860	31099.08	15352

2015	2629	26923.29	20496
2016	1898	25597.96	14069
2017	2177	60687.42	19355
2018	1539	47452.2	14442
2019	1123	20081.26	8618
Total	17079	323803.89	140451

Source: CIC, Assam.

Table 5 Descriptive Statistics

	Mean	Std. Deviation	N
Jobs	4.1342	.11375	10
MSME	3.2193	.11193	10
Investment	4.4880	.13927	10

Note: Calculations were Performed by the Author Using SPSS.

Table 6 Pearson Correlations

	Jobs	MSME	Investment
Jobs	1.000	.874	.598
MSME	.874	1.000	.403
Investment	.598	.403	1.000

Note: Calculations were performed by the author using SPSS.

Table 7 Model Summary

Model	R	R Square	Adjusted R Square	Std. The error of the estimate
1	.915[a]	.836	.790	.05218

Note: a. Predictors: (Constant), Investment, MSME. b. Dependent Variable: Jobs. Calculations were performed by the author using SPSS.

Table 8 ANOVA[a]

	Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.097	2	.049	17.886	.002[b]
	Residual	.019	7	.003		
	Total	.116	9			

Note: a. Dependent variable: Jobs, b. Predictors: (Constant), investment, MSME, Author's calculation in SPSS.

Table 9 Coefficients[a]

Model	Unstandardised Coefficients	Standardised Coefficients	t	Sig.	95.0% Confidence Interval for B	Correlations	Collinearity Statistics

		B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	.585	.636		.919	.388	-.919	2.088					
	MSME	.768	.170	.756	4.525	.003	.367	1.170	.874	.863	.692	.838	1.193
	Investment	.240	.136	.294	1.758	.122	-.083	.562	.598	.553	.269	.838	1.193

Source: a. Dependent Variable: Jobs