

ECONOMIES OF SCALE ANALYSIS AMONG ENDEK WEAVERS IN SIDEMEN VILLAGE, KARANGASEM REGENCY

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Abstract

Sidemen Endek fabric is highly valued in international markets and has been showcased on global stages such as by Christian Dior. However, the industry faces critical challenges, including declining competitiveness, limited capital, raw material shortages, and a lack of young labor force. The COVID-19 pandemic further exacerbated these issues. Nevertheless, several SMEs such as Pelangi Traditional Weaving and other home industries have continued to innovate and preserve this cultural heritage. This study aims to explore the development potential of Endek weaving SMEs in Sidemen to sustain the industry and foster the preservation of local culture in Karangasem. A quantitative associative approach with a causal relationship was employed. Data were collected through observation, structured and in-depth interviews, and questionnaires. The analysis technique used was multiple linear regression based on the Cobb-Douglas production function model. The research population comprised 294 Endek weavers across 15 weaving business groups. The findings reveal that capital, labor, and raw materials simultaneously have a significant influence on Endek fabric production. Individually, each of these variables also has a positive effect on production output. The analysis of economies of scale indicates that the weavers are operating under increasing returns to scale, meaning that increases in input factors result in proportionally greater increases in output. The efficiency of input utilization was found to be optimal, though it can still be improved through more effective production strategies. The study concludes that optimizing production factors is crucial for enhancing the competitiveness of the Endek fabric industry.

Keywords: Production, Capital, Labor, Raw Materials

INTRODUCTION

The economic development of a country is influenced by various factors such as human resources, natural resources, capital, and technology. In Indonesia, regional development is implemented in an integrated manner by maximizing local potential through collaboration among the government, communities, and the private sector. The main objective is to enhance public welfare by creating employment opportunities and increasing the production of goods and services. One of the key focus areas is the industrial sector, particularly small and medium-sized enterprises (SMEs), which are believed to drive equitable development and reduce poverty. SMEs play a vital role as job creators, drivers of local economies, and major contributors to the Gross Domestic Product (GDP), accounting for 61.07% or approximately IDR 8,573.89 trillion of the GDP in 2021, according to the Ministry of Cooperatives and SMEs.

The industrial sector also includes the rapidly growing creative industries, particularly in the era of globalization and digitalization. These industries not only produce economically valuable goods and services but also express distinctive local cultural identities. Creative industries such as crafts, art, music, design, and advertising serve as significant sources of economic growth while empowering communities and fostering cultural expression. Scaling up operations in the processing industry has also proven to improve efficiency and competitiveness. With the support of appropriate technology, the industrial sector—including creative industries—has vast potential for continued growth, job creation, and meaningful contributions to national economic development and public welfare.

Bali Province is one of Indonesia's 38 provinces that plays a vital role in national economic growth, primarily through the tourism sector and the development of Micro, Small, and Medium Enterprises (MSMEs). In Bali, MSMEs are not only a leading economic sector but also absorb a significant amount of local labor and promote regional economic growth. A 2020 study by the Ministry of Research and Technology indicates that digitally based creative industries have helped strengthen Bali's economic structure in the face of Industry 4.0.

However, in 2020, the processing industry in Bali experienced a sharp decline, as reflected in a drop in the regional gross domestic product (GRDP) from 15.22% in 2019. The COVID-19 pandemic was the primary cause of this decline, slowing industrial activity across all scales, from large enterprises to small and medium-sized ones. The pandemic also led to decreased consumer purchasing power due to mass layoffs, which reduced consumption and demand in both domestic and international markets.

The pandemic's effects also included reduced production capacity in several key manufacturing subsectors, such as chemicals, pharmaceuticals, automotive, metals, electronics, textiles, and garments. Demand instability and limited capital further disrupted production, particularly among small and medium industries (SMIs). According to Statistics Indonesia, approximately 5.5 million workers in the industrial sector were affected, most of whom came from the SMI sector. These conditions underscore the importance of revitalizing the industrial sector, particularly MSMEs, as a strategic step in Bali's post-pandemic economic recovery.

Table 1. Formal and Non-Formal Industry Data for Karangasem Regency in 2023

Source: Department of Trade and Industry, Karangasem Regency, 2024

No	Subdistrict	Formal Industry		Non-formal industry	
		Business Unit	Workforce (People)	Business Unit	Workforce (People)
1	Abang	240	453	2.011	2,552
2	Bebandem	412	830	1.104	1,521
3	Karangasem	522	978	2.19	2.434
4	Kubu	52	620	1.93	2,741
5	Manggis	167	229	971	1,371

6	Rendang	106	184	482	1.176
7	Selat	175	321	1,786	3.021
8	Sidemen	123	235	341	3,644
	Amount	1,797	3.85	13,884	18.46

Table 1 shows the distribution of Small and Medium Industries in Karangasem Regency, in general the Non-Formal Industry sector in Sidemen District has the most business units, while the Formal Industry sector is the largest in Karangasem District. The non-formal industry in Sidemen is closely related to the local community. They actively participate in the development of this industry, so that they can increase participation and equality of production and distribution processes by the community, just as in Karangasem District it is said to have many formal industries (Disperindag Karangasem Regency, 2023).

Sidemen Village is a place rich in culture and local wisdom, such as endek woven cloth, songket and lontar comics. Sidemen Bali's typical endek and songket cloth have become famous icons among traditional cloth enthusiasts, because the manufacturing process is entirely manual and its unique motifs, such as woven motifs, moon kayonan, wayangan, or peacock, using cotton threads of various colors, as well as gold and silver threads. Meanwhile, lontar comics are carvings or drawings on lontar leaves that tell stories of Balinese Hindu culture (Desa Sidemen.com, 2024).

Table 2. Summary Data on the Number of Non-Formal Industries in Sidemen District in 2023

No	Commodity Name	Number of Businesses (Units)
1	Woven Ate	1
2	Woven bamboo	9
3	Brick	10
4	Coconut shell	1
5	Tabas Stone	3
6	Embroidery	1
7	Printing photos	5
8	Photo Copy	2
9	Furniture	1
10	Garment	4
11	Rooftile	1
12	Lidi's Ingka	3
13	Garment/Tailor	22
14	Kite	4
15	Palm leaf	13
16	Coconut oil	6
17	VCO Oil	1
18	Food Processing	37
19	Iron Pade	4

20	Alang-alang Craftsmen	4
21	Wood Craftsman	8
22	Silver Craftsman	5
23	Processing of Arak	1,096
24	Palm wine processing	12
25	Know	3
26	Cassava Tape	1
27	Tempeh	4
28	Weave	2.141
29	Iron/Welded Trellis/Fence	4
30	Wood carving	4
Amount		3.410

Source: Department of Trade and Industry, Karangasem Regency, 2024

According to the data, the most prevalent informal industry in Sidemen District is the weaving business, particularly endek fabric, with a total of 2,141 business units. Sidemen's endek fabric is renowned for its intricate, authentic, and vibrant patterns. This traditional textile is passed down through generations and is mostly produced manually using non-mechanical looms (ATBM), making it a highly artistic product. In addition to endek, artisans also produce songket and bebalı fabrics, which are commonly used in traditional ceremonies. Sidemen's endek has a strong export value to various countries and has even gained international recognition through a showcase by Christian Dior. However, this industry faces significant challenges, including declining competitiveness, limited capital, raw material shortages, and a decreasing number of young workers. The COVID-19 pandemic has further exacerbated these issues. Nevertheless, there are still SMEs such as Pelangi Traditional Weaving and other home industries that continue to innovate and preserve this cultural heritage. Therefore, this study aims to explore the development potential of endek weaving SMEs in Sidemen, so that the industry can remain sustainable and continue to promote the preservation of local culture in Karangasem.

RESEARCH METHOD

This study employs a quantitative associative approach with a causal relationship, aiming to determine the effect of independent variables on the dependent variable—namely, the influence of capital (X_1), labor (X_2), and raw materials (X_3) on the production output of endek weavers (Y) in Sidemen Village, Karangasem Regency. Data were collected through observation, structured and in-depth interviews, and questionnaires. The data analysis technique used is multiple linear regression based on the Cobb-Douglas production function model.

The research location was selected because Sidemen Village is recognized as a central hub for endek fabric production in Karangasem. The research subjects consist of all endek weavers organized into 15 weaving business groups, with a total population of

294 individuals. Based on Slovin's formula with a 10% margin of error, a sample of 75 respondents was selected using the Proportionate Stratified Random Sampling technique to ensure proportional representation across population strata.

The types of data used include quantitative data in the form of numerical values such as capital amount, number of workers, raw material quantity, and production value, along with qualitative data to support the interpretation of results. Primary data were obtained directly from respondents, while secondary data were sourced from official institutions such as the Central Bureau of Statistics (BPS), the Department of Industry, and the Sidemen Subdistrict Office. Data analysis techniques include descriptive statistics, classical assumption tests (normality and multicollinearity), and multiple linear regression analysis using natural logarithm form to identify the relationships among variables. The regression model will indicate the contribution of each independent variable to the production output of endek crafts in the study area.

RESULTS AND DISCUSSION

Descriptive Statistical Analysis

Table 3. Descriptive Statistical Analysis

Descriptive Statistics

N		Minimum	Maximum	Mean	Std. Deviation
Production (Million Rupiah)	75	21000000	208000000	102062413.33	52788477.399
Capital (Million Rupiah)	75	10200000	102000000	44608000.00	27156661.420
Workforce (People)	75	15	60	32.40	10,246
Raw Materials (Million Rupiah)	75	1666000	8333000	3588906.67	1034077.303
Valid N (listwise)	75				

Source: Appendix 5

Based on the descriptive statistical analysis in table 3, it can be explained that there are differences in business scale between craftsmen in Sidemen Village. Some craftsmen have larger production because they are supported by higher capital, labor, and raw materials. However, there are also craftsmen with smaller production capacity.

Multiple Linear Regression

- 1) Intercept $Y = 1.776$ means that when all production factors (capital, labor and raw materials) have a value of zero (logarithmically), the estimated output (production) has a constant value of 1.766.
- 2) Coefficient $X_1 = 0.571$ means that if capital increases by 1% then production will increase by 0.571%

- 3) Coefficient $X_2 = 0.588$ means that if the workforce increases by 1% then production increases by 0.588%
- 4) Coefficient $X_3 = 0.302$ means that if raw materials increase by 1%, production will increase by 0.302%

The R^2 value of 0.880 indicates that 88% of the variation in the dependent variable (production) can be explained by the independent variables (capital, labor, and raw materials). This means that most changes in production can be explained by changes in capital, labor, and raw materials. Only 12% of the variation in production is influenced by other factors outside the model such as external factors that are not included in the regression.

Classical Assumption Test

1) Normality Test

**Table 4. Results of Normality Test with One Sample Statistic Test
Kolmogorov-Smirnov Test**

One-Sample Kolmogorov-Smirnov Test			
			Unstandardi zed Residual
N			75
Normal Parameters ^{a,b}	Mean		.0000000
	Std.		.20182672
	Deviation		
Most Extreme Differences	Absolute		.100
	Positive		.063
	Negative		-.100
Test Statistics			.100
Asymp. Sig. (2-tailed)			.061 ^c

a. Test distribution is Normal.

b. Calculated from data.

c. Lilliefors Significance Correction.

Source: Appendix 6

Based on the test results in Table 4, the Kolmogorov-Smirnov statistical value is 0.100 with Sig (2-tailed) of 0.061 which is greater than 0.05. Because the residual model is normally distributed, the model is suitable for further analysis.

2) Multicollinearity Test

Table 5. Multicollinearity Test Results Coefficients^a

		Collinearity Statistics	
Model		Tolerance	VIF
1	LnX1	.498	2.007
	LnX2	.542	1,845
	LnX3	.867	1.154

a. Dependent Variable: LnY

Source: Appendix 7

Based on the regression results above, the VIP value for the capital, labor, and raw material variables is less than 10 as well as the tolerance value which is greater than 0.1. So, it can be concluded that this study does not experience multicollinearity.

3) Heteroscedasticity Test

Table 6. Results of Heteroscedasticity Test (Glejzer Test)

Coefficients^a

		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	-.012	.019		-.643	.523
	LNx1	.001	.002	.243	.719	.475
	LnX2	.000	.001	-.250	-.607	.546
	LnX3	.030	.032	.528	.942	.350

a. Dependent Variable: ABS_RES

Source: Appendix 8

Based on the results of data processing, it can be seen that there is no influence of independent variables (capital, labor and raw materials) on the absolute residual, either simultaneously or partially. Therefore, the value of the significance of each independent variable exceeds the alpha value (= 0.05 significant t. This means that the independent variables studied do not have a significant influence on the absolute value of the residual at = 5%. Thus, the model created does not contain symptoms of heteroscedasticity, so it is feasible to predict. $\alpha \leq a$

Simultaneous Regression Coefficient Test

The results of the statistical analysis using SPSS software show an F-value of 174.263, which is greater than the critical F-table value of 2.73. This indicates that the null hypothesis (Ho) is rejected, meaning that capital, labor, and raw materials simultaneously have a significant effect on the production of Endek in Sidemen Village, Karangasem

Regency. The coefficient of determination (R^2) is 0.880, implying that 88% of the variation in Endek production can be explained by capital, labor, and raw materials, while the remaining 12% is influenced by other variables outside the model. This finding aligns with previous research by Sisdiyantoro & Lestari (2022), which found that capital, labor, and raw materials jointly influence the production of the SMB garment industry in Tulungagung. Similar findings were reported by Hafie & Yunani (2021), who demonstrated that these factors positively affect the production of wood-processing industries in Alalak Selatan and Alalak Tengah, North Banjarmasin District. Thus, the hypothesis in this study is supported by prior findings indicating a positive relationship between capital, labor, raw materials, and production in the Endek industry of Sidemen Village.

Partial Significance Test of Regression Coefficients (t-Test)

The t-test was conducted to determine the partial effect of each independent variable on the dependent variable, assuming that other variables remain constant. The magnitude of the regression coefficient for each independent variable reflects its partial influence.

1. The Effect of Capital on Endek Production in Sidemen Village

The t-value of 10.631 exceeds the t-table value of 1.6666, indicating that the null hypothesis is rejected. Hence, capital has a positive and significant effect on Endek production. The regression coefficient of 0.571 means that a 1-unit increase in capital will increase production by 0.571 units, holding other variables constant. According to Atmaja (2018:55), capital is the fund used to procure assets and finance business operations. This finding is consistent with Mahendra & Ayuningsasi (2024), who found that capital positively influences the production and income of wooden carving SMEs in Gianyar, and with Ola et al. (2023), who confirmed the positive effect of capital on pearl production in East Flores.

2. The Effect of Labor on Endek Production in Sidemen Village

The t-value of 6.023 is greater than the t-table value of 1.6666, so the null hypothesis is rejected. Labor positively and significantly affects Endek production. The regression coefficient of 0.588 indicates that a 1-unit increase in labor input will raise production by 0.588 units. This finding is supported by Achsanuddin et al. (2023), who demonstrated a significant positive influence of labor on tempeh production in Burau Sub-district, East Luwu Regency, and by Putra & Sudibia (2023), who found a similar effect on coffee farm workers in Kintamani.

3. The Effect of Raw Materials on Endek Production in Sidemen Village

With a t-value of 3.175 exceeding the t-table value of 1.6666, raw materials are shown to have a significant and positive effect on production. The regression coefficient of 0.302 implies that each unit increase in raw materials results in a 0.302-unit increase in production, assuming other inputs are constant. This result is consistent with Tarigan (2020), who reported a significant positive impact of raw materials on tofu production in Pematangsiantar.

Economies of Scale Analysis

To assess the economic scale of Endek production in Sidemen Village, a regression model based on the Cobb-Douglas function using the double-log method was applied. The estimated model is:

$$\ln \hat{Y} = 1.776 + 0.571 \ln X_1 + 0.588 \ln X_2 + 0.302 \ln X_3$$

Where X_1 = capital, X_2 = labor, and X_3 = raw materials. The sum of the coefficients ($\beta_1 + \beta_2 + \beta_3 = 1.461$) is greater than 1, indicating increasing returns to scale. According to Soekartawi (2003:76), this means that proportionate increases in input factors lead to greater proportional increases in output. Specifically, a 1% increase in all input factors leads to a 1.461% increase in output, reflecting production efficiency and the potential for greater profitability by scaling up production. This finding aligns with Nainggolan et al. (2021) on rice farming productivity and Sari et al. (2020) on chili farming, both of which reported increasing returns to scale.

Efficiency Analysis of Production Factors

Efficiency levels of capital, labor, and raw materials in Endek production in Sidemen Village were calculated using the following results:

- Capital Efficiency ($Ef X_1$) = 53.275,74
- Labor Efficiency ($Ef X_2$) = 1.344.205,66
- Raw Material Efficiency ($Ef X_3$) = 225,87

All three efficiency values are greater than 1, indicating that the use of capital, labor, and raw materials is efficient and their utilization can still be optimized. This finding supports Sandi & Wenagama (2023), who also found capital, labor, and raw materials to be efficiently used in pottery production in Masbagik District.

Discussion

Simultaneous Influence of Capital, Labor, and Raw Materials on Endek Production: The results confirm that capital, labor, and raw materials have a simultaneous, significant, and positive impact on Endek production in Sidemen Village. These findings are in line with Santi & Lusianna (2023) and Aliya & Priyono (2021), who found similar results in PT ABC and salted egg home industries, respectively.

Partial Influence of Capital, Labor, and Raw Materials: Each of the independent variables (capital, labor, raw materials) has a positive and significant individual effect on production. This is consistent with findings by Sisdiyantoro & Lestari (2022b) and Achsanuddin et al. (2023b), who analyzed similar effects in different industries.

Economies of Scale: Based on Sadono Sukirno's macroeconomics theory, economies of scale refer to the decline in per-unit production costs as production volume increases. The result showing an increasing return to scale (1.461) confirms that proportional increases in inputs result in more than proportional increases in output, reflecting operational efficiency.

Efficiency in Input Utilization: According to Sadono Sukirno (2010), production efficiency refers to the optimal use of inputs to produce maximum output at minimal cost. The analysis shows that the production process in Sidemen Village is efficient and input usage can be further optimized.

CONCLUSION

1. Capital, labor, and raw materials simultaneously have a significant effect on the production of Endek in Sidemen Village, Karangasem Regency.
2. Each variable—capital, labor, and raw materials—has a significant partial effect on production.
3. The Endek business in Sidemen Village operates under increasing returns to scale.
4. The use of capital, labor, and raw materials is efficient and can be further optimized in the production process.

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