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Efficiency and Economic Scale of the Batik Industry in Tarakan City

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Abstract
This research aims to measure, analyze the efficiency and economic scale of Asian Batik, D'Erte Batik, Semandate Batik and Julak Batik. The data used is primary data from interviews. Based on the results of data processing using EMS, the efficiency of cotton batik is only produced by Batik D'Erte and Satin Batik by Batik Asia is 100% efficiency each. For Cotton Batik produced by Asian Batik, Semandat Batik, and Julak Batik were inefficient by 98.16%, 35.47%, and 28.00%. Meanwhile, satin batik produced by Batik D'Erte, Batik Semandat, and Julak Batik were inefficient by 77.09%, 14.16%, and 21.43%. Each batik producer that is inefficient in its batik production has an intensity value ranging from 0.05 to 1.23. For cotton batik, the largest difference is the input from Julak Batik of Rp. 11,150,846 and satin batik, the largest difference is also in Julak Batik with an input difference of Rp. 9,632,727 and output of Rp. 200,000. The value of the regression coefficient of the production activities of the four producers is 1.340362, which is increasing return to scale, meaning that the production activities carried out by batik producers are at an increased rate of increase in yield or if an addition is made to capital, raw materials or labor in production, it will increase output by 1.34%.

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Abstrak
Penelitian ini bertujuan untuk mengukur dan menganalisis efisiensi dan skala ekonomi produksi Batik Pakis Asia, Batik D'Erte, Batik Semandat dan Batik Julak. Data utama yang digunakan adalah dari wawancara. Berdasarkan hasil pengolahan data menggunakan EMS, efisiensi batik katun hanya diproduksi oleh Batik D'Erte dan Batik Satin oleh Batik Pakis Asia, masing-masing dengan efisiensi 100%. Untuk Batik Kapas yang diproduksi oleh Batik Pakis Asia, Batik Semandat, dan Julak Batik, inefisiensinya adalah 98,16%, 35,47%, dan 28,00%. Sementara itu, batik satin yang diproduksi oleh Batik D'Erte, Batik Semandat, dan Batik Julak adalah 77,09%, 14,16%, dan 21,43% tidak efisien. Setiap produsen batik yang tidak efisien dalam produksinya memiliki nilai intensitas berkisar antara 0,05 hingga 1,23. Untuk batik kapas, perbedaan terbesar adalah masukan dari Batik Julak sebesar IDR. 11.150.846 dan batik satin, perbedaan terbesar juga pada Batik Julak dengan selisih input Rp. 9.632.727 dan keluaran IDR. 200.000. Nilai koefisien regresi kegiatan produksi keempat produsen tersebut adalah 1.340362, yaitu peningkatan return to scale, artinya kegiatan produksi yang dilakukan oleh produsen batik berada pada tingkat hasil yang meningkat atau jika penambahan modal, bahan baku, atau tenaga kerja ke dalam produksi, maka akan meningkatkan output sebanyak 1,34%.

Kata kunci
Efisiensi; Industri Batik;
Masukan;
Hasil;
Skala Ekonomi.

1. Introduction

National development is defined as multidisciplinary development, not only in the context of economic development. Throughout the history of the Indonesian economy, national development goals have been achieved starting from the New Order administration in a series of policies implemented.

As one of the developing countries, Indonesia is experiencing a phase of structural transformation where there is a shift in contribution in the national income structure. The industrial sector is currently the driving force of the Indonesian economy. This means that other sectors are integrated with the industrial sector. As one of the sectors that has an important role in the economy, not only contributing to national income but also industry is also a solution to the problem of unemployment and poverty. The contribution of the industrial sector in the economy includes providing value added for domestic raw materials.

The added value of large and medium industries increased throughout 2015 to 2019 while micro industries provided greater added value compared to small industries with a value of 50% of the value of large and medium industries (Central Statistics Agency, 2023).

In addition, the industrial sector also contributes to absorbing labor, especially for labor-intensive industries as shown in table 1. As much as 12% to 14% of the industrial sector plays a role in overcoming the problem of unemployment. In addition, there are other contributions made by this industrial sector, namely foreign exchange receipts from export activities and contributions to state revenues from taxes and excise.

Table 1. Number of Micro, Small, Large and Medium Industrial Workers (People), Year 2016 – 2020

Year	Micro Industry	Small Industries	Large Medium Industries	Total
2017	7660091	3118505	6614954	17393550
2018	7183934	2250324	6123185	15557443
2019	7363163	2212283	6241121	15816567
2020	6953975	2693567	5902367	15549909

Source: BPS, 2022.

In addition, there are other contributions made by this industrial sector, namely foreign exchange receipts from export activities and contributions to state revenues from taxes and excise. The largest contribution made by the industrial sector to the economy is assumed to not be maximized in actual terms. Several empirical reviews show that the performance of the manufacturing industry sector nationally is inefficient, which causes low industrial competitiveness and productivity of each sub-sector. One of the factors supporting the inefefficiency is the inequality in the market structure, namely with the control of such a large market share while the performance of the sub-sectors of the industrial sector has not been maximized, only a few sub-sectors dominate. In addition, empirically, the use of technology in the industrial sector in Indonesia is still relatively low and further contributes to low productivity compared to capital and labor.

In the economy of Tarakan City, the industrial sector contributes 12% to regional income and absorbs a workforce of 15,630 people (BPS, 2021), namely 3,212 people in micro and small industries and 6,332 people in medium and large industries.

Table 2. Number of Companies and Labor in Small Micro Industries and Large Medium Industry, Year 2021

Regency/City of North Kalimantan Province	Number of Companies and Labor in Micro and Small Industries		Number of Companies and Workers in Medium and Large Industries	
	Company	Workforce	Company	Workforce
Malinau	828	1.416	-	-
Bulungan	1.215	2.409	3	2.585
Tana Tidung	187	317	1	41
Nunukan	1223	2.281	10	6.363
Tarakan	1706	3.212	18	6.332
North Kalimantan	6.082	9.635	32	15.321

Source: BPS, 2022.

The batik industry in Tarakan City is one of the subsectors contributing to regional revenue. In the production activities carried out by batik producers, a number of inputs are integrated to produce batik consisting of two types, namely satin fabric batik and cotton fabric batik. In Tarakan City, there are 4 (four) batik brands, namely Batik Asia, Batik D'Erte, Batik Semandat and Julak Batik.

The production carried out by the four batik producers is more based on consumer needs/demands due to the large production costs compared to the revenue obtained. In addition, there are obstacles in the provision of production inputs such as raw materials, low labor productivity, limited capital and a less supportive marketing system so that the problem lies in the input value and output of production activities. In this case, it is necessary to measure efficiency in production activities in the batik industry in the city of Tarakan so that the production costs incurred by the batik producer can produce maximum output, in this case the batik producer gets the optimal profit/profit from each production period.

In production activities, it is also necessary to measure economies of scale. By measuring and determining economies of scale and efficiency analysis, it can ultimately help batik producers to produce economic decisions on batik production activities carried out. The formulation of this research problem is:

1) What is the efficiency value of the production activities of Asian Batik, D'Erte Batik, Semandat Batik and Julak Batik?
2) Of the four batik productions, which input and output values are the benchmarks to produce inefficient batik production efficiency?
3) What is the difference between the input of efficient batik production and the inefficient input?
4) What is the difference between the output of efficient batik production and inefficient inputs?
5) The economy of Berapa, in Asia, Batik D'Erte, Batik Semandat dan Julak Batik?
6) How is the analysis of the resulting economies of scale?

In the description of its contribution and problems in the economy related to the efficiency and economic scale of the industrial sector, especially in the batik industry in Tarakan City, it is a material that needs to be researched with the aim of measuring, determining and analyzing the level of efficiency and economic scale of production. This efficiency and scale analysis is also needed to determine the level of input that can produce the efficiency value of a DMU (Decision Making Unit) or unit of economic activity. Based on these things, it is necessary to conduct a study entitled Efficiency and Economic Scale of the Batik Industry in Tarakan City.

There are several studies that have the relevance of this research, including:

1) Research by Putri Devintha S.B., Imam Asngari and Suhel in 2018 entitled Analysis of Efficiency and Economic Scale in the Cooking Spice and Cooking Flavoring Industry in Indonesia

2) Pande Made Sukayanti, Ni Nyoman Yuliarmi in 2021 Analysis of Economic Scale and Factors Affecting Production in the Furniture Industry in Gianyar Regency
3) Research by Anak Agung Mas Krismayanti and I Gusti Bagus Indrajaya in 2021 with the title Analysis of Economic Scale and Efficiency in the Mosaic Glass Craft Industry in Tegallalang Village, Gianyar Regency
4) Research by Putu Taranitha Putri Wilanda and Surya Dewi Rustariyuni in 2019 with the title Analysis of Efficiency and Economic Scale in the Bamboo Weaving Handicraft Industry, Susut District, Bangli Regency.
5) Research by Lely R. and Malik Cahyadin (2017) on the Efficiency of Micro and Small Industries in Indonesia with a Data Envelopment Analysis (Dea) Approach;
6) Maya Fauziah Permatasari and Anton Agus Setyawan (2019) with a research entitled Measurement of MSME Performance Efficiency Using the Data Envelopment Analysis (Dea) Method;
7) Rahmatika, et al. (2019) Research on measuring the efficiency of the performance of clothing industry commodities in Agam district using envelopment analysis (DEA) data.
8) The research was entitled Measurement of the Efficiency Level of Small and Medium Enterprises in Surakarta Residency in 2015-2016 by Tiya Putri Ariyani and Malik Cahyadin (2020).

2. Method

2.1. Types and Sources of Data

This study uses primary data and secondary data. Primary data was obtained from interviews with batik industry owners in Tarakan City, namely Batik Asia, Batik D'Erte, Batik Semandat and Julak Batik. Secondary data as a support for the research was obtained from the Central Statistics Agency and the Tarakan-City Industry, Trade and Cooperatives Office (Disperindagkop).

2.2. Data Analysis Methods

1) Efficiency Through DEA

DEA is an analytical tool used to measure efficiency in various fields, including for health research, education, transportation, manufacturing, and banking. The benefits obtained from measuring efficiency with DEA (Insukindro et al., 2000), first, as a benchmark to obtain relative efficiency that is useful to facilitate comparisons between the same economic units. Second, measure the various variations in efficiency between economic units to identify the causal factors, and third, determine the policy implications so that they can increase their efficiency level.

In this study, the efficiency value will be measured using the EMS (Effieciency Measurement System) application using the input and output values of the batik industry obtained through interviews. The number of batik industries used in the study will be DMU (Decision Making Unit) and will be seen as an information and benchmark.

2) Economy of Scale

In this study, to determine the economic scale of batik industry activities, it is necessary to determine the elasticity value of the production activities of the four batik industries. The elasticity value is obtained from regression of the production model. In this case, the form of regression equation used is Multiple Linear Regression

In the multiple linear regression model, the form of the regression model is arranged as follows:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + e$$

or with a natural logarithmic model

$$LnY = \alpha + \beta_1 LnX_1 + \beta_2 LnX_2 + \beta_3 lnX_3 +$$

Where

Y : Production of Batik Fabric (Rp.);
α : Regression coefficient;

$\beta_1;;\ \beta_2\beta_3$: Variable coefficient;
X1 : Capital (Rp.).
X2 : Raw Materials (Rp.)
X3 : Labor (People)
e : error terms

In multiple linear regression to determine the elasticity value by adding the variable coefficients of capital, raw materials and labor (;;). $\beta_1\ \beta_2\beta_3$

Determination of economies of scale is based on the following criteria:
If : > 1, then the conclusion of production results on $\beta_1\ \beta_2\beta_3$increasing return to scale
If : < 1, then the conclusion of production results on $\beta_1\ \beta_2\beta_3$decreasing return to scale
If : = 1 then the conclusion of the production result at constant $\beta_1\ \beta_2\beta_3$return to scale

3. Result and Discussion

3.1. Analysis of the Efficiency Level of the Batik Industry in Tarakan City

The efficiency measurement in this study focuses on technical efficiency, namely the ability of the production unit to produce maximum output with a certain number of inputs. The measurement of efficiency in the batik industry in Tarakan City is to compare the efficiency values of four batik producers in Tarakan City, namely Batik Asia, Batik D'Erte, Batik Semandate and Julak Batik. The efficiency value is obtained from the processing of output and input values from the four batik producers in Tarakan City.

The following is an overview of the data that has been collected regarding the input and output values of Asian Batik, D'Erte Batik, Semandat Batik and Julak Batik.

Table 3. Input and Output Values Batik Industry in Tarakan City in 2023

DMU (MSMEs)	Input Value (Rupiah)		Output Value (Rupiah)	
	Cotton Batik	Batik Satin	Cotton Batik	Batik Satin
Asian Fern Batik	34.995.518	27.461.518	60.000.000	45.000.000
Batik D'Erte	27.911.666	17.811.666	48.750.000	22.500.000
Batik Semandat	13.114.258	9.480.926	8.125.000	2.200.000
Julak Batik	15.337.595	12.104.263	7.500.000	4.250.000

From the input value and output value in table 3., of the four batik producers, only Batik Asia and Batik D'Erte have an output value > input value, while Batik Semandat and Batik Range have an output value < input value for both cotton batik and satin batik. This shows that the production of batik carried out by Batik Semandat and Julak Batik is a *Loss Profit* because the cost is greater than the receipt. Meanwhile, Batik Asia and Batik D'Erte are profitable because the revenue is greater than the cost.

This is ultimately related to the production efficiency of the four batik producers which in this study is presented in the following table 4.

Table 4. Efficiency of the Batik Industry in Tarakan City Year 2023

DMU (MSMEs)	Efficiency Rate (%)	
	Cotton Batik	Batik Satin
Asian Fern Batik	98,16	100
Batik D'Erte	100	77,09
Batik Semandat	35,47	14,16
Julak Batik	28,00	21,43

Based on the results of data processing using EMS (*Efficiency Measurement System*) software, the efficiency for cotton batik is only in the production carried out by Batik D'Erte and for Satin Batik by Batik Asia with a value of 100% efficiency each.

For Cotton Batik produced by Asian Batik, Semandat Batik, and Julak Batik are inefficient with their values respectively being 98.16%, 35.47%, and 28.00%. Meanwhile, satin batik produced by D'Erte Batik, Semandat Batik, and Julak Batik are inefficient with values of 77.09%, 14.16%, and 21.43%, respectively.

3.2. Benchmark Analysis and Intensity Values

Data processing using EMS (*Efficiency Measurement System*) also produced *benchmarks* and values of batik production intensity from Asian Batik, D'Erte Batik, Semandat Batik, and Julak Batik. Based on table 8. The *benchmark* value of cotton batik is D'Erte Batik and for Satin Batik, *the benchmarks* are on the production carried out by Asian Batik.

Each batik producer that is inefficient in its batik production has an intensity value ranging from 0.05 to 1.23. This intensity value can be used as a benchmark in determining input and output values that can produce production efficiency or production with an efficiency level of 100%. The intensity value of data processing using EMS can calculate the difference between input and output values by each batik producer which is inefficient or is a projection or estimate of the input and output values that can produce production efficiency. The difference between the input and output values based on the intensity value is presented in table 5 and table 6.

Table 5. *Benchmarks* and intensity values Takan City Batik Industry, Year 2023

No.	DMU (MSMEs)	*Benchmarks* and Intensity Values	
		Cotton Batik	Batik Satin
1.	Asian Fern Batik	2 (1,23)	3
2.	Batik D'Erte	3	1 (0,50)
3.	Batik Semandat	2 (0,17)	1 (0,05)
4.	Julak Batik	2 (0,15)	1 (0,09)

Table 6. Input and Output Value of Cotton Batik Based on Value of the Intensity of the Takan City Batik Industry, Year 2023

DMU	Cotton Batik					
	Input (Rp.)	Initial Input (Rp.)	Difference (Rp.)	Output (Rp.)	Initial Output (Rp.)	Difference (Rp.)
Asian Fern Batik	34.331.350	34.995.519	**664.168,7**	59.962.500	60.000.000	**37.500**
Batik D'Erte	-	-	**-**	-	-	**-**
Batik Semandat	4.744.983	13.114.259	**8.369.275**	8.287.500	8.125.000	**-162.500**
Julak Batik	4.186.750	15.337.596	**11.150.846**	7.312.500	7.500.000	**187.500**

Table 7. Satin Batik Input and Output Value Based on Value of the Intensity of the Takan City Batik Industry, Year 2023

DMU	Batik Satin					
	Input (Rp.)	Initial Input (Rp.)	Difference (Rp.)	Output (Rp.)	Initial Output (Rp.)	Difference (Rp.)
Asian Fern Batik	-	-	-	-	**-**	**-**
Batik D'Erte	13.730.759	17.811.667	**4.080.908**	22.500.000	**22.500.000**	**0**
Batik Semandat	1.373.076	9.480.927	**8.107.851**	2.250.000	**2.200.000**	**-50.000**
Julak Batik	2.471.537	12.104.264	**9.632.727**	4.050.000	**4.250.000**	**200.000**

Of the production carried out by the four batik producers in Tarakan City, namely Batik Asia, Batik D'Erta, Batik Semandat, Julak Batik, only Batik Asia and Batik D'Erte are the benchmark, in this case it is about the cost (input value) and receipt (output) of batik production carried out (based on the efficiency value in table 7). The benchmark here is interpreted as *benchmarks* where each batik producer with an efficiency value of less than 100% can achieve an efficiency value of 100% if the intensity value is multiplied by the input and output value of Asian Batik (for cotton batik) and D'Erte batik (for satin batik). This is also a projection or recommendation for producers whose efficiency value has not yet reached 100%.

Based on tables 6. and 7. For cotton batik, the biggest difference is the input from Julak Batik of Rp. 11.150.846 If you look at the comparison of the input with the initial output of Julak Batik is the input < output; then this results in production inefficiency. And for the output based on the calculation of the intensity value of Rp. 7,312,500, it means that the receipt of batik cotton obtained by Julak Batik should be Rp. 7,312,500 with an input of Rp. 4,186,750.

For satin batik, the biggest difference is also in the production of Julak Batik with the input difference of Rp. 9,632,727 and an output of Rp. 200,000. Similar to cotton batik in Julak Batik, the comparison of input and output from the results of production activities shows that input > output, in production means that Julak Batik suffers losses and this causes inefficiency in production. After calculating the intensity value, the input value is Rp. 2,471,537 and the output value is Rp. 4.050.000. ini means that Julak Batik must reduce production costs and reduce prices so that production achieves efficiency.

3.3. Scale Analysis

In this study, in addition to measuring the level of production efficiency, it also measures the economic scale of the production of the four batik producers in Tarakan City. The economy is measured by regression of the production models of the four batik producers, namely Batik Asia, Batik D'Erte, Batik Semandat and Julak Batik.

In multiple linear regression to determine the elasticity value by adding the variable coefficients of capital, raw materials and labor (). β_1; β_2; β_3

Determination of economies of scale is based on the following criteria:

If $\beta_1 + \beta_2 + \beta_3 > 1$, then the conclusion of production results on *increasing return to scale*

If $\beta_1 + \beta_2 + \beta_3 < 1$, then the conclusion of production results on *decreasing return to scale*

If $\beta_1 + \beta_2 + \beta_3 = 1$ then the conclusion of the production yield at *constant return to scale*

The regression coefficient measurement was carried out using *the EVIEWS* application and the following results were obtained.

Table 8. Regression Measurement Results via *EVIEWS*

No.	Items	Value
1	C	-4.490134
2	β1X1 (Capital)	0.031077
3	β2 X2 (Raw Material)	1.291327
4.	β3 X3 (Labor)	0.017958

From the results of data processing using *EVIEWS* , the regression coefficient value of the four batik production activities of batik producers was obtained. To determine the economic scale of production, the regression coefficients of Capital, Raw Materials and Labor need to be added first, and a total regression coefficient of 1.340362 is obtained. The criterion for adding the regression coefficient is *increasing return to scale* , meaning that the production activities carried out by batik producers are at an increased rate of increase in yield or if an addition is made to capital, raw materials or labor in batik production, it will increase output by 1.34%. This means that batik production carried out in Tarakan City has the potential to be recommended to continue.

4. Conclusion

Based on the results of data processing using EMS (Efficiency Measurement System) software, the efficiency for cotton batik is only in the production carried out by Batik D'Erte and for Satin Batik by Batik Asia with a value of 100% efficiency each. For Cotton Batik produced by Asian Batik, Semandat Batik, and Julak Batik are inefficient with their values respectively being 98.16%, 35.47%, and 28.00%. Meanwhile, satin batik produced by D'Erte Batik, Semandat Batik, and Julak Batik are inefficient with values of 77.09%, 14.16%, and 21.43%, respectively.

The benchmark value of cotton batik is D'Erte Batik and for Satin Batik, the benchmarks are on the production carried out by Asian Batik. Each batik producer that is inefficient in its batik production has an intensity value ranging from 0.05 to 1.23. This intensity value can be used as a benchmark in determining input and output values that can produce production efficiency or production with an efficiency level of 100%.

For cotton batik, the biggest difference is the input from Julak Batik of Rp. 11,150,846. And for the output based on the calculation of the intensity value of Rp. 7,312,500, it means that the receipt of batik cotton obtained by Julak Batik should be Rp. 7,312,500 with an input of Rp. 4,186,750. For satin batik, the largest difference is also in the production of Julak Batik with an input difference of Rp. 9,632,727 and an output of Rp. 200,000.

From the results of data processing using EVIEWS, the total regression coefficient value of the batik production activities of the four producers was obtained at 1.340362. The criterion for adding the regression coefficient is *increasing return to scale* , meaning that the production activities carried out by batik producers are at an increased rate of increase in yield or if an addition is made to capital, raw materials or labor in batik production, it will increase output by 1.34%. This means that batik production carried out in Tarakan City has the potential to be recommended to continue.

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