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Decreasing Return to Scale in Cottage Industries: Empirical Evidence from the Coconut Sugar Industry in Banyumas, Indonesia*

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Abstract

This study aims to analyze the economies of scale of the cottage industry for coconut sugar production in Banyumas, Indonesia. This study applies a survey method to coconut sugar craftsmen. Data analysis was performed by regression analysis based on the Cobb-Douglas production function approach. The findings indicated that decreasing returns to scale was a problem for the domestic production of coconut sugar. These findings show that the production of coconut sugar is not very productive. Labor and financial capital inputs have a significant positive share but the resulting increase in output is less proportional than the increase in the two inputs. Social capital, experience, and education do not affect industrial performance. To increase input productivity and production efficiency, it is necessary to apply more effective production techniques and technologies to produce quality products so that the selling price can be higher. Additionally, it is required to enhance the sap's quality through its extraction methods and the regrowth of high-yielding coconut tree varieties. From the institutional aspect, the development of this industry requires stronger partnerships with related parties such as local governments, exporting companies, cooperatives, and universities through research and development.

Keywords: Economies of Scale, Cottage Industry, Coconut Sugar, Cobb-Douglas Production Function, Decreasing Returns to Scale

JEL Classification Code: D13, D24, J24, L26

1. Introduction

Indonesia is a country with the potential for a very large number of coconut trees. As a tropical country and many areas with lowlands strongly support the life of coconut trees. Even Indonesia is a country that has the largest coconut plantation in the world. Coconut trees have many benefits, especially coconuts and their sap. Coconut can be used as an ingredient in cooking and cooking oil, while sap can be used as a raw material for coconut sugar. With a relatively simple process, coconut sap can add value by being transformed into coconut sugar, a more valuable commodity. Coconut sugar is traditionally produced through evaporation of the sap to reach its saturated liquid and form a crystal structure (Nurhadi et al., 2018).

Coconut sugar in its utilization also provides many uses. Apart from being an ingredient in cooking, coconut sugar can be used as an additional ingredient to make a variety of foods and ingredients for making cosmetics. Because of its many benefits, coconut sugar has its market, both domestic and international markets. The global coconut sugar market is expected to grow positively along with increasing public awareness of healthy food, and awareness of consumption of dietary fiber. In addition, coconut sugar contains many nutrients which include minerals, phytonutrients, and vitamins. Coconut sugar also has many uses for other products such as confectionery, beverages, food products,

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and cosmetics. Therefore, the increase in demand for coconut sugar, especially from emerging countries, encourages an increase in the potential of the global market.

The process of making coconut sugar is generally carried out in the home industry. The coconut sugar home industry is characterized by its existence which is concentrated in rural areas. In these villages, there are many coconut trees in the yards of houses and coconut gardens. However, the abundance of coconut production does not provide benefits for coconut farmers due to falling prices in the market due to falling demand for coconut along with increasing demand for palm oil. Farmers who own coconut trees can still take advantage of coconut trees by taking the sap to be processed into coconut sugar. Coconut sugar is an alternative for farmers' income when they cannot rely on profits from selling coconuts. Many studies have shown that the income potential is much higher by utilizing coconut sap into coconut sugar than the sale of coconut.

The process of making coconut sugar is usually not through a large industrial process but by the home industry. Coconut sugar production is still carried out at the cottage industry level (Somawiharja et al., 2018). Therefore, the production process is also traditional because it does not use modern methods and technology. For farming households, the coconut sugar production business that has been going on for generations is relied on to generate income to meet their daily needs. Therefore, the coconut sugar production business becomes a reliable source of livelihood for their welfare. However, in general, home or cottage industries whose production has traditionally been faced with the problem of limited economies of scale. A business that has been occupied for so long may not necessarily be able to expand its business scale. Production efficiency is still an obstacle in developing its business. Even small and medium industries generally still face inefficiency problems as in the study conducted by Radam et al. (2008).

The cottage industry is a small-scale industry that is carried out at home and is located in rural areas. In developing countries, the cottage industry can be the backbone of the rural economy. The cottage industry plays an important role in developing countries because it is labor-intensive and provides opportunities for women to work. The important role of the cottage industry is as important socially and economically as the role of micro, small and medium industries. Micro, small and medium industries have main characteristics, namely, there are many in rural areas, that absorb a lot of labor, and provide business opportunities for women (Tambunan, 2019). The cottage industry is also a source of permanent employment for people who have relatively low education (Mohd Raof et al., 2020).

So far, there has been attention from stakeholders such as the government and private companies as partners for coconut sugar craftsmen farmers. However, the results of the assistance and partnerships obtained have not fully met the expectations of coconut sugar craftsmen to increase their income from this coconut sugar business. To develop a reliable coconut sugar business, it is necessary to know how the economies of scale of their business to determine the efficiency of their production. By understanding the characteristics and existing economies of scale, solutions can be found for existing problems, both due to constraints in their development, limited capacity in production, and the inefficiency problems they face.

In many studies on industrial economies of scale, the target of research on traditional home industries is still rarely carried out, especially on coconut sugar cottage industries. Research on industrial economies of scale is generally carried out on large, small, and medium-sized companies. Research on economies of scale for small and medium enterprises (SMEs) has been widely carried out. In many studies, the use of the Cobb-Douglas production function gives adequate results. The model approach with the Cobb-Douglas production function can give results that are no different from the more general functions (Hájková & Hurník, 2007). The use of the Cobb-Douglas production function in analyzing the productivity of domestic companies has become popular because the model can be developed according to research objectives, one of which is research conducted by Apostolov (2016). However, the results of his research still provide mixed conclusions, especially in studies of SMEs. Pinkovtskaia et al. (2019) proved the increasing returns to scale faced by SMEs in Russia, although the level of efficiency still varies in the available resources. From the aspect of business feasibility, generally, studies do provide decent business results with a ratio between benefits and costs greater than one (Satyarini et al., 2021). However, the ratio is relatively not far from the value of one. Aspects of SMEs studies so far have not been intensely related to studies on home and cottage industries which are mostly found in developing countries. Previous research on the industry, in general, has not been satisfactory to provide adequate empirical results related to the home and cottage industry. Regarding the problems of the coconut sugar industry which are included in the scope of the home industry, information about the economic scale of the business is important for efforts to improve the performance of the coconut sugar business. Therefore, information about the economic scale characteristics of the coconut sugar cottage industry is still not available, so research to explore empirical results needs to be done.

The empirical gap that exists is the lack of research on SMEs in terms of the existence of the cottage industry which is widely spread in developing countries. The significant role of the cottage industry as a provider of job opportunities and a source of permanent livelihood for people with low education is not responded to by the necessarily related studies. To fill this empirical gap, a study of the cottage

industry was carried out with the case of the coconut sugar industry.

This study aims to provide empirical evidence about the economies of scale in coconut sugar production as one of the main problems characteristic of the home industry that needs to be studied and found a solution. The scale of production becomes a problem when facing decreasing returns to scale, which indicates that production becomes less efficient when the use of production factors is increased. Therefore, this problem becomes an obstacle for the coconut sugar industry in increasing its business scale. This study takes a case in Cilongok Sub-District, Banyumas Regency, Central Java, Indonesia, which is the center of the largest coconut sugar industry in Banyumas Regency. Meanwhile, Banyumas Regency already has an international certificate as the largest producer of coconut sugar in Indonesia.

2. Literature Review

Coconut sugar is made from coconut sap. Because it is made from coconut sap, coconut sugar is a natural sugar that has several main advantages. Coconut sap is an ingredient in coconut sugar that is rich in minerals, vitamins C and B, and antioxidants (Asghar et al., 2020). Therefore, coconut sugar has a relatively high economic value because it is a healthier product. The development of coconut sugar production can be done through product diversification. In addition to molded sugar, coconut sugar can also be made in the form of crystal sugar which has a high selling value (Kurniawati et al., 2018). So far, both molded and crystal sugar are generally still produced traditionally through home industries (Nurhadi et al., 2018).

Analysis of production that produces output from a combination of inputs used in neoclassical theory is described by the production function which is a positive nonconstant function (Wang & Fu, 2013). The use of the production function in the analysis related to the production process assumes maximum output with available technology. Analysis of the relationship between the use of inputs and the resulting output in the production process can show economies of scale.

In measuring economies of scale, two terms are distinguished, namely real and financial (Becchetti & Bruni, 2020). In real terms, economies of scale are a decrease in the use of a certain amount of input when it will increase a certain amount of output. Meanwhile, in financial terms, economies of scale are reduced costs paid for inputs used to produce outputs. In economies of scale, the demand for inputs will increase.

Production efficiency analysis and returns to scale can be related to fully understanding economies of scale in the real sense. In production theory, three types of returns to scale are distinguished, namely constant, decreasing, and increasing returns to scale. Constant returns to scale mean that an increase in the use of inputs will result in an increase in output produced with the same proportion of increase. Decreasing returns to scale means an increase in the use of inputs that produces output with a smaller proportion. Meanwhile, increasing returns to scale describes an increase in output that is higher than the increase in input use. So the proportion of the increase in output is greater than the increase in the use of inputs. The nature of returns to scale will vary between industries. The general rule is that increasing returns to scale will be experienced by industries with small operating scales, and vice versa decreasing returns to scale for large operating scales (Browning & Zupan, 2020).

Constant returns to scale and decreasing returns to scale are distinguished by increasing returns to scale in explaining economic growth (Ren & Jie, 2019). In encouraging higher economic growth, it is necessary to reform the supply-side structure change from an increase in output due to an increase in inputs based on constant returns to scale to an economic structure that prioritizes efficiency improvements based on increasing returns to scale.

Constant returns to scale were initially always an assumption in the development of economic models in the analysis of economic growth before the emergence of endogenous growth theory. However, the concept of increasing returns to scale is becoming more important and is starting to be used as a premise in the study of economic growth. In the concept of increasing returns to scale, increasing marginal returns from capital and labor is possible through technological advances and innovation (Farhidi et al., 2015). The results of the study by Farhidi et al. (2015) prove that increasing the level of education and research activities are the main factors in encouraging economic growth.

Hossian and Islam (2013) proved that not all types of industries face increasing returns to scale and constant returns to scale as assumed in many microeconomic models. Assumptions regarding increasing returns to scale in the manufacturing sector according to the New Economic Geography literature are still debatable (Anguo et al., 2011). The results of the research of Anguo et al. (2011) did provide evidence of increasing returns to scale in the selected manufacturing sector in his study. A study conducted by Hossain and Al-Amri (2010) also found the majority of increasing returns to scale in production in selected manufacturing industries except for the chemical industry and chemical products. Meanwhile, the results of research by Hossian and Islam (2013) show that the cement, hemp, and textile industries experienced a decreasing return to scale. However, this industry can provide job opportunities, empower women, and reduce poverty. On the other hand, the problems faced along with decreasing returns to scale

are underutilization of the use of equipment, low skills of workers, shortage of raw materials, and low financial investment.

The use of the Cobb-Douglas production function in research can be used to analyze patterns and trends in the performance of an industry (Gaire, 2018). In a broader sense, the Cobb-Douglas production function is not only for the analysis of individual firms but also for industries within sectors. By basing the Cobb-Douglas production function, Gao and Kehrig (2017) prove that the manufacturing and construction sectors experience decreasing returns to scale. The average value of returns to scale is less than one for all manufacturing and construction sectors studied. Returns to scale determine industry outcomes such as dispersion and concentration. The results of the returns to scale analysis become important information in assessing efficiency and welfare due to the distribution of total factor productivity.

In the financial sector, McLemore (2019) conducted a study on the characteristics of returns to scale mutual funds. This study aims to examine the relationship between size and performance. The results of the study show that after the merger mutual funds experienced decreasing returns to scale. This result is consistent with the negative relationship between size and performance in mutual funds.

Mukhlis and Pratama (2016) found evidence of the characteristics of returns to scale in small-scale industries, namely the rattan furniture industry. This industry is facing decreasing returns to scale. An increase in production provides an increase in profit with a smaller proportion. A certain increase in output requires an increase in the use of all inputs by a larger additional proportion. These results are consistent with the labor-intensive nature of the industry.

In partially investigating the effect of production inputs, Batool and Zulfiqar (2013) proved that labor and capital inputs have a positive effect on the output of small and medium-sized industries. Furthermore, labor inputs that have a significant effect on output in small and medium industries are male workers. The same results were also obtained in the research conducted by Long and Anh (2017) that both inputs had a significant positive effect on the output of small and medium industries. At the macro data level, Amuka et al. (2018) also proved the positive influence of labor and capital inputs on output. The findings also show that aggregate production in the Nigerian economy is experiencing decreasing returns to scale.

In addition to labor and capital inputs, social capital in the literature also influences output. In the organization, social capital among members can encourage the ability to share knowledge and ideas which can then increase the ability to utilize resources and performance in running their business (Florin et al., 2003; Lakse Mudiyanselage, 2020). In addition, social capital is also an important factor in providing benefits for knowledge and opportunities for organizations to understand the structure of organizational networks (Celestini et al., 2013). According to Agyapong et al. (2017), social capital has a positive effect on performance and innovation in micro and small businesses to encourage business success. Social capital and innovation play an important role in achieving the success of micro and small businesses. Furthermore, Jalali et al. (2013) stated that social capital has a positive effect on the success of Micro, Small, and Medium Entreprises (MSMEs). Innovation can mediate the relationship between social capital and MSME success. Sun et al. (2019) also found evidence that in rural areas, residents who have higher social capital tend to have higher entrepreneurial spirit and practices than residents in urban areas. In rural areas, small business entrepreneurship tends to become a necessity when employment opportunities in the formal sector are limited for rural residents. Furthermore, from the social capital dimension, Ha (2021) proved that cognitive social capital has a positive effect on the operational performance of SMEs. Cognitive Social Capital indicates the level of sharing of the same perspective and understanding among network members. According to Hoang and Truong (2021), the quality of social capital has a significant impact on knowledge sharing, which is one of the pathways connecting social capital with enterprise performance.

Additional factors that can influence industrial performance are education and experience. Education and experience can encourage worker productivity which in turn improves business performance. Susanto and Purwiyanta (2014) stated that education is a driver of labor productivity. Furthermore, labor productivity can improve industrial performance. Based on the results of their study, Kampelmann et al. (2018) suggested that education has a stronger impact on productivity than an increase in wages. A positive relationship between higher education and productivity was also found by Jung (2015) based on the results of his research. Karadag (2017) also proved the strong positive influence of the level of education of the owners on the performance of SMEs.

Meanwhile, related to work experience, Kekezi (2021) stated that related work experience has a positive effect on labor productivity, while work experience that is not related to the work done can have a negative effect. Đukec and Miroslav (2017) also found evidence that work experience affects labor productivity in companies. According to Pellissier and Nenzhelele (2013), the work experience of owners and managers in SMEs has a major influence on the awareness and practice of gathering information from the business environment. Training programs need to be implemented in this domain to help build a competitive advantage. Furthermore, the information collected from the internal and external business environment is analyzed as a decision-making material. Chiliya and Roberts-Lombard (2012) also find evidence that previous experience has

a positive relationship with SME performance. Similar findings were reached by Salfiya Ummah et al. (2021) in their study, which showed that experience from the human capital side positively impacts business performance.

3. Methodology

3.1. Data and Variable

The data in this study are primary data obtained from surveys in mid of 2021. Respondents used as samples are coconut sugar craftsmen in the form of molded sugar and crystal sugar. The population of coconut sugar craftsmen is located in Cilongok Sub-District, Banyumas Regency, Central Java, Indonesia. The coconut sugar industry in this region is the largest industrial center in Banyumas, Central Java, Indonesia. With a purposive sampling approach, 10 percent of the samples were taken from five villages with the largest number of craftsmen in the Cilongok Sub-District. The sufficiency of the sample is as much as 10 percent by considering the population of craftsmen who are relatively homogeneous. With these considerations, the number of respondents who were used as samples in this study was 165.

The variables analyzed in this study include output, labor, financial capital, social capital, experience, and length of education. Output is measured in rupiah per month. Labor is measured by the total working hours of family workers for one month. Financial capital is business capital measured in rupiah, which is used for investment in equipment and production facilities. Social capital is measured by a Likert scale so that it obtains a final score based on three indicators, namely norms, trust, and networking. Experience in running a business is measured in years and length of education is also measured in years.

3.2. Model

The estimated models are divided into three models. The first model is the core model in which the production function consists of only two main variables, namely capital, and labor. This model is a conventional model of the Cobb-Douglas production function which is stated as follows.

$$Q = AL^{\alpha}K^{\beta} \quad (1)$$

where:
Q = output
L = labor
K = capital
A = Positive constant that measures total factor productivity

Furthermore, equation (1) is expressed as a log-linear equation with the variables in the logarithm. The econometric model of equation (1) can be expressed as the following equation.

$$lnQ_i = \phi + \alpha\, lnL_i + \beta\, lnK_i + u_i \quad (2)$$

where $\phi = \ln A$ and u is disturbance term
Expected estimated parameters:
$\alpha > 0$, $\beta > 0$, and $\alpha + \beta < 1$

Estimated parameters α and β show the elasticity coefficient of changes in the output by changes in each input, namely labor, and capital. As stated in Gaire (2018) and Hossain and Al-Amri (2010) that $\alpha + \beta$ reflects returns to scale. If $\alpha + \beta = 1$ then production experiences constant returns to scale. If $\alpha + \beta > 1$ then production has increasing returns to scale. If $\alpha + \beta < 1$ then the production is experiencing decreasing returns to scale.

In addition to model estimation using the ordinary least squares (OLS) method, quantile regression is also applied to obtain robust results related to the estimated parameters and tests against economies of scale. Quantile regression is one type of modeling that can be used to explain the response variables in each quantile and can be applied to inhomogeneous residual conditions. Quantile regression is able to provide more robust and complete estimates than mean regression, even when the normality assumption is not met or there are outliers (Huang et al., 2017).

In the estimation of the basic model as stated in equation (2) the estimated parameter $\alpha + \beta$ can be tested with the Wald test. The use of Wald test can be used to test the significance of the total effect of variables in the model as has been done in research conducted by Arintoko (2021).

The second model is an extension of the first model in equation (2) by adding experience and length of education as independent variables. Meanwhile, the third model is an extension of the second model by adding social capital as an explanatory variable. Expansion of the model by adding explanatory variables other than the core variables can be done to measure the effect of other characteristics in production as was done in a study conducted by Hanink (2005). In the research of Armagan and Ozden (2007) the expansion of the Cobb-Douglas model can be done based on the conventional production function.

The second econometric model estimated in this study is expressed in the following equation.

$$lnQ_i = \phi + \alpha ln\, L_i + \beta ln\, K_i + \delta ln\, \mathrm{EXP}_i + \gamma ln\, \mathrm{EDU}_i + u_i \quad (3)$$

where
Q = output
L = labor
K = kapital
EXP = experince

EDU = education
u = disturbance term
Expected estimated parameters:
$\alpha > 0, \beta > 0, \delta > 0$, and $\gamma > 0$

The third econometric model is an extension of the second econometric model by adding social capital variables.

$$ln\ Q_i = \phi + \alpha lnL_i + \beta lnK_i + \delta ln\text{EXP}_i + \gamma\ ln\text{EDU}_i + \lambda\ \text{SC}_i + u_i \quad (4)$$

where SC is social capital
Expected estimated parameters:
$\alpha > 0, \beta > 0, \delta > 0, \gamma > 0, \lambda > 0$

4. Results and Discussion

The description of the sample characteristics can be shown in the statistical description presented in Table 1. Coconut sugar produced by craftsmen has an average of 1,894,999 rupiahs per month. The average financial capital as working capital for coconut sugar craftsmen is 1,449,271 rupiahs. The experience of workers with an average of 26.53 years shows that the experience of coconut sugar craftsmen is rich inexperience. However, coconut sugar craftsmen generally have low education with an average length of education of six years which is equivalent to elementary school education. Social capital scores are obtained from indicators of norms, trust, and networking. There is a fairly high variation for output, financial capital, and experience with a standard deviation greater than the minimum value. Meanwhile, the standard deviation for working hours, social capital, and length of education is lower than the minimum value. The variation of the three variables is relatively small.

Table 2 shows the estimation results with three models. The estimated coefficient of financial capital obtained in this analysis is higher than the coefficient of labor estimation. The elasticity of changes in the output by changes in financial capital is greater than the elasticity of changes in the output by changes in labor. These results are in line with the results of research conducted by Zatsu and Jamir (2019), which proves the operation of micro and small manufacturing enterprises with decreasing returns to scale in Nagaland, India. The similarity of the findings obtained is also in the higher elasticity of capital than the elasticity of labor.

The estimation results show that the financial capital and labor variables consistently have a significant positive effect on the output for the three models. Even the parameters of the two input variables are relatively stable in the three models. However, the sum of the two estimated parameters is consistent with a value of less than one which confirms

Table 1: Descriptive Statistics

Variables	Mean	Maximum	Minimum	Std. Dev.
Output (Rp per month)	1,894,999	4,800,000	560,000	751,319.9
Financial Capital (Rp)	1,499,271	8,000,000	497,500	864,729.1
Labor (Total working hours per month)	325.27	480.00	150.00	67.16
Social Capital (Likert score)	31.77	43.39	20.16	4.99
Experience (Year)	26.53	60.00	5.00	10.55
Length of Education (Year)	6.04	12.00	3.00	1.10

N = 165.

Table 2: Parameters Estimated from Regression with Ordinary Least Squares

Variables	Model 1	Model 2	Model 3
Constant	7.1092***	7.7749***	7.9829***
Financial Capital	0.3812***	0.3555***	0.3521***
Labor	0.3282**	0.3191**	0.3207**
Social Capital	–	–	–0.0486
Experience	–	–0.1047	–0.1067
Lenght of Education	–	0.0469	0.0498

Notes: ***$p < 0.01$, **$p < 0.05$.

the decreasing returns to scale. The estimation results of model 2 also show that the experience and length of education variables have no significant effect on coconut sugar production. Similarly, the estimation results of model 3 show that the social capital variable has no significant effect on coconut sugar production in the coconut sugar industry. Based on the comparison of performance models, Table 3 shows that model 1 is the best based on *F*-statistic, Akaike Information Criterion (AIC), and Schwarz Information Criterion (SIC). The three models have passed the problems of nonnormality, multicollinearity, heteroscedasticity, and autocorrelation.

The econometric model test related to the economies of scale of the coconut sugar home industry is reported in Table 4. The test results by applying the Wald test with a *p*-value of 1 percent show that with the estimation of the three models, the value of $\alpha + \beta$ is significantly less than one. These results conclude that the home industry of coconut sugar production has decreasing returns to scale.

The model based on the Cobb-Douglas production function found that the basic model was the best. When there are additional variables other than the core inputs of labor and capital, namely social capital, experience, and length of education, the estimation results show that the three variables have no significant effect on output. Table 5 summarizes the test results with the Wald test for adding social capital, experience, and length of education variables. The results conclude that the three variables are not significant if they are included in the model. With the *t*-test and *F*-test, the estimation results for the three variables are not significant at a *p*-value of 1 percent.

Social capital has no significant effect on the output produced by the coconut sugar business. This result is in line with the findings in the studies conducted by Meflinda et al. (2018) and Purwati et al. (2021) that social capital does not have a direct effect on the performance of culinary SMEs. This study also found no evidence that education level had an effect on coconut sugar business output. This finding is in line with the study conducted by Amarteifio and Agbeblewu (2017), who informed that the level of education did not significantly improve the performance of SMEs. This finding is also in line with the conclusions of the study conducted by Sun et al. (2019) that people with higher levels of education tend to choose to work in the formal sector rather than owning a small business. People with higher education levels have a higher opportunity cost of owning a small business. In this study, the experience of coconut sugar craftsmen did not have a positive effect on increasing the output of their small business. These results are in line with the findings in the study conducted by Cowling et al. (2018) that the experience of entrepreneurs in small businesses does not have a substantive effect on small business performance. The results of the study by Rahaman et al. (2021) also reported that previous experience had no significant effect on the performance of SMEs.

To test the consistency of the results that inform the conclusion that decreasing returns to scale are robust, the model estimation is also carried out on quantile regression. Table 6 shows the estimated values of α, β, and $\alpha + \beta$ at various values of τ, i.e., different conditional quantiles. The results conclude that the share of labor input and financial capital input is significant with a positive sign. In addition, from the results of the estimated value of $\alpha + \beta$ which is consistently less than one, it can be concluded that there are decreasing returns to scale (DRTS) in the coconut sugar home industry. The finding of decreasing returns to scale in the cottage industry makes sense regarding the characteristics

Table 3: Diagnostic Test of Regression

Elements	Model 1	Model 2	Model 3
R^2	0.2233	0.2354	0.2357
Adj. R^2	0.2137	0.2163	0.2117
F-stat	23.292***	12.316***	9.8098***
AIC	0.8186	0.8272	0.8388
SIC	0.8751	0.9213	0.9518
Jarque-Bera	4.4101	4.4919	4.4238
Max VIF	1.0023	1.0884	1.1359
BPG *F*-stat	0.9173	0.4199	0.3878
B-G LM *F*-stat	0.8530	0.8278	0.8069

Notes: ***$p < 0.001$.

Table 4: Testing for Economies of Scale

Model	Value of $\alpha + \beta$	Wald *t* test	Conclusion
Model 1	0.7095	5.0067***	Significant DRTS
Model 2	0.6747	4.6755***	Significant DRTS
Model 3	0.6728	4.6436***	Significant DRTS

Notes: ***$p< 0.01$.

Table 5: Additional Variable Significance Using Wald Test

Variables	*t*-stat.	*F*-stat	Conclusion
Social Capital	0.0569	0.0032	Insignificant included
Experience	1.5625	2.4415	Insignificant included
Lenght of Education	0.4271	0.1824	Insignificant included

Notes: *$p < 0.05$.

Table 6: Quantile Regression Results

τ	α	β	$\alpha+\beta$	Wald *t* test	Conclusion
0.1	0.4248***	0.3683	0.7931	2.3256**	Significant DRTS
0.25	0.4385***	0.4578**	0.8963	3.5065***	Significant DRTS
0.5	0.3377***	0.3033**	0.6410	4.2717***	Significant DRTS
0.75	0.3448***	0.3628***	0.7077	4.9186***	Significant DRTS
0.9	0.3178***	0.5387***	0.8566	4.8218***	Significant DRTS

Notes: ***p < 0.01, **p < 0.05.

and shortcomings of this industry. This production does not use high technology, does not require higher education for its workers, and does not go through a complicated production process, so variations in experience do not have much effect on output, and social capital also has no effect on production performance. Because labor productivity is relatively constant and it is difficult to increase production in large quantities due to limited inputs both in quantity and quality. Adoption of appropriate technology, improvement of input quality, especially coconut trees and sap extraction techniques, and guarantee and stability of higher selling prices are needed to increase productivity and income for coconut sugar producers. The study conducted by Bukit et al. (2018) found no evidence of the effect of worker experience on productivity. Meanwhile, the research conducted by Tanjung and Muryani (2019) did not find a direct effect of social capital on human capital that can encourage productivity.

The findings of past studies for small and medium-sized enterprises align with the findings of the cottage industry's decreasing returns to scale, including those conducted by Batool and Zulfiqar (2013), Long and Anh (2017), and Zatsu and Jamir (2019). The characteristics of cottage industries are closer to small industries. The results of this study are different from the findings of studies on large manufacturing industries whose characteristics are different from those of small and home industries. The finding of decreasing returns to scale in the coconut sugar cottage industry is different from the findings of many other studies on large manufacturing industries, including studies by Hossain and Said Al-Amri (2010) and Anguo et al. (2011), who found increasing returns to scale. Thus, this study has confirmed the inherent problems of SMEs in the case of the coconut sugar cottage industry.

Increasing production efficiency with the application of technology to support the improvement of the quality of coconut sugar can also increase labor productivity. However, this effort also needs to be accompanied by an increase in the knowledge and skills of workers considering the lessons learned from the results of research conducted by Thuy et al. (2020) that the application of technology in companies is not sufficient to increase labor productivity. Improving the quality of coconut sugar through improving the production process with other alternative methods can be done. Research by Nurhadi et al. (2018) offers an alternative solution to obtain the desired coconut sugar yield through the drying method, either by vacuum or spray drying.

Improving the performance of the coconut sugar production business needs to be a concern for interested parties, especially local governments, partner companies, cooperatives, and universities, with a focus on improving product quality, marketing, and higher selling price stability. Increased knowledge and utilization of production techniques and technology to improve quality is a priority. These efforts are important in increasing the income of coconut sugar craftsmen, which on average, are still below the standard of living for Banyumas Regency, as stated by Rahajuni et al. (2021). These efforts cannot be separated from the support, commitment, and cooperation of the various related parties.

5. Conclusion

This study has confirmed the problems inherent in SMEs, using the cottage industry for coconut sugar as an example, where production performance demonstrates a poor level of productivity. This study found evidence of decreasing returns to scale in the coconut sugar cottage industry. Labor and capital inputs have a positive share of output. Although it has a significant positive contribution to output, this production economy of the scale represents decreasing returns to scale. The increase in labor and capital inputs gives an increase in output in a smaller proportion than the increase in inputs. This condition indicates relatively low productivity of labor and capital. This condition is a representation of the common problems faced by home, micro, small and medium industries. The problem of inadequate quality and quantity of sap and coconut trees, resulting in a relatively low selling price, has resulted in low income and low bargaining position of coconut sugar craftsmen. The production process which is still carried out traditionally, is also the reason for this problem.

From the input aspect, the quality of superior varieties of coconut trees is needed, and the need for regeneration of coconut trees as a source of sap which is the raw material for coconut sugar production. To create coconut sugar of a higher quality with added value and at a higher selling price, it is necessary to improve production methods and technology by leveraging innovations from universities. From the marketing aspect, stronger networks and partnerships are needed to ensure a definite and higher selling price and are more oriented towards the export market. Cooperation and partnerships with interested parties such as local governments, partner companies, cooperatives, and universities will greatly support the existence and sustainability of the coconut sugar cottage industry.

References

Agyapong, F. O., Agyapong, A., & Poku, K. (2017). Nexus between social capital and performance of micro and small firms in an emerging economy: The mediating role of innovation. *Cogent Business and Management*, *4*(1), 1, 1309784. https://doi.org/10.1080/23311975.2017.1309784

Amarteifio, E. N. A., & Agbeblewu, S. (2017). Level of education, business experience, and small and medium enterprise performance in the Accra Metropolis of Ghana. *International Journal of Multidisciplinary and Current Research*, *5*(12), 1460–1466. http://ijmcr.com/category/ijmcr/vol-5-nov-dec-2017/

Amuka, J. I., Asogwa, F. O., Ugwu, C. C., & Ugwu, K. C. (2018). Testing the fit of Cobb-Douglas production function within unrestricted least squares. *International Journal of Economics and Financial Issues*, *8*(3), 142–147. https://www.econjournals.com/index.php/ijefi/article/view/5544

Anguo, L., Ge, G., & Kaizhong, Y. (2011). Returns to scale in the production of selected manufacturing sectors in China. *Energy Procedia*, *5*, 604–612. https://doi.org/10.1016/j.egypro.2011.03.106

Apostolov, M. (2016). Cobb–Douglas production function on FDI in southeast Europe. *Journal of Economic Structures*, *5*(1), 10, 28–43. https://doi.org/10.1186/s40008-016-0043-x

Arintoko, A. (2021). The stock price response of palm oil companies to industry and economic fundamentals. *Journal of Asian Finance, Economics, and Business*, *8*(3), 99–110. https://doi.org/10.13106/jafeb.2021.vol8.no3.0099

Armagan, G., & Ozden, A. (2007). Determinations of total factor productivity with Cobb-Douglas function in agriculture: The case of Aydin-Turkey. *Journal of Applied Sciences*, *7*(4), 499–502. https://doi.org/10.3923/jas.2007.499.502

Asghar, M. T., Yusof, Y. A., Mokhtar, M. N., Ya'acob, M. E., Mohd Ghazali, H., Chang, L. S., & Manaf, Y. N. (2020). Coconut (Cocos nucifera L.) sap as a potential source of sugar: Antioxidant and nutritional properties. *Food Science and Nutrition*, *8*(4), 1777–1787. https://doi.org/10.1002/fsn3.1191

Batool, S. A., & Zulfiqar, S. (2013). Analyzing the input-output relationship of small and medium enterprises in Pakistan: An econometric approach. *International Journal of Business and Economic Development*, *1*(1), 66–73. https://mpra.ub.uni-muenchen.de/50069/

Becchetti, L., & Bruni, L. (2020). The theory of production decisions. In: L. Becchetti, L. Bruni & S. Zamagni (Eds.). *The microeconomics of wellbeing and sustainability* (pp. 115–138). Cambridge, MA: Academic Press.

Browning, E. K., & Zupan, M. A. (2020). *Microeconomics: Theory and applications* (13th ed). Hoboken, NJ: John Wiley & Sons.

Bukit, I. N. M., Ismida, Y., Maulana, R., & Nasir, M. (2018). The influence of wage, age, and experience on labor productivity in construction works in Kota Langsa, Aceh. *MATEC Web of Conferences*, *147*(4), 6004. https://doi.org/10.1051/matecconf/201814706004

Celestini, J., Gavronski, & Kaynak, H. (2013). The relationship between social capital and operational performance. https://www.pomsmeetings.org/confpapers/051/051-0820.pdf

Chiliya, N., & Roberts-Lombard, M. (2012). Impact of the level of education and experience on the profitability of small grocery shops in South Africa. *International Journal of Business Management and Economic Research*, *3*(1), 462–447.

Cowling, M., Liu, W., & Zhang, N. (2018). Did firm age, experience, and access to finance count? SME performance after the global financial crisis. *Journal of Evolutionary Economics*, *28*(1), 77–100. https://doi.org/10.1007/s00191-017-0502-z

Đukec, D., & Miroslav, S. (2017). The effect of human capital on labor productivity: A case study of Hilding Anders Ltd. *Education for Entrepreneurship*, *7*(1), 9–19. https://hrcak.srce.hr/file/270406

Farhidi, F., Isfahani, R. D., & Emadzadeh, M. (2015). Ideas, increasing returns to scale, and economic growth: An application for Iran. *Journal of Business & Economic Policy*, *2*(1), 88–97. https://jbepnet.com/journals/Vol_2_No_1_March_2015

Florin, J., Lubatkin, M., & Schulze, W. (2003). A social capital model of high-growth ventures. *Academy of Management Journal*, *46*(3), 374–384. https://doi.org/10.2307/30040630

Gaire, H. N. (2018). Estimation of the production function for furniture and pharmaceutical industries in Nepal. *NRB Economic Review*, *30*(2), 19–34. https://www.nrb.org.np/contents/uploads/2019/12/vol30-2_art2.pdf

Gao, W., & Kehrig, M. (2017). Returns to scale, productivity, and competition: Empirical evidence from U.S. manufacturing and construction establishments. *SSRN Journal, 16, 596*. http://doi.org/10.2139/ssrn.2731596

Ha, M. (2021). Social capital and firm operational performance: The mediating roles of knowledge sharing. *Cogent Business and Management*, *8*(1), 237. https://doi.org/10.1080/23311975.2021.1973237

Hájková, D., & Hurník, J. (2007). Cobb-Douglas production function: The case of a converging economy. *Czech Journal*

of Economics and Finance, *57*(9–10), 465–476. https://journal.fsv.cuni.cz/mag/issue/list/limit/20/offset/80/

Hanink, D. M. (2005). Spatial externality. In: K. Kempf-Leonard (Ed.), *Encyclopedia of social measurement* (pp. 621–626). Elsevier: The Netherlands. https://doi.org/10.1016/B0-12-369398-5/00362-5

Hoang, T. N., & Truong, C. B. (2021). The relationship between social capital, knowledge sharing and enterprise performance: Evidence from Vietnam. *Journal of Asian Finance, Economics, and Business*, *8*(11), 133–143. https://doi.org/10.13106/JAFEB.2021.VOL8.NO11.0133

Hossain, M. Z., & Said Al-Amri, K. (2010) Use of Cobb-Douglas production model on some selected manufacturing industries in Oman. *Education, Business and Society: Contemporary Middle Eastern Issues*, *3*(2), 78–85. https://doi.org/10.1108/17537981011047925

Hossain, S., & Islam, A. K. M. N. (2013). Productivity analysis and measuring the returns to scale of manufacturing firms in the South-West Region of Bangladesh. *IOSR Journal of Humanities and Social Science*, *17*(2), 69–77. https://doi.org/10.9790/0837-1726977

Huang, Q., Zhang, H., Chen, J., & He, M. (2017). Quantile regression models and their applications: A review. *Journal of Biometrics and Biostatistics*, *08*(3), 354. https://doi.org/10.4172/2155-6180.1000354

Jalali, M., Jalali, F., Shamsodin, R., Dadbeh, F., & Sharifi, S. (2013). The role of social capital and innovation in SMEs' success: A partial least squares approach. *Journal of Basic and Applied Scientific Research*, *3*(4), 515–522.

Jung, D. B. (2015). Effectiveness of higher education to labor productivity. *PEOPLE: International Journal of Social Sciences*, *1*(1), 01–22. https://doi.org/10.20319/pijss.2015.11.0122

Kampelmann, S., Rycx, F., Saks, Y., & Tojerow, I. (2018). Does education raise productivity and wages equally? The moderating role of age and gender. *IZA Journal of Labor Economics*, *7*(1), 37. https://doi.org/10.1186/s40172-017-0061-4

Karadag, H. (2017). The impact of industry, firm age and education level on financial management performance in small and medium-sized enterprises (SMEs): Evidence from Turkey. *Journal of Entrepreneurship in Emerging Economies*, *9*(3), 300–314. https://doi.org/10.1108/JEEE-09-2016-0037

Kekezi, O. (2021). Diversity of experience and labor productivity in creative industries. *Journal of Labour Market Research*, *55*(18), 21. https://doi.org/10.1186/s12651-021-00302-3

Kurniawati, E., Nurul, R., Lironika, A., & Destarianto, P. (2018). Coconut sugar craftsmen business group in Wonosobo-Banyuwangi village as a helicos center. *Proceedings of the First International Conference of Food and Agriculture,* Jember State Polytechnic, October 20–21, 2018 (pp. 270–275). https://publikasi.polije.ac.id/index.php/ProceedingICOFA/article/view/1307

Lakse Mudiyanselage, C. S. M. (2020). Effect of social capital on firm performance: An empirical study of small enterprises in Sri Lanka. *Sri Lanka Journal of Social Sciences Research*, *16*, 108–125. https://doi.org/10.24297/jssr.v16i.8904

Long, P. D., & Anh, H. T. M. (2017). Innovation and productivity of Vietnamese small and medium enterprises: Firm-level panel data evidence. *International Journal of Economics and Financial Issues*, *7*(3), 226–232. https://www.econjournals.com/index.php/ijefi/article/download/4467/pdf

McLemore, P. (2019). Do mutual funds have decreasing returns to scale? Evidence from fund mergers. *Journal of Financial and Quantitative Analysis*, *54*(4), 1683–1711. https://doi.org/10.1017/S0022109018001023

Meflinda, A., Mahyarni, M., Indrayani, H., & Wulandari, H. (2018). The effect of social capital and knowledge sharing on the small-medium enterprise's performance and sustainability strategies. *International Journal of Law and Management*, *60*(4), 988–997. https://doi.org/10.1108/IJLMA-03-2017-0073

Mohd Raof, N., Ab Rahim, S., Mukhtar, D., & Muhammad, M. Z. (2020). The challenges for small-medium enterprise (SME) in the cottage industries. *Advanced International Journal of Banking, Accounting, and Finance*, *2*(2), 01–12. https://doi.org/10.35631/AIJBAF.22001

Mukhlis, B. A, & Pratama, D. (2016). Economies of scale of rattan furniture industry in Palembang, South Sumatra. *Proceeding 2nd Sriwijaya Economics, Accounting, and Business Conference*, *Indonesia*, November 23–24, 2016 (pp. 613–628). Palembang: UNSRI Publisher. https://www.researchgate.net/publication/316250195

Nurhadi, B., Sukri, N., Sugandi, W. K., Widanti, A. P., Restiani, R., Noflianrini, Z., Rezaharsamto, B., & Herudiyanto, M. (2018). Comparison of crystallized coconut sugar produced by traditional method and amorphous coconut sugar formed by two drying methods: Vacuum drying and spray drying. *International Journal of Food Properties*, *21*(1), 2339–2354. https://doi.org/10.1080/10942912.2018.1517781

Pellissier, R., & Nenzhelele, T. E. (2013). The impact of work experience of small and medium-sized enterprises owners or managers on their competitive intelligence awareness and practices. *SA Journal of Information Management*, *15*(1), 551. https://doi.org/10.4102/sajim.v15i1.551

Pinkovtskaia, I. S., Rojas-Bahamon, M. J., & Arbeláez-Campillo, D. F. (2019). Estimation of production functions of turnover small and medium enterprises: Experience of Russian regions. *Revista Espacios*, *40*(13), 7–14. http://www.revistaespacios.com/a19v40n13/a19v40n13p07.pdf

Purwati, A. A., Budiyanto, M., & Suhermin, I. (2021). Social capital, entrepreneurial leadership, and SMEs performance: The mediating effect of innovation capability. *Journal of Business Education and Management*, *7*(3), 170–181.

Radam, A., Abu, M. L., & Abdullah, A. M. (2008). Technical efficiency of small and medium enterprise in Malaysia: A stochastic frontier production model. *International Journal of Economics and Management*, *2*(2), 395–408. http://www.ijem.upm.edu.my/vol2_no2.htm

Rahajuni, D., Badriah, L. S., & Arintoko. (2021). Analysis of income, costs, and income distribution of coconut sugar craftsmen in Cilongok District. http://jp.feb.unsoed.ac.id/index.php/sca-1/article/view/2784. *Proceeding of 11th Sustainable Competitive Advantage 2021 International Conference, Colloquium, and Call for Papers,* Jenderal Soedirman University, October 26, 2021 (pp. 21–30). http://jp.feb.unsoed.ac.id/index.php/sca-1/article/view/2784

Rahaman, M. A., Luna, K. F., Ping, Z. L., Islam, M. S., & Karim, M. M. (2021). Do risk-taking, innovativeness, and proactivity affect the business performance of SMEs? A case study in Bangladesh. *Journal of Asian Finance, Economics, and Business*, *8*(5), 689–695. https://doi.org/10.13106/jafeb.2021.vol8.no5.068

Ren, B., & Jie, W. (2019). An empirical study on the returns to scale of supply structure in China's economic growth: 1993–2015. *China Political Economy*, *2*(2), 354–372. https://doi.org/10.1108/CPE-10-2019-0019

Salfiya Ummah, M. A. C., Choy, C. S., & Sulaiha Beevi, A. (2021). Factors influencing the business performance of small and medium enterprises: A case study in Sri Lanka. *Journal of Asian Finance, Economics, and Business*, *8*(4), 201–212. https://doi.org/10.13106/JAFEB.2021.VOL8.NO4.0201

Satyarini, B. T., Sutrisno, & Wira Kartika, F. (2021). Feasibility based on production patterns by home industries in Hargotirto, Kokap, Kulon Progo, Yogyakarta. *E3S Web of Conferences*, *232*, 02012. https://doi.org/10.1051/e3sconf/202123202012

Somawiharja, Y., Wonohadidjojo, D. M., Kartikawati, M., Suniati, F. R. T., & Purnomo, H. (2018). An Indigenous technology of tapping, collecting, and processing coconut (Cocos nucifera) sap and its quality in Blitar Regency, East Java, Indonesia. *Food Research*, *2*(4), 398–403. https://doi.org/10.26656/fr.2017.2(4).075

Sun, X., Xiong, A., Li, H., Westlund, H., & Li, Y. (2019). Does social capital influence small business entrepreneurship? Differences between urban and rural China. *Annals of Regional Science, 16*, 1–22. https://doi.org/10.1007/s00168-019-00922-1

Susanto, J., & Purwiyanta, M. (2014). Education, labor productivity and industrial performance: Evidence of Indonesia. *Proceedings of the International Conference on Contemporary Economic Issues*, Malaysia, December 11–12. Kuala Lumpur (pp. 17–21). Kuala Lumpur: Universiti Sains Malaysia. https://eprints.upnyk.ac.id/12171/

Tambunan, T. (2019). Recent evidence of the development of micro, small and medium enterprises in Indonesia. *Journal of Global Entrepreneurship Research*, *9*(18), 4–19. https://doi.org/10.1186/s40497-018-0140-4

Tanjung, F., & Muryani, R. (2019). The influence of social capital in economic development in Indonesia: Macro data analysis of 2012 and 2014. *International Journal of Advances in Scientific Research and Engineering*, *5*(3), 128–132. https://doi.org/10.31695/IJASRE.2019.33117

Thuy, L. T. H., Le, N. P., Cuong, L. V., & Tu, N. T. T. (2020). Application of Cobb-Douglas production in analyzing the private enterprises' ability of job creation in Phu Tho province. *Journal of Science and Technology*, *21*(4), 29–39.

Wang, X., & Fu, Y. (2013). Some characterizations of the Cobb-Douglas and CES production functions in microeconomics. *Abstract and Applied Analysis*, *76,* 832. https://doi.org/10.1155/2013/761832

Zatsu, M., & Jamir, Y. T. (2019). An economic analysis of micro and small manufacturing enterprises in Nagaland. *Economic Affairs*, *64*(1), 99–105. https://doi.org/10.30954/0424-2513.1.2019.13