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Research article

The Production Efficiency of Small Medium Enterprises in West Sumatera Province

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Abstract: The purpose of this study is to determine the effect of capital, labor, and resources on the technical efficiency production of SMEs in West Sumatra and to see whether the SMEs production in West Sumatra is technically efficient. The type of data used in this study is panel data for 19 regencies/cities in West Sumatra from 2015 to 2021 using the Stochastic Frontier Analysis (SFA) approach. This research examines production efficiency technically at SMEs in the West Sumatra region. The result of this study indicates that the production factors of capital and resources have a positive and significant effect on the production of SMEs in West Sumatra, while labor has a negative and insignificant effect on the production of SMEs in West Sumatra. The result of the technical efficiency calculation shows that the mean level of technical efficiency of the SMEs production in West Sumatra from 2015 to 2021 is 0.543 or 54.3 percent, which means that production in SMEs is technically inefficient. This research implies that the government can compile regulations and road maps that can increase the productivity of SMEs in the West Sumatra region, and for SMEs to be able to engage more broadly with sustainable programs for production efficiency such as attending training and business guidance, using the rural business credit program from the government, as well as establishing cooperation partners for raw materials with other SMEs.

Keywords: capital, labor, resource, SMEs production, technical efficiency

JEL Classification: D24, J24, O13, L13, D61

Abstrak: Tujuan penelitian ini adalah untuk mengetahui pengaruh modal, tenaga kerja dan bahan baku terhadap produksi Industri Kecil Menengah di Sumatera Barat serta melihat apakah produksi UKM di Sumatera Barat efisien secara teknis. Jenis data yang digunakan dalam penelitian ini adalah data panel 19 kabupaten/Kota di Sumatera Barat dari tahun 2015 sampai 2021 dengan menggunakan pendekatan Stochastic Frontier Analysis (SFA). Hasil penelitian ini menunjukkan bahwa modal dan bahan baku berpengaruh positif dan signifikan terhadap produksi UKM di Sumatera Barat, sedangkan tenaga kerja berpengaruh negatif dan tidak signifikan terhadap hasil produksi UKM Sumatera Barat. Hasil perhitungan efisiensi teknis menunjukkan rata-rata tingkat efisiensi teknis produksi UKM Sumatera Barat dari tahun 2015-2021 adalah 0.543 atau 54,3 persen yang berarti produksi pada UKM secara teknis tidak efisien. Implikasi dari penelitian ini ialah pemerintah dapat menyusun regulasi serta *road map*s yang dapat meningkatkan produktifitas UKM di Sumatera Barat, dan bagi pelaku UKM mampu terlibat lebih luas dengan program yang berkesinambungan terhadap efisiensi produksi seperti mengikuti pelatihan dan bimbingan usaha, menggunakan program kredit usaha rakyat dari pemerintah, serta menjalin mitra kerja sama bahan baku dengan SME lainnya.

Kata kunci: modal, tenaga kerja, sumber daya, produksi UKM, efisiensi teknis

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1. INTRODUCTION

Economic growth is several activities to increase an economy in producing goods and services. The industry is one sector that plays a role in national development. West Sumatra is one of the provinces which is a small industry development area because it is rich in socio-culture and the characteristics of local people who have an entrepreneurial spirit. Industry according to Law Number 5 of 1984, concerning Industry is an economic activity that processes resource, resources, semi-finished goods, and or finished goods into goods with a higher value for their use. The industrial sector contributed 8.37 percent or Rp. 20.63 trillion for the formation of the economic structure of West Sumatra, while also assisting the government in creating new jobs compared to other sectors, as well as helping to equalize income distribution, increasing foreign exchange through export activities to contribute to national GDP (West Sumatra Small micro industry profile, 2020).

In the era of globalization, the industrial sector continues to grow rapidly, especially in large industries with the use of increasingly sophisticated technology in the production process, however, even though the large industrial sector plays a role in producing the largest output and added value, small industries continue to experience development every year and play a major role in developing the community's economy, especially rural areas with home industries and manufacturing. Small and medium industry is the most vital sector in a country's economy, because the small and medium industry provides and generates job opportunities, especially during a recession, as well as the main source of modernization, innovation, and entrepreneurial spirit. competitiveness so it is very important for future industrial development (Loku et al., 2021).

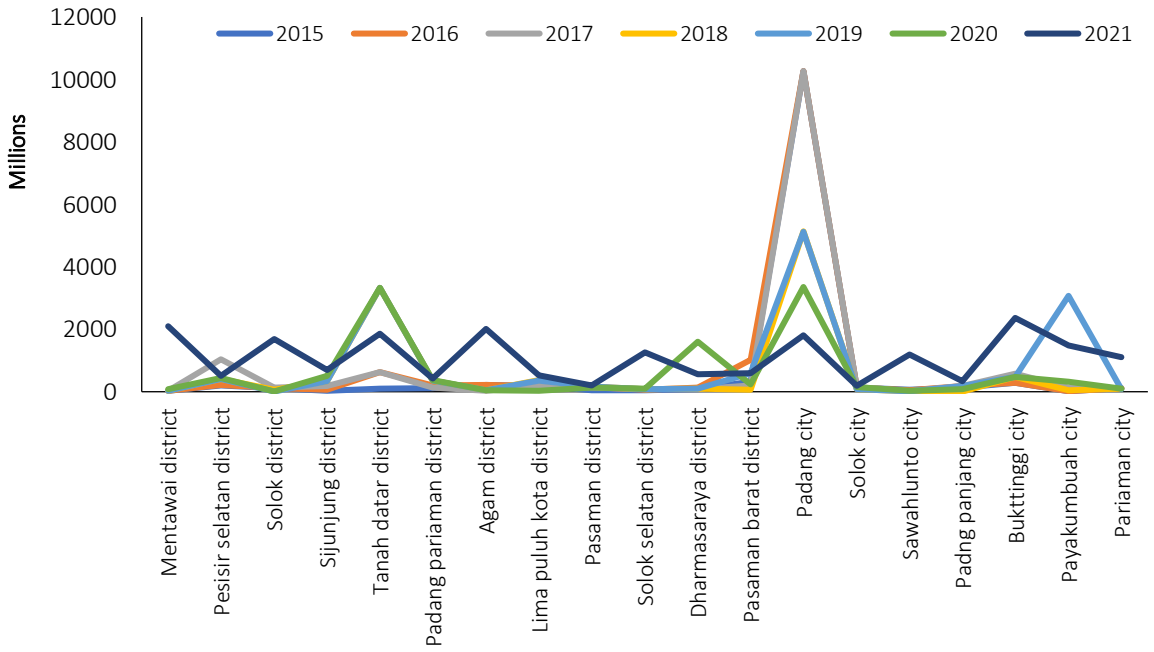

Figure 1. West Sumatra Small and Medium Industry production in 2015-2021
Source: West Sumatra Province BPS data for 2015-2021, the data processed

Based on Figure 1, the production of the SMEs in West Sumatra has decreased twice during 2015-2021, from 2018 by 21.91 percent and in 2020 by 23.40 percent. This is different from the growth of capital, labor and resource which on mean have increased in each regency/city in West Sumatra, whereas based on the theory of the function of the factors of production capital, labor and resource have a positive relationship while factors of production increase, then the production will be also increase (Case et al., 2017).

Production is the process of combining several inputs to be converted into (Case et al., 2017). The previous studies have examined input factors that can affect production, such as daily labor, resource and costs, these factors are the main input factors in a production process such as those

used by farmers in China (Ho et al., 2014). The production function reflects the technology used to convert capital and labor into output, the existing production technology will determine how much output is produced from a certain amount of capital and labor (Mankiw, 2019). From some of these issues, the issue of capital is an exemplary issue looked by SMEs. Since they are small and medium-sized businesses, they frequently fail to meet the technical requirements that a bank or other financial institution requires in order to obtain credit in order to improve their business, making it difficult for them to grow (Susanti, 2021). According to Mohammed (2023) capital is the lifeline of daily operations in a company because working capital is used for 4 purposes, namely first providing investment or fixed assets, secondly seasonal or periodic financing such as resource, production and sales, thirdly maintaining company growth and the fourth to improve business operations and maintain competitiveness.

Table 1. Total capital, labor and resource for SMEs West Sumatra in 2015-2021

Year	Capital (IDR)	Labor (person)	Resource (IDR)
2015	63,190,441	3,694	178,338,895
2016	73,059,254	4,159	223,664,168
2017	65,484,995	5,017	436,903,926
2018	163,174,503	6,319	510,616,001
2019	30,172,259	6,247	384,533,879
2020	50,842,726	6,481	301,715,929
2021	84,538,707	5,957	593,335,760

Source: West Sumatra Province BPS data for 2015-2021, the data processed

Table 1 reports that the mean capital of the West Sumatra SMEs has increased throughout 2015-2021, but this increase is not compatible with total production which has decreased as shown in figure 1, this is due to the use of inefficient production factors. In addition to capital, labor is a factor that influences production, increasing labor productivity will encourage an increase in output produced by a number of labor inputs with the assumption of ceteris paribus. According to Law no. 13 of 2003 labor is every person who can do work to produce goods or services to meet their own needs and that of society. The manufacturing industry sector or in this case the SMEs is an industrial sector that plays a role in absorbing labor, until august 2020 it was recorded that 123,199 workers were absorbed, more than 9.46 percent of the total working population in West Sumatra (Badan Pusat Statistik, 2019). Meanwhile, the increase in the number of workers does not reflect the high amount of production of the SMEs in West Sumatra, in 2018 the number of workers increased by 26 percent, but the production of the SMEs in West Sumatra has decreased by 21 percent, the same thing also happened in 2021 where the total workforce increases by 4 percent while total production decreases by 23 percent (Badan Pusat Statistik, 2021). This decline in total production was due to the inefficient use of labor factors.

Not only the labor factor, the factor of resource has a negative relationship with the amount of production, resource are an integral part of the finished product that is processed in manufacturing companies (Moehadi, 2021). The lower the production costs, in this case the resource, the more output produced by the business/industry (Ngatindriatun et al., 2018). The availability of resource in sufficient quantities, continuously and at prices that can be reached by business actors will expedite the production process and meet consumer demand or needs (Wati et al., 2021). Table 1 reports resource has increased by an mean of 45 percent in 2016-2028, while production has decreased by 21 percent. This is due to the use of resources or production factors that have not been efficient. Walter (2008) assumes a production activity is said to be efficient when it produces output using the lowest input, so that efficiency can be interpreted as the absence of waste in the use of production factors. According Hanafi (2017) efficiency is the ability to achieve a maximum result (output) by using or sacrificing minimal resources (input).

Radlińska (2023) explains that in economics terminology, efficiency can be divided into three, namely technical efficiency, allocative or price efficiency, and economic efficiency. Technical efficiency is also referred to as a comparison between actual production and production levels

that can potentially be achieved (Ndubisi et al., 2021; Niemeyer et al., 2020; Wu et al., 2022). Based on the phenomena presented above, the factors of capital, labor, and resource to produce SMEs in West Sumatra indicate inefficiencies in the production of the SMEs of West Sumatra, Therefore, it is essential to maximize production factors proportionally. Therefore, the problems in this study can be formulated as follows: 1) how much effect does capital have on the production of the SMEs of West Sumatra. 2) how much effect the workforce has on the production of West Sumatra SMEs. 3) how big the effect of resources on the production of West Sumatra SMEs and Is SMEs production in West Sumatra technically efficient? The mainstay of this research is the analysis to measure the technical efficiency of IKM production in each city district in West Sumatra Province.

2. RESEARCH METHODS

2.1. Data

This type of research is a quantitative research using secondary data obtained from several indirect sources, namely the Central Bureau of Statistics and the Office of Industrial and Trade of the Province of West Sumatra. The type of data used in this study is panel data, which is a combination of Cross Section data and Time Series developed by (Arellano & Bond, 1991) for cross section data using 19 Regencies/Cities of West Sumatra and and time series data taken for 7 years, from 2015 to 2021

Table 2. The operational defenition of variables

Variables	Operational defenition5	Unit	Data Source
SMEs Production (Q)	The total SMEs production in the districts/city of West Sumatra in one year	Rupiah	West Sumatra BPS
Capital (C)	The total investment value of the SMEs in the districts/city of West Sumatra in one year	Rupiah	West Sumatra BPS
Labor (L)	The number of workers working SMEs in the districts/city of West Sumatra in one year	Person	West Sumatra BPS
Resource (R)	The total amount of raw materials for SMEs in the districts/city of West Sumatra in one year	Rupiah	West Sumatra BPS

Source: West Sumatra Province BPS data for 2015-2021

2.2. Model

Data analysis techniques in this research used multiple linear regression analysis with panel data tests and production analysis using Stochastic Frontier Analysis (SFA). The panel data regression estimation method can be carried out through three approaches, namely the common effect model (CEM), fixed effect (FEM), and random effect (REM) models (Ogawa, 2023). In determining the panel data estimation model, it can be done by comparing the following three test results using Chow test, Hausman, and Langrange Multiplier (LM) test. Furthermore, in the Ordinary Least Square (OLS) based multiple linear analysis, the classic assumption test is performed to meet statistical requirements or meet the Best Liner Unbiased Estimator (BLUE) criteria. The production function of the SMEs of West Sumatra is estimated using the Stochastic Frontier production approach, mathematically the Cobb-Douglas production function for the SMEs of West Sumatra can be written as follows:

$$Q = AK^{\alpha}L^{\beta} \text{ where, } \alpha + \beta = 1 \quad (1)$$

The stochastic frontier production function was independently proposed by (Aigner et al., 1977) and Meeusen & Broeck (1977). According to (Aldida et al., 2013) suggests that production efficiency is the ratio of output and input associated with achieving maximum output with a number of inputs. This model can be expressed in the form of the following equation:

$$y_i = x_i\beta + (v_i - u_i),\ i = 1, \ldots, N \quad (2)$$

where, y_i is the production or logarithm of the production of firm i; x_i is the $k'1$ vector of the number of inputs of firm i; β is the vector of the unknown parameter; v_i is the assumed random variable; u_i is the non-negative random variable assumed to be responsible for technical inefficiencies in production (Minangsari et al., 2019; Le et al., 2018).

$$Q_{it} = \beta_0 + \beta_1 C_{it} + \beta_1 L_{it} + \beta_1 R_{it} + e_{it} \quad (3)$$

Equation (2) is the result of the transformation of the Cobb Douglas production function equation in the form of a x and y relationship. To facilitate the estimation of the equation, it is converted into a multiple linear equation by logarithm in the form of a double log (ln) (Rahim, 2016). Hence, in Eqution (3) Q is the amount of production produced by SMEs in one production year (rupiah); C shows the amount of capital owned by SMEs (Rupiah); L shows the number of labors used in the production process (unit person); and R is the number of raw materials in one year of production (Rupiah). in Cobb Douglas function β_0 is constants, β_1,β_2,β_3 is the regression coefficient; i is district/city; t is year, and ε is the error term.

3. RESULTS AND DISCUSSION

The scope of this research is the SMEs of West Sumatra Province with the period from 2015-2021. The processing industry or manufacturing industry, especially the SMEs in West Sumatra, plays an important role in promoting development and economic growth. There were 38,174 Small and Medium Industry companies recorded in West Sumatra Province in 2020 where Fifty Cities District, Agam Regency and Padang City are City Districts with the highest number of Small and Medium Industry businesses, while the Mentawai Islands, South Solok Regency and Solok City are City Districts with the largest number the lowest Small and Medium Industry business. This potential must be accompanied by efficient resource management and wise use of natural resources so that development planning can improve the welfare of the people of West Sumatra in the long term. Based on the formulation of the problem in this study, empirical testing was carried out to determine the effect of capital, labor and resource on the production of SMEs in West Sumatra. Data processing is done using Stata version 4.1.

Table 3. The result of descriptive statistics

Descriptive	Production (Q)	Capital (C)	Labor (L)	Resource (R)
Mean	8.314	7.508	3.603	8.101
Maximum	10.011	9.154	4.401	9.388
Minimum	6.458	6.173	2.161	6.665
Std. Dev.	0.670	0.515	0.360	0.670
Number of Observations	133	133	133	133

Source: Authors calculation

Table 3 reports the descriptive statistics using the Stata program above, the mean production of SME West Sumatra during 2015-2021 is IDR.746,017,772, for the highest mean production for SME West Sumatra in 2015-2021 it will be in 2021, which is IDR.1,101,455,533 and the lowest mean production will be in 2018, which is IDR.588,683,461.

The panel data regression estimation method can be carried out through three approaches, namely the CE, FE and RE models. In determining the panel data estimation model, it can be done by comparing the following three test results, that is Chow test, Langrange Multiplier, and Hausman. The results of the model estimation are as presented in Table 4. The estimation results of the model will then be selected as one of the best models through the model specification test. First, the Chow test on state is done by looking at the p-value on the results of the FEM test, where H_0 = CEM and H_1 = FEM. Based on the test results with SFA model, the p-value in FEM is 0.015 which means less than α 5 percent or 0.05, so H_0 is rejected. Based on the chow test the selected

model is FEM. Next is the Langrange test, the Langrange test is carried out to compare or choose which model is the best between the CEM and the REM. Based on the results of the LM test, the p-value on the LM test is 0.033 which means less than α 5 percent or 0.05, so H_0 is rejected. Based on the LM test model chosen is REM. Finally, the Hausman test, based on the results of the Hausman test, the p-value is 0.168 which means it is greater than 0.05 so that H_0 is accepted. Based on the Hausman test on the best stata model to see the effect of capital, labor and resource on the production of SME West Sumatra is to use the REM.

Table 4. The results of research model estimation

Dependent variable: SMEs production (Q)

Variables		**Model Estimation Approach**		
		CEM	**FEM**	**REM**
Constant	Coefficient	0.554	1.850	0.911
	Std. Error	0.511	0.767	0.569
	t-statistic	1.08	2.41	1.60
	Prob.	0.280	0.018*	0.110
Capital	Coefficient	0.346	0.183	0.289
	Std. Error	0.085	0.098	0.087
	t-statistic	4.07	1.88	3.32
	Prob.	0.000*	0.063	0.001*
Labor	Coefficient	-0.018	-0.048	-0.009
	Std. Error	0.156	0.178	0.158
	t-statistic	-0.12	-0.27	-0.06
	Prob.	0.907	0.787	0.953
Resource	Coefficient	0,691	0.688	0.692
	Std. Error	0.059	0.767	0.061
	t-statistic	11.60	2.41	11.20
	Prob.	0.000*	0.018*	0.000*
R^2		0.691	0.682	0.691
F-stats		71.86	33.73	230.91
Prob (F-Stats)		0.000	0.015	0.000
Chow test			0.015	
Langrange test				0.033
Hausman test				0.168

Note: *represent significance at 5% levels respectively

Source: Authors calculations

Based on the test results, the p-value on the Hausman test is 0.168 greater than 0.05 so that H_0 is accepted. Based on the Hausman test on the best stata model to see the effect of capital, labor, and resource on the production of the West Sumatra SMEs in 2015-2021 is to use the REM. Based on the results of the best model selection test in panel data regression, REM was obtained as the best model in this study. Following are the estimation results of the REM using statistics.

Table 5 presents the equation the constant value of 0.911 shows that the increasing SME production in West Sumatra is 0.911 percent assuming the independent variables (capital, labor, and resource) are considered constant. Based on the results of the equation shows that capital has a positive and significant effect on the production of SME West Sumatra with a regression coefficient of 0.29, meaning that if capital increases by 1 percent, then SME production will also increase by 0.29 percent. In running a business, SMEs need capital as one of the production factors for their business, the majority of SMEs issue initial capital from their personal wallets, relatively small capital often becomes an obstacle for SMEs in running their business. This is in accordance with Cobb Douglas theory which states that production output is influenced by capital and labor inputs. Study by (Salas-Velasco, 2017; Kleine-Moellhoff et al., 2018; Pérez-Gómez et al., 2018) also shows the same results when there is an increase in the amount of capital, the amount of production will also increase.

Table 5. Estimation Results of the Random Effect Model

Dependent variable: SMES production (Q)			
Variables	**Coefficient**	**Std. error**	**t-Statisitc**
Constant	0.911	0.569	1.60
Capital (C)	0.289*	0.087	3.32
Labor (L)	-0.009	0.158	-0.06
Resource (R)	0.692*	0.061	11.20
Summary			
Obs.	133		
R^2	0.691		
Adjusted R^2	0.546		
Prob > chi^2	0.000		
F-Stats	230.91		
Sigma_u	0.127		
Sigma_e	0.353		
rho	0.115	(Fraction of variance due to u_i)	

Note: * represent significance at 5% levels respectively
Source: Authors calculations

Labor has a negative and insignificant effect on SME production in West Sumatra with the regression coefficient of -0.09, meaning that if the workforce increases by 1 percent, SME production will decrease by 0.09 percent, this is not in accordance with production theory which states that production in influenced by labor. The mean level of education for entrepreneurs in West Sumatra is SMA/equivalent, while for entrepreneurs who are experts in their field only 5 percent of entrepreneurs. Therefore, the use of factors of production such as capital and labor that is not efficient can reduce production results. The study by Tinneke et al (2020) also showed the same results where labor had a negative effect on the production of small fish processing industries in Manado City, the implication of this research is that if the number of people working in small industries increases, small industrial production Processed fish in Manado City will increase, but often an increase in the amount of labor input causes a decrease in the productivity of the business.

Resources have a positive and significant effect on the production of West Sumatra SMEs with a regression coefficient of 0.69, meaning that if resources increase by 1 percent, production will increase by 0.69 percent assuming cateris paribus. The economic problem in this modern era is the increasingly limited available resources, moreover the manufacturing/manufacturing industry sector generally produces products whose resource come from nature, this is what causes SMEs to often experience difficulties with resource, including SMEs (Mia & Soltane, 2016). in West Sumatra, there were 21.22 thousand SMEs in 2020 experiencing raw material difficulties, both due to high raw material prices and rare or difficult to reach resource. In addition, the SMEs of West Sumatra do not have partnerships with other companies, only 46 SMEs have partnered with resource, even though with partnerships such as the procurement of resource, the SMEs will find it easier to obtain resource, because if the resource difficult to obtain, whether it is expensive or rare, then production will be hampered and even tend to stop. This result is compatible with previous research which showed that resources affect the production value of woven fabrics in Jepara Regency, Central Java, the influence of resources on the production value of woven fabrics shows that the weaving business is very dependent on the amount of available resources (Irmawati, 2016).

Production will be technically efficient if the production factors used are able to produce maximum output and have an efficiency level value above 80 percent. Technical efficiency is a production process using a combination of several inputs to produce maximum output. Based on the estimation results of the Stochastic Frontier production function for SMEs of West Sumatra, the regression coefficient is an elasticity coefficient considering that the model is in the form of natural logarithms (ln). The following are the results of the technical efficiency of the production of SME West Sumatra.

Table 6. Technical Efficiency of West Sumatra SMEs

Efficiency level	Technically efficient	
	District/City	Percentage
<0,50	50	0.38
0,51- 0,60	33	0.25
0,61- 0,70	25	0.19
0,71- 0,80	17	0.13
0,81- 0,90	7	0.05
0,91- 1,00	1	0.01
Amount	133	
Mean	0.543	
Minimum	0.101	
Maximum	0.914	

Source: processed state data 14

Based on the results of the SFA model, the mean level of technical efficiency to produce SMEs West Sumatra in 2015-2021 was 54.3 percent with the lowest level of technical efficiency in Pariaman in 2018 of 10.4 percent. In 2015 SMEs West Sumatra which had a technical efficiency level above 80 percent was only in Padang City, which was 85 percent. In 2016 efficient SMEs remained in Padang City with a value of 85.5 percent, in 2017 efficient SMEs were found in Padang City and Pesisir Selatan District, namely 84.8 percent and 81.3 percent respectively. In 2018 efficient SMEs are in Padang Panjang City by 85.9 percent, while in 2019 efficient ISMEs are in West Pasaman Regency, Mentawai Regency and Padang City and in 2020 to 2021 not a single Small and Medium Industry has experienced technical efficiency in production.

The results of this calculation indicate that the use of production factors in the SMEs of West Sumatra is not technically efficient so that it is necessary to reduce and add inputs or factors of production. Based on the Small and Micro Industry Survey, most businesses in West Sumatra experience problems with capital and promotion, this is due to the low interest and knowledge of entrepreneurs in carrying out marketing strategies and allocating existing resources, this phenomenon is in accordance with the level of education completed by entrepreneurs , based on the West Sumatra IMK Profile 2020, the mean education level of entrepreneurs in West Sumatra is high school/equivalent, while for entrepreneurs who are experts in their field or who call higher education only 5% are entrepreneurs. Therefore the inefficient use of production factors such as capital and labor can reduce production results, in accordance with the theory of diminishing return growth (Özbuğday et al., 2020; Thiede et al., 2013; Jiang et al., 2022; Okumu & Buyinza (2018).

4. CONCLUSIONS

This research concludes that the capital and resource production have a positive and significant effect on SMEs production in West Sumatra in 2015-2021, meaning that when capital and reource variables are added it will increase SMEs production output, while labor input has a negative and insignificant effect on the production results of SMEs in West Sumatra, meaning that additional labor input causes a decrease in SMEs production in West Sumatra. The results of calculating technical efficiency show that the mean level of technical efficiency in the production of the SMEs of West Sumatra in 2015-2021 is 54.3 percent, which indicates that the use of factors of production in the SMEs of West Sumatra is not technically efficient. Therefore, SMEs are expected to be able to use and take advantage of input factors that are owned proportionally, included to increase skills, both hard skills and soft skills employees and entrepreneurs , the higher the quality of human resources used, the easier it is to manage activities and the production process of the SMEs, besides that the government work with stakeholders in improving the quality of the industry, both in the production process and in the products that will be marketed, such as utilizing technology by creating applications that can facilitate production data collection and constraints on production factors in every SMEs in West Sumatra to create a technology-based creative economy and spur business actors to compete in the globalization era.

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REFERENCES

Aigner, D., Lovell, C. A. K., & Schmidt, P. (1977). Formulation and Estimation of Stochastic Frontier Production Function Models. *Journal of Econometrics*, *6*(1), 21–37. https://doi.org/10.1016/0304-4076(77)90052-5

Aldida, B., Santosa, P. B., Iesp, J., Ekonomika, F., & Diponegoro, U. (2013). Analysis of Production and Efficiency of Handwritten Batik Small and Medium Industries (IKM) in Semarang City. *Diponegoro Journal of Economics*, *2*(1), 1–10. https://doi.org/http://ejournal-s1.undip.ac.id/index.php/jme

Arellano, M., & Bond, S. (1991). Some Tests of Specification for Panel Carlo Application to Data : Evidence and an Employment Equations. *Oxford University Press*, *58*(2), 277–297. https://doi.org/10.2307/2297968

Badan Pusat Statistik. (2019). *Profile of Micro and Small Industries in West Sumatra Province*. Badan Pusat Statistik Provinsi Sumatera Barat. https://doi.org/6104006.13

Badan Pusat Statistik. (2020). *Profile of Micro and Small Industries in West Sumatra Province*. Badan Pusat Statistik Provinsi Sumatera Barat. https://doi.org/6104006.13

Badan Pusat Statistik. (2021). *West Sumatra Province in Figures 2021*. Badan Pusat Statistik Sumatera Barat. https://doi.org/1102001.13

Case, K. E., Fair, R. C., & Oster, S. M. (2017). *Principle of Microeconomics* (12 (ed.); Global). United Stated of America.

Hanafi, R. (2017). Analysis of the Efficiency of Using Production Factors in Small and Medium Furniture Industries in Pekanbaru City. *Jurnal Online Mahasiswa Fakultas Ekonomi*, *4*(1), 883–897. https://jom.unri.ac.id/index.php/JOMFEKON/article/view/12964

Ho, T. Q., Yanagida, J. F., & Illukpitiya, P. (2014). Factors Affecting Technical Efficiency of Small-holder Coffee Farming in the Krong Ana Watershed , Vietnam. *Asian Journal of Agricultural Extension, Economics & Sociology*, *3*(1), 37–49. https://doi.org/10.9734/AJAEES/2014/6599

Irmawati, S. (2016). The Analysis on Leading industries in Central Java Province. *JEJAK: Jurnal Ekonomi Dan Kebijakan, 8*(2), 215-228. doi:http://dx.doi.org/10.15294/jejak.v8i2.6172

Jiang, R., Kang, Y., Liu, Y., Liang, Z., Duan, Y., Sun, Y., & Liu, J. (2022). A trust transitivity model of small and medium-sized manufacturing enterprises under blockchain-based supply chain finance. *International Journal of Production Economics, 247*, 108469. https://doi.org/10.1016/j.ijpe.2022.108469

Kleine-Moellhoff, P., Braun, A. T., Reichenberger, V., & Seiter, S. (2018). Approach to enable a material efficiency-strategy for small and medium sized manufacturing enterprises. *Procedia CIRP, 69*, 787-792. https://doi.org/10.1016/j.procir.2017.11.106

Le, V., Vu, X. B. B., & Nghiem, S. (2018). Technical efficiency of small and medium manufacturing firms in Vietnam: A stochastic meta-frontier analysis. Economic Analysis and Policy, 59, 84-91. https://doi.org/10.1016/j.eap.2018.03.001

Loku, A., Loku, N., & Baftiu, N. (2021). Small and Medium Enterprises: Importance for the Kosovo Economy. *Technium Social Sciences Journal*, *1*(3), 215–221. https://doi.org/2668-7798

Mankiw, N. G. (2019). *Principles of Economics* (ninth). Harvard university. www.cengage.com/highered

Meeusen, W., & Broeck, J. Van Den. (1977). Efficiency Estimation from Cobb-Douglas Production Functions with Composed Error. *International Economic Review*, *18*(2), 435–444. https://doi.org/10.9734/AJAEES/2014/6599

Mia, M. A., & Soltane, B. I. B. (2016). Productivity and its determinants in microfinance institutions (MFIs): Evidence from South Asian countries. *Economic Analysis and Policy, 51*(September),

32-45. https://doi.org/10.1016/j.eap.2016.05.003
Minangsari, F., Robiani, B., & Mukhlis, M. (2019). The Efficiency of the Pharmaceutical Industry in Indonesia: A Stochastic Frontier Approach. *Jurnal Ekonomi Pembangunan, 17*(2), 49–58. https://doi.org/10.29259/jep.v17i2.8949
Moehadi. (2021). The Effect of Labor and Raw Materials on Production Results at Home Industry Tofu in Kabunan Village, Balen District, Bojonegoro Regency, Indonesia. *International Journal of Arts and Social Science, 4*(6), 111-114.
Mohammed, M. J., Alyaseen, M., & faez hasan, M. (2023). Role of Company's Efficiency Measure in achieving return: Iraq's Private Banks Case. *Technium Social Sciences Journal*, *39*(1), 377–392. www.techniumscience.com%0ARole
Ndubisi, N. O., Zhai, X. A., & Lai, K. H. (2021). Small and medium manufacturing enterprises and Asia's sustainable economic development. *International Journal of Production Economics, 233*, 107971. https://doi.org/10.1016/j.ijpe.2020.107971
Ngatindriatun, Saraswati. L. A., Hardiyansyah., & Aries. (2018). Production Efficiency Analysis for Empowerment Strategy of Troso Weaving Craft Micro, Small, and Medium Enterprises (SMES) in Jepara Central Java. *Pertanika Journal of Social Sciences & Humanities, 26*(March), 193-198.
Niemeyer, C. L., Gehrke, I., Müller, K., Küsters, D., & Gries, T. (2020). Getting Small Medium Enterprises started on Industry 4.0 using retrofitting solutions. *Procedia Manufacturing, 45*, 208-214. https://doi.org/10.1016/j.promfg.2020.04.096
Ogawa, K. (2023). Technical inefficiency and firm behavior: A panel study of small and medium Japanese manufacturing firms. Social Sciences & Humanities Open, 7(1), 100388. https://doi.org/10.1016/j.ssaho.2022.100388
Okumu, I. M., & Buyinza, F. (2018). Labour productivity among small-and medium-scale enterprises in Uganda: the role of innovation. *Journal of Innovation and Entrepreneurship, 7*(1), 1-17. https://doi.org/10.1186/s13731-018-0095-2
Özbuğday, F. C., Fındık, D., Özcan, K. M., & Başçı, S. (2020). Resource efficiency investments and firm performance: Evidence from European SMEs. *Journal of Cleaner Production, 252*, 119824. https://doi.org/10.1016/j.jclepro.2019.119824
Pérez-Gómez, P., Arbelo-Pérez, M., & Arbelo, A. (2018). Profit efficiency and its determinants in small and medium-sized enterprises in Spain. *BRQ Business Research Quarterly, 21*(4), 238-250. https://doi.org/10.1016/j.brq.2018.08.003
Radlińska, K. (2023). Some Theoretical and Practical Aspects of Technical Efficiency—The Example of European Union Agriculture. Sustainability, 15(18), 13509. https://doi.org/10.3390/su151813509
Rahim, A. (2016). *Basic Economic Theory with Equation Function Models (Research case studies)* (M. Hasan (ed.); 1st ed.). PKBM Rumah Buku Carabaca Makassar.
Salas-Velasco, M. (2018). Production efficiency measurement and its determinants across OECD countries: The role of business sophistication and innovation. *Economic Analysis and Policy, 57*(March), 60-73. https://doi.org/10.1016/j.eap.2017.11.003
Susanti. (2021). The performance of Micro, Small and Medium Enterprises sector in the era of ASEAN-China Free Trade. *Technium Social Sciences Journal*, *17*(3), 194–211.
Thiede, S., Posselt, G., & Herrmann, C. (2013). SME appropriate concept for continuously improving the energy and resource efficiency in manufacturing companies. *CIRP Journal of Manufacturing Science and Technology, 6*(3), 204-211. https://doi.org/10.1016/j.cirpj.2013.02.006
Tinneke, L., Kolanus, O., Rumate, V. A., & Engka, D. S. M. (2020). Factors that Influence the Income of Micro and Small Enterprises (UMK) in Manado City. *Jurnal Pembangunan Ekonomi Dan Keuangan Daerah 21*(4), 46–62. https://doi.org/10.35794/jpekd.32837.21.4.2020
Walter, N. (2008). *Microeconomic Theory Basic Principle and Extensions*. South-Western Cengage Laerning.
Wati, R., Rohmah, M., & Rahmadani, R. (2021). The Influence of Raw Material Availability on the Income of Roof Tiles Craftsmen in the Village of Gedung Rejo BK IX Belitang Oku Timur.

UTILITY: Jurnal Ilmiah Pendidikan Dan Ekonomi, *5*(01), 24–34. https://doi.org/10.30599/utility.v5i01.1168

Wu, S. H., Lin, F. J., & Perng, C. (2022). The affecting factors of small and medium enterprise performance. *Journal of Business Research, 143*, 94-104. https://doi.org/10.1016/j.jbusres.2022.01.025