# Social Assistance Performance on Local Economic Development Evidence from Island Regions in East Indonesia

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# Social Assistance Performance on Local Economic Development: Evidence from Island Regions in East Indonesia

**Abstract**

During an economic situation of uncertainty after the COVID-19 pandemic, social assistance is vital in helping to ease the economic burden on the poor and vulnerable to poverty, especially those living in island-based areas. The research aims to measure the performance of social assistance programs in the regional economy in the North Maluku Archipelago Province. The study uses Data Envelopment Analysis (DEA) and Stochastic Frontier Analysis (SFA) to measure the efficiency value with the input variables of social aid, unemployment, and inflation. In contrast, the output variable is the poverty. The results revealed that social assistance is not effective in reducing poverty. Several obstacles, namely the minimal amount of the budget, the inaccuracy of the assistance recipients, and the too short of a period for distributing aid were the leading causes of the inefficiency of social aid programs.

**Keywords***:* Social Assistance; Efficiency; DEA; Stochastic Frontier

**JEL Classification**: H53, H55, H71, I38

## Introduction

Social assistance programs are essential in poverty alleviation in local economic development. Social assistance is an attempt to obtain cash and other benefits as compensation for lack of income, inability to accept health services, insufficient family approval, and conditions of poverty caused by risks of social vulnerability (Baylan, 2019). Social assistance addresses the dangers individuals, families, and communities face. Vulnerability risks can come from within, which are permanent, and can also come from outside, such as natural disasters, economic crises, or social conflicts (Indonesian Ministry of National Development Planning, 2014). Therefore, the social aid budget is helpful in supplying people with their fundamental requirements.

Studies related to the impact of social assistance on macroeconomic variables such as poverty and inequality have been carried out before. For example, raising the social compensation payments in rural areas can lower poverty (Le-rong & Xiao yun, 2021). Programs for social assistance are designed to assist poor and neglected people in the community in meeting their most basic needs. Other studies proved that government social assistance programs positively increase GDP in the long term (De Senna & Souza, 2016). Social safety nets have a significant role in reducing the number of chronic poverty (Devereux, 2002).

In Indonesia, social protection initiatives to combat poverty and inequality include social assistance programs as a necessary component. According to Rizki, (2021), the Covid-19 pandemic's social program support impacted the modest increase in disadvantaged individuals. The poverty rate in Indonesia had dropped from 13.33% in 2010 to 9.22% in 2019 before the Covid-19 outbreak. The poverty rate rose again to 9.71% during the pandemic in 2021 (Indonesian Central Bureau of Statistics, 2022). Meanwhile, the realized budget for social assistance in 2020 reached IDR 230.21 trillion. Even though the national social assistance policy in the form of the Family Expectation Program (PKH) has a high level of effectiveness in reducing poverty and the effectiveness value of the non-cash food assistance program (BPNT) is the lowest for reducing poverty, an increase in the amount of the social assistance program budget is considered to have a slow effect on reducing poverty and unemployment rates (Arfandi & Sumiyarti, 2022).

Studying the function of social assistance programs in the socioeconomic life of the community is crucial, particularly in light of the unpredictability of the current condition of the world economy following the Covid-19 pandemic. It is feared that the threat of unemployment, inflation, and poverty levels will increase, especially in suburban areas and islands. The efficiency and effectiveness of using social assistance programs for poverty alleviation in island-based areas differ from land-based ones. Communities living on small islands far from the centre of the economy and politics are highly dependent on external financial assistance (Briguglio, 1995). The social and economic characteristics of coastal island communities are vulnerable to various upheavals resulting from social, economic, and environmental changes (Fernandes & Pinho, 2017). So, the social assistance program is a tool that can enhance the socioeconomic well-being of islanders, particularly in eliminating poverty.

Studies on the performance of social assistance in the context of regional economic development in archipelagic areas have never been carried out. Thus, to fill this knowledge gap, this study addresses to measure the performance of social assistance programs on reducing poverty in the island regions. Employing data employment analysis (DEA) and stochastic frontier analysis (SFA), the paper investigates the achievement of social aid in increasing local community welfare. This work contributes to the literature by analyzing the impact of social assistance on local economic development.

## Literature Review

### Social Assistance Program in Indonesia

Social assistance is temporary aid provided by local governments to poor communities. Providing this support can help ease the economic burden on the lives of the poor (Kenworthy, 1999).

The primary consideration in providing social assistance to the community is the existence of social risks. An incident or incident faced by society, which is the impact of a social crisis, economic crisis, political crisis, natural phenomenon, or natural disaster, if social assistance is not provided, people's lives will get worse, and they will not be able to live in good conditions. Therefore, providing social assistance spending to the community can only be carried out sparingly because it is short-term (Devereux, 2002).

Regulation of the Minister of Home Affairs of the Republic of Indonesia number 77 of 2020 confirms that social aid spending is used to budget for the provision of assistance in the form of money and goods to individuals, families, groups and communities, which is not continuous and selective, to protect against the possibility of this occurring. Unless under certain circumstances, social risk can be sustainable (Ministry of Home Affairs, 2020). The social support expenditure provided to the community is a temporary aid expenditure, stipulating that it can be provided every fiscal year until the aid recipient is protected from the social risks they are experiencing.

At the provincial, district and city levels, the legal basis for providing social assistance spending to the community is regulated in regional head regulations. The rule manages the procedures for providing social assistance sourced from the Regional Revenue and Expenditure Budget (APBD), including the budgeting process, implementation, administration, accountability reporting, and monitoring and evaluation. The basic principle in providing social aid to the community is regional financial capacity by paying attention to the principles of justice, compliance, rationality, transparency, accountability and benefits for the community.

In the budgeting aspect, social service expenditure planning must follow the provisions where proposals for social assistance are submitted in writing by community members or groups to regional heads through regional work units (SKPD) by their affairs and authority. The regional head then appoints the relevant SKPD to evaluate the proposal, and recommendations from the SKPD evaluation results are submitted to the regional leader through the local government budget team (TAPD). Furthermore, TAPD considers the recommendations based on regional priorities and financial capabilities. The SKPD head's recommendations and TAPD considerations are the basis for including the social assistance budget allocation in the draft General Budget Policy (KUA) and Temporary Budget Ceiling Priorities (PPAS) as regulated in articles 27 and 28 of Minister of Home Affairs Regulation Number 32 of 2011 concerning guidelines for providing grants and assistance social.

The inclusion of social assistance budget allocations in the APBD can be in the form of money and goods. Social assistance in the form of cash is monetary assistance given directly by the local government to recipients, such as scholarships for poor children, foundations managing orphans, poor fishermen, the elderly, neglected, severely disabled and health benefits for the sons and daughters of heroes who cannot afford it. Meanwhile, social assistance in the form of goods is material assistance provided directly by the local government to recipients, such as operational vehicle assistance for private special schools and underprivileged communities, boat assistance for poor fishermen, food/clothing assistance to orphans/socially disabled, livestock assistance, and for disadvantages community groups.

The social assistance target is not only given to individuals, families, and communities experiencing unstable conditions as a result of social, economic, and political crises, disasters or natural phenomena but also to non-governmental institutions in the fields of education, religion and other fields to protect individuals, groups and society from the possibility of social risks.

Using the Data Envelopment Analysis (DEA) and Stochastic Frontier analysis (SFA) methods is a new thing in research to measure the performance of social assistance. The advantage of using this method is that it can determine the efficiency level of social assistance programs and their impact on poverty reduction. The section below outlines the definitions and conceptions of the DEA and SFA methods.

**Data Envelopment Analysis (DEA)**

A mathematical optimization technique, Data Envelopment Analysis (DEA), determines the production growth points at various phases of a linear program. In 1978, Charnes, Cooper and Rhodes (CCR) introduced DEA to assess technical efficiency regarding production limits (Ahn et al., 1988). DEA-CCR makes it possible to measure the relative technical efficiency of Decision Making Units (DMU) with the premise of constant return to scale (CRS), which is carried out by measuring the proportion of the number of weighted outputs to the number of weighted inputs. According to Charnes et al., (1989), selecting decision-making units (DMUs) as the entity in charge of turning inputs into outputs is the essence of the DEA idea.

Cullinane *et al.*, (2006) defined DEA is a nonparametric approach for gauging the efficiency of a decision-making unit with numerous inputs and outputs. DEA does not require a functional model or real weights in selecting input and output forms, so it allows the use of DEA more easily. Efficiency assessment of the value of the inputs used and the resulting output will be demonstrated by each DMU so that DEA is helpful to determine the sources of inefficiencies that occur in each DMU. As a result, the efficiency results depend on the level of performance demonstrated by all DMUs, or 100% efficiency. In other words, individually and collectively, relative comparisons with other DMUs are used to determine the efficiency of each DMU and the sources of inefficiency for each DMU using DEA. The only DMUs that can be used for comparison and evaluation of efficacy in DEA are those that have a value of 100% (A. Charnes, W.W. Cooper, 1978).

$$X = \begin{vmatrix} x_{11} & x_{12} & \ldots\ldots & x_{1n} \\ x_{21} & x_{22} & \ldots\ldots & x_{2n} \\ . & . & \ldots\ldots & . \\ . & . & \ldots\ldots & . \\ x_{m1} & x_{m2} & \ldots\ldots & x_{mn} \end{vmatrix} \quad (1)$$

$$Y = \begin{vmatrix} y_{11} & y_{12} & \ldots\ldots & y_{1n} \\ y_{21} & y_{22} & \ldots\ldots & y_{2n} \\ . & . & \ldots\ldots & . \\ . & . & \ldots\ldots & . \\ y_{s1} & y_{s2} & \ldots\ldots & y_{sn} \end{vmatrix} \quad (2)$$

It is presumed that the number of analysis units (DMUs) to be evaluated is n. Each DMU consumes several different inputs m to generate some outputs s. Definitely DMUj requires an amount of Xj = $\{x_{ij}\}$ for input (i = 1,....., m) and creates an amount of Yj = {yrj) for output (r = 1,....., s ). The output matrix s x n is called Y, and the input matrix m x n is called X. In addition, it is also assumed that $x_{ij} > 0$ and $y_{rj} > 0$. For each relative efficiency of each DMUs it is called $DMU_0$, where the relative efficiency for $DMU_0$ is adjusted in the ratio form of the total output weight to the number of inputs weight. The constraint is that no DMU can have a relative efficiency value greater than one.

$$\max_{u,v} \frac{\sum_r u_r y_{r0}}{\sum_i v_i x_{i0}} = \frac{u^T Y_0}{v^T X_0} \quad (3)$$

where $u = (u_1, \ldots\ldots\ldots, u_s)^T$ and $v = (v_1, \ldots\ldots\ldots, v_m)^T$, with the constraint:

$$\frac{u^T Y_j}{V^T X_j} = \frac{\sum_r u_r y_{rj}}{\sum v_i x_{rj}} \leq 1 \quad (4)$$

For j = 1,2,.......n; ur ,vi ≥ 0 for r = 1,2, .....s and i = 1,2,.....n. Where $u_r$ is the output weight *r* and $v_i$ is the input weight *i*. In this case, $y_{rj}$, $x_{rj}$ with positive values are the output and input of $_j$ from the DMU and $u_r$, $v_i \geq 0$ is the variable weight decided as a solution to this issue, namely the data in all DMUs used as a reference (A. Charnes, W.W. Cooper, 1978).

**Stochastic Frontier Analysis (SFA)**

Aigner et al. (1977) and Meeusen & Broeck (1977) first developed the Stochastic frontier production function, which assumes a parametric role of input and output production models. The SFA model not only identifies technical inefficiencies but also observes the possibility that random effects outside of production control variables may affect output. As a result, the stochastic frontier consists of two random components: random and non-negative random. Random assesses the influence of various measurement mistakes, whereas non-negative random captures the effect of inefficiencies on the stochastic frontier function (Coelll, 1995).

The formula for the stochastic frontier model is typically expressed as equation (5), where $U_i$ is the technical efficiency of region *i* and must be a positive number. The noise statistical component $V_i$, however, might be either positive or negative.

$$y_i = x_i\beta + v_i - u_i, \qquad i = 1, 2, \ldots, N \qquad (5)$$

$y_i$ is the output; $x_i$ is the input vector, and $\beta$ is the unknown parameter vector. Random error $v_i$ calculates measurement errors and other random factors for unspecified input variables in the production function. According to Aigner et al., (1977), the value of $v_i$ is independent and indicated to be normally distributed with zero mean and constant variance N(0, $\sigma^2$v). Meanwhile, $u_i$ is an independent non-negative random variable and is assumed to be half-normally distributed.

In standard error calculation and hypothesis testing, the stochastic frontier model generally uses the maximum likelihood (MLE) method because this method is more efficient for measuring the effects of technical inefficiencies in the stochastic frontier production function (Coelli et al., 1998). The maximum likelihood method is used to estimate the value of the technical inefficiency parameter where the random variable ui is assumed to be truncated over N(0, $\sigma^2$) independent of $v_i$, which is supposed to be normally distributed. Aigner et al., (1977) described the likelihood function in the form of two variant parameters, namely $\sigma_s^2 = \sigma^2 + \sigma_v^2$ and $\lambda = \sigma/\sigma_v$ where the parameters of the likelihood function are in the mathematical equation as described in Battese & Corra, (1977). Furthermore, the technical efficiency of the SFA function, TE = exp($-u_i$) can be calculated using the assumption that the technical inefficiency random variable $u_i$ is half-normally distributed, i.e.

$$E[\exp(-u_i)] = 2[1-\Phi(\sigma_s\sqrt{\Upsilon})]\exp(-\Upsilon\sigma_s^2/2) \qquad (6)$$

The ML estimator for the average value of technical efficiency is obtained by substituting the ML estimator for the relevant parameters in equation 6 (Coelli, 1998). As for testing the hypothesis of the frontier model equation 5, the null hypothesis ($H_0$), namely that there is no effect of technical inefficiency in the model, can be done by testing the alternative hypothesis of likelihood ratio, $H_0$: $\sigma^2$=0 and $H_1$: $\sigma^2$>0.

## Research Method

### Definition of Input and Output Variables

The DEA approach is still not widely used to assess regional economic performance. Charnes et al., (1989) measure regional economic performance in Chinese cities by using indicators of the number of industrial workers, labor wages, and investment as input variables, while the value of industrial GDP, taxes, and retail sales results are used as output variables. Measurement of regional economic performance by comparing the stochastic frontier analysis (SFA) and data envelopment analysis (DEA) methods was studied by Cooper, W W. Kumbhakar, S. Thrall, Robert M. Yu, (1995) on the impact of China's economic reforms on the textile, chemical, and steel industries using a single output and two inputs, namely labor and capital.

The selection of indicators for this study was based on the need to understand how well social assistance programs were doing in the North Maluku Province's regional economy. The variables used as output are the district/city poverty rate, and the input variables are the social assistance budget, unemployment rate, and inflation. The unit of analysis used as the DMU is all regencies and cities in the North Maluku province. District and city panel data of the North Maluku province for 2015 – 2021 was collected through documentation at the Central Bureau of Statistics. An overview of the average value of the variables from each unit of analysis is shown in Table 1.

Table 1. Data Information of Input and Output Variables

| Regions | Average (2015 -2021) | | | |
|---|---|---|---|---|
| | **Output** | **Input** | | |
| | Poverty Percent (%) | Social Aid Billion ($US)* | Unemployment Percent (%) | Inflation Percent (%) |
| Tidore Island | 5,85 | 21.690,67 | 4,47 | 2,72 |
| Ternate Island | 6,97 | 1.239.810,45 | 5,92 | 2,72 |
| South Halmahera | 10.83 | 787.290,68 | 44,2 | 2,72 |
| West Halmahera | 10,28 | 582.442,604 | 33,29 | 2,72 |
| Central Halmahera | 7,1 | 33.127,18 | 55,34 | 2,72 |
| East Halmahera | 14,04 | 85.725,39 | 4,55 | 2,72 |
| North Halmahera | 8,66 | 654.354,93 | 5,65 | 2,72 |
| Morotai Island | 4,62 | 906.009,15 | 55,91 | 2,72 |

| | | | | |
|---|---|---|---|---|
| Sula Island | 8,89 | 103.399,25 | 4,42 | 2,72 |
| Taliabu | 3,82 | 124.675,52 | 5,85 | 2,72 |

*Currency on December 10, 2023
Source: Statistical Agent, 2022

**DEA and Stochastic Frontier Models**

DEA models were categorized based on whether the model is input or output oriented. This study focuses on input orientation, namely the use of social assistance, unemployment and inflation rate variables. This study also uses the parametric frontier stochastic analysis method to measure the efficiency performance of social assistance in the North Maluku province. One of the most well-liked methods for examining productivity and efficiency is the stochastic frontier analysis (SFA) model. Aigner, Lovell and Schmidt, (1977) created the first version of this model to quantify the importance of a business unit's or company's technical efficiency and recognize the causes of technical inefficiency.

Table 2. Summary statistics of Variables

| | Output | Inputs | | |
|---|---|---|---|---|
| | Poverty (%) | Social Aid (IDR) | Unemployment (%) | Inflation (%) |
| Mean | 8.108571 | 7.00E+09 | 4.964 | 2.72 |
| Standard error | 0.364452 | 1.21E+09 | 0.2003013 | 0.123682 |
| Median | 8.01 | 3.62E+09 | 4.725 | 2.13 |
| Standard deviation | 3.049222 | 1.01E+10 | 1.675841 | 1.0348 |
| Kurtosis | 2.429033 | 6.771536 | 4.620963 | 1.985231 |
| Skewness | 0.410894 | 2.085433 | 1.079596 | 0.924141 |
| Minimum | 3.55 | 1000000 | 1.94 | 10.36 |
| Maximum | 14.97 | 4.38E+10 | 1.9 | 4.52 |
| Count | 70 | 70 | 70 | 70 |

The SFA model provides for inefficiency model forms from frontier observations and error or noise variables. Specifically, the stochastic frontier production function equation is as follows.

$$ln(y_{it}) = x_{it}\beta + v_{it} - u_{it} \qquad i = 1,2,.....,N \qquad t = 1, 2, ...., T \qquad (7)$$

The first thing to do is determine the shape of the model in the form of identification of the research variables, namely the dependent variable and the independent variable. The dependent variable is the poverty rate ($y_{it}$). The independent variable ($x_{it}$) is measured by assumption that these variables impact district/city poverty. By using the double-log specification (Cobb Douglas), the equation function is as follows:

$$ln (y_{it})= \beta_0 + \beta_1 lnX_{1it} + \beta_{2it} lnX_{2it} + \beta_{3it} lnX_{3it} + v_{it} - u_{it} \quad i = 1,2,.....,N \quad t = 1, 2, ...., T \qquad (8)$$

$y_{it}$ is the output of the district/city $_i$ poverty level, $X_{it}$ is the factor that predicts a production frontier. There are three factors of production input, namely $X_1$: district social assistance budget; $X_2$: number of unemployed; $X_3$: inflation rate. $\beta_0$ is the intercept; $_i$ is district/city; *t* is the time, and *β* is the parameter to be estimated; $v_{it} - u_{it}$ is the specific error term of *i* th observation and time t. Amin *et al.*, (2021) noticed the random variable $v_{it}$ is useful for calculating the size of the error and the factors outside the control or also called statistical noise in the value of the output variable, along with the combined effects of unspecified input variables in the production function where random normally distributed or $N(0, \sigma^2_v)$. Meanwhile, the $u_i$ variable is called one-side disturbance which captures effect of the inefficiency. The research uses the model employed by Battese., George. Coelli, (1992) estimates the value of technical inefficiency where the variable ui is a non-negative variable ($u_i \geq 0$) and is estimated to be normally truncated $N(\mu, \sigma^2)$ (Battese., George. Coelli, 1992). Local governments can control the internal error component through regional policies or regulations related to the management of social assistance, as reflected by $u_i$.This error value has a symmetrical (one-sided) distribution, namely $u_i \geq 0$, where if economic activity is efficient (te = 1,000), then the resulting technical efficiency value is close to its maximum potential, namely $u_i = 0$. Conversely, if $u_i \leq 0$ means below the maximum.

## Results and Discussion

**Efficiency results of DEA**

The DEA model provides two approaches to measure efficiency scales: DEA-CCR and DEA-BCC. Table 3 displays the estimated efficiency and efficiency scale of the use of social assistance for each district and city in North Maluku Province. The average value of the estimated efficiency of the DEA-CCR is lower than the DEA-BCC, namely 0.541 and 0.59, where the maximum efficiency index value is 1.00. About 5 and 9 of the 70 periods involved in the analysis were identified as efficient when the DEA-CCR and DEA-BCC models were operated. ANOVA testing of the efficiency values of DEA-CCR and DEA-BCC generate a F value of 3.92 at a significance level of 1% and a critical value of 3.49. Spearman test results ranking correlation coefficient efficiency value of the DEA-CCR and DEA-BCC analysis is 0.93. The positive sign and the high Spearman ranking correlation coefficient indicate that the ranking of each model component has a very strong relationship. The efficiency estimates generated by the two model techniques follow a consistent pattern across regions, according to the ANOVA and Spearman rank correlation coefficient analysis.

Table 3. Efficiency of Social Security Expenditure, Unemployment, and Inflation

| Regions | Year | DEA-CCR | DEA-BCC | Scale Efficiency | Return to Scale |
|---|---|---|---|---|---|
| West Halmahera | 2015 | 0.594 | 0.752 | 0.79 | decreasing |
| | 2016 | 0.73 | 0.73 | 1 | Constant |
| | 2017 | 0.965 | 1 | 0.965 | Increasing |
| | 2018 | 0.722 | 0.751 | 0.962 | decreasing |
| | 2019 | 0.733 | 0.751 | 0.976 | decreasing |
| | 2020 | 0.803 | 0.805 | 0.998 | Increasing |
| | 2021 | 0.795 | 0.795 | 1 | Constant |
| South Halmahera | 2015 | 0.394 | 0.678 | 0.581 | decreasing |
| | 2016 | 0.672 | 0.672 | 1 | Constant |
| | 2017 | 0.653 | 0.656 | 0.995 | Increasing |
| | 2018 | 0.623 | 0.775 | 0.805 | decreasing |
| | 2019 | 0.811 | 0.811 | 1 | Constant |
| | 2020 | 0.814 | 0.858 | 0.949 | decreasing |
| | 2021 | 1 | 1 | 1 | Constant |
| Central Halmahera | 2015 | 0.544 | 0.544 | 1 | Constant |
| | 2016 | 0.527 | 0.527 | 1 | Constant |
| | 2017 | 0.326 | 0.326 | 1 | Constant |
| | 2018 | 0.543 | 0.543 | 1 | Constant |
| | 2019 | 0.575 | 0.575 | 1 | Constant |
| | 2020 | 0.565 | 0.565 | 1 | Constant |
| | 2021 | 0.457 | 0.534 | 0.855 | decreasing |
| East Halmahera | 2015 | 0.962 | 0.962 | 1 | Constant |
| | 2016 | 1 | 1 | 1 | Constant |
| | 2017 | 1 | 1 | 1 | Constant |
| | 2018 | 1 | 1 | 1 | Constant |
| | 2019 | 1 | 1 | 1 | Constant |
| | 2020 | 0.977 | 1 | 0.977 | decreasing |
| | 2021 | 0.861 | 1 | 0.861 | decreasing |
| North Halmahera | 2015 | 0.38 | 0.603 | 0.631 | decreasing |
| | 2016 | 0.563 | 0.563 | 1 | Constant |
| | 2017 | 0.553 | 0.556 | 0.995 | Increasing |
| | 2018 | 0.416 | 0.576 | 0.722 | decreasing |
| | 2019 | 0.605 | 0.605 | 1 | Constant |
| | 2020 | 0.574 | 0.603 | 0.951 | decreasing |
| | 2021 | 0.593 | 0.678 | 0.874 | decreasing |
| Sula Islands | 2015 | 0.61 | 0.646 | 0.944 | decreasing |
| | 2016 | 0.652 | 0.652 | 1 | Constant |
| | 2017 | 0.625 | 0.63 | 0.992 | decreasing |
| | 2018 | 0.437 | 0.643 | 0.679 | decreasing |
| | 2019 | 0.682 | 0.682 | 1 | Constant |

| | | | | | |
|---|---|---|---|---|---|
| | 2020 | 0.582 | 0.629 | 0.925 | decreasing |
| | 2021 | 0.688 | 0.695 | 0.989 | Increasing |
| Morotai | 2015 | 0.157 | 0.346 | 0.454 | decreasing |
| | 2016 | 0.325 | 0.325 | 1 | Constant |
| | 2017 | 0.318 | 0.319 | 0.995 | Increasing |
| | 2018 | 0.177 | 0.312 | 0.568 | decreasing |
| | 2019 | 0.334 | 0.334 | 1 | Constant |
| | 2020 | 0.289 | 0.302 | 0.957 | decreasing |
| | 2021 | 0.26 | 0.297 | 0.874 | decreasing |
| Taliabu Islands | 2015 | 0.257 | 0.257 | 1 | Constant |
| | 2016 | 0.277 | 0.277 | 1 | Constant |
| | 2017 | 0.262 | 0.263 | 0.996 | Increasing |
| | 2018 | 0.177 | 0.264 | 0.671 | decreasing |
| | 2019 | 0.274 | 0.274 | 1 | Constant |
| | 2020 | 0.254 | 0.267 | 0.95 | decreasing |
| | 2021 | 0.237 | 0.273 | 0.865 | decreasing |
| Ternate Island | 2015 | 0.23 | 0.429 | 0.536 | decreasing |
| | 2016 | 0.426 | 0.426 | 1 | Constant |
| | 2017 | 0.426 | 0.429 | 0.995 | Increasing |
| | 2018 | 0.258 | 0.452 | 0.571 | decreasing |
| | 2019 | 0.499 | 0.499 | 1 | Constant |
| | 2020 | 0.534 | 0.55 | 0.971 | decreasing |
| | 2021 | 0.494 | 0.57 | 0.865 | decreasing |
| Tidore Islands | 2015 | 0.288 | 0.369 | 0.781 | decreasing |
| | 2016 | 0.368 | 0.368 | 1 | Constant |
| | 2017 | 0.384 | 0.389 | 0.987 | decreasing |
| | 2018 | 0.303 | 0.417 | 0.728 | decreasing |
| | 2019 | 0.429 | 0.442 | 0.97 | decreasing |
| | 2020 | 0.441 | 0.486 | 0.906 | decreasing |
| | 2021 | 0.6 | 1 | 0.6 | Increasing |
| Total Average | | 0.5412 | 0.5901 | 0.9093 | |

Source: data analysis, 2023

**Efficiency results of SFA models**

Checking the sign of skewness in the sample data is the first step in utilizing the SFA model to confirm the usefulness of the maximum likelihood estimate (Waldman, 1982). The sign on the skewness value is used to test the stochastic frontier model where the results of the OLS residuals display a negative skewness sign (Kumbhakar et al., 2015). The OLS calculation results show a skewness value of -1.252, so the model follows the stochastic frontier specifications. Coelli (1995) mentioned that testing a feasibility of the stochastic frontier model can also be carried out with the likelihood ratio (LR) statistical test after estimating the maximum likelihood.

Table 4. Frontier production function of regions

| Variables parameters (ln Poverty) | OLS | MLE |
|---|---|---|
| ln Unemployment | -0.3844 | -0.3198 |
| | (0.012**) | (0.035**) |
| ln Inflation | 0.135788 | 0.06822 |
| | (0.343) | (0.635) |
| ln Social Aid | 3.77E-13 | -0.06115 |
| | (0.935) | (0.629) |
| Constant | 2.484933 | - |
| μ | - | 0.37641 |
| λ | - | 1.935571 |
| σu | - | 0.3985002 |
| σv | - | 0.2058825 |
| Unrestricted log-likelihood function | - | -29.5886 |
| Restricted log-likelihood function | - | -30.2581612 |
| LR | | 1.33912 |

Note: **5% significance test, *p-value* in brackets

Equation $-2[L(H_0) - L(H_1)]$ is used to calculate the statistical likelihood ratio test findings. where the restricted (OLS) model's log-likelihood value is $L(H_0)$, and the unrestricted stochastic frontier model's log-likelihood value is $L(H_1)$ (Kumbhakar et al., 2015). The value of likelihood ratio of 1,339 indicates that the finding of rejecting $H_0$ means there is no technical inefficiency, so the $H_1$ form can be accepted. The next part is to calculate the technical efficiency, where $TE_{it} = \exp(-u_{it})$, in accordance with the Jondrow, Knox and Schmidt (1982).

**Discussion**

Social assistance performance measurement methods using the DEA and SFA methods are rarely used. The measurement results of the frontier production function model in Table 4 show that the social assistance input variable has a sign of a negative correlation with the poverty level output variable. The interpretation of these results explains that if there is an increase in social assistance by IDR 1 million, the poverty rate can decrease by 0.061%. Although the effect of social assistance on the poverty rate is statistically insignificant, the negative relationship follows the findings conducted by Arfandi & Sumiyarti (2022) and Le-rong & Xiao Yun (2021). The results of other studies prove that food assistance packages and direct cash assistance increase the survival of people experiencing poverty (Pramanik, 2020).

Reducing poverty through social assistance programs in Indonesia is an important agenda for the government. Post-Covid-19 economic recovery policies continue to be carried out with several social protection policies. These efforts are carried out by maintaining the level of consumption and purchasing power of the poor through social protection programs such as social assistance, subsidies and maintaining price stability at the consumer level. However, implementing the government's social aid in Indonesia faces several challenges, namely the inaccuracy of targeting beneficiaries and the program's short duration.

Table 5. Efficiency results derived from SFA models

| Residences | Year | Technical Efficiency | Residences | Year | Technical Efficiency |
|---|---|---|---|---|---|
| West Halmahera | 2015 | 0.7654348 | Morotai Island | 2015 | 0.5386574 |
| | 2016 | 0.7188563 | | 2016 | 0.3851448 |
| | 2017 | 0.6511759 | | 2017 | 0.454169 |
| | 2018 | 0.6988138 | | 2018 | 0.4496616 |
| | 2019 | 0.7278112 | | 2019 | 0.4596522 |
| | 2020 | 0.7352306 | | 2020 | 0.4175786 |
| | 2021 | 0.7341985 | | 2021 | 0.4492981 |
| South Halmahera | 2015 | 0.7866718 | Taliabu Islands | 2015 | 0.3878151 |
| | 2016 | 0.6795233 | | 2016 | 0.3248163 |
| | 2017 | 0.7328826 | | 2017 | 0.3956962 |
| | 2018 | 0.7695779 | | 2018 | 0.3725283 |
| | 2019 | 0.8272049 | | 2019 | 0.3861128 |
| | 2020 | 0.8351242 | | 2020 | 0.3753937 |
| | 2021 | 0.7302456 | | 2021 | 0.4123979 |
| Central Halmahera | 2015 | 0.7031153 | Ternate Island | 2015 | 0.5868754 |
| | 2016 | 0.5397371 | | 2016 | 0.4779177 |
| | 2017 | 0.3841068 | | 2017 | 0.6114381 |
| | 2018 | 0.5820644 | | 2018 | 0.60031 |
| | 2019 | 0.6058004 | | 2019 | 0.6591821 |
| | 2020 | 0.6731242 | | 2020 | 0.7045931 |
| | 2021 | 0.618983 | | 2021 | 0.7130241 |
| East Halmahera | 2015 | 0.816438 | Tidore Island | 2015 | 0.4445918 |
| | 2016 | 0.8236095 | | 2016 | 0.4191248 |
| | 2017 | 0.8496172 | | 2017 | 0.5130729 |
| | 2018 | 0.8187913 | | 2018 | 0.5098945 |
| | 2019 | 0.8784066 | | 2019 | 0.5358015 |
| | 2020 | 0.8947079 | | 2020 | 0.5679975 |
| | 2021 | 0.9001514 | | 2021 | 0.4925154 |
| North Halmahera | 2015 | 0.7225712 | Sula Islands | 2015 | 0.6510807 |

| | | | |
|---|---|---|---|
| 2016 | 0.5937963 | 2016 | 0.6564024 |
| 2017 | 0.6622798 | 2017 | 0.7357618 |
| 2018 | 0.6825529 | 2018 | 0.7175685 |
| 2019 | 0.7410871 | 2019 | 0.7167211 |
| 2020 | 0.7476488 | 2020 | 0.7050028 |
| 2021 | 0.8354011 | 2021 | 0.6002931 |

Source: data analysis, 2023

Technical obstacles in allocating social aid that are not on target make social assistance programs ineffective in helping the poor and vulnerable. The DEA and SFA results reveal that the average value of the technical efficiency of social assistance programs in all districts and cities in North Maluku Province is below one or categorized as inefficient (Table 6).

Table 6. Comparing Efficiency Estimates by DEA and SFA Models

| Regions | Average (2015-2021) | |
|---|---|---|
| | SFA | DEA-CCR |
| East Halmahera | 0.854 | 0.971 |
| South Halmahera | 0.765 | 0.710 |
| West Halmahera | 0.718 | 0.763 |
| North Halmahera | 0.712 | 0.526 |
| Sula | 0.683 | 0.611 |
| Ternate | 0.621 | 0.410 |
| Central Halmahera | 0.586 | 0.505 |
| Tidore | 0.497 | 0.402 |
| Morotai | 0.450 | 0.266 |
| Taliabu | 0.379 | 0.248 |

Source: data analysis, 2023

Another obstacle is that most social institutions that receive aid in the regions are not credible and illegal because they have yet to be legal entities. For example, in East Halmahera Regency, several cases were found of several village residents who had moved and lived in other villages but still received assistance in their home villages. Not a few of the cash assistance provided was misused by parties acting on behalf of the management of social institutions. Communities who receive cash and non-cash assistance feel that most of the social assistance they receive is not compelling enough to improve the economic welfare of their families. The distribution of social assistance has even caused conflict because people who are classified as well-off also get social assistance.

In contrast, less well-off people do not get social assistance. Social assistance in the form of cash was cut quite large by the village administrators on the argument that to pay operational costs to take care of the disbursement of social assistance. The amount of social assistance received differs from the amount set by the government. For example, in the City of Tidore Islands case, the non-cash social assistance received in the form of five kilos of rice, two kilos of cooking oil, and one kilo of sugar per household was considered ineffective because it was only used briefly.

The inaccuracy of targeting beneficiaries was caused by different data on the number of beneficiaries between government agencies at the regional and central levels. The confusion of poverty data requires that it is essential that one poverty data be realized immediately. It is challenging to create one poverty data, considering that each agency collects data differently and approaches it. Unifying poverty data from various institutions requires the same point of view regarding the definition, collection method, and periodicity of published poverty data (Djuanda, 2024). Mistakes in identification between the rich and the poor often occur. The period for publication of poverty data conducted once a year is fragile, considering poverty is dynamic. Currently classified as poor, next year may be classified as not poor anymore. Especially in island-based areas, social service activities for the basic needs of society still need to be advanced (Kerr, 2005). Many forms of social assistance, such as business group empowerment activities, need improvement. The provision of capital for developing a production scale for small and medium enterprises in coastal and islands areas faces obstacles regarding a productive workforce, mastery of technology, markets, and low product quality.

The planning of social assistance budgeting in archipelagic districts is also constrained by the minimal budget. For example, in North Maluku Province, before the Covid-19 pandemic, the average social assistance budget was less than IDR 10 billion per year. At the time of Covid-19, the budget increased drastically, with an average of more than IDR 50 billion and even reached IDR 300 billion. However, the rise in the budget for social assistance during Covid-19 was considered insufficient to maintain the poor's economic resilience in the archipelago. The average poverty rate in all districts and cities in the North Maluku Islands Province increased by 0.5%. Assistance in providing production facilities for groups of farmers and fishermen is often outside the needs and requests. So efforts to enlarge income and business development of poor island community groups were unsuccessful.

## Conclusion

The article analyzes the performance and impact of social assistance on regional poverty rates. The DEA and Stochastic frontier results suggest the performance of social assistance in all research areas is inefficient in reducing poverty. Several obstacles, namely the minimal amount of the budget, the inaccuracy of the assistance recipients, and the too short period for distributing aid were the leading causes of the inefficiency of social assistance programs.

**Policy Implication**

Updating poverty data into one unified and integrated data is vital for the efficiency of the distribution of social assistance. Accurate targeting and distribution timing are the keys to the effectiveness of social assistance programs in reducing poverty. Another thing that can be done is to increase the amount of assistance by synergizing assistance programs between government agencies so that the combination of programs can increase the value of benefits for the welfare of poor in villages. The small number of variables utilized in the efficiency model is the study's main flaw. Future studies should identify other variables related to social assistance, which have implications for the effectiveness of reducing the poverty rate in island areas.

**Declaration of Interests**

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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**References**

A. Charnes, W.W. Cooper, E. R. (1978). Measuring the efficiency of decision making units. *European Journal of Operational Research*, *2*, 429–444. https://doi.org/10.1016/0377-2217(78)90138-8

Ahn, T., Charnes, A., & Cooper, W. W. (1988). Efficiency characterizations in different DEA models. *Socio-Economic Planning Sciences*, *22*(6), 253–257. https://doi.org/10.1016/0038-0121(88)90007-9

Aigner, D., Lovell, C. A. K., & Schmidt, P. (1977). Formulation and Estimation of Stochastic Frontier Production Function Models. *Journal of Econometrics*, *6*, 21–37.

Amin, C., Mulyati, H., Anggraini, E., & Kusumastanto, T. (2021). Impact of maritime logistics on archipelagic economic development. *The Asian Journal of Shipping and Logistics*, *xxxx*. https://doi.org/10.1016/j.ajsl.2021.01.004

Arfandi, R. Z., & Sumiyarti. (2022). Dampak Program Bantuan Sosial Terhadap Pengentasan Kemiskinan dan Pengurangan Ketimpangan di Indonesia [The Impact of Social Assistance Programs on Poverty Alleviation and Reducing Inequality in Indonesia]. *Media Ekonomi*, *30*(1), 1–15. https://doi.org/10.25105/me.v30i1.10304

Battese., George. Coelli, T. (1992). Frontier Production Functions , Technical Efficiency and Panel Data : With Application to Paddy Farmers in India. *Journal of Productivity Analysis*, *3*(May), 153–169. https://doi.org/10.1007/BF00158774

Battese & Corra. (1977). Estimation Of A Production Frontier Model: With Application to The Pastoral

Zone Of Eastern Australia. *Australian Journal of Agricultural Economics*, *21*(3), 169–179.

Baylan, M. (2019). Impact of Social Security Expenditures on Income Distribution: Case of Turkey. *MANAS Sosyal Araştırmalar Dergisi*, *8*(3), 2579–2593. https://doi.org/10.33206/mjss.590102

Briguglio, L. (1995). Small Island Developing States and Their Economic Vulnerabilities. *World Development*, *23*(9), 1615–1632.

Charnes, A., Cooper, W. W., & Li, S. (1989). Using data envelopment analysis to evaluate efficiency in the economic performance of chinese cities. *Socio-Economic Planning Sciences*, *23*(6), 325–344. https://doi.org/10.1016/0038-0121(89)90001-3

Coelli, T. (1998). *An introduction to efficiency and productivity analysis*. Springer Science.

CoellI, T. I. M. (1995). Estimators and Hypothesis Tests for a Stochastic Frontier Function : A Monte Carlo Analysis. *The Journal of Productivity Analysis*, *268*, 247–268.

Coelli, T., Rao, D. S. P., & Battese, G. E. (1998). An Introduction to Efficiency and Productivity Analysis. In *An Introduction to Efficiency and Productivity Analysis*. https://doi.org/10.1007/978-1-4615-5493-6

Cooper, W W. Kumbhakar, S. Thrall, Robert M. Yu, X. (1995). DEA and Stochastic Frontier Analyses of the 1978 Chinese Economic Reforms. *Socio-Econ. Plann. Sci.*, *Vol. 29*, *N*(ca 1991), 85 112.

Cullinane, K., Wang, T. F., Song, D. W., & Ji, P. (2006). The technical efficiency of container ports: Comparing data envelopment analysis and stochastic frontier analysis. *Transportation Research Part A: Policy and Practice*, *40*(4), 354–374. https://doi.org/10.1016/j.tra.2005.07.003

De Senna, V., & Souza, A. M. (2016). Assessment of the relationship of government spending on social assistance programs with Brazilian macroeconomic variables. *Physica A: Statistical Mechanics and Its Applications*, *462*, 21–30. https://doi.org/10.1016/j.physa.2016.05.022

Devereux, S. (2002). Can Social Safety Nets Reduce Chronic Poverty ? *Development Policy Review*, *20*(5), 657–675.

Djuanda, B. (2024). Urgensi Kebijakan Satu Data Kemiskinan [The Urgency of One Poverty Data Policy]. *Https://Www.Republika.Id/Posts/43874/Urgensi-Kebijakan-Satu-Data-Kemiskinan*.

Fernandes, R., & Pinho, P. (2017). The distinctive nature of spatial development on small islands. *Progress in Planning*, *112*, 1–18. https://doi.org/10.1016/j.progress.2015.08.001

Indonesian Central Bureau of Statistics. (2022). *Percentage of Poor Population by Province and Region*. https://www.bps.go.id/indicator/23/192/2/persentase-penduduk-miskin-p0-menurut- provinsi-dan-daerah.html

Indonesian Ministry of National Development Planning. (2014). *Perlindungan Sosial di Indonesia: Tantangan dan Arah ke Depan [Social Protection in Indonesia: Challenges and Future Directions]*. Direktorat Perlindungan dan Kesejahteraan Masyarakat.

Jondrow, J., Knox, C. A., & Schmidt, P. (1982). On The Estimation of Technical Inefficiency In The Stochastic Frontier Production Function Model. *Journal of Econometrics*, *19*, 233–238.

Kenworthy, L. (1999). Do social-welfare policies reduce poverty? A cross-national assessment. *Social Forces*, *77*(3), 1119–1139. https://doi.org/10.1093/sf/77.3.1119

Kerr, S. A. (2005). What is small island sustainable development about? *Ocean and Coastal Management*, *48*(7–8), 503–524. https://doi.org/10.1016/j.ocecoaman.2005.03.010

Kumbhakar, S. C., Wang, H., & Horncastle, A. (2015). *A Practitioner's Guide to Stochastic Frontier*

*Analysis Using Stata*. Cambridge University Press.

Le-rong, Y., & Xiao yun, L. (2021). The effects of social security expenditure on reducing income inequality and rural poverty in China. *Journal of Integrative Agriculture*, *20*(4), 1060–1067. https://doi.org/10.1016/S2095-3119(20)63404-9

Meeusen, W., & Broeck, J. Van Den. (1977). Efficiency Estimation From Cobb-Douglas Production Function With Composed Error. *International Economic Review*, *18*(2), 435–444.

Ministry of Home Affairs. (2020). Permendagri Republik Indonesia Nomor 77 Tahun 2020. In *2020*. https://peraturan.bpk.go.id/Details/162792/permendagri-no-77-tahun-2020

Pramanik, N. D. (2020). Dampak Bantuan Paket Sembako dan Bantuan Langsung Tunai terhadap Kelangsungan Hidup Masyarakat Padalarang pada Masa Pandemi Covid 19 [The Impact of Food Package Assistance and Direct Cash Assistance on the Survival of the Padalarang Community during the C. *Jurnal Ekonomi, Sosial Dan Humaniora*, *01*(12), 113–120. https://www.jurnalintelektiva.com/index.php/jurnal/article/view/209/149

Rizki, M. (2021). Dampak Program Perlindungan Sosial Dalam Mengatasi Kemiskinan Di Tengah Pandemi Covid-19 [The Impact of the Social Protection Program in Overcoming Poverty Amid the Covid-19 Pandemic]. *Jurnal Good Governance*, *17*(2), 125–135. https://doi.org/10.32834/gg.v17i2.335

Statistics, C. B. of. (2022). *North Maluku Province in Figures.* https://malut.bps.go.id/publication.html

Waldman, D. M. (1982). A stationary point for the stochastic frontier likelihood. *Journal of Econometrics*, *18*(2), 275–279. https://doi.org/10.1016/0304-4076(82)90041-0

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