

Administrative Cost Inefficiency of Local Tax Collection: Comparing Cities and Regencies in Supporting SDG 16

Jalu Aji Prakoso^{1*}, Arif Rahman Saleh¹, Suci Nasehati Sunaningsih¹, Khresna Bayu Sangka²

¹Universitas Tidar, Magelang, Indonesia

²Universitas Sebelas Maret, Surakarta, Indonesia



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ABSTRACT

Objective: To measure the technical efficiency of local tax collection and identify the factors affecting the technical inefficiency of tax collection administrative costs in regency and city governments in Central Java Province. **Method:** Employing a quantitative approach using cross-sectional data from 35 regencies and cities in Central Java Province in 2019. Tax collection administrative costs are measured using the expenditure approach and analyzed using Stochastic Frontier Analysis (SFA) with Maximum Likelihood Estimation (MLE). **Results:** Local Own-Source Revenue (PAD) has a positive and significant effect on tax collection administrative costs. Gross Regional Domestic Product (GRDP) has a negative and significant effect, indicating that stronger economic activity improves tax collection efficiency. Population size significantly affects administrative costs, while the administrative status dummy variable reveals efficiency differences between regency and city governments. In addition, the size of the administrative area has a significant negative effect on technical inefficiency. The average technical efficiency of local tax collection reaches 87.34%, indicating that there is still room for efficiency improvement. **Novelty:** Contributing to the local public finance and sustainable governance literature by applying Stochastic Frontier Analysis (SFA) to evaluate tax collection administrative efficiency and comparing efficiency performance between regency and city governments in Central Java. The findings provide empirical evidence on how efficient local tax administration can support SDG 16 through the strengthening of effective and accountable public institutions under fiscal decentralization.

INTRODUCTION

Theoretically, decentralization can result in efficiency because the regional government is considered understanding better its people's need (allocative efficiency) and having distributing ability at lower cost (productive efficiency) using local resources (Barankay & Lockwood, 2007). The delegation of authority to regional level leads to the reinforcement in financial management by regency or city regional government. The region not merely does what the Central Government orders, but it also has discretion to improve creativity in developing potency that was fettered during centralization era (Ginting et al., 2019). The reinforcement of regional government's role is reflected on financial management, in either revenue aspect related to the regional revenue management or expenditure aspect in the form of regional expense (Hummel & Kusumasari, 2025).

Effective tax administration is closely linked to the achievement of Sustainable Development Goal (SDG) 16, particularly Target 16.6, which emphasizes the development of effective, accountable, and transparent institutions at all levels. Local governments play a crucial role in mobilizing public revenue through taxation, enabling the provision of public services and supporting sustainable regional development. Efficient tax collection systems not only strengthen fiscal capacity but also enhance public trust in government institutions by ensuring that public resources are managed responsibly and transparently. Therefore,

improving the efficiency of local tax administration can be viewed as an important strategy for advancing institutional effectiveness and supporting the broader objectives of sustainable development.

Regional revenue in the form of tax managed and used to stimulate regional economy has obvious targets, one of which is to enable the economic growth to make the people prosperous (Garaika et Al., 2019). The amount of regional tax component revenue is highly affected by the number of regional tax types applied and adjusted with the enacted regulation (Geys & Revelli, 2011). The larger the regional potency managed by The Government, the higher will be regional income received (Saudi, 2022). To a region, a large amount of tax revenue will give the government a discretion to realize the state’s achievement through routine programs implemented annually. The implementation of governmental program using tax funding source should be people wellbeing-oriented in its administrative area. The programs are implemented measurably so that the government can evaluate the existence of government through the policies implemented (Marfiana et al., 2024).

Before tax is used for the people interest, the government collects first the types of tax specified according to the regulation enacted in its own region (Daryanto, 2019). The tax collection mechanism is conducted and controlled systematically to produce a policy of collecting tax fairly and evenly (Rasji & Trawocoadji, 2023). Regional tax collection includes collecting data of tax object and subject, estimating the payable tax, and collecting the tax from taxpayers and supervising the tax output deposit. Consequently, a series of collecting activities generate cost that should be assumed by the regional government in the attempt of tax administration (Goode, 1981). The cost generated is expected to be as minimal as possible and thereby not burdening tax administration. Tax administration, includes some activities: identifying tax object, appraising tax object ability, collecting tax, and enforcing tax payment. One of tax management problems results from tax administration system for indirect tax type. The problem arises due to the collector’s incapability of understanding well the tax administration mechanism (Mansor et al., 2005). In addition, tax administration problem arises due to the problem in tax management institution and the lower rate of tax reporting by the insurer.

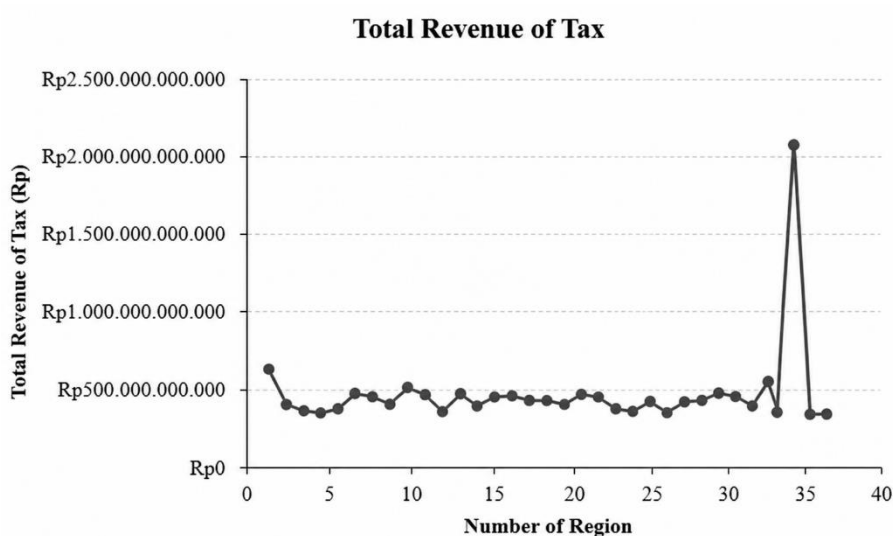


Figure 1. The realization of regency and city tax revenue in Central Java

This research aims to identify the cost efficiency resulting from the administration of tax collection by the regional government. Thirty five regency and city regional governments located in administrative region of Central Java Province has been the object of research. Figure 1 shows the realization of tax revenue by regional government through managing the potencies of respective regions. Tax revenue in the research area shows that there is 1 (one) region with revenue higher than the average revenue in other regions. It is because the region with tax revenue higher than the average is the capital city province constituting the industrial and office activity center (Zulfi & Wijaya, 2024). Recalling that the authority of local tax management is delegated to respective regions, consequently the administrative cost generated is different between one region and another. The difference of tax administrative costs generated is putatively due to the problem related to the institution collecting regional tax and the tax level specified. The difference of tax collection administrative cost is due to the difference of regional government expenditures. The region with relatively small population number will have lower expenditure level compared with the region with large population number (Buettner & Holm-Hadulla, 2013). Moreover, in the implementation of tax collection in regional government level is closely related to the protecting legal aspect and thereby increases the complexity of regional tax administration (Lewis, 2006). The measurement of tax collection efficiency in regional government in Central Java Province is conducted using two approach schemes. Firstly, the simple mechanism is implemented through estimating the ratio of tax administrative cost to regional tax revenue. Secondly, econometric approach is implemented through frontier stochastic analysis deriving from specification and estimation of frontier stochastic cost regression model.

The frontier stochastic analysis was developed firstly by Aigner et al (1977). Stochastic Frontier Analysis (SFA) method not only estimates technical efficiency of each policy maker unit, but also analyzes quantitatively the effect of factors causing disparity in technical efficiency. Technical efficiency, according to Farrel (1957) is a company's ability of achieving the highest possible output level with a number of inputs and certain technology. Efficiency is a parameter of good performance and can be measured using some indicators. There are two econometrical methods commonly used to measure the efficiency of government: non-parametric and parametric approaches. The non-parametric approach often used is Data Envelopment Analysis (DEA). Meanwhile, the parametric approach commonly used is Stochastic Frontier Analysis (SFA) (Lampe & Hilgers, 2015). The measurement of public sector efficiency using stochastic frontier has been conducted by some previous researchers. García measured the efficiency of regional government's service in providing clean water in Spanyol (García-Sánchez, 2006). The result of research on the efficiency of clean water service providing showed that population density is one of factors causing service inefficiency. Worthington (2000) conducted research on stochastic frontier to find out the efficiency of governmental (public) service in New South Wales, Australia by evaluating technical efficiency, allocation and cost. Afonso & Fernandes (2003) measured the efficiency of regional government's expenditure conducted research on the efficiency of public sector in big cities in US (Grossman et al., 1999).

The research using stochastic frontier approach to find out the efficiency of local tax collection analyzed through local tax administrative cost is not the first one conducted. Lewis conducted research on taxation in regional government using stochastic frontier approach through an analysis of administrative cost inefficiency (Lewis, 2006). In addition to finding out the inefficiency of local tax collection, this study also aims to compare the efficiency level of regency government and that of city (municipal) government, tending to have technical difference and thereby generating administrative cost.

Afonso study was related to the measurement of public sector efficiency in New European Union states compared with that in developing state markets (Afonso & Fernandes, 2003). The conceptualization of research built is to measure the efficiency of governmental expenditure through governmental expenditure approach to achieve the government's objective. The result of analysis shows the varying efficiency of governmental expenditure in all member states of European Union, compared with the market group with good performance in Asia. Considering the score analysis of Public Sector Efficiency, this research shows that the states with lean public sector and public expenditure not more than 30% of GDP tend to be more efficient.

Moesen & Persoon's (2002) study on the efficiency of tax office in tax collection in 289 tax office areas in Belgium. The efficiency of tax office's production was evaluated using frontier non-parametric methods including Free Disposal Hull (FDH) and Data Envelopment Analysis (DEA) methods. The study found that the organizational design of tax office at both central and local levels tends to affect the efficiency of tax office in Belgium.

Geys measured the inefficiency of local government's performance in Flemish, by comparing FDH, DEA, and econometric approaches to measure the governmental economic efficiency viewed from output and input numbers used (Geys & Moesen, 2009). This study found that several approaches used provided different outputs. The efficiency is measured from the task assigned to the employees to provide public goods more efficiently at lower level.

Grossman studied the technical inefficiency of public sector in many cities in United States of America using stochastic frontier analysis concept to measure the inefficiency of public sector based on land value in the region (Grossman et al., 1999). The result showed that the property value generated in the city cannot be regulated by the government. The inefficiency of governmental performance can be seen from the regulation to suppress the growth rate of property price value in US.

Arcelus study aimed to identify the factors causing technical efficiency in governmental expenditure, with 260 small towns in Navarre, Spain being the object of research (Arcelus et al., 2015). Using data of 2005 and translog production function, Navarre, Spanyol found that the cost-efficiency of local government in providing service increases along with the increase in (1) the cooperation of providing cross-city service; (2) funding higher than tax; (3) larger accumulated investment in the past infrastructure; and (4) involvement of public accountant that audits financial report in the city.

Considering the finding of previous studies conducted, it can be seen that there are some factors that can affect the efficiency of local tax collection. Tax collection in local government conducted by the local income managing service office should take efficiency and effectiveness principles into account, recalling that the tax objects managed by local government are varying and the rule of local tax management also regulates the collection activity thoroughly. The higher the collecting cost of local tax, the higher will be the burden of local finance. Local government (Rezaei & Jablonsky, 2026). through the local tax managing service office, is expected to achieve the efficient ratio in spending collection cost of local government tax.

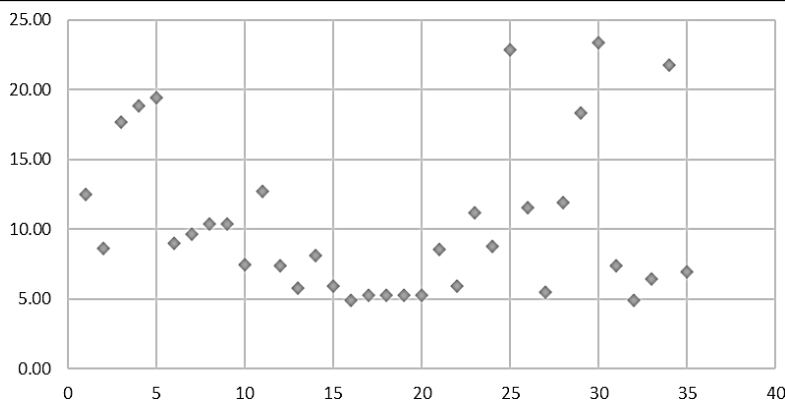


Figure 2. The ratio of tax cost to local original income in regencies and cities in Central Java Province

Figure 2 shows a simple ratio of the expense of local tax managing service office to local tax income. The ratio is used to measure the inefficiency in tax management. Some regions have higher ratio of tax cost to tax income, with Magelang City being the region with the highest tax collection inefficiency. The government with highest inefficiency is the region that spends a large tax collecting cost to get an optimum local tax income. Meanwhile, the region with the lowest tax collection cost inefficiency is Salatiga City. The region with the lowest ratio of collection cost inefficiency shows that the local government can minimize the collecting cost to produce maximum tax income. Thus, this research aims to measure the technical efficiency and to identify the factors affecting the technical inefficiency of tax collection conducted by Regency and Municipal (City) local government in Central Java province to achieve an efficient market economic performance.

RESEARCH METHOD

To measure the efficiency, two approaches can be used: firstly, macro measurement intended to evaluate the public expense entirely, and secondly, micro measurement attempting to determine the relationship between expense and benefit in the function and sub-function of certain budget. This research attempted to use the public expenditure approach as the model in public revenue measurement constituting local tax revenue. There are two types of technical efficiency measurement: output-oriented and input-oriented measurements. This research used output-oriented measurement. This study is a frontier balanced panel data because the variables used in this research are fiscal and non-fiscal parameters to provide the output in the form of local government's tax revenue. Therefore, equation (1) changes into:

$$\varepsilon_{it} = U_{it} - V_{it} \quad (1)$$

From the equation (2), the stochastic non-fiscal frontier can be written as follows:

$$Y_{it} = f(X_i; \beta) + U_{it} - V_{it} \quad (2)$$

Where Y is output, X_i is the actual input vector and β is the vector of parameter. Data is transformed into natural logarithm aiming to reduce heteroscedasticity risk and to make sense economically as it reflects the differentiated variable growth.

In Stochastic Frontier Analysis (SFA), there are two models needed. The first or basic model is the plain model indicating the effect of independent variable on dependent variable. Meanwhile, the second model or inefficiency effects model is the one used to see the variables causing inefficiency (Battese & Coelli, 1995). The basic (main) model used in this research is

the modification of model used by Tahir and Haron (2008), Hasan et al. (2012), and Bhattacharyya and Pal (2013), written as follows:

$$\ln PDPP_{it} = \beta_0 + \beta_1 \ln PAD_{it} + \beta_2 \ln RGP_{it} + \beta_3 \ln PDRB_{it} + \beta_4 \ln JPD_{it} + \beta_5 D_{it} + U_{it} + V_{it} \quad (3)$$

The second model is the one intended to see the factors causing inefficiency, a modification of model used by (García-Sánchez, 2006 and Geys & Moesen, 2009). Thus, the inefficiency effects model in this research can be expressed as follows.

$$U_{it} = f(TPPKD_{it}, LWA_{it}, RPPP_{it}) \quad (4)$$

or:

$$U_{it} = \alpha_0 + \alpha_1 \ln TPPKD_{it} + \alpha_2 \ln LWA_{it} + \alpha_3 \ln RPPP_{it} \quad (5)$$

Both models are then estimated using Maximum Likelihood Methods (MLE). The estimation assumes that the distribution of U_{it} is half-normal, just like that found in Aigner et al (1977). Like Aigner et al (1997) study, this research assumes that there is a technical inefficiency in the local government's tax collection operation by Regency and City local governments in Central Java Province.

Table 1. Variables and description of frontier equation model

| Name of Variable | Description |
|------------------|--|
| PDPP (Y) | Log of local tax managing service office's expenditure |
| PAD (X1) | Log of local original income managed by the local tax managing service office |
| RGP (X2) | Log of governmental employee's mean salary |
| PDRB (X3) | Log of gross regional domestic product |
| JPD (X4) | Log of population number |
| Dummy | Dummy variable for the administrative type of government (=1 for city government, =0 for others) |
| TPPKD (Z1) | Log of Central-to-Local Government transfer in respective local governments |
| LWA (Z2) | Log of Local Government's Administrative Area Width |
| RPPP (Z3) | Ratio of Governmental Employees' Education, between Employees with Elementary School Education and Total number of employees |

RESULTS AND DISCUSSION

Results

The descriptive statistics of respective variables used in this this research is expressed below. The descriptive statistics is useful to see the characteristics of respective variables. In this research, there are 35 observed regencies and cities located in administrative area of Central Java Province during the research (2019).

Table 2. Descriptive statistics of research variable

| Var | Unit | OBS | Mean | Std. Dev. | Min | Max |
|---|--------------------|-----|------------|------------|---------|-----------|
| Variables of Technical Efficiency | | | | | | |
| PDPP (Y) | Million Rupiah | 35 | 38,483.06 | 24,303.83 | 11,532 | 139,392 |
| PAD (X1) | Million Rupiah | 35 | 403,485.70 | 322,343.20 | 212,777 | 2,159,412 |
| RGP (X2) | Million Rupiah | 35 | 123.60 | 83.58 | 37 | 585 |
| PDRB (X3) | Million Rupiah | 35 | 27,215.49 | 23,251.85 | 6,473 | 140,326 |
| JDP (X4) | Thousand people | 35 | 1,032.69 | 438.25 | 122 | 1,937 |
| Variable of Technical Inefficiency | | | | | | |
| TPPKD (Z1) | Million Rupiah | 35 | 1,715.23 | 713.99 | 667 | 4,701 |
| LWA (Z2) | Squared Meter | 35 | 1,016.31 | 480.44 | 46 | 2,139 |
| RPPP (Z3) | Percent | 35 | 0.18 | 0.03 | 0.10 | 0.23 |

From Table 2 showing descriptive statistics, it can be seen that there is a substantial difference of maximum and minimum value between one variable and another. It indicates that there is a fairly wide gap between one region and another. The variable of collection cost indicates the region capable of saving tax collecting cost. It can be seen from the expenditure of tax managing service office in the region. In addition, in the variable of local original income, some regions have much local original income but some others have only a few. It indicates that some regions have higher potency and high success level in autonomy implementation and some others have lower ones. In addition, some regions should spend higher cost to result in tax and some others need to spend lower cost to do so. The variable of Gross Regional Domestic Product (GRDP or PDRB in Indonesian) shows very wide interval between lower and upper margins. Some regions have very high GRDP, but some others have very lower.

Local tax management inefficiency

Table 3 shows a correlation indicating the coefficient of correlation between independent variables used in this research. Considering the coefficient of correlation, it can be seen that generally there is no independent variable having strong correlation with another independent variable. With the rule of thumb of 0.8 to do multicollinearity test, the variable used in this research is avoided from multicollinearity problem.

Table 3. Correlation between research variables

| Variable | lnX2 | lnX3 | lnX4 | lnZ1 | lnZ2 | Z3 |
|----------|-------|-------|-------|-------|-------|------|
| lnX2 | 1.00 | | | | | |
| lnX3 | 0.25 | 1.00 | | | | |
| lnX4 | 0.10 | 0.63 | 1.00 | | | |
| lnZ1 | 0.07 | -0.39 | -0.79 | 1.00 | | |
| lnZ2 | -0.04 | -0.06 | 0.44 | -0.23 | 1.00 | |
| Z3 | 0.01 | -0.06 | -0.14 | -0.02 | -0.08 | 1.00 |

The result of estimated stochastic cost frontier can be seen in Tabel 4. Considering the result of estimation, technical inefficiency is still found in some regions in Central Java. It can be seen from lambda close to one, 0.923. The lambda value close to one (1) indicates that the error of model is caused more by technical inefficiency, while the lambda value close to zero is caused more by statistical noise.

Table 4. The result of estimated basic model and inefficiency effects model

| Variable | Coefficient | Std. Error | Variable | Coefficient | Std. Error |
|----------------------------------|-------------|------------|------------------------------------|-------------|------------|
| Variable of Technical Efficiency | | | Variable of Technical Inefficiency | | |
| Coefficient | 1.05 | 2.73 | Coefficient | 125.49 | 138.59 |
| PAD (X1) | 0.79 | 0.37*** | TPPKD (Z1) | -9.98 | 11.95 |
| RGP (X2) | 0.06 | 0.19 | LWA (Z2) | -4.76 | 4.68** |
| PDRB (X3) | -0.36 | 0.24* | RPPP (Z3) | -171.38 | 164.46 |
| JPD (X4) | 0.37 | 0.23** | | | |
| Dummy | 0.48 | 0.34* | | | |
| Number of Observations | | 35 | | | |
| Log Likelihood | | -18.669395 | | | |

From the basic model, it can be seen that Local Original Income (PAD) affects the tax collecting administrative cost of local government positively and significantly. It means that the higher the PAD of Local Government, the higher is the tax collection cost spent. The increase in PAD by one million rupiah will contribute to the increase in the collection cost by 0.79 million rupiah. Such condition indicates that the volume of income obtained by the government should sacrifice an amount of money as the tax collection administrative cost.

Gross Regional Domestic Product (GRDP) affects the tax collection cost of local government negatively and significantly (degree of freedom = 15 percent). An increase in the size of GRDP in a region will cause a decrease in the tax collection cost. This correlation indicates that the more the product and the service resulting from economic activity, the higher will be the efficiency of tax collection. The increase in GRDP will be an indicator of the more tax objects that can increase the Local Government's income. In addition, the higher the GRDP, the more efficient will be the tax collection conducted by local government over the tax objects specified in the legislations enacted in respective regions.

Population number affects the tax collection cost of local government positively and negatively. The economic activity of populations in respective regions are the objects to which the local government imposes tax. Thus, the correlation is logical, meaning that the higher the number of populations in the region, the higher will be the economic activities done. The consequence of such economic activity is the imposition of tax that will be the local government's income. To collect tax from tax object, administrative cost is required and this cost is expected not more than the amount of tax obtained.

Dummy variable is used to see the difference of tax management efficiency between regency and city governments. The result of estimation shows that there is a difference of collection cost efficiency between regency and city governments in Central Java Province. The difference of tax collection cost efficiency between regency and city government can be the rationale to find out which one having higher efficiency, regency or city. This inter-variable correlational test can be used to do follow-up analysis in another research to measure the factor causing the difference of efficiency between regency and city.

The tax collection cost Inefficiency of local government can be found in the estimated result of second equation over statistical noise used as the reference. The tax collection cost

inefficiency in regency and city in Central Java Province will affect the amount of collection cost the government should spend. The administrative area width of regency and city government affects the tax collection cost of local government negatively and significantly. The wider the administrative area width of local government, the lower will be the tax collection cost spent, and vice versa.

The estimated result of technical inefficiency in regencies and cities in Central Java Province

Having estimated the first and the second models, the scores of technical efficiency and technical inefficiency are found for the regions individually and entirely. Technical efficiency and technical inefficiency scores for the regions in Central Java Province will be presented based on administrative area status. Armstrong study analyzed the difference of economic performance between territorial regions (Armstrong & Read, 2000). Metropolitan region will have higher control over non-metropolitan one. There is a trickledown effect of economic activity agenda in metropolitan territory over non-metropolitan one. The division of area between city and regency is used to see whether or not there is a relatively more apparent difference of local government's revenue coming from local or regional tax (Hadiyatno et al., 2020).

Table 5. Size of technical efficiency and technical inefficiency in regency government

| Level of Government | Technical Efficiency | Technical Inefficiency |
|---------------------|----------------------|------------------------|
| Regency 1 | 87.14 | 12.86 |
| Regency 2 | 89.21 | 10.79 |
| Regency 3 | 87.34 | 12.66 |
| Regency 4 | 89.97 | 10.03 |
| Regency 5 | 89.87 | 10.13 |
| Regency 6 | 90.00 | 10.00 |
| Regency 7 | 89.82 | 10.18 |
| Regency 8 | 89.88 | 10.12 |
| Regency 9 | 89.43 | 10.57 |
| Regency 10 | 88.86 | 11.14 |
| Regency 11 | 90.00 | 10.00 |
| Regency 12 | 89.59 | 10.41 |
| Regency 13 | 76.31 | 23.69 |
| Regency 14 | 71.18 | 28.82 |
| Regency 15 | 88.93 | 11.07 |
| Regency 16 | 88.12 | 11.88 |
| Regency 17 | 89.98 | 10.02 |
| Regency 18 | 84.87 | 15.13 |
| Regency 19 | 90.00 | 10.00 |
| Regency 20 | 88.91 | 11.09 |
| Regency 21 | 87.52 | 12.48 |
| Regency 22 | 89.96 | 10.04 |
| Regency 23 | 90.00 | 10.00 |
| Regency 24 | 81.37 | 18.63 |
| Regency 25 | 87.97 | 12.03 |
| Regency 26 | 89.91 | 10.09 |
| Regency 27 | 89.78 | 10.22 |
| Regency 28 | 89.92 | 10.08 |
| Regency 29 | 89.99 | 10.01 |

Table 5 shows the size of technical efficiency and technical inefficiency in the Regency Governments in Central Java Province. Closely observed, there is a significant difference between one region and another. The highest technical efficiency score is 90.00 percent, and the lowest one is 71.18 percent. However, overall Regency Governments in Central Java have mean technical efficiency score of 87.79 percent. It means that the regency governments in Central Java have about 12.21 percent potency to optimize the local government’s tax collection.

Table 6. Size of technical efficiency and technical inefficiency in city governments

| Level of Government | Technical Efficiency | Technical Inefficiency |
|---------------------|----------------------|------------------------|
| City 1 | 90.00 | 10.00 |
| City 2 | 76.55 | 23.45 |
| City 3 | 52.65 | 47.35 |
| City 4 | 88.90 | 11.10 |
| City 5 | 85.54 | 14.46 |
| City 6 | 90.00 | 10.00 |

Table 6 shows the size of technical efficiency and technical inefficiency in the City Governments located in Central Java Province. Closely observed, there is a significant difference between one region and another. The highest Technical Efficiency score is 90.00 percent, and the lowest one is 52.65 percent. However, overall the City Governments in Central Java have mean technical efficiency score of 80.61 percent. It means that City Governments in Central Java have about 19.39 percent potency to optimize the local government’s tax collection.

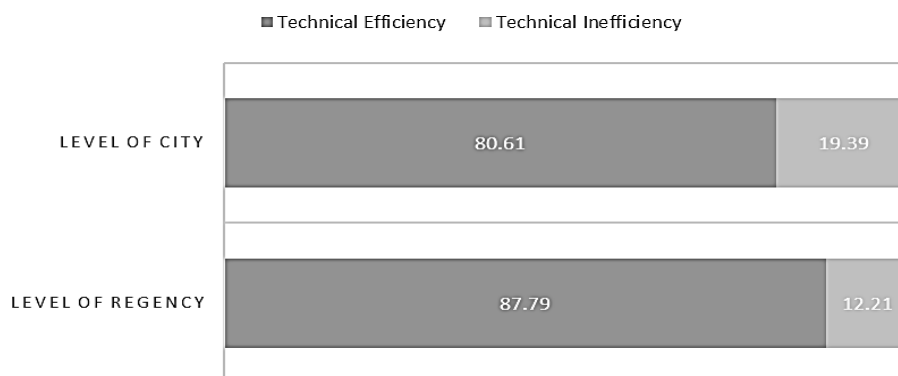


Figure 3. Mean scores of technical efficiency and technical inefficiency between regency and city

Figure shows the sizes of technical efficiency and technical inefficiency for City and Regency Governments in Central Java. Overall, the Regency Governments have higher technical efficiency score (87.78 percent) than the City Governments do (80.61 percent). Meanwhile, based on the technical inefficiency score, it can be seen that the City Governments are more inefficient than the Regency ones. It is indicated with the technical inefficiency score of City Governments (19.39 percent) higher than that of Regency Governments (12.21 percent).

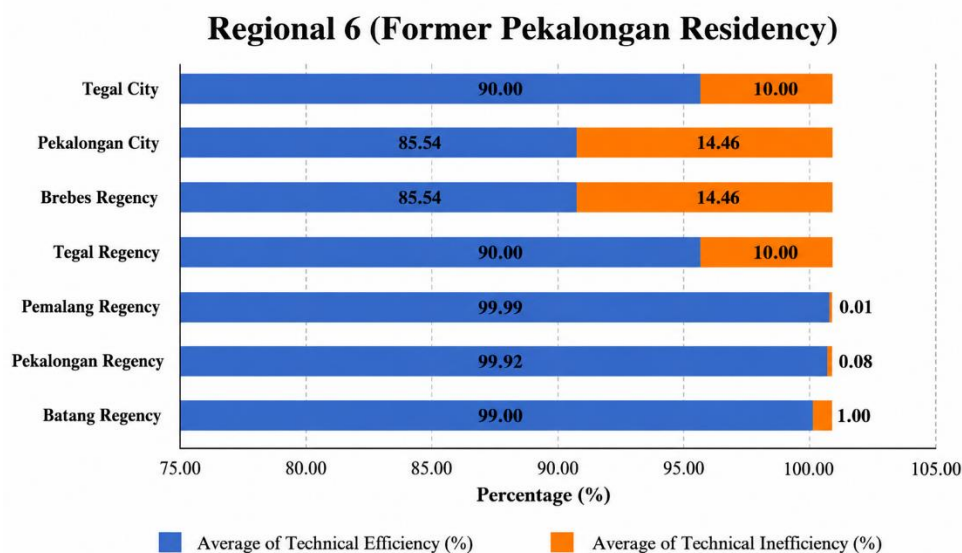


Figure 4. Mean score of technical efficiency and technical inefficiency in region 6

Figure 4 shows one of conditions in region 6 of Pekalongan Residency area. Closely observed, there is a difference of technical efficiency and technical inefficiency between one region and another in Pekalongan Residency area. There is a region with highest technical efficiency score (90.00 percent), i.e. Tegal City. It means that Tegal City has about 10.00 percent potency to optimize its local government's tax collection. However, there is a region with lower technical efficiency score (85.54 percent), i.e. Pekalongan City. It means that Pekalongan City still has 14.46 percent of technical inefficiency in its Local Government's tax collection. However, generally, Pekalongan Residency area still has mean score of technical efficiency of 89.06 percent. It means that Pekalongan Residency still has about 10.94 percent potency to optimize its Local Government's tax collection.

Implications for SDG 16 and sustainable local governance

The findings of this study have important implications for the achievement of Sustainable Development Goal (SDG) 16, particularly Target 16.6, which promotes effective, accountable, and transparent institutions at all levels. Efficient local tax administration reflects the ability of regional governments to mobilize public revenue while minimizing administrative costs. Higher efficiency in tax collection enables local governments to allocate a larger proportion of public resources toward development programs and public service delivery.

The results indicate that regions with stronger economic performance tend to experience lower tax collection administrative costs, suggesting that institutional capacity and economic development are closely related. Conversely, inefficiencies in tax administration may reduce fiscal effectiveness and limit the capacity of local governments to support sustainable development initiatives. Therefore, improving tax administration efficiency should not only be viewed as a fiscal objective but also as a governance strategy to strengthen institutional performance.

Furthermore, the differences in efficiency between regency and city governments indicate that local characteristics influence the effectiveness of tax administration. This finding highlights the need for adaptive governance approaches that consider regional conditions and administrative capacities. By enhancing tax administration systems, strengthening institutional capacity, and promoting accountable financial management, local governments

can contribute more effectively to SDG 16 while supporting broader sustainable development objectives.

CONCLUSION

Fundamental Finding: This study measured the technical efficiency of tax collection and identified the determinants of technical inefficiency in regency and city governments in Central Java Province using Stochastic Frontier Analysis (SFA). The results indicate that Local Own-Source Revenue (PAD) has a positive and significant effect on tax collection administrative costs, while Gross Regional Domestic Product (GRDP) has a negative and significant effect, indicating that stronger economic activity improves tax collection efficiency. Population size and differences in administrative status between regencies and cities also significantly influence tax collection costs. Furthermore, administrative area size negatively affects technical inefficiency. The average technical efficiency score of local tax collection is 87.34%, suggesting that approximately 12.66% efficiency improvement remains achievable. **Implication:** The findings imply that local governments should strengthen tax administration systems and optimize resource allocation to improve tax collection efficiency. Enhancing administrative efficiency can reduce collection costs, increase fiscal capacity, and improve the effectiveness of public service delivery. These improvements are closely aligned with SDG 16, particularly Target 16.6, which emphasizes the development of effective, accountable, and transparent institutions. Furthermore, policies that support regional economic growth and strengthen tax management capacity can enhance local revenue mobilization while promoting sustainable governance. The observed differences between regency and city governments also suggest the need for context-specific tax administration strategies to ensure more inclusive and efficient institutional performance across regions. **Limitation:** This study is limited to cross-sectional data from 35 regencies and cities in Central Java Province for the year 2019. Therefore, the findings may not fully capture efficiency dynamics over time or reflect conditions in other provinces. **Future Research:** Future studies are encouraged to employ panel data covering multiple years and broader geographical areas to provide more comprehensive evidence. Additional variables related to institutional quality, digital tax administration, governance, and taxpayer compliance may also be incorporated to better explain variations in tax collection efficiency.

AUTHOR CONTRIBUTIONS

Jalu Aji Prakoso: Conceptualization, Methodology, Formal Analysis, Supervision, Writing – Review & Editing. **Arif Rahman Saleh:** Data Curation, Investigation, Validation, Writing – Original Draft. **Suci Nasehati Sunaningsih:** Investigation, Literature Review, Data Interpretation, Writing – Review & Editing. **Khresna Bayu Sangka:** Methodology Validation, Project Administration, Visualization, Writing – Review & Editing. All authors have read and approved the published version of the manuscript.

CONFLICT OF INTEREST STATEMENT

The authors state that no financial or personal conflicts of interest exist that may have affected the content or findings of this research.

STATEMENT ON THE USE OF AI OR DIGITAL TOOLS IN WRITING

The authors declare that no artificial intelligence (AI) tools or other digital writing assistants were used in the preparation, analysis, or writing of this manuscript. All stages of the research process, including data analysis, interpretation, and manuscript writing, were

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REFERENCES

- Afonso, A., & Fernandes, S. (2003). *Efficiency of local government spending: Evidence for the Lisbon region* (Working Paper No. 9-2003/DE/CISEP). Instituto Superior de Economia e Gestão (ISEG), Departamento de Economia. Repositório da Universidade de Lisboa.
- 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](https://doi.org/10.1016/0304-4076(77)90052-5)
- Arcelus, F. J., Arocena, P., Cabasés, F., & Pascual, P. (2015). On the cost-efficiency of service delivery in small municipalities. *Regional Studies*, 49(9), 1469–1480. <https://doi.org/10.1080/00343404.2013.837872>
- Armstrong, H. W., & Read, R. (2000). Comparing the economic performance of dependent territories and sovereign microstates. *Economic Development and Cultural Change*, 48(2), 285–306. <https://doi.org/10.1086/452459>
- Barankay, I., & Lockwood, B. (2007). Decentralization and the productive efficiency of government: Evidence from Swiss cantons. *Journal of Public Economics*, 91(5–6), 1197–1218. <https://doi.org/10.1016/j.jpubeco.2006.11.006>
- Battese, G. E., & Coelli, T. J. (1995). A model for technical inefficiency effects in a stochastic frontier production function for panel data. *Empirical Economics*, 20(2), 325–332. <https://doi.org/10.1007/BF01205442>
- Buettner, T., & Holm-Hadulla, F. (2013). City size and the demand for local public goods. *Regional Science and Urban Economics*, 43(1), 16–21. <https://doi.org/10.1016/j.regsciurbeco.2012.10.003>
- Daryanto. (2019). Authorities of regional governments in collecting taxes in Indonesia. *Scientific Research Journal*, 7(8), 50–54. <https://doi.org/10.31364/SCIRJ/v7.i8.2019.P0819684>
- Farrell, M.J. (1957) The measurement of productive efficiency. *Journal of the Royal Statistical Society*, 120, 253–290. <https://doi.org/10.2307/2343100>
- Garaika, G., Margahana, H., Sari, S. S., & Feriyana, W. (2019). Measuring the economic growth and community welfare through analysis of regional revenue and financial performance. *ECo-Fin*, 1(2), 99–108. <https://doi.org/10.32877/ef.v1i3.143>
- García-Sánchez, I. M. (2006). Efficiency measurement in Spanish local government: The case of municipal water services. *Review of Policy Research*, 23(2), 355–372. <https://doi.org/10.1111/j.1541-1338.2006.00205.x>
- Geys, B & Moesen, W. (2009). Measuring local government technical (in) efficiency: An application and comparison of FDH, DEA and econometric approaches. *Public Performance and Management Review*. 32(4) 499–513. <https://doi.org/10.2753/PMR1530-9576320401>
- Geys, B., & Revelli, F. (2011). Economic and political foundations of local tax structures: An empirical investigation of the tax mix of Flemish municipalities. *Environment and Planning C: Government and Policy*, 29(3), 410–427. <https://doi.org/10.1068/c10116r>
- Ginting, A. M., Hamzah, M. Z., & Sofilda, E. (2019). The impact of fiscal decentralization on economic growth in Indonesia. *Economic Journal of Emerging Markets*, 11(2), 152–160. <https://doi.org/10.20885/ejem.vol11.iss2.art3>
- Goode, R. (1981). Some economic aspects of tax administration. *Staff Papers*, 28(2), 249–274. <https://doi.org/10.2307/3866931>

- Grossman, P. J., Mavros, P., & Wassmer, R. W. (1999). Public sector technical inefficiency in large U.S. cities. *Journal of Urban Economics*, 46(2), 278–299. <https://doi.org/10.1006/juec.1998.2122>
- Hadiyatno, D., Susiswo, S., Patimah, S., Nainggolan, H., & Ernayani, R. (2020). The effect of local taxes, regional retribution, and other legal district own source revenues on the increase of district own source revenue. *Humanities and Social Sciences Reviews*, 8(1), 1–3. <https://doi.org/10.18510/hssr.2020.8153>
- Hummel, D., & Kusumasari, B. (2026). Local government financial performance and decentralization in Indonesia. *State and Local Government Review*, 58(2), 206–227. <https://doi.org/10.1177/0160323X251364379>
- Jaya, E. S., & Susanto, E. E. (2022). The effectiveness and contribution of hotel and restaurant tax revenue to PAD Palopo City. *International Journal of Entrepreneurship and Business Development*, 5(5), 936–944. <https://doi.org/10.29138/ijebd.v5i5.1990>
- Lampe, H. W., & Hilgers, D. (2015). Trajectories of efficiency measurement: A bibliometric analysis of DEA and SFA. *European Journal of Operational Research*, 240(1), 1–21. <https://doi.org/10.1016/j.ejor.2014.04.041>
- Lewis, B. D. (2006). Local government taxation: An analysis of administrative cost inefficiency. *Bulletin of Indonesian Economic Studies*, 42(2), 213–233. <https://doi.org/10.1080/00074910600873666>
- Mansor, M., Tayib, M., & Yusof, R. N. (2005). Tax administration system: A study on the efficiency of Malaysian indirect taxes. *International Journal of Accounting, Auditing and Performance Evaluation*, 2(3), 321–343. <https://doi.org/10.1504/IJAAPE.2005.007678>
- Marfiana, A., Prabowo, S., Wijaya, S., & Irawan, F. (2024). The impact of local tax revenue on society welfare. *Educoretax*, 4(12), 1561–1579. <https://doi.org/10.54957/educoretax.v4i12.1310>
- Moesen, W., & Persoon, A. (2002). Measuring and explaining the productive efficiency of tax offices: A non-parametric best practice frontier approach. *Tijdschrift voor Economie en Management*, 47(3), 399–416. <https://ideas.repec.org/a/ete/revbec/20020306.html>
- Morgenroth, E. (2010). The regional dimension of taxes and public expenditure in Ireland. *Regional Studies*, 44(6), 777–789. <https://doi.org/10.1080/00343400802093839>
- Rasji, & Farell David Trawocoadji. (2023). Settlement of tax disputes through the application of the principle of equity. *JILPR Journal Indonesia Law and Policy Review*, 5(1), 254–264. <https://doi.org/10.56371/jirpl.v5i1.209>
- Rezaei, E., & Jablonsky, J. (2026). A generalized inefficiency model for interpreting tax collection efficiency. *Public Finance Review*, 54(4). <https://doi.org/10.1177/10911421251401130>
- Saudi, N. D. S. (2022). Analysis of economic growth and income disparity on inter-regional welfare. *Point of View Research Economic Development*, 2(4), 68–87. <http://journal.accountingpointofview.id/index.php/POVRED/article/download/173/138>
- Worthington, A. C. (2000). Cost efficiency in Australian local government: A comparative analysis of mathematical programming and econometric approaches. *Financial Accountability & Management*, 16(3), 201–223. <https://doi.org/10.1111/1468-0408.00105>
- Zulfi, M. R., & Wijaya, S. (2024). Factors affecting the local taxes revenue by provincial governments in Indonesia. *Educoretax*, 4(1), 116–125. <https://doi.org/10.54957/educoretax.v4i1.718>

***Jalu Aji Prakoso (Corresponding Author)**

Faculty of Economic, Universitas Tidar

Jl. Kapten Suparman 39, Potrobangsan, North Magelang, Central Java 56116, Indonesia

Email: jaluaji@untidar.ac.id

Arif Rahman Saleh

Faculty of Engineering, Universitas Tidar

Jl. Kapten Suparman 39, Potrobangsan, North Magelang, Central Java 56116, Indonesia

Email: arifrahmansaleh@untidar.ac.id

Suci Nasehati Sunaningsih

Faculty of Economic, Universitas Tidar

Jl. Kapten Suparman 39, Potrobangsan, North Magelang, Central Java 56116, Indonesia

Email: sucinasehati@untidar.ac.id

Khresna Bayu Sangka

Faculty of Teacher Training and Education, Universitas Sebelas Maret

Jl. Ir. Sutami No. 36A, Ketingan, Jebres, Surakarta, Central Java, 57126Indonesia

Email: b.sangka@staff.uns.ac.id
