The Effect of Accountability on the Efficiency of Local Government Expenditures

Wulan Sri Rahayu[1*], Khoirunurrofik[2]

The Audit Board of The Republic of Indonesia, Jakarta, Indonesia[1]

Faculty of Economics and Business, University of Indonesia, Jakarta, Indonesia[2]

ABSTRACT

This study aims to examine the effect of accountability, as one of the governance aspects, on the efficiency of local government spending at the district/city level in Indonesia. This study uses panel data analysis with 228 districts/city government entities from 2014 to 2018. The analysis is conducted in two stages; the first stage measures the efficiency of every local government by using Data Envelopment Analysis (DEA) method. The second stage estimates the effect of accountability and other control variables on local government expenditure efficiency by regression using the Tobit method. The result shows a non-linear relation between accountability, which is proxied using the Indonesia Audit Board Opinion Index, and the efficiency of local government expenditure. Initially, accountability will proceed hand in hand with increasing efficiency; however, at a certain point, an increase in accountability will no longer increase the efficiency level of local government expenditure. Another control variable that positively relates to efficiency is population expenditure per capita. Meanwhile, the ethnic fractionalization index (EFI) and distance negatively affect efficiency. The results of this study have not been able to show a relation between political competition and the gender of regional heads with efficiency.

* Corresponding Author
  Email: wulan.rahayu@bpk.go.id

INTRODUCTION

Efficiency in public service provision especially at the local government level become a most discussed topic in literature (Benito, Faura, Guillamon, & Rios, 2019). It results from the increasing public demand for better public services and the limited sources owned by the government (Benito, Bastida, & Garcia, 2010). Other than that, the higher cost of public service provision (Perez-Lopez, Prior, & Zafra-Gómez, 2018) and the rigorous budget constraints (Narbón-Perpiñá, Arribas, Balaguer-Coll, & Tortosa-Ausina, 2020) have also prompted attention to the topic of efficiency.

The local government in Indonesia has greater authority in public service provision as there are delegations of authority and responsibility from the central government to the local government in several main service sectors post-decentralization. The authority delegated to local governments is claimed to have the ability to increase efficiency because local governments have a better understanding of the general preferences in their territory (Oates. 1999; Barankay & Lockwood. 2007). Based on the mandate specified in Law Number 23 of 2014, the local government carries out responsibility for concurrent government affairs, which include mandatory and optional affairs. Several responsibilities of the main public service that should be delivered by local governments as specified in the government mandatory affair for basic public service include education, health, infrastructure, and social affairs. Whereas, regarding basic nonservice mandatory affairs, such responsibility includes food, environment, employment, and population.

However, previous literature shows that inefficiency remained present in government expenditure at regional levels. Inefficiency in government expenditure continues to remain the leading problem in public service man-agement in Indonesia, as it results in the government expenditure's inability to increase the quality of public services and public welfare (Wardhani, Rossieta, & Martani, 2017). Other quantitative literature has also shown that there is still inefficiency in local government expenditure. At the regional level, this inefficiency is revealed in a study by Tirtosuharto (2010), explaining that from 1999 to 2005 the provincial governments' allocative efficiency scores in Indonesia ranged from 0.76 to 0.85. At the district/city government level, a study by Andriani (2016) illustrated that the average efficiency scores of district/city governments in North Sumatra and West Java were 0.82 and 0.77.

The difference in efficiency score can be affected by external factors (environmental factors) that cannot be controlled by the local government and internal factors related to the management capability (Afonso & Fernandes, 2008). Therefore, the government can use improved governance management as one of the ways to improve efficiency. Governance quality might influence public funds' ability to achieve better outcomes through efficiency. In other words. good governance can reduce the inefficiency of government spending (Wardhani et al.. 2017).

Good governance is required to encourage performance improvement and ensure that public sector entities act for the public interest. The absence of good governance can inhibit the achievement of development goals. Governance includes various mechanisms, including a structure explaining the responsibilities of various stakeholders related to the organization, an approach to improving abilities in fulfilling responsibilities, and a tool such as a system for internal control and external accountability. These mechanisms show the importance of accountability or responsibility (Almquist, Grossi, van Helden, & Reichard, 2013). Accountability asks each party to be responsible for their behaviors

and tasks. In the public sector, accountability asks the government to fulfill its functions, obligations, responsibilities, and authority to manage available resources (Keping, 2018).

From the perspective of agency theory, agency relationships in the public sector can be seen from the relationship between the government as the agent and the public as the principal that delegates the authority to the government to provide public services and financial management (Wardhani et al., 2017). In this agency relationship, inherently, there is an asymmetry of information between the agent and the principal (Ludwig, Merode, & Groot, 2010). The public, as principal, has limited information regarding the intention and actions of government apparatus in managing resources or utilizing local public funds. Information gaps may lead to non-optimal outcomes if the government fails to follow the 'public's desire and realizes an inefficient expenditure (Persson, Roland, & Tabellini, 1997).

Accountability will minimize the effect of possible principal-agent issues caused by the information gap. Accountability acts as a check and balance mechanism to reduce information asymmetry. Accountable and monitored management can encourage compliance in financial management following the applicable regulations and provisions. An accountable financial management system will push policymakers to adopt better policies (Arbatli & Escolano, 2015). Meanwhile. from the principal perspective, the public can monitor the government expenditure policy. Therefore, there is control over biased expenditures that can come from the harmful actions of policymakers (Bauhr & Grimes, 2014).

Accountability is one of the general principles in national/regional financial management. Financial accountability through transparent budgeting will improve public awareness of government plans or actions. leading to efficient expenses (Montes, Bastos, & de Oliveira, 2018). Accountability implementation is expected to facilitate orderly, efficient, economic, effective, and transparent financial management as regulated in Law Number 17 of 2003 concerning state finance. This can also be proven in the previous literature which shows that accountability improvement positively affected efficiency (Hauner & Kyobe, 2010). However, to our knowledge, no literature regarding efficiency specifically analyzed accountability's effect on efficiency at the district/city level in Indonesia. Therefore, this study is attempting to fill the literature gap.

This study will estimate the relative efficiency level of the local government expenditure at the district/city level in Indonesia and the effect of accountability on efficiency. The first stage will measure the relative efficiency of Indonesia's district/city government expenditure from 2014 to 2018 using the Data Envelopment Analysis (DEA) method. Quantitative efficiency measurement is vital to measure performance, enabling a comparison between typical units and evaluating relative efficiency. Efficiency analysis can be a tool to assess the local government's ability to manage existing resources to provide optimal public service (Narbon-Perpina et al., 2020). In the second stage, the Tobit method will be conducted to identify the effect of accountability and other control variables on the expenditure efficiency of district/city local governments in Indonesia. Accountability, as one of the governance aspects. is commissioned using the opinion delivered by BPK on the local government financial statements.

This study differs from the previous one, which analyzes efficiency in local governments throughout Indonesia. Furthermore, this study employs a larger sample from all regions in Indonesia in addition to the latest

data. This study also undertakes a further analysis of the effect of accountability on efficiency. Such analysis has yet to be conducted using the data of the district/city governments in Indonesia. Moreover, this study also attempts to detect a potential non-linear relationship between accountability and expenditure efficiency of local governments in Indonesia.

RESEARCH METHOD

The research design of this benchmarking study included two main steps. First, calculation of the local government efficiency scores; second, examination of the relationship between efficiency and the variable of interest. An efficient local government can require fewer resources (input) to produce higher public goods (output). In contrast, an inefficient local government spends more resources to produce a moderate or low level of public goods (Ashworth, Geys, Heyndels, & Wille, 2014). As such, the efficiency of local government spending can be examined by connecting the total input (local government expenditure) with the output level produced (public services and public goods provision). The existing literature discussed parametric and non-parametric methods applied to measure the local government's expenditure efficiency (Narbon-Perpina & De Witte, 2018). Among these methods in existing literature are Data Envelopment Analysis (DEA) (Lo Storso, 2016). Free Disposable Hull (FDH) and Statistical Frontier Analysis (SFA) (Lampe, Hilgers, & Ihl, 2015).

In this study, the local government expenditure's efficiency is measured using the DEA non-parametric approach developed by Charnes, Cooper, and Rhodes (1978). DEA is a non-parametric technique commonly used in conducting a comparative study and is known as a decision-making supporting tool in managerial control (Lo Storso, 2016). DEA does not require any functional form and allows multiple input and output models (Narbon-Perpina et al., 2020). In addition, in the DEA method, input and output variables can have different units of measurement, and each DMU determines its variable weighting to achieve the highest efficiency (Hadinata & Manurung, 2006).

DEA applies a linear programming technique to evaluate the relative efficiency of the Decision-Making Unit (DMU). which is the local government. Local government is assumed as the production function that produces various output levels from several input combinations. The ability of a unit to produce a set of particular outputs with minimum consumption from a set of related input-regardless of any input cost- is a relative technical efficiency measured as the maximum ratio of linear combination from output towards linear combination from input (LoStorso, 2016). DEA forms an efficient frontier restricted by a unit that is assumed as a "best-practice" unit. and a distance between every unit to the frontier shows the efficiency measurement. An efficient unit will have an efficiency score equal to one, while an inefficient unit will get a score below one (Narbon-Perpina et al., 2020).

DEA models can be either input or output oriented. In this study, the measurement of technical efficiency uses the DEA concept from an output perspective. This follows the approach of Pettas and Giannikos (2014), which is in accordance with stakeholders' main goal in the public services field, which is not to reduce costs while maintaining a constant level of absorption of funds but to maximize output achievements and minimize the risk of loss. This study assumes a variable return to scale (VRS) as it is assumed that local governments are suboptimal in producing various public services due to obstacles, including budget constraints.

The constant return to scale (CRS) assumption will only be accurate when all DMU has operated optimally (Kalb, 2009). However, this technique also has its weaknesses. Due to its deterministic nature, the DEA does not recognize random error, so all deviations from the frontier will be considered a form of inefficiency (Narbon-Perpina et al., 2020). DEAP 2.1 software is used in this study to examine the DEA method.

A second-stage procedure was implemented to analyze the effect of accountability on the efficiency of local government expenditure. Following this procedure, the efficiency score obtained in the first stage using DEA analysis was regressed on a variable of interest (accountability) and a set of control variables using the Tobit regression method. Tobit regression is used to estimate the model because the dependent variable is an efficiency score that denotes continued data that has a limitation on the value limit between 0 and 1 (Fonchamnyo & Sama, 2016). The Tobit model is better used if the dependent variable has a value limit to reduce biased and inconsistent estimation results (Wooldridge, 2016).

This study is conducted at the districts/cities level because the main responsibility and authority of the public service sector rest on the districts/cities. We construct a dataset of the local government at the districts/cities level for 2014-2018. After removing districts/cities with no available data on input, output, or explanatory variables, there are 228 districts/cities per year.

First Stage: Input and Outputs of the DEA model

Inputs and outputs of the local government are not easily defined due to data availability problems (de Borger & Kersten, 1996), and the choice of the inputs and output data followed the criteria of relevance and availability (Lo Storso, 2016). The input variable represents the total expenditure per local government function at the districts/municipalities level. In this study, efficiency measurement is limited to the government's main task in delivering its four functions: education, health, general service, and housing also public facilities. The use of the expenditure amount reflects the total cost for the services provided in every district/city (Narbon-Perpiñá et al., 2020), so with the use of those types of input, it is expected to ensure that every input is used in the analysis (Afonso & Fernandes, 2006). The realization of government expenditure data per function at the district/cities is obtained from the Directorate General of Fiscal Balance. Ministry of Finance. On average, the budget realization of the four functions from 2014 to 2018 covers an estimated 84% of the total expenditure; therefore, it is expected to portray the pattern of local government expenditure.

The output used is public service data provided by the government based on the function of education, health, housing and public facilities, and general service. The output indicator used for the basic service function in the education sector is the total number of elementary and junior high school students. This indicator selection is in line with the studies of Šťastná and Gregor (2015) also Lampe et al. (2015). The number of students is used as a proxy to portray the local government's needs in basic education services. Output indicator used in the health sector is the percentage of total medical assisted birth and the percentage of children under the age of five who get vaccinated. Those two aspects show the government's efforts in providing basic services in the health sector, especially in the attempt to suppress maternal and child mortality, which has become one of the targets of the Sustainable Development Goals (SDGs).

The output indicator of housing and public facilities function employs several indicators used in previous studies. The indicators are notably the length of district roads and the percentage of good quality city roads (Ashworth et al., 2014), the rate of households that have safe sanitation access, and the percentage of households that have access to clean water (Moore, Nolan & Segal, 2005). The local government undertakes responsibility for road development and maintenance that becomes the districts/cities' authority. However, because the road length and quality data from transportation statistics only consist of aggregate data at the provincial level, this study employs the provincial level data and averaged for each district/city. This matter has become one of the research limitations.

The population proxy is used to depict the output of public service to the population. The total population is not the direct output. However, it shows an important indication regarding the number of public services that need to be delivered to the public (lo Storso, 2016). In the preceding description, the total population is equivalent to the number of services needed. Data on various output indicators were obtained from BPS and The Indonesia Database for Policy and Economic Research (Indodapoer, 2020).

The Second Stage: Independent Variables of DEA Analysis

This study assesses whether accountability affects local government spending efficiency, or it can be formulated as illustrated in Formula 1.

$$Efficiency_{it} = \alpha + \beta_1 opinion_{it} + \beta_2 opinion_{it}^2 + X_{it} + \varepsilon_{it} \quad ..(1)$$

Where efficiency is the efficiency score for district/municipalities i at time t; The efficiency score was obtained from the measurement using the DEA method at the first stage. The opinion is an opinion index, a proxy for accountability measured by the Min-Max data normalization method. While subscript it indicates the ith district/city at time t and ε_{it} represents the error term. The vector X_{it} is a control variable capturing potential influences from political variables (political competition and gender of the districts/cities' head), economic variable (expenditure per capita), social demographic variable (ethnic fractionalization index), and geographical variable (distance of the district/city central government to the capital of the province).

Accountability, as a governance aspect, acts as checks and balances mechanism to reduce information asymmetry. Accountability and supervision can boost financial management to comply with various applicable rules and regulations. Financial accountability through transparent budgeting can improve public awareness of government plans or actions, affecting more efficient expenditure (Montes et al., 2018).

As a form of government financial resource management accountability and one of the concrete efforts to create transparency and accountability of national/regional financial management, local financial management is mandated to prepare financial statements as regulated in Law number 17 of 2003. BPK inspects the financial statements based on the mandate specified in Law number 15 of 2004 and Law number 15 of 2006. Therefore the financial statements BPK has audited can be regarded as a form of government transparency and accountability in managing their financial resources.

In this study, BPK's opinion is used as a proxy for the district's/municipalities' level of local government accountability. An opinion provided by BPK consists of an unqualified opinion (Wajar Tanpa Pengecualian, WTP), qualified opinion (Wajar Dengan Pengecualian, WDP).

adverse opinion (Tidak Wajar, TW), and disclaimer (Tidak Memberikan Pendapat, TMP). In order to facilitate performance comparison, BPK's opinion was formed into an index. In compiling a single index opinion, WTP, WDP, TW, and TMP opinions will be given a value of 4, 3, 2, and 1, respectively. Single index opinion measurement is used with the Min-Max data normalization method. as presented in Formula 2.

$$f'_{ij} = \frac{[f_{ij} - Min(f_{ij})]}{[Max(f_{ij}) - Min(f_{ij})]} \quad \ldots\ldots\ldots\ldots(2)$$

The political competition variable (polcomp) reflects the party's power in the regional election and demonstrates the political concentration in the Regional House of Representatives (Dewan Perwakilan Rakyat Daerah. DPRD). Political concentration is measured using the Herfindahl Hirschman Index (HHI). When the level of political concentration is higher, the opposition level is low, and it becomes easier for the ruling party to direct policy and affect the budget (Borge, Falch, & Tovmo, 2008), which is expected to improve efficiency. However, the low level of political competition can complicate other parties in controlling government budgets and expenses, reducing efficiency (Ashworth et al., 2014).

The gender variable (gender) for regional heads is a dummy variable used to describe one of the characteristics of regional heads. with a value of 1 for male regional heads and 0 for female regional heads. Gender affects policymaking preferences, financial management, and government expenditure (Boetti, Piacenza & Turati, 2012). Public expenditure level per capita (excap) is expected to depict the community welfare and economy level. When the population becomes more prosperous then the amount of tax being paid is higher, this will consequently t impose higher pressure on the local government to provide public

services and infrastructure more efficiently (Hauner, 2008; Narbón-Perpiñá et al., 2020).

The Ethnic Fractionalization Index (EFI) variable reflects ethnic diversity in a region. EFI score range between 0-1. A low EFI score shows that a region is more homogenous in ethnicity. If there is a more balanced ethnicity component in a region, the political power will be balanced, so that ethnic groups bargain in zero-sum games, which leads to efficiency (Nikolov & Hrovatin, 2013). The data of EFI was obtained from the study results of Arifin et al. (2015). The distance variable (distance) is used to portray the distance between the district/city central government and the capital of the province by using measurement in kilometers. Distance will affect the coordination process between local governments. The closer the distance between districts/cities to the center, the easier the access is to the public goods provided. Thereby districts/cities closer to the capital will be more efficient (Narbon-Perpina & De Witte, 2018).

RESULT AND DISCUSSION

Efficiency Measurement and Analysis of the Effect of Accountability on Efficiency

Appendix 1 demonstrates the technical efficiency score of districts/cities' government expenditure during 2014-2018, obtained from an output-oriented DEA model analysis using four inputs and nine outputs. The technical efficiency score ranges from 0 - 1. with 1 indicating the most efficient score (Narbon-Perpina et al., 2020). The score obtained from this DEA method is also a relative efficiency, suggesting that there is a possibility of not having high-efficiency DMU included in the calculation, and the result of DMU efficiency will look more effi-

cient than the actual (Hadinanta & Manurung, 2006). Table 1 below presents the efficient technical score obtained if the average score per year is calculated.

As presented in Table 1, the annual average technical efficiency score fluctuated from 2014-2018. While maintaining the level of local government spending during that period, average output achievement can be increased by 0.0227 points (2.27%). Local governments can improve their policies to reach the optimum level of public goods or services. In other words, they can do better. From 2014 to 2018, 60 entities or as much as 26.31% of local governments have gained a full efficiency average (score DEA=1). Therefore, based on our observation, 168 local governments, or at least 73.68% of districts/ municipalities, can still improve their output with the same amount of budget absorption as it is today.

In addition to being influenced by management skills, efficiency difference can also be influenced by other exogenous factors beyond management's control, so some areas might not be able to achieve "best practice" because there are unfavorable uncontrollable factors (Narbon-Perpina et al., 2020). These factors can be in the form of institutional factors, socio-economic and geographical environmental factors (Da Cruz & Marques, 2014). In this study, the authors intend to analyze whether the accountability represented by the opinion index affects the efficiency of local government expenditure in Indonesia.

Table 2 provides a statistical description of the variable that will be tested in the second stage to estimate the effect of accountability on efficiency. At the same time, some specifications of the relationship between the independent and dependent variables are presented in Appendix 2. Using the Tobit method, column (1) is tested with a basic equation that only estimates the change in the interest variable (opinion index) on the achievement of efficiency scores, while column (2) is added a set of control variables. To explore the possibility of a non-linear relationship between accountability and efficiency, we added a variable opinion index squared in columns (3) and (4). However, the regression does not yet accommodate the possibility of endogeneity caused by a two-way relationship in the accountability, which uses opinion index, and efficiency.

Table 1. Summary of the Average Score of Annual Technical Efficiency

Year	2014	2015	2016	2017	2018
Average technical efficiency per year	0.9774	0.9717	0.9737	0.9807	0.9833
Total average			0.9773		

Table 2. Statistics Descriptive of Regression Variable

Variable	Obs	Mean	Std. Dev.	Min	Max
Efficiency	1140	0.9773	0.0390	0.6430	1
Opinion	1140	0.9000	0.1790	0	1
Political competition	1140	0.8624	0.0450	0.5050	1
Gender	1140	0.9289	0.2570	0	1
Ln Exp Cap	1140	16.1090	0.2020	15.5590	16.7960
Efi	1140	0.3650	0.2890	0.0100	0.9000
Lndistance	1140	4.2710	1.1490	0.2150	6.6310

The results in columns (1) and (2) at Appendix 2 show a positive and significant relationship between the governance accountability aspect that is proxied using the opinion index and the local government efficiency level. Although the magnitude achieved after adding variable control in column (2) is corrected compared to column (1), it is still visible that there is a linear relationship between the increase in accountability and the increase in efficiency. The results show that accountability quality improvement will align with the increased score of the local government expenditure efficiency.

The results in column (3) are an equation to test the existence of a non-linear relationship, while in column (4), a set of control variables are added. The results show a non-linear relationship between accountability and efficiency. The opinion index variable has a positive and significant coefficient, while a squared opinion index variable has a negative and significant coefficient. It shows that an improvement in accountability will be associated with improved efficiency up to a certain threshold. Furthermore, after reaching the threshold, improvements in the accountability aspect are no longer in line with the increase in efficiency score.

In the early stages. the increasing value of accountability is in line with the increase of the efficiency value. It is suspected that every 1 point increase in the accountability quality index is related to the efficiency increase of 0.18 points. Since the output-oriented efficiency measurement is being done in this study, in terms of increasing efficiency, there will be an increase in output achievement of 18% higher than the current output achievement. These results are in line with Fonchamnyo and Sama (2016). They conclude that the governance aspect, represented by the financial management and budgeting index, positively correlates with the efficiency score in the health and education sector. An-

other study by Hauner and Kyobe (2010) also concludes that the governance aspect, represented by government accountability, affected the education sector's performance efficiency.

An important characteristic of accountability is the evaluation of its performance and its public availability. With this, stakeholders can assess whether the duties and obligations have been carried out as expected. Accountability acts as a checks and balances mechanism to reduce information asymmetry between local governments and stakeholders, reducing the potential for opportunistic behavior in financial management. The existence of supervision and evaluation can encourage financial management to comply with various applicable rules and regulations. Financial accountability through transparent budgeting will increase public awareness of government plans or actions, leading to more efficient spending (Montes et al., 2018). Transparency in financial management will also increase the participation of various elements of society in supervising the public services provided by local governments, thereby encouraging more efficient local government expenditure.

The proxy used to represent accountability in this study is BPK's opinion index. BPK's opinion, scoring local government financial statements can signal the quality of the local government's governance. The better the opinion BPK has given for the financial statements, the better the quality of financial management by the local government concerned. If the quality of financial management improves, the practice of rent-seeking can be avoided, leading to efficient use of the public fund. The opinion is generated from an annual audit of the local government financial statement (LKPD). Regular audits as a means to evaluate accountability can indirectly improve efficiency in local govern-

ments in Indonesia. It is in accordance with Olken's (2007) study, which also shows that if there is a certainty that the management of funds will be examined, then the management will be more accountable, reducing budget leakage. Monitoring mechanisms as a form of accountability evaluation to local governments can lead to better management and more efficient provision of public services.

The number of local governments that received WTP opinions during 2014 – 2018 continued to increase by an average of 15% per year. It demonstrates that there is more region with financial management that meets the government accounting standards (Standar Akuntansi Pemerintah, SAP), adequacy of disclosure, compliance with the regulations, and effectiveness of internal control. Financial management conformity with SAP that applies accrual-based accounting can improve efficiency. It is in line with Lampe et al's (2015) study which has proven that accrual accounting implementation positively impacts financial management efficiency. Accrual-based accounting implementation will improve accountability also internal and external transparency as well as allow the identification of every cost in the public sector. Both of these will trigger improvements in resource allocation, improving performance and efficiency in public services (Lampe et al., 2015).

This study also explores the possibility of a non-linear relation between accountability and efficiency. The results show that accountability improvement will be associated with efficiency improvement up to a certain threshold. Furthermore, after reaching the threshold, improvements in accountability are no longer in line with increases in efficiency scores. These conditions indicate that in regions with an opinion index value below the threshold, any improvement in the opinion score suggests an effort to improve ac-

countability and simultaneously will be able to enhance the level of efficiency. However, in regions with accountability score above the threshold or even maximum, the increase in accountability scores no longer affect the efficiency score and even tend to lower it.

If traced further, during the period 2014 to 2018, it is known that 97 entities have an average opinion index value of 1. Of those 97 entities, 27 (28%) entities consistently get an average efficiency value of 1, while the other 70 (72%) entities get an average efficiency value of around 0.859 to 0.999. These show a trend of decreasing efficiency value for the regions that consistently get a high opinion index. The relation pattern between opinion index and efficiency in 97 entities with an opinion index value of 1 is presented in Figure 1.

Furthermore, the non-linear relationship shown in Figure 2 reveals the average annual achievement of opinion and efficiency of 70 entities with an opinion index score of 1 but
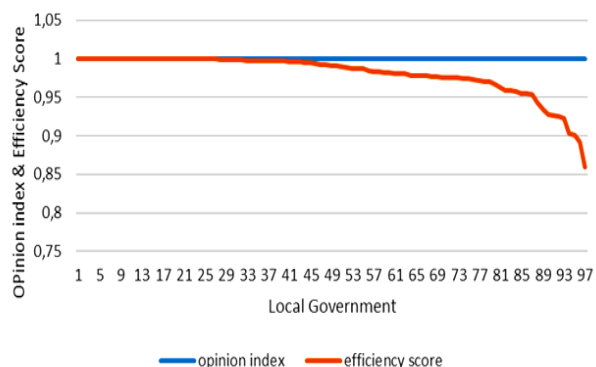

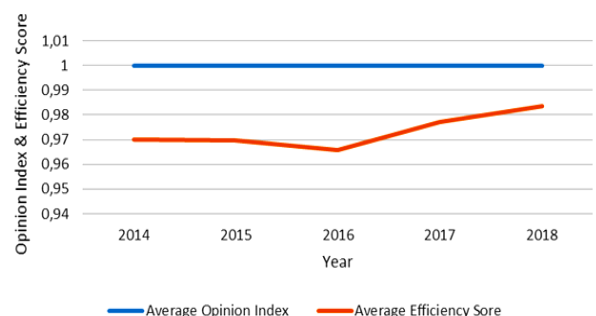**Figure 1.** Relationship Pattern of Opinion Index and Efficiency Score

Figure 2. Annual Average Efficiency of 70 Entities

do not reach the maximum efficiency value of 1. The average annual efficiency value obtained fluctuated during the observation period. The tendency of a decreasing efficiency level when the government has reached the maximum accountability value can happen because the government is less adaptive in governance management when there is an increase in budget. If the budget increase trend is managed with the same pattern, achieving efficiency will be limited. In the agency theory perspective, the government as an agent has to strive for efficiency because there is a budget constraint and political motivation to be chosen again by the principal. Those motives encourage an agent to undertake optimal and accountable financial management, which later can boost efficiency.

On the other side, other than the motivation, the government's assurances in fulfilling accountability are also driven by statutory obligations. In this case, the responsibility for financial statement arrangement periodically is the form of budget management responsibilities. The responsibility can make financial statement arrangements as a part of the routine procedure. Therefore, the motivation for accountability presentation shifts to fulfilling obligations to obtain a good assessment and loses the initial enthusiasm to create efficiency. Christensen and Cheney (2015) state that the demand for an information supply is one of the motivations for providing transparency and accountability. However, the information itself is not the final aim.

The tendency of a decrease in the efficiency level when accountability is at the optimal point could also happen as a consequence of perverse learning, where the government has studied the measured aspects of accountability assessment so that the information is used to adjust the statement. For example, by maximizing effort into the measured aspects, then the performance will consider increased (Van Thiel & Leeuw, 2002). Focusing on the statement fulfillment will reduce the attention towards other aspects that are not the focus of attention. Management in other areas will not be optimum and will end up contributing to inefficiency. Society, as principal, supervision motive towards the agent is caused by the information gap between agent and principal. When the government achieves a good accountability evaluation from the authorized institution for several periods, the society might feel they can loosen their supervision towards government. The lack of supervision can reduce the government's motivation for efficient public services.

This study has several limitations, including potential bias (endogeneity) caused by the reverse causality between efficiency and accountability. The endogeneity is ideally overcome by using the instrumental variable; however, the authors have not yet obtained a suitable and qualified instrumental variable. The following limitation is the potential for measurement error and the limited sample because there are many missing government expenditure data by function during 2014-2018, so the observations are limited to only 228 local governments. The sample limitation causes the relative efficiency to be unable to capture the actual conditions in the dynamics of efficiency in all regions in Indonesia. It could be that areas with high efficiency are not included in the sample. Consequently, the relative efficiency generated in the observations is higher than the actual one. Further research can use the instrumental variable to overcome the endogeneity potential. Moreover, the addition of other indicators of government accountability can provide more accurate test results.

Other Control Variable in Relation with Efficiency

The political competition variable used to assess the influence of political competition

in the district/city DPRD has a negative but insignificant impact on the local government expenditure efficiency. Given that the political competition level in the district/city DPRD did not affect the local government efficiency score, this study showed different results from Borge et al. (2008).

This study's absence of the relationship between political competition level and efficiency can be caused by the political coalition phenomenon formed after the legislative or local elections. It is driven by the regulation governing the regional head election nomination threshold. Parties that wish to participate in the regional election but do not meet the requirements for obtaining a minimum number of DPRD seats will form a coalition to carry out a joint candidate. As a result, though a region has a high political competition level, if seen based on the 'party's fragmentation in legislative, it could be that the existence of a coalition or political understanding will eliminate the effect of competition.

The gender variable of regional heads is used to describe the influence of the characteristics of the regional head in policy-making. This study has not shown the influence of preferences due to gender differences on the achievement of local government expenditure efficiency; the results of this study are in line with the study of Boetti et al. (2012). The expenditure per capita variable used to show the communities prosperity level has a positive and significant coefficient on the efficiency score. This means that every 1% increase in the society's expenditure per capita level is related to the increase in government expenditure efficiency score of 0.0009 points. Estimation results on the regression show a relation between the population expenditure level per capita and efficiency is in line with the study by Hauner (2008).

EFI variable has a negative and significant coefficient towards the efficiency score achievement. Every 1-point increase in the ethnic fractionalization index is related to the decrease in the local government expenditure efficiency level of 0.023. The regression estimation results that indicate a negative relationship between ethnic diversity and efficiency are in line with the study results of Nikolov and Hrovatin (2013), which state that regions with a higher level of ethnic fragmentation would be less efficient.

Another variable control is the distance used to show the relation of a geographic factor to efficiency. The distance variable has a negative and significant relationship with the efficiency of local government expenditure; the result is in line with the study of Šťastná and Gregor (2015). It means that every 1% increase in the distance from the district/city capital to the local province capital corresponds with a decrease in the efficiency level of the district/city local government by 0.00007 points.

Robustness Check

Several additional tests were carried out to check the robustness by intervening in forming efficiency variables, eliminating one particular island sample from the model, and testing using other estimation models. In the main model, the DEA calculation uses an output perspective and assumes a return-to-scale variable, and is carried out on the input-output of four government service functions. The robustness check scenarios by intervening in forming efficiency variables carried out include:
1. Change the perspective to the input perspective of DEA but with a fixed assumption, Variable Return to Scale (VRS);
2. Change the assumption to Constant Return to Scale (CRS) while using the output orientation approach;
3. Issue inputs and output of general service functions in calculating efficiency while

maintaining the output perspective and VRS assumption.

A robustness check will also be conducted by removing one of the islands following the main equation to test whether a specific region drives accountability impact on efficiency in local government in Indonesia. Other robustness checks also are conducted by using fixed-effect and random-effect regression methods. The regression results on all types of robustness testing above are consistent with the main model. There is a non-linear relationship between the accountability aspects reflected by the opinion value with the efficiency level obtained.

CONCLUSION

The DEA method's measurement results produce an average local government efficiency score of 0.9773 from 2014-2018. The measurement results on local government efficiency reveal that, on average, there are still gaps in inefficiency in local government expenditure during the research period. Therefore, local governments are still able to optimize their output achievement. The results also show a non-linear relationship between the accountability variable and the local government expenditure efficiency. The study results show that accountability improvement is related to efficiency improvement up to a certain threshold. After reaching the threshold, any improvements in accountability are no longer in line with the increase in the efficiency score.

Several control variables indicate negative relation with efficiency, notably EFI and distance. On the other hand, the population expenditure per capita positively relates to efficiency. The results of this study cannot yet indicate any relationship between political competition and the regional head's gender

with efficiency. Through the internal supervision apparatus, local government can perform technical efficiency measurements and evaluate local expenditure independently and gradually, especially on government basic service functions. A gradual efficiency measurement can detect potential inefficiency, so government expenditure management improvement can be made faster. Efficiency measurement for each function can provide information on which function is less efficient so that sectoral improvement can be prioritized. Furthermore, local governments can carry out benchmarking activities towards other local government that is more efficient.

The monitoring and evaluation process upon efficiency can be done in line with the attempt of accountability improvement and governance generally. Internal auditors at the regional level can undertake supervision and assistance over financial management in every work unit to maintain accountability from the minor organizational level. Supervision by internal auditors at local governments is conducted by regularly auditing the financial statements of local governments, and by doing so, it is expected to suppress potential budget leakage.

REFERENCES

Afonso, A., & Fernandes, S. (2006). Measuring local government spending efficiency: Evidence for the Lisbon region. *Regional Studies, 40*(1), 39–53. DOI: 10.1080/00343400500449937

Afonso, A., & Fernandes, S. (2008). Assessing and explaining the relative efficiency of local government. *The Journal of Socio-Economics, 37*(5), 1946–1979. DOI: 10.1016/j.socec.2007.03.007

Almquist, R., Grossi, G., van Helden, G. J., & Reichard, C. (2013). Public sector governance and accountability. *Critical Perspectives on Accounting, 24*(7–8), 479–

487. DOI: 10.1016/j.cpa.2012.11.005

Andriani, T. (2016). *Efisiensi belanja pemerintah daerah dan dampaknya terhadap pertumbuhan ekonomi daerah tahun 2004-2013.* (Unpublished master's thesis). Universitas Indonesia, Jakarta, Indonesia.

Arbatli, E., & Escolano, J. (2015). Fiscal transparency, fiscal performance, and credit ratings. *Fiscal Studies, 36*(2), 237–270. DOI: 10.1111/1475-5890.12051

Arifin, E. N., Ananta, A., Wilujeng Wahyu Utami, D. R., Budi Handayani, N., & Pramono, A. (2015). Quantifying 'Indonesia's ethnic diversity: Statistics at national, provincial, and district levels. *Asian Population Studies, 11*(3), 233–256. DOI: 10.1080/17441730.2015.1090692

Ashworth, J., Geys, B., Heyndels, B., & Wille, F. (2014). Competition in the political arena and local government performance. *Applied Economics, 46*(19), 2264-2276. DOI: 10.1080/00036846.2014.899679

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. DOI: 10.1016/j.jpubeco.2006.11.006

Bauhr, M., & Grimes, M. (2014). Indignation or resignation: The implications of transparency for societal accountability. *Governance: An International Journal of Policy, Administration, and Institutions, 27*(2), 291-320. DOI: 10.1111/gove.12033

Benito, B., Bastida, F., & García, J. A. (2010). Explaining differences in efficiency: An application to Spanish municipalities. *Applied Economics, 42*(4), 515–528. DOI: 10.1080/00036840701675560

Benito, B., Faura, U., Guillamon, M.D., & Rios, A. M (2019). The efficiency of public services in small municipalities: The case of drinking water supply. *Cit-

ies, 93,* 95-103. DOI:10.1016/j.cities.2019.04.016

Boetti, L., Piacenza, M., & Turati, G. (2012). Decentralization and local 'governments' performance: How does fiscal autonomy affect spending efficiency? *FinanzArchiv- Public Finance Analysis, 68*(3), 269-302.

Borge, L. E., Falch, T., & Tovmo, P. (2008). Public sector efficiency: The roles of political and budgetary institutions, fiscal capacity, and democratic participation. *Public Choice, 136,* 475–495. DOI: 10.1007/s11127-008-9309-7

Charnes, A., Cooper, W. W., & Rhodes, E. (1978). Measuring the efficiency of decision-making units. *European Journal of Operational Research, 2*(6), 429–444. DOI: 10.1016/0377-2217(78)90138-8

Christensen, L. T., & Cheney, G. (2015). Peering into transparency: Challenging ideals, proxies, and organizational practices. *Communication Theory, 25*(1), 70–90. DOI: 10.1111/comt.12052

Da Cruz, N. F., & Marques, R. C. (2014). Revisiting the determinants of local government performance. *Omega, 44*(C), 91–103. DOI: 10.1016/j.omega.2013.09.002

De Borger, B., Kerstens, K (1996). Cost efficiency of Belgian Local Governments: A comparative analysis of FDH, DEA, and econometric approaches. *Regional Sciences and Urban Economics, 26*(2), 145-170. DOI: 10.1016/0166-0462(95)02127-2

Fonchamnyo, D. C., & Sama, M. C. (2016). Determinants of public spending efficiency in education and health: Evidence from selected CEMAC countries. *Journal of Economics and Finance, 40*(1), 199–210. DOI: 10.1007/s12197-014-9310-6

Hadinata, I., & Manurung, A. (2011). Penerapan Data Envelopment Ananlysis (DEA) untuk mengukur efisiensi kinerja dan reksadana saham. *Jurnal Akuntansi, 12*(1), 1-25.

Hauner, D. (2008). Explaining differences in public sector efficiency: Evidence from 'Russia's Regions. *World Development, 36*(10), 1745–1765. DOI: 10.1016/ j.worlddev.2007.09.011

Hauner, D., & Kyobe, A. (2010). Determinants of government efficiency. *World Development, 38*(11), 1527–1542.

Indodapoer (2020). *Indonesia database for policy and economic research*. Retrieved from http://databank. worldbank.org/reports.aspx? source=1266

Kalb, A. (2009). What determines the Local Government' technical efficiency? The case of road maintenance. ZEW - Centre for European Economic Research Discussion Paper No. 09-047. DOI: 10.2139/ssrn.1494310

Keping, Y. (2018). Governance and Good Governance: A New Framework for Political Analysis. *Fudan Journal of the Humanities and Social Sciences, 11*(1), 1–8.

Law of The Republic of Indonesia Number 17 of 2003 concerning The State Finance (Undang-Undang Republik Indonesia Nomor 17 Tahun 2003 tentang Keuangan Negara). Retrieved from https:// www.bpk.go.id/assets/files/storage/ 2013/12/file_storage_1386161145.pdf

Lampe, H., Hilgers, D., & Ihl, C. (2015). Does accrual accounting improve 'municipalities' efficiency? Evidence from Germany. *Applied Economics 47* (41), 4349–4363. DOI: 10.1080/ 00036846.2015.1030562

Lo Storso, C. (2016). The trade-off between cost efficiency and public service quality: A non-parametric frontier analysis of Italian major municipalities. *Cities, 51,* 52-63.

Ludwig, M., Merode, F. V., & Groot, W. (2010). Principal agent relationship and the efficiency of hospitals. *Eur J Health Econ, 11*(3), 291-304. DOI: 10.1007/ s10198-009-0176-z

Montes, G. C., Bastos, J. C. A., & de Oliveira, A. J. (2018). Fiscal transparency, government effectiveness and government spending efficiency: Some international evidence based on panel data approach. *Economic Modelling, 79*(C), 211–225. DOI: 10.1016/j.econmod.2018.10.013

Moore, A., Nolan, J., & Segal, G. F. (2005). Putting out the trash: Measuring municipal service efficiency in US cities. *Urban Affairs Review 41*(2), 237–259.

Narbon-Perpina, I., & De Witte, K. (2018). Local governments' efficiency: a systematic literature review—part II. *International Transactions in Operational Research, 25*(4), 1107–1136.

Narbon-Perpina, I., Arribas, I., Balaguer-Coll, M. T., & Tortosa-Ausina, E. (2020). Explaining local governments' cost efficiency: Controllable and uncontrollable factors. *Cities, 100*(July 2019), 102665. DOI: 10.1016/j.cities.2020.102665

Nikolov, M., & Hrovatin, N. (2013). Cost efficiency of Macedonian municipalities in service delivery: Does ethnic fragmentation matter? *Lex Localis, 11*(3), 743–775.

Oates, W. E. (1999). An essay on fiscal federalism. *Journal of Economic Literature 37* (3), 1120–1149. DOI: 10.1257/ jel.37.3.1120

Olken, B. A. (2007). Monitoring corruption: Evidence from a field experiment in Indonesia. *Chicago Journal, 115*(2), 200–249.

Perez-Lopez, G., Prior, D., & Zafra-Gomez, J. L. (2018). Temporal scale efficiency in DEA panel data estimations: An application to the solid waste disposal service in Spain. *Omega, Elsevier, 76*(C), 18–27. DOI: 10.1016/j.omega.2017.03.005

Persson, T., Roland, G., Tabellini, G. (1997). Separation of powers and political accountability. *The Quarterly Journal of Economics, 112*(4), 1163-1202.

Pettas, N., & Giannikos, I. (2014). Evaluating the delivery performance of public spending programs from an efficiency

perspective. *Evaluation and Program Planning, 45*(C), 140–150. DOI: 10.1016/j.evalprogplan.2014.03.007

Šťastná, L., & Gregor, M. (2015). Public sector efficiency in transition and beyond. *Applied Economics, 47*(7), 680–699. DOI: 10.1080/00036846.2014.978077

Tirtosuharto, D. (2010). The impact of fiscal decentralization and state allocative efficiency on regional growth in Indonesia. *Journal of International Commerce, Economics and Policy, 1*(02), 287–307. DOI: 10.1142/S1793993310000160

Van Thiel, S., & Leeuw, F. L. (2002). The performance paradox in the public sector. *Public Performance & Management Review, 25*(3), 267–281.

Wardhani, R., Rossieta, H., & Martani, D. (2017). Good governance and the impact of government spending on the performance of local government in Indonesia. *International Journal of Public Sector Performance Management, 3*(1), 77–102. DOI: 10.1504/IJPSPM.2017.082503

Wooldridge, J. M. (2016). *Introductory econometrics: A modern approach* (6th Ed.). Boston: Cengage Learning.

APPENDICES

Appendix 1. Technical Efficiency Scores (Data Envelopment Analysis Output)

No	Area Code	2014	2015	2016	2017	2018	Average efficiency score	No	Area Code	2014	2015	2016	2017	2018	Average efficiency score
1.	1208	1.00	1.00	1.00	1.00	1.00	1.00	28	1403	1.00	1.00	1.00	1.00	1.00	1.00
2.	1212	1.00	1.00	1.00	1.00	1.00	1.00	29	1402	1.00	1.00	1.00	1.00	1.00	1.00
3.	1215	0.95	0.92	0.98	0.97	0.97	0.96	30	1406	1.00	1.00	1.00	1.00	1.00	1.00
4.	1211	1.00	0.99	1.00	0.99	1.00	1.00	31	1404	1.00	1.00	1.00	1.00	1.00	1.00
5.	1207	0.99	0.98	1.00	1.00	1.00	1.00	32	1473	1.00	1.00	1.00	1.00	1.00	1.00
6.	1222	1.00	0.92	0.98	0.99	1.00	0.98	33	1504	1.00	1.00	1.00	1.00	1.00	1.00
7.	1201	0.95	0.85	1.00	0.90	1.00	0.94	34	1509	1.00	1.00	1.00	1.00	1.00	1.00
8.	1220	0.86	0.87	0.88	0.86	0.97	0.89	35	1507	1.00	1.00	1.00	1.00	1.00	1.00
9.	1217	1.00	0.90	1.00	1.00	1.00	0.98	36	1506	1.00	1.00	1.00	1.00	1.00	1.00
10.	1218	1.00	1.00	1.00	1.00	1.00	1.00	37	1508	1.00	1.00	1.00	1.00	1.00	1.00
11.	1209	0.99	1.00	1.00	0.98	0.95	0.98	38	1571	1.00	1.00	1.00	1.00	1.00	1.00
12.	1204	1.00	0.96	0.86	0.95	0.96	0.95	39	1572	1.00	1.00	1.00	1.00	1.00	1.00
13.	1205	0.92	0.95	0.85	0.96	0.96	0.93	40	1604	0.99	0.97	0.97	0.98	0.98	0.98
14.	1277	1.00	0.98	0.98	1.00	1.00	0.99	41	1603	0.96	0.97	0.97	0.97	0.97	0.97
15.	1273	1.00	1.00	0.99	1.00	1.00	1.00	42	1605	0.92	0.95	1.00	1.00	1.00	0.97
16.	1274	1.00	1.00	1.00	1.00	1.00	1.00	43	1602	0.96	0.98	0.97	0.97	0.97	0.97
17.	1309	0.91	0.93	0.94	0.94	1.00	0.94	44	1601	0.96	1.00	0.99	1.00	0.98	0.99
18.	1312	0.91	0.95	0.94	0.97	0.97	0.95	45	1609	0.95	0.98	0.97	0.98	0.99	0.97
19.	1302	0.97	0.98	0.96	1.00	1.00	0.98	46	1674	0.96	0.98	0.98	1.00	1.00	0.98
20.	1304	0.95	0.99	0.99	0.98	0.98	0.98	47	1671	1.00	1.00	1.00	1.00	1.00	1.00
21.	1303	0.93	0.91	0.92	0.93	0.96	0.93	48	1672	0.95	0.96	0.99	0.98	1.00	0.98
22.	1310	0.92	0.92	0.95	0.98	0.99	0.95	49	1701	0.97	0.99	0.97	0.97	1.00	0.98
23.	1305	0.99	0.99	0.97	1.00	1.00	0.99	50	1708	0.97	0.99	1.00	1.00	1.00	0.99
24.	1375	1.00	1.00	1.00	1.00	1.00	1.00	51	1707	0.94	0.91	1.00	1.00	1.00	0.97
25.	1374	1.00	1.00	1.00	1.00	1.00	1.00	52	1771	1.00	1.00	0.98	1.00	1.00	1.00
26	1376	1.00	1.00	1.00	1.00	1.00	1.00	53	1801	0.94	1.00	0.93	0.96	0.96	0.96
27	1373	0.96	1.00	1.00	1.00	1.00	0.99	54	1806	1.00	1.00	1.00	1.00	1.00	1.00

No	Area Code	2014	2015	2016	2017	2018	Average efficiency score	No	Area Code	2014	2015	2016	2017	2018	Average efficiency score
55	1810	0.97	1.00	1.00	0.98	1.00	0.99	99	3511	1.00	0.98	0.97	0.99	1.00	0.99
56	1901	0.97	0.99	1.00	1.00	1.00	0.99	100	3525	1.00	1.00	1.00	1.00	1.00	1.00
57	1904	0.99	1.00	0.99	1.00	0.97	0.99	101	3509	1.00	1.00	1.00	1.00	1.00	1.00
58	1906	0.99	1.00	1.00	1.00	1.00	1.00	102	3517	1.00	0.99	1.00	1.00	1.00	1.00
59	2103	0.94	0.95	0.99	0.97	0.99	0.97	103	3506	1.00	1.00	1.00	1.00	1.00	1.00
60	2172	1.00	1.00	1.00	1.00	1.00	1.00	104	3524	1.00	1.00	1.00	1.00	1.00	1.00
61	3215	1.00	0.96	1.00	0.98	0.96	0.98	105	3519	1.00	1.00	1.00	1.00	1.00	1.00
62	3210	0.97	0.97	1.00	1.00	1.00	0.99	106	3520	1.00	1.00	1.00	1.00	1.00	1.00
63	3202	1.00	1.00	1.00	1.00	1.00	1.00	107	3507	1.00	1.00	1.00	1.00	1.00	1.00
64	3206	1.00	1.00	0.96	0.99	1.00	0.99	108	3501	1.00	1.00	1.00	1.00	1.00	1.00
65	3273	1.00	1.00	1.00	1.00	1.00	1.00	109	3514	1.00	0.98	0.99	1.00	1.00	0.99
66	3279	1.00	1.00	1.00	1.00	1.00	1.00	110	3502	1.00	1.00	1.00	1.00	1.00	1.00
67	3275	1.00	1.00	1.00	1.00	1.00	1.00	111	3527	1.00	0.92	0.96	1.00	1.00	0.98
68	3274	0.99	0.98	1.00	1.00	1.00	0.99	112	3515	1.00	1.00	1.00	1.00	1.00	1.00
69	3272	1.00	1.00	0.97	1.00	1.00	0.99	113	3512	1.00	0.95	1.00	1.00	1.00	0.99
70	3304	0.98	1.00	0.99	1.00	0.99	0.99	114	3503	1.00	1.00	1.00	1.00	1.00	1.00
71	3316	0.99	1.00	1.00	1.00	1.00	1.00	115	3523	1.00	0.99	1.00	1.00	1.00	1.00
72	3309	0.99	1.00	1.00	1.00	0.99	1.00	116	3504	1.00	1.00	1.00	1.00	1.00	1.00
73	3329	1.00	1.00	0.99	1.00	1.00	1.00	117	3579	1.00	1.00	1.00	1.00	1.00	1.00
74	3301	1.00	1.00	1.00	1.00	1.00	1.00	118	3572	1.00	1.00	1.00	1.00	1.00	1.00
75	3321	1.00	1.00	1.00	1.00	1.00	1.00	119	3574	1.00	1.00	1.00	1.00	1.00	1.00
76	3313	1.00	1.00	1.00	1.00	1.00	1.00	120	3604	1.00	1.00	1.00	1.00	1.00	1.00
77	3305	0.99	1.00	1.00	0.99	0.99	0.99	121	3672	0.99	1.00	1.00	1.00	1.00	1.00
78	3324	1.00	1.00	1.00	1.00	1.00	1.00	122	5103	1.00	1.00	1.00	1.00	1.00	1.00
79	3310	1.00	1.00	1.00	1.00	1.00	1.00	123	5108	0.99	1.00	1.00	1.00	1.00	1.00
80	3319	0.99	1.00	1.00	1.00	1.00	1.00	124	5104	0.99	1.00	1.00	1.00	1.00	1.00
81	3308	1.00	1.00	0.98	1.00	1.00	1.00	125	5101	1.00	1.00	0.98	1.00	1.00	1.00
82	3318	1.00	1.00	1.00	0.99	0.99	1.00	126	5107	1.00	1.00	0.98	1.00	1.00	1.00
83	3326	0.99	1.00	0.99	0.99	1.00	0.99	127	5105	1.00	1.00	1.00	1.00	1.00	1.00
84	3327	0.99	1.00	0.96	1.00	1.00	0.99	128	5102	0.99	1.00	1.00	1.00	1.00	1.00
85	3303	1.00	1.00	0.96	0.99	1.00	0.99	129	5171	1.00	1.00	1.00	1.00	1.00	1.00
86	3306	0.98	0.99	1.00	1.00	0.99	0.99	130	5205	0.99	0.98	0.97	0.98	0.98	0.98
87	3322	1.00	1.00	1.00	1.00	1.00	1.00	131	5203	1.00	1.00	0.98	1.00	0.98	0.99
88	3328	1.00	1.00	1.00	1.00	1.00	1.00	132	5208	1.00	1.00	1.00	1.00	1.00	1.00
89	3323	1.00	1.00	1.00	1.00	1.00	1.00	133	5204	0.97	0.95	0.99	0.98	0.98	0.98
90	3307	1.00	1.00	0.98	0.99	1.00	0.99	134	5307	0.85	0.80	0.90	0.94	0.98	0.90
91	3375	0.99	1.00	1.00	1.00	1.00	1.00	135	5311	1.00	0.94	0.96	0.99	0.99	0.98
92	3373	1.00	1.00	1.00	1.00	1.00	1.00	136	5309	0.98	0.99	0.98	1.00	1.00	0.99
93	3372	1.00	1.00	1.00	0.99	1.00	1.00	137	5313	0.98	0.98	1.00	1.00	1.00	0.99
94	3376	1.00	1.00	1.00	1.00	1.00	1.00	138	5315	0.98	0.99	0.97	0.99	1.00	0.98
95	3402	1.00	1.00	1.00	1.00	1.00	1.00	139	5302	0.97	0.93	0.99	0.98	0.98	0.9706
96	3403	1.00	1.00	1.00	1.00	1.00	1.00	140	5304	1	0.97	0.96	0.96	0.98	0.9746
97	3401	1.00	1.00	1.00	1.00	1.00	1.00	141	6102	0.95	0.95	0.92	0.96	0.96	0.9464
98	3522	1.00	0.99	1.00	1.00	1.00	1.00	142	6111	0.89	0.94	0.9	0.99	0.87	0.917

No	Area Code	2014	2015	2016	2017	2018	Average efficiency score	No	Area Code	2014	2015	2016	2017	2018	Average efficiency score
143	6112	1	0.96	0.95	0.97	0.9	0.9554	187	7207	0.97	0.98	1	0.92	0.93	0.9588
144	6103	0.91	0.94	0.98	0.9	0.9	0.925	188	7203	1	0.94	0.98	0.95	0.94	0.962
145	6110	0.92	0.83	0.97	0.91	0.92	0.91	189	7209	0.91	0.87	0.88	0.92	0.93	0.9006
146	6104	0.95	0.89	0.89	0.88	0.89	0.8992	190	7303	1	1	0.99	1	0.98	0.9938
147	6109	0.84	0.93	0.91	0.96	0.97	0.9224	191	7311	0.99	1	0.96	0.93	1	0.9758
148	6171	1	0.99	0.94	0.97	1	0.9806	192	7302	0.99	1	0.92	0.9	0.96	0.9538
149	6212	0.95	0.97	1	1	1	0.9834	193	7306	1	1	0.95	0.99	0.94	0.9774
150	6205	0.87	0.88	0.85	0.81	0.88	0.8592	194	7301	0.99	1	0.99	1	1	0.9948
151	6211	0.95	0.89	0.85	0.96	0.96	0.9236	195	7317	1	1	0.94	0.96	0.96	0.9706
152	6203	0.87	0.89	0.92	0.9	0.9	0.8936	196	7322	0.99	1	1	1	1	0.9984
153	6209	0.91	0.9	0.94	0.94	0.94	0.927	197	7308	1	1	0.97	0.96	0.96	0.9762
154	6207	0.94	0.97	0.96	0.94	0.97	0.955	198	7309	0.99	1	0.92	0.98	0.98	0.973
155	6213	0.86	0.86	0.84	0.81	0.73	0.8222	199	7315	0.99	1	1	1	0.99	0.9964
156	6206	1	0.92	0.94	0.93	1	0.9584	200	7314	1	1	1	1	0.99	0.9978
157	6271	0.96	0.99	1	1	1	0.99	201	7312	1	1	1	1	1	1
158	6311	0.99	0.96	0.98	0.99	0.99	0.983	202	7305	0.99	1	0.96	1	1	0.9898
159	6303	0.89	0.91	0.95	0.97	0.95	0.934	203	7326	1	1	1	1	1	0.9988
160	6304	0.95	0.95	0.95	0.99	0.99	0.9666	204	7313	0.99	1	1	1	0.97	0.9916
161	6306	0.93	0.95	1	0.97	1	0.97	205	7372	1	1	1	1	1	1
162	6308	0.93	0.96	0.95	1	1	0.968	206	7406	0.94	0.89	0.88	0.9	0.9	0.9034
163	6302	0.87	0.87	0.9	0.89	0.89	0.8838	207	7408	0.81	0.89	0.86	0.91	1	0.892
164	6309	0.99	1	1	0.99	0.99	0.9916	208	7405	1	0.96	0.98	0.92	0.91	0.9526
165	6310	0.94	0.96	1	0.99	0.99	0.9758	209	7410	0.95	0.83	0.9	0.99	1	0.935
166	6301	0.96	0.98	0.99	1	0.98	0.9832	210	7407	1	0.87	0.85	0.96	0.96	0.9272
167	6305	0.96	0.95	0.94	0.98	0.98	0.9632	211	7471	0.97	0.95	0.98	1	1	0.9806
168	6371	1	1	1	1	1	1	212	7501	0.96	0.93	0.98	1	0.98	0.969
169	6405	0.97	0.98	1	0.99	0.99	0.986	213	7504	0.98	0.96	0.98	0.98	0.99	0.9778
170	6402	0.97	0.95	1	0.97	0.98	0.9748	214	7502	0.96	0.96	0.98	1	0.99	0.9786
171	6403	0.98	1	0.98	0.98	0.96	0.977	215	7505	1	0.97	0.99	1	1	0.991
172	6401	0.96	0.98	0.96	1	0.97	0.972	216	7503	0.94	0.94	0.92	1	1	0.9588
173	6474	1	1	1	1	1	1	217	7571	1	1	0.98	1	1	0.9956
174	6472	0.99	1	1	1	1	0.9978	218	7604	1	0.99	0.88	0.9	0.97	0.9486
175	7110	1	0.99	0.95	0.95	1	0.9786	219	7605	1	1	0.94	0.88	1	0.9648
176	7111	1	0.98	0.96	0.97	1	0.981	220	7602	0.88	1	0.92	0.97	0.98	0.9494
177	7107	1	1	0.96	0.96	1	0.9834	221	8103	0.94	0.9	0.87	0.91	0.92	0.9082
178	7103	0.99	0.97	0.99	0.99	0.99	0.9868	222	8106	0.89	0.79	0.81	0.87	0.87	0.848
179	7108	1	1	1	1	1	1	223	8171	1	0.97	0.93	0.98	1	0.9766
180	7102	0.99	0.95	1	1	1	0.9886	224	8172	1	0.93	0.95	1	1	0.9766
181	7105	0.98	1	0.99	0.94	0.94	0.9684	225	8202	0.89	0.93	0.93	0.9	0.88	0.9042
182	7106	0.96	0.98	0.97	0.96	0.96	0.9652	226	8203	1	0.64	0.8	0.93	0.94	0.862
183	7172	0.97	1	0.99	1	1	0.991	227	8207	1	0.88	1	1	0.8	0.9362
184	7171	1	0.96	0.98	1	1	0.9878	228	8271	1	0.96	0.96	0.96	1	0.9754
185	7173	1	1	1	1	1	1								
186	7201	1	0.88	0.9	0.95	0.94	0.934								

Appendix 2. Summary of Regression Results

	(1) Efficiency	(2) Efficiency	(3) Efficiency	(4) Efficiency
Opinion	0.0533***	0.0316***	0.180***	0.181***
	(0.0106)	(0.0106)	(0.0400)	(0.0368)
Opinion^2			-0.0894***	-0.109***
			(0.0273)	(0.0257)
Polcomp		-0.0321		-0.0344
		(0.0473)		(0.0467)
Gender		-0.0062		-0.0051
		(0.0102)		(0.0101)
LnExpcap		0.0926***		0.0935***
		(0.0172)		(0.0172)
EFI		-0.0253**		-0.0233*
		(0.0120)		(0.0119)
Indistance		-0.0073**		-0.0079***
		(0.0029)		(0.0029)
Constant	0.959***	-0.436	0.920***	-0.495*
	(0.0102)	(0.291)	(0.0155)	(0.290)
sigma_u	0.0545***	0.0361***	0.0546***	0.0361***
	(0.0036)	(0.0026)	(0.0036)	(0.0026)
sigma_e	0.0385***	0.0374***	0.0380***	0.0367***
	(0.0013)	(0.0013)	(0.0013)	(0.0013)
N	1140	1140	1140	1140
ll	557.4	648.6	562.7	657.5
chi2	25.34	225.9	36.54	242.0
Kontrol				
Island effect	No	Yes	No	Yes
Time effect	No	Yes	No	Yes
Timetrend*island	No	Yes	No	Yes

Description: Dependent variable using a relative efficiency. Column 1 and 2 shows linear model equation. Column 1 uses independent variable of opinion index. Column 2 added political variable, socio-economic characteristics, and geographic variable. Column 3 & 4 uses non-linear model. Column 3 uses independent variable of opinion index. Column 4 added political variable, socio-economic characteristics, and geographical variable. The regression results are using balanced tobit data panel. The number in the brackets indicates the standard error.

*$p < 0.1$, ** $p < 0.05$, *** $p < 0.01$*

Appendix 3. Summary of Robustness Testing with the Change on DEA Assumption

	(efficiency) 4 Function Input Perspective+VRS	(efficiency) 4 Function Output Perspective+CRS	(efficiency) 3 Function Output Perspective+VRS
Opinion	0.721***	0.310**	0.162***
	(0.265)	(0.143)	(0.0355)
Opinion^2	-0.426**	-0.208**	-0.0977***
	(0.185)	(0.0986)	(0.0247)
Polcomp	0.516	0.234	-0.0059
	(0.332)	(0.159)	(0.0449)
Gender	-0.129*	-0.0131	-0.0038
	(0.0674)	(0.0271)	(0.0099)
LnExpcap	0.319***	-0.0780*	0.101***
	(0.109)	(0.0430)	(0.0172)
EFI	0.0602	0.0148	-0.0253**
	(0.0775)	(0.0305)	(0.0119)
Indistance	-0.0436**	0.00848	-0.00697**
	(0.0185)	(0.0071)	(0.0029)
Constant	-4.668**	1.562**	-0.638**
	(1.864)	(0.746)	(0.289)
sigma_u	0.230***	0.0708***	0.0365***
	(0.0179)	(0.0081)	(0.0026)
sigma_e	0.289***	0.179***	0.0355***
	(0.0092)	(0.0044)	(0.0012)
N	1140	1140	1140
ll	-517.2		726.7
chi2	570.0		236.4
Island Time Trend	Yes	Yes	Yes
Year Effect	Yes	Yes	Yes
Island Effect	Yes	Yes	Yes

Appendix 4. Summary of Robustness Test by Removing the Island Sample

	(efficiency)	(efficiency)	(efficiency)	(efficiency)	(efficiency)
	Non Jawa	Non Sumatera	Non Kalimantan	Non Sulawesi	Non Bali-NT-Maluku
Opinion	0.177***	0.311***	0.183***	0.194***	0.0966**
	(0.0385)	(0.0557)	(0.0381)	(0.0385)	(0.0413)
Opinion^2	-0.102***	-0.190***	-0.112***	-0.118***	-0.0543*
	(0.0274)	(0.0369)	(0.0272)	(0.0272)	(0.0282)
Polcomp	-0.0499	-0.0337	-0.00450	-0.0227	-0.0660
	(0.0514)	(0.0488)	(0.0527)	(0.0495)	(0.0587)
Gender	0.0022	-0.0066	-0.0075	-0.0042	-0.0069
	(0.0131)	(0.0096)	(0.0123)	(0.0116)	(0.0102)
LnExpcap	0.0935***	0.105***	0.0886***	0.0852***	0.0910***
	(0.0200)	(0.0174)	(0.0193)	(0.0197)	(0.0187)
EFI	-0.0218	-0.0547***	-0.0325**	-0.0051	-0.0028
	(0.0134)	(0.0124)	(0.0130)	(0.0147)	(0.0126)
Indistance	-0.0081**	-0.0039	-0.0084**	-0.0129***	-0.0068**
	(0.0032)	(0.0029)	(0.0033)	(0.0038)	(0.0029)
Constant	-0.488	-0.702**	-0.431	-0.363	-0.412
	(0.336)	(0.295)	(0.327)	(0.332)	(0.313)
sigma_u	0.0391***	0.0298***	0.0356***	0.0377***	0.0348***
	(0.0031)	(0.0027)	(0.0030)	(0.0031)	(0.0027)
sigma_e	0.0376***	0.0384***	0.0379***	0.0350***	0.0341***
	(0.0014)	(0.0016)	(0.0015)	(0.0014)	(0.0013)
N	835	840	970	910	1005
ll	617.7	506.5	441.0	501.5	585.7
chi2	153.5	263.6	180.2	211.9	193.9
Island Time Trend	Yes	Yes	Yes	Yes	Yes
Year Effect	Yes	Yes	Yes	Yes	Yes
Island Effect	Yes	Yes	Yes	Yes	Yes

Appendix 5. Summary of Robustness Testing by Using Fixed Effect (FE) and Random Effect (RE)

	(FE) efficiency	(RE) efficiency
Opinion	0.114^{***}	0.119^{***}
	(0.0221)	(0.0209)
$Opinion^2$	-0.0683^{***}	-0.0700^{***}
	(0.0152)	(0.0144)
Polcomp	-0.0152	-0.0292
	(0.0327)	(0.0270)
Gender	0.0032	-0.0003
	(0.0066)	(0.0049)
LnExpcap	-0.0025	0.0482^{***}
	(0.0583)	(0.0097)
EFI		-0.0177^{**}
		(0.0071)
Indistance		-0.0031^{*}
		(0.0016)
Constant	0.983	0.204
	(0.937)	(0.165)
N	1140	1140
r2	0.0802	
r2_o	0.0144	0.304
r2_w	0.0802	0.0789
ll	2769.4	
chi2		230.4

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$