Assessing the efficiency of government budget expenditure across provinces in Thailand

Sukhumal Chollagran[1], Prasopchai Pasunon[2*], Afifi Lateh[3]
[1]Doctor of Philosophy Program in Management, Faculty of Management Science, Silpakorn University, Thailand.
[2]Faculty of Management Science, Silpakorn University, Thailand; pasunon_p@su.ac.th (P.P.).
[3]Faculty of Education, Prince of Songkla University, Thailand.

Abstract: This research aims to: 1) identify input and output factors for evaluating the efficiency of government budget spending in the spatial dimension of provinces in Thailand, and 2) evaluate the efficiency of government budget spending in the spatial dimension of 76 provinces in Thailand, excluding Bangkok. A mixed-method approach was employed, combining qualitative and quantitative research. The qualitative study involved in-depth interviews with 20 key informants to determine input, output, and environmental factors. The quantitative analysis utilized the Data Envelopment Analysis method, applying both the CCR and BCC models to evaluate efficiency scores. The research results revealed: 1) The input factors consist of total budget expenditure and total budget expenditure per capita. The output factors include provincial gross product, proportion of poor people, coefficient of income inequality, employment rate, and crime cases. The environmental factors encompass population density, average years of education, and unemployment rate. 2) Based on the model utilizing the input factors and the output factors, the evaluation of government budget spending efficiency in 76 provinces (excluding Bangkok) found that the CCR model had an average efficiency score of 0.567, the BCC model had an average efficiency score of 0.619, and the SE model had an average efficiency score of 0.932.

Keywords: Business model, Data envelopment analysis, Efficiency score, Management strategies, Thai government budget.

1. Introduction

In an era of global economic uncertainty and heightened competition, the government's role in fiscal management is crucial. It is responsible for generating tax revenue and allocating expenditures to govern the country, often representing 40-60% of national income. Effective fiscal policies, such as employing a deficit budget to stimulate economic growth and investing in infrastructure, enhance national competitiveness and foster a favorable investment environment for the private sector [1]. Moreover, budget allocation serves as a key instrument in shaping national development and ensuring the equitable distribution of resources to address public needs. Government agencies must efficiently manage limited resources to minimize losses and maximize societal benefits. Additionally, transparent reporting on budget utilization promotes public trust, enhances satisfaction, and strengthens the stability of national governance [2].

The government implements a financial plan to allocate limited resources to various agencies through the annual expenditure budget, aiming to achieve national objectives and maximize benefits. The Budget Bureau plays a crucial role in distributing funds and assessing spending efficiency to ensure effective budget management [3]. Currently, the Budget Bureau employs the Strategic Performance-Based Budgeting (SPBB) system, which prioritizes budget allocation based on performance outcomes and the delivery of services that meet public needs. For this system to be effective, a clear methodology

is essential for measuring government agencies' expenditures and evaluating the efficiency of the annual budget [4].

From fiscal years 2008 to 2024, the Budget Bureau utilized the Performance Assessment Rating Tool (PART) to evaluate the efficiency of government agencies' budget spending. Agencies conducted self-assessments across five key areas: (1) Objectives and formats, (2) Strategic planning, (3) Budget linkage, (4) Management, and (5) Evaluation of outputs and outcomes. The assessment consisted of 30 questions, totaling 100 points, with results categorized into three levels: less than 60 points (needs improvement), 60-85 points (moderate need for improvement), and more than 85 points (good). These results informed budget allocation decisions and aligned government spending with national strategies [5].

However, challenges arose in using PART to analyze the effectiveness of budget expenditures. Issues included unclear policies and criteria, limited personnel knowledge and understanding, excessive workload due to documentation requirements, and the fact that respondents were not agency executives. As a result, many agencies did not prioritize PART in their self-evaluations [6]. In response, the Cabinet resolved to discontinue the use of PART on June 25, 2024 [7]. Currently, the Budget Bureau has implemented a system to monitor and evaluate government agency performance based on work and budget plans, utilizing a standardized reporting format to measure outcomes and assess budget expenditure success [8]. However, quantitative measurement tools have yet to be adopted for evaluating the efficiency of government budget spending.

The efficiency of government budget expenditure refers to the government's ability to maximize economic activity for a given level of spending or minimize spending while maintaining a certain level of economic activity [9]. There are four key approaches to assessing budget efficiency: (1) evaluation by expenditure type to enhance agency performance, (2) quantitative assessment focusing on inputs, (3) measurement based on outputs, and (4) an approach that considers both inputs and outputs to optimize resource utilization [10]. Data Envelopment Analysis (DEA) is widely used to assess the efficiency of government budget expenditure due to its flexibility as a non-parametric estimation method. It is well-suited for handling diverse data types and different measurement units across government agencies [11]. The DEA method evaluates efficiency by analyzing agencies' inputs and outputs [12]. Its key advantage is the ability to measure productivity and efficiency among agencies with similar characteristics while accounting for multiple input and output factors [13]. Additionally, DEA generates a single efficiency score, making it easier to compare agencies with similar functions and identify efficiency levels. This insight helps agencies improve performance by determining whether to reduce input factors or enhance output production [14]. Given these benefits, DEA is a valuable tool for evaluating government budget expenditure efficiency and can play a crucial role in enhancing the annual budget planning process.

Thailand continues to face challenges in budget management efficiency, necessitating reforms through integrated budgeting, monitoring, and evaluation [15]. The Senate Committee has emphasized that spatial budget allocation should prioritize tangible benefits for the public [16]. In response, this research focuses on examining the efficiency of government budget expenditure by identifying relevant input, output, and environmental factors. The study aims to select the most appropriate factors for evaluating budget efficiency within the spatial dimension of Thailand's provinces. By doing so, it introduces a new approach to assessing government spending efficiency, contributing to the improvement of annual budget management at the provincial level. This research can serve as an effective tool and mechanism to help the government achieve national strategic goals while ensuring fiscal responsibility and maximizing public benefits.

2. Objectives

1. To identify input and output factors for assessing the efficiency of government budget expenditure across provinces in Thailand.

2. To evaluate the efficiency of government budget expenditure in 76 provinces of Thailand, excluding Bangkok.

3. Methods

The research followed a mixed-method approach, integrating both qualitative and quantitative methodologies, and was conducted in three key steps:

Step 1: Analyze and synthesize concepts related to the efficiency of government budget expenditure through documentary research. This involves reviewing secondary data, including research studies, academic articles, books, laws, regulations, guidelines, and relevant criteria manuals. The objective is to identify input and output factors for evaluating budget efficiency across Thailand's provinces, as well as environmental factors influencing expenditure efficiency in the spatial dimension.

Step 2: Selection of input, output, and environmental factors, with in-depth interviews: Conduct interviews with 20 key informants, following Taha [17] who stated that with 17 or more informants, the error rate decreases steadily and can be as low as 0.02 [18]. The key informants were divided into four groups, each consisting of five individuals, for a total of 20 participants: Group 1: Five executives from government agencies with at least five years of experience in budget management at the provincial level. Group 2: Five budget experts from legislative organizations with a minimum of five years of experience in reviewing annual budget bills. Group 3: Five provincial governors, and Group 4: Five academics with expertise in budgeting, budget research, or dissertation work related to budget management. The research team initially selected one reliable and willing key informant from each group. Each informant then recommended the next participant, following a snowball sampling approach. This process continued until five individuals were identified in each group, combining purposive sampling with snowball sampling techniques.

Step 3: Evaluate the efficiency of government budget expenditure across 76 provinces, excluding Bangkok, using the identified input and output factors. Utilizing statistical data from 2017 to 2022, corresponding to the implementation period of the 12th National Economic and Social Development Plan [15]. The assessment employs the Data Envelopment Analysis (DEA) method, applying both the CCR and BCC models from an input-oriented perspective, utilizing the DEAP program.

This research involved two participant groups: (1) key informants, including government executives, budget experts, provincial governors, and academics, and (2) budget experts from both executive and legislative levels. As an indirect and low-risk human research study, it utilized in-depth interviews. The study adhered to the ethical guidelines for human research set by the National Research Council of Thailand [19] and received approval from the Human Research Ethics Committee of Silpakorn University under Exemption Review, No. COE 68.0311-023.

4. Results and Discussion

Identifying input, output, and environmental factors for evaluating the efficiency of government budget expenditure at the provincial level through in-depth interviews with key informants.

Based on in-depth interviews with 20 key informants, the research team conducted content analysis to identify input and output factors that reflect budget spending efficiency at the provincial level, as well as environmental factors influencing government budget expenditure efficiency. The details are as follows:"

4.1. Input Factors

Key informants identified total expenditure and total expenditure per capita as the most appropriate input factors for assessing the efficiency of government budget spending at the provincial level. One

key informant emphasized the relevance of total expenditure, stating: "In the context of government budget spending in the provincial spatial dimension in Thailand, I agree with using total expenditure as a variable because it reflects spending in the area. This budget comes from three main sources: the budget allocated to provinces and provincial groups, subsidies to local administrative organizations, and funds allocated to government agencies and state enterprises operating in the region." (Key Informant No. 7, 2024)

Similarly, another informant supported this view, explaining: "If we consider input factors in the spatial dimension, they should include the total budget spent in the area, consisting of three main components: subsidies for provinces and provincial groups, funds allocated through the Department of Local Administration Promotion, and budgets of other government agencies operating in that province." (Key Informant No. 9, 2024) Another informant highlighted the suitability of using total expenditure as an input factor based on the principles of budget allocation: "The Input-Output Ratio approach is appropriate for evaluating budget spending efficiency because provincial budget allocations follow a standard framework based on area size and population. Therefore, total provincial budget expenditure can be used as an input factor." (Key Informant No. 16, 2024)

Regarding total expenditure per capita, key informants agreed on its importance in addressing differences in population size. One informant noted: "When considering government spending as an input, the total budget should be included as comprehensively as possible. However, analysis must account for population size effects. To address this, total budget expenditure per capita should be used as an input variable." (Key Informant No. 20, 2024). Another informant further reinforced this perspective, stating: "Total budget expenditure per capita is an appropriate input factor because it reflects government spending per person in a given area. This expenditure includes both current and capital expenditures." (Key Informant No. 4, 2024)

4.2. Output Factors

Key informants identified several key output factors for evaluating the efficiency of government budget spending at the provincial level. These include provincial gross domestic product (GPP), the proportion of poor people, the coefficient of income inequality, the employment rate, and crime cases, as they effectively reflect both economic performance and social outcomes. One key informant emphasized the need to include economic indicators alongside measures of inequality: "In assessing the efficiency of government budget spending in the spatial dimension, the output variables should capture both economic aspects, such as provincial gross domestic product (GPP), and indicators reflecting income inequality at the provincial level." (Key Informant No. 10, 2024)

Another informant further stressed the importance of incorporating both economic growth and social inequality in the assessment: "Output variables should cover both economic growth and inequality. Provincial development is not just about increasing GPP; it must also address income inequality to prevent wealth concentration in specific areas. Additionally, crime cases should be considered as an output variable since they reflect both economic conditions and social inequality." (Key Informant No. 4, 2024) Regarding employment as an output factor, an informant highlighted its relevance in the Thai economic context: The employment rate, calculated as the ratio of employed individuals to the total labor force, is a suitable output variable for Thailand, which has a significant agricultural sector. Employment in agriculture may not always translate into formal job creation, yet it still contributes to GPP." (Key Informant No. 4, 2024)

These insights suggest that a comprehensive evaluation of government budget efficiency should consider both economic prosperity and social well-being, ensuring a balanced assessment of provincial development.

4.3. Environmental Factors

Key informants identified population density, unemployment rate, and average years of schooling as key environmental factors influencing the efficiency of government budget spending at the provincial

level. These factors impact how effectively government resources are utilized in different spatial contexts. One informant emphasized the role of education in ensuring the success of government initiatives: "The education level of local residents is crucial. If the government implements various projects in a province, people with higher education levels will be more capable of participating in these projects, increasing the likelihood of achieving the intended goals and objectives." (Key Informant No. 9, 2024)

Regarding population density, another informant highlighted its significance as an environmental factor, particularly in the context of budget allocation: Population density influences the efficiency of government budget spending at the provincial level. Using official population data from the Department of Provincial Administration is more appropriate than including the latent population, as the latter fluctuates rapidly due to migration and is difficult to predict with certainty." (Key Informant No. 1, 2024)

The unemployment rate was also noted as a crucial factor in assessing budget efficiency: "I agree that the unemployment rate should be considered. Budget allocation should consider not only population size but also the level of unemployment. A high unemployment rate affects economic growth and serves as an indicator of the efficiency of government budget spending." (Key Informant No. 2, 2024)

These insights suggest that evaluating budget efficiency requires considering both structural and socio-economic conditions that influence the effectiveness of government spending across provinces.

The analysis revealed two input factors: total budget expenditure and total budget expenditure per capita. These factors serve as indicators reflecting the resources allocated by the government to each province, which influence the efficiency of budget spending. For output factors, five variables were identified: provincial gross product, proportion of poor people, coefficient of income inequality, employment rate, and crime cases. These variables reflect the outcomes of budget spending that impact the province's economy and society. Environmental factors included three variables: population density, average years of education, and unemployment rate. While these factors can affect the efficiency of budget spending, they are not directly controlled by the government.

Furthermore, input factors such as allocated budget and output factors such as economic growth and income inequality are closely linked to the efficiency of government budget spending in Thailand. This finding aligns with the relationship between budget allocation and actual spending in government organizations. For instance, [20] demonstrated that the budget allocated to educational organizations influences the quality of education and the development of human capital. Klanpreecha [21] showed that differences across agencies affect the efficiency of budget disbursement, highlighting how internal factors within an agency impact the effective use of the budget. Suksai [22] which analyzed the relationship between government investment and economic growth using 36 quarters of retrospective data, found that government investment has both short- and long-term effects on economic growth. Additionally, Soktiyanurak and Riabroy [23] analyzed the impact of government budget spending on economic inequality in Thailand using data from 2000-2015, concluded that government spending influences income distribution inequality.

4.4. Assessment of Government Budget Expenditure Efficiency Scores for 76 Provinces, Excluding Bangkok

Evaluation of the government budget expenditure efficiency scores for 76 provinces, excluding Bangkok, was conducted using input and output variables selected based on the content validity index criteria. These variables were used to calculate the efficiency scores of government budget expenditure across the provinces. The analysis included two input variables: total budget expenditure and total budget expenditure per capita. There were five output variables: provincial gross product, proportion of poor people, coefficient of income inequality, employment rate, and crime cases.

The efficiency scores were calculated using statistical data from 2017 to 2022, in line with the 12th National Economic and Social Development Plan. The Data Envelopment Analysis (DEA) method was applied, utilizing both the CCR model and BCC model from the input-oriented perspective. The model

considered both economic and social output, with input factors including total budget expenditure per capita, and output factors including Gross Provincial Product (GPP), poverty rate, Gini coefficient, employment rate, and crime cases. The calculation results based on this model are presented in Table 1.

The calculation of the government budget expenditure efficiency scores, as presented in Table 1, yielded the following results: the CCR model showed an average efficiency score of 0.567, the BCC model had an average score of 0.619, and the SE (Scale Efficiency) model had an average score of 0.932. There were eight provinces that achieved efficiency in all three models (CCR, BCC, and SE) with a perfect efficiency score of 1. These provinces were: Kalasin, Nakhon Si Thammarat, Buriram, Rayong, Ratchaburi, Si Sa Ket, Samut Prakan, and Samut Sakhon. These provinces demonstrated both operational and technical efficiency, as well as optimal size for their operations.

The provinces that showed efficiency in the BCC model (variable returns to scale) were seven: Chonburi, Chiang Rai, Narathiwat, Prachinburi, Pattani, Yasothon, and Roi Et. Meanwhile, 16 provinces demonstrated SE efficiency, including Krabi, Chanthaburi, Chaiyaphum, Nakhon Pathom, Nonthaburi, Pathum Thani, Phra Nakhon Si Ayutthaya, Phayao, Phitsanulok, Phetchaburi, Lopburi, Lamphun, Loei, Sa Kaeo, Saraburi, and Uthai Thani.

The remaining 45 provinces were deemed inefficient across all three models (CCR, BCC, and SE). Based on the BCC (VRS) model, the provinces with efficiency scores higher than 0.9 but lower than 1 were Nong Bua Lamphu, Phetchabun, Ubon Ratchathani, Surin, and Sakon Nakhon, with efficiency scores of 0.914, 0.925, 0.932, 0.938, and 0.950, respectively. This suggests that in order to achieve more efficient spending, these provinces would need to reduce their per capita spending by 8.6%, 7.5%, 6.8%, 6.2%, and 5.0% respectively.

For the group of provinces with efficiency scores between 0.7 - 0.9, there were 9 provinces: Lamphun, Suphan Buri, Phatthalung, Saraburi, Amnat Charoen, Nakhon Ratchasima, Udon Thani, Chaiyaphum, and Trang, with efficiency scores ranging from 0.723 to 0.892. The remaining 47 provinces had efficiency scores lower than 0.7.

Table 1.
Efficiency Score of Government Budget Expenditure According to the Model (Excluding Bangkok).

Comparison of Mean Values Across Models	Average Efficiency Score of the Model		
	CCR (CRS)	BCC (VRS)	SE
	0.567	0.619	0.932
Provinces with CCR (CRS), BCC (VRS), and SE Efficiency Scores of 1			
Kalasin, Nakhon Si Thammarat, Buriram, Rayong, Ratchaburi, Si Sa Ket, Samut Prakan, and Samut Sakhon	1.000	1.000	1.000
Provinces with BCC (VRS) Efficiency Score of 1			
Chonburi, Chiang Rai, Narathiwat, Prachinburi, Pattani, Yasothon, and Roi Et	-	1.000	-
Provinces with SE Efficiency Scores of 1			
Krabi, Chanthaburi, Chaiyaphum, Nakhon Pathom, Nonthaburi, Pathum Thani, Phra Nakhon Si Ayutthaya, Phayao, Phitsanulok, Phetchaburi, Lopburi, Lamphun, Loei, Sa Kaeo, Saraburi, and Uthai Thani	-	-	1.000
Provinces with Efficiency Scores Near 1 According to the BCC Model			
Province	BCC (VRS)	Percentage of Budget to be Reduced	
Nong Bua Lamphu	0.914	8.6	
Phetchabun	0.925	7.5	
Ubon Ratchathani	0.932	6.8	
Surin	0.938	6.2	
Sakon Nakhon	0.950	5.0	
Provinces with Moderate Efficiency Scores (0.7 - 0.9) According to the BCC Model			
Province	BCC (VRS)	Percentage of Budget to be Reduced	
Lamphun, Suphan Buri, Phatthalung, Saraburi, Amnat Charoen, Nakhon Ratchasima, Udon Thani, Chaiyaphum, and Trang	0.723 - 0.892	10.8 - 27.7	

The analysis of government budget expenditure efficiency scores, based on the calculation model, revealed that the CCR model had an average efficiency score of 0.567, while the BCC model had an average score of 0.619, and the SE (Scale Efficiency) model had an average score of 0.932. These results suggest that while government budget spending is relatively efficient, there remains significant potential for improvement, particularly in terms of technical efficiency. The higher average score of the BCC model (0.619 compared to 0.567) indicates better technical efficiency when accounting for size limitations (Variable Returns to Scale - VRS). The lower CCR score suggests that overall efficiency is constrained by factors not fully managed in the operations. The SE model's high score of 0.932 indicates that most of the efficiency is influenced by the scale of spending, demonstrating that government budget allocations are appropriately adjusted to a high level. However, technical efficiency remains an area for improvement. This highlights the need to focus on enhancing technical efficiency within each agency handling the budget, and the importance of adjusting budget allocation policies to address factors that influence spending efficiency, such as minimizing waste and maximizing policy outcomes.

The research results indicate that there are still significant gaps in government budget spending, highlighting the need to improve efficiency and reduce inequality. This aligns with parliamentary analyses of the budget and spatial inequality between 2019-2022, which examined the budget allocation of various ministries by province. It was found that the allocation of budgets is closely related to inequality between provinces [24]. The efficiency of budget spending is influenced by both the type and distribution of the budget. For example, Soktiyanurak and Riabroy [23] demonstrated that government spending in areas like public health and education can exacerbate economic inequality, while spending in other sectors, such as housing and community development, can help reduce inequality. Moreover, government budget spending still faces efficiency challenges that need addressing to enhance policy outcomes. According to Chitsuchon [25] report, the most effective policies for reducing inequality involve welfare and social spending, including tax policy. However, these policies have not yet been fully implemented by the Thai government as needed.

The analysis revealed that eight provinces—Kalasin, Nakhon Si Thammarat, Buriram, Rayong, Ratchaburi, Si Sa Ket, Samut Prakan, and Samut Sakhon—achieved efficiency scores of 1 across all CCR, BCC, and SE models, indicating that their government budget spending was highly efficient, with resources fully utilized and managed appropriately in size and technical efficiency. This success may be attributed to strong management, planning capabilities, and an economic structure that supports efficient resource use. On the other hand, 7 provinces—Chonburi, Chiang Rai, Narathiwat, Prachin Buri, Pattani, Yasothon, and Roi Et—were only efficient in the BCC model, showing they were technically efficient but lacked efficiency in terms of size. This suggests that the resource allocation was either too large or too small, and adjustments to the budget or the economic structure are necessary for improvement.

Sixteen provinces—Krabi, Chanthaburi, Chaiyaphum, Nakhon Pathom, Nonthaburi, Pathum Thani, Phra Nakhon Si Ayutthaya, Phayao, Phitsanulok, Phetchaburi, Lopburi, Lamphun, Loei, Sa Kaeo, Saraburi, and Uthai Thani—demonstrated specific efficiency in the SE model, meaning that they were efficient in terms of size but lacked technical efficiency. This suggests these provinces can fully utilize their resources when operations are appropriately scaled, but they still need improvements in internal management efficiency, such as enhancing the capacity of officials or better budget planning. The remaining 45 provinces were inefficient across all models (CCR, BCC, and SE), indicating potential structural issues such as improper budget allocation, ineffective use of resources, weak management capabilities within local government agencies, or economic and infrastructure challenges hindering development.

Overall, the findings underscore the need for further improvements in government budget spending to maximize efficiency. Budget allocations should focus on increasing the capabilities of provinces that are inefficient, adjusting the size of spending appropriately, and systematically developing the management skills of local government agencies.

5. Conclusion

This study analyzed the input, output, and environmental factors for evaluating the efficiency of government budget expenditure at the provincial level using in-depth interviews. The findings revealed two input variables (total budget expenditure and total budget expenditure per capita), five output variables (gross provincial product, proportion of poor people, coefficient of income inequality, employment rate, and crime cases), and three environmental variables (population density, average years of education, and unemployment rate). The efficiency analysis indicated that the average scores of the CCR, BCC, and SE models were 0.567, 0.619, and 0.932, respectively. Eight provinces demonstrated the highest efficiency in all models, including Kalasin. Seven provinces showed BCC efficiency—Chonburi, Chiang Rai, Narathiwat, Prachinburi, Pattani, Yasothon, and Roi Et. Sixteen provinces were efficient in terms of SE—Krabi, Chanthaburi, Chaiyaphum, Nakhon Pathom, Nonthaburi, Pathum Thani, Phra Nakhon Si Ayutthaya, Phayao, Phitsanulok, Phetchaburi, Lopburi, Lamphun, Loei, Sa Kaeo, Saraburi, and Uthai Thani. The remaining 45 provinces were inefficient across the CCR, BCC, and SE models. For provinces with low BCC scores, the budget should be reduced to an appropriate level. Additionally, regarding production size, 24 provinces were found to have an appropriate size, while 52 provinces were deemed inappropriate. Nine provinces should increase their size (IRS), and 43 provinces should reduce their size (DRS) to improve the efficiency of government budget spending.

Transparency:

The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

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