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EFFICIENCY UNDER INFLUENCE: HOW BUREAUCRATIC QUALITY AND RENT-SEEKING SHAPE PUBLIC FUNDS ALLOCATION EFFICIENCY

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Abstract

Unproductive and misallocated public spending endures as a major international concern, eroding socio-economic gains and public trust in governance. Recent research often takes an isolated approach either governmental inefficiency or private-sector rent-seeking as singular causes. This study tackles this gap by exploring together the impact of bureaucratic efficiency and rent-seeking behavior on public funds efficiency across 12 countries from 2012 to 2023. Public funds efficiency was measured using Data Envelopment Analysis, considering inputs from health, education, and infrastructure, with outputs reflecting societal welfare indicators. Bureaucratic efficiency evaluated by ICRG Quality of Government Index, while rent-seeking behavior by the reverse Economic Freedom Index. Using OLS and quantile regression, the analysis reveals that bureaucratic efficiency positively influences public funds efficiency ($\beta = 0.1305$, $p = 0.004$), whereas rent-seeking has a significant negative impact ($\beta = -0.1441$, $p < 0.000$). These effects are particularly salient in countries with lower efficiency levels, as highlighted by quantile regression results pointing to sustainable advantages from targeted governance enhancements in these context. It highlights that impact of bureaucratic efficiency and rent-seeking behavior is not one-size-fit-

Volume. 4 Issue No. 3 (2025)
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all but varies significantly across different efficiency tiers. The findings offer practical implications for policymaker, calling for bespoke governance reforms and anti-rent-seeking strategies to enhance public resource allocation effectiveness globally.

Keywords*:* Rent-seeking Behavior, Public Fund Efficiency, Bureaucratic Efficiency, DEA model, Quantile regression, Economic freedom index

1. Introduction

Efficient public fund management forms the bedrock of sustainable economic development and social wellbeing. Public funds sourced from taxpayers and government revenues, are funneled into key sectors to essential sectors such as health, education, and infrastructure, in anticipation of maximizing societal welfare. Yet, enduring challenge of misallocation of public funds where resources are inefficiently used or tied up for non-productive purposes undermines economic growth, widens inequality, and public losses trust on government. World Bank (2022) and IMF (2021), highlight that despite increased government spending in many countries, the goal of countries to become better in economic & social way is not achieved, raising concerns about how effectively these funds are utilized. Reasons interplay between of internal government inefficiencies and external private sector influences**.** Bureaucratic inefficiency, characterized by excessive administrative burdens, lack of accountability, and weak governance practices, wastages of resources and subpar public service outcomes (Knack & Keefer, 1995; Mauro, 1995). On the other hand, rent-seeking behavior where individuals or groups seek to gain benefits through manipulation of public policies rather than gainful pursuits, further distorts resource allocation (Krueger, 2008; Buchanan,1984 & Tulloch, 1991). These rent-seeking activities often divert public resources for private gain, productive drain and governance integrity (Dina, Dina, & Negri, 2021). Collectively bureaucratic inefficiency and rent-seeking have been widely studied independently, there is a notable gap in research examining their simultaneous effects on public funds efficiency, particularly using a

Volume. 4 Issue No. 3 (2025)
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comparative, global perspective. Most existing studies dive deep into corruption or governance quality alone, missing the broader interplay between public administration and private sector influence (Afonso, Romero-Barrutieta, & Monsalve, 2013; Negri & Dina, 2023).

This research attempts to analyze how a high functioning bureaucracy utilizes public resources by ensuring effective utilization of every cent and considers how rent seeking may disrupt it. It also considers whether the impact of bureaucratic efficiency is universally applicable in all countries or this impact depends on the countries baseline level of efficiency and most devoid public funds management provide a way to find out that the most vulnerable rent seeking behavior existed in these countries. Leveling quantile regression models with Ordinary Least Squares (OLS) then applying Data Envelopment Analysis (DEA) to assess efficiency examines a dozen countries from 2012 to 2023 incorporating diverse economic and governance contexts. It rests upon the assumption that public funds efficiency impact is curbed by higher rent seeking behavior and increased bureaucratic efficiency which is mostly in line with traditional reasoning (Mauro, 1995; Krueger, 2008). As noted earlier the primary objective is to help policymakers aiming to optimize the management of public funds and consolidate governance to refine their approaches guided by evidence analysis results.

2. Literature Review

In the past twenty years the global discourse concerning public expenditure has changed from "how much" is being spent by governments to "how well" those finances are spent and converted into tangible results. Despite the increase in the budget over time several nations continue to lag behind in areas such as health, education, infrastructure, and poverty alleviation. The widening gap between inputs and outcomes has prompted researchers to look into public funds allocation optimization as a vexing problem of governance and institutional capacity. Scholarly work has been done using a distribution free method Data Envelopment Analysis(DEA) to compare multiple inputs and outputs from decision making units like countries. In the public sector it has gained acceptance because of its adaptability to policy issues. A foundational study was conducted by (Afonso and St. Aubyn ,2006) who assessed productivity from education and health spending across OECD countries. Their research showed that some nations achieved set goals while using fewer resources than others which was attributed to differences in administrative quality and institutional governance. After that further studies are done like (Herrera and Pang, 2005) applied DEA to evaluate social sector efficiency across developing nations. Their analysis revealed that different management approaches to similar expenditure levels resulted suggesting that the way funds are managed is as important as the amount spent. At the same time Gupta and Verhoeven (2001) focused on publicly financed activities in African countries and demonstrated that inappropriately low efficiency was often associated with corrupt, weakly accountable and bureaucratically limited structures, thus strengthening institutional weaknesses as explanatory frameworks of inefficiency in resource use.

As empirical applications expanded, researchers began to explore the underlying drivers of these efficiency disparities. (Raj Kumar and Swaroop 2008) made a significant contribution by combining DEA-generated efficiency scores with governance indicators. They concluded that better institutions—including stronger rule of law and reduced corruption—enhanced the effectiveness of public spending. Their study marked a turning point, emphasizing that spending is not just a financial issue, but also a governance challenge. Building on this, (Hauner and Kyobe 2010) introduced fiscal policy variables such as budget transparency and bureaucratic quality into the efficiency framework, highlighting how administrative performance and institutional structure directly affect public service outcomes. The theoretical underpinnings of this empirical work are grounded in the principles of New Institutional Economics, which emphasize the role of both formal rules (laws, policies) and informal practices (rent-seeking behavior, favoritism) in shaping

Volume. 4 Issue No. 3 (2025)
Online ISSN: 3006-2047
Print ISSN: 3006-2039

economic outcomes (North, 1990). This literature helps explain why public funds often miss the mark because government inefficiencies on one hand, and private power distortions on the other, both undermining the delivery of public services. Concurrently, policy-oriented studies have further demonstrated the practical implications of these efficiency gaps. (Jayasuriya and Wodon 2003) assessed education spending in MENA countries and other developing countries and called for institutional reforms to enhance outcome-based budgeting and (Mardani et al. 2017) conducted a systematic review of DEA applications in energy and environmental sectors, illustrating the method's tap into potential in evaluating public sector performance across contexts. These studies reinforce the idea that efficiency is not just a technical metric but a policy imperative, especially in thin on resource countries.

2.1 Bureaucratic Efficiency & Rent Seeking Behavior

In the grand scheme on institutional quality and its influence on public sector performance, it is essential to distinguish between two distinct forces that shape the efficiency of public funds allocation: government-side inefficiencies, represented by bureaucracy quality, and private-side distortions, manifested through rent-seeking behavior. Despite both are institutional in nature, they originate from different sources, operate through different channels, and demand different policy responses. Bureaucracy efficiency reflects the internal functioning of the government its ability to follow through services, implement policies, and manage public resources effectively. It is hand in hand with the professionalism, accountability, and administrative discipline of the civil service. Scholars such as (Evans and Rauch 1999) argue that countries by the book, merit-based bureaucracies achieve stronger development outcomes. This is supported by (Hauner and Kyobe ,2010), who found that efficient bureaucracies gave better budget outcomes and enhanced public service delivery. (Raj Kumar and Swaroop 2008) showed that even well-funded programs often fail when administrative capacity is weak, reinforcing the idea that government inefficiency can significantly constrain

Volume. 4 Issue No. 3 (2025)
Online ISSN: 3006-2047
Print ISSN: 3006-2039

spending effectiveness. In contrast, rent-seeking behavior arises when private actors have a public decisions or extract benefits from government resources through non-productive means—such as bribery, favoritism, or manipulation of regulations. Unlike bureaucracy inefficiency, which is a systemic issue within the public administration, rent-seeking is driven by external interest groups and private agents who exploit weaknesses in governance for personal gain. As (Krueger 2008) originally framed, rent-seeking leads to resource misallocation and economic inefficiency by shifting the focus from productive activity to political maneuvering. Later studies by (Tanzi and Davoodi 1998) and (Rose-Ackerman,1999) emphasize that rent-seeking not only wastes public funds but also encourages inflated costs and substandard outputs in public investment projects.

2.2 Bureaucratic Efficiency and Public Funds Allocation

Recent literature emphasizes bureaucratic efficiency as a crucial determinant of effective public spending, highlighting how capable and transparent public administration directly influences outcomes. For instance, (Cingolani, Thomson, and de Crombrugghe 2015) examined public sector efficiency across European countries, showing that efficient bureaucracies significantly improve the allocation and utilization of structural funds from the European Union. Their key strength was demonstrating practical implications for regional policy; however, their analysis primarily focused on developed European economies, limiting its broader applicability to developing nations. Further expanding this line of inquiry, **(**Dahlström, Teorell, Dahlberg, Hartmann, Lindberg, and Nistotskaya 2013) explored how meritocratic bureaucracies correlate with higher-quality governance and less corruption across multiple regions globally. Their research was notable for using comprehensive international datasets, enhancing generalizability. Nevertheless, the cross-sectional nature of their analysis limited insights into how bureaucratic efficiency evolves over time.

Volume. 4 Issue No. 3 (2025)
Online ISSN: 3006-2047
Print ISSN: 3006-2039

2.3 Public Funds Allocation and Rent-Seeking Behavior

Rent-seeking behavior private wrings out personal benefits from public resources persists as a significant issue to efficient public spending globally. For instance, (Benfratello, Monte, and Pennacchio 2018) found that rent-seeking through political lobbying heavily biased the allocation of public procurement contracts, resulting in paying more for less. Their excellent providing detailed micro-level evidence from procurement data; however, their study primarily focused on developed countries, limiting broader applicability. Similarly, (Hessami 2014) showed that politically motivated rent-seeking behaviors in regional governments led to misallocation of infrastructure investments, emphasizing the political calculus. (Liu and Mikesell 2014) provided evidence from China, tells that this behavior reduced local governments' spending efficiency in infrastructure projects. Their strength was combining detailed municipal data with clear policy implications; however, the unique institutional context of China might constrain generalizability. Additionally, (Fazekas and Tóth 2016) analyzed public procurement across multiple European countries and identified clear links between political connections, rent-seeking, and inefficient fund allocation. Their multi-country approach increased generalizability, though their analysis remained largely descriptive. Collectively, these studies illustrate clearly that rent-seeking behaviors consistently undermine efficient public resource allocation, but many remain limited by their regional or context-specific focus, thus emphasizing the need for broader comparative research, such as that pursued in the current study.

3. Methodology

For achieving sustainable socio economic growth and improving the quality of life in the countries effective allocation of public funds is very important. People of countries concerns that inefficient utilization of taxpayer contribution due to government inefficiencies and private interests. In particular, two influential factors bureaucracy efficiency representing

Volume. 4 Issue No. 3 (2025)
Online ISSN: 3006-2047
Print ISSN: 3006-2039

governmental capability and rent seeking behavior reflecting private sector interference are argued to significantly impact how effectively public funds are allocated to intended projects and services. This study specifically addresses the gap concerning the simultaneous influence of these governmental and private forces, aiming to clarify their respective and combined roles in public fund efficiency.

Thus, this research addresses the following primary questions:

- How does bureaucracy efficiency impact the efficiency of public funds allocation?
- What is the effect of private-sector rent-seeking behavior on public funds efficiency?
- Does bureaucratic efficiency have a one-size-fit-all approach, or does it impact vary depending on the country's baseline efficiency levels?

To empirically investigate these research questions, the current study employs a quantitative research approach quantile regression approach. A quantitative methodology is particularly suitable given the necessity of objectively measuring public funds efficiency and quantifying the impact of bureaucracy efficiency and rent-seeking behaviors. Specifically, Data Envelopment Analysis (DEA) is employed to calculate the dependent variable, public funds efficiency, facilitating an objective comparative assessment across multiple countries over a significant time period. Additionally, statistical techniques such as correlation analysis, ordinary least squares (OLS), and quantile regression are utilized to rigorously quantify and examine relationships among the variables. Such quantitative tools are essential for providing robust evidence of the systematic patterns and statistical significance of the hypothesized relationships within the framework of this research.

3.1 Data

3.1.1Data sampling

The present study encompasses an analysis of 12 countries over the period 2012 to 2023.

Volume. 4 Issue No. 3 (2025)
Online ISSN: 3006-2047
Print ISSN: 3006-2039

In purposive sampling technique, selection of countries based on significant variations in their economic development or income levels and governance quality as defined by World Bank classifications and widely accepted governance indicators. The sample comprise of lower-middle-income (India), upper-middle-income (China, Brazil, South Africa), and high-income nations (Norway, Netherlands, Germany, France, Finland, Denmark, Sweden, and Switzerland), incorporating a diverse spectrum of economic contexts. Choosing countries strategically across different income groups and governance quality spectra, a balanced and comparative approach is employed in the study, enhancing the generalizability and robustness of findings regarding how bureaucracy efficiency and rent-seeking behavior impact the efficiency of public fund allocation.

3.1.2 Data Sources

Data utilized in this study are secondary in nature, obtained exclusively from reliable and internationally recognized databases, ensuring accuracy, comparability, and credibility of the analytical results.

- **Dependent variable:** Public Funds Allocation, is represented by public funds efficiency and is calculated using the Data Envelopment Analysis (DEA) method. The inputs considered in this analysis include current health expenditure, government expenditure on education and gross fixed capital formation**.** These inputs represent the allocation of national resources towards health, education, and infrastructure development. The outputs of the analysis include life expectancy at birth, access to electricity, primary completion rate, poverty headcount ratio at national poverty lines and infant mortality rate**.** These output indicators are used to evaluate the effectiveness of public funds in improving societal well-being and infrastructure from the World Bank.
- **Independent variable:** Bureaucracy efficiency by ICRG Quality of Government (QOG) Index, which includes sub-indicators on bureaucracy quality, corruption, and law and order. International

Volume. 4 Issue No. 3 (2025)
Online ISSN: 3006-2047
Print ISSN: 3006-2039

Country Risk Guide database is used to obtain this data and the Economic freedom index serves as a proxy to measure rent-seeking behavior. This index is developed by reputable institutions such as The Heritage Foundation and Fraser Institute

3.1.3 Data description

With the utilization of relevant input-output variable that are presented in Table 1 public funds efficiency the dependent variable was assessed via Data Envelopment analysis(DEA).

Table 1: ***Input and Output Variables Used in DEA Analysis***

Variable Type	Variable Name	Measurement unit
Input	Current health expenditure	% of GDP
	Government expenditure on education	% of GDP
	Gross fixed capital	% of GDP
Output	Life expectancy at birth	total, years
	Access to electricity	% of population
	Primary completion rate	% of relevant age group
	Poverty headcount ratio at national poverty lines	% of population
	Infant mortality rate	per 1,000 live births

Note. Inputs and outputs are represented by resource allocation and public service outcomes showcasing the efficiency of public funds usage respectively.

ICRG Quality of Government (QOG) index, encompassing key dimension of institutional strength, bureaucratic quality, and the government's capability in policy implementation is used for bureaucracy efficiency (Teorell et al., 2016)and on the other hand Economic Freedom Index (reverse-scored) utilize to capture rent seeking behavior where lower scores signal higher regulatory complexity, market intervention and more room for private interests to

Volume. 4 Issue No. 3 (2025)
Online ISSN: 3006-2047
Print ISSN: 3006-2039

engage in rent-seeking activities (Gwartney et al, 2021). Table 2 provides a detailed breakdown of the dependent and independent variables.

Table 2: ***Variable Description***

Type	Variable	Measure	Description
DV	Public Fund efficiency	DEA	Optimal utilization of public resources
IV	Burecracy efficiency	ICRG_QOG	the effectiveness of public institutions and governance structures
IV	Rent-seeking behavior	Economic Freedom Index (Reverse-scored)	Measure of the degree of economic freedom present within a country

3.2 Data Management

To maintain uniformity across different variables and comparability z-score standardization is utilized for data management. This normalization framework equips every variable for equal representation which improves the value of statistical exercises performed in Stata

3.3 Hypothesis Development

H1: *Bureaucracy Efficiency has a positive effect on Public Fund Efficiency*

To improve resource distribution and management by the meritorious bureaucracy's public sector performance is enhanced (Evans & Rauch, 1999).

H2: *Rent-Seeking Behavior has a negative effect on Public Fund Efficiency*

Across all quantiles the economic freedom index (reverse-scored) is expected to diminish public fund efficiency attributed to rent-seeking behavior. (Krueger, 2008) originally framed this concept which claims rent seeking wastes resources and lowers economic productivity because it involves more politically motivated activity rather than productive work.

Volume. 4 Issue No. 3 (2025)
Online ISSN: 3006-2047
Print ISSN: 3006-2039

H3: *Countries with different efficiency level impact of bureaucratic efficiency & rent seeking behavior varies*

The effect varies across quantiles uncovered by (Negri & Dina, 2023).

H4: *Stronger Rent-Seeking Effect in Lower Quantiles*

Where governance is weak, rent seeking is likely to have a greater negative impact on the efficiency of public funds utilization in the least efficient countries (Krueger, 2008).

3.4 Analytical Method

3.4.1 DEA (Data Envelopment Analysis)

Data Envelopment Analysis (DEA) is used to evaluate public funds efficiency across nations in an input oriented system under Variable Returns to Scale (VRS) model using (Charnes et al. 1978) and (Banker et al. 1984) as a foundation. The input orientation concentrates on how efficiently nations reduce costs with and the output achieved while the assumption of VRS allows for variation in scale and development across countries.

To analyze efficiency over time, Window Analysis (or Sequential DEA) is applied, calculating annual DEA efficiency scores and combining them into a time-series dataset. This method captures the temporal dynamics of efficiency, as suggested by (Cooper, Seiford, and Zhu 2011). The model benchmarks each country against the best performers, with a score of 1 indicating full efficiency. However, variations in input selection, such as health or education investment, can affect the overall efficiency score and may give some countries an advantage, which future research could address by using more context-specific indicators. These methodological choices are supported by prior research, including (Afonso and St. Aubyn ,2006) and (Raj Kumar and Swaroop,2008), who applied DEA to explore public funds efficiency.

3.4.2 *Correlation Analysis*

To set the foundation this research performs a correlation analysis. This step gauges how strongly and in what direction the linear relationships between

Volume. 4 Issue No. 3 (2025)
Online ISSN: 3006-2047
Print ISSN: 3006-2039

the components of bureaucratic efficiency, rent seeking behavior, and the efficiency of administering public funds. Moreover, correlation matrices aid in identifying the presence of multicollinearity among some of the independent variables which is crucial for the validity of the regression techniques applied in the subsequent stages of the analysis.

3.4.3 OLS Regression

The preceding description defines the application of an OLS regression a linear relationship has been fitted to measure the effectiveness of public funds, bureaucratic efficiency, and the rent seeking behavior on the public funds and seeking into not just spending, but also showing the average relationships which provides a basis understanding of the scenario.

3.4.4 Quantile Regression

As stated before quantile regression is utilized at the 10th, 25th, 50th, 75th, and 90th percentiles in order to analyze the underlining heterogeneous influence of the bureaucracy efficiency and the rent seeking behavior for different levels of public funds efficiency. This offers a glimpse into how factors influence efficiency from various positions in the distribution, especially the lower and upper extremes and thus offers more sophisticated understanding of the linkages.

3.4.5 VIF

The variance inflation factor is a technique used to find multicollinearity among the independent variables of a regression model. Variables correlated to other variables can have drastic effects in weakening the reliability of the model. A high VIF value indicates strong correlations which can bias the coefficient estimates. Ensuring a low VIF is required for the control of the dependability of results outputted.

3.5 Reliability & Validity

To maintain reliability credible data sources such as World Bank, ICRG, and the Economic Freedom Index is used which ensures accuracy and consistency of measurements. Alignment validation ascertained through input and output

Volume. 4 Issue No. 3 (2025)
Online ISSN: 3006-2047
Print ISSN: 3006-2039

indicators defined by benchmarks for efficiency evaluation of public spending ensures that the constructs reflect the intended governance and economic aspects.

3.6 Ethical Consideration

Credible International sources for secondary data in this study ensuring no human subjects were involved, for minimizing ethical risks. Data integrity and objectivity are curated by accurately reporting findings without manipulation. Proper citations and adherence to academic research standards were strictly followed to uphold research ethics.

4. Analysis

4.1 Descriptive Analysis

In this study, based on the sample of 144 observation descriptive statistics are computed to summarize and highlights the characteristics and distribution of the data. The dependent variable efficiency score has a mean of 0.670 (SD = 0.344, range = 0.029–1.000) with moderate negative skewness of -0.775 and a kurtosis of 2.141 that show distribution are slightly flatter than normal.

Then bureau efficiency has a mean 0.776 (SD = 0.218, range = 0.389–1.000) with a negative skewness of -0.687 and a kurtosis of 1.789, suggesting that distribution relatively peaked. Rent seeking behavior has a mean of 68.155 (SD = 9.769, range = 48.000–84.200) with a slight negative skewness of -0.401 and a kurtosis of 1.779 reflecting a distribution close to normal, which is measured in arbitrary units. Results revealed that no extreme outliers across the variables (z-scores |z| < 3.0). Concise picture of the data's central tendencies and distributions is provided by these results setting the stage for subsequent analyses present in Table 3.

Table 3: ***Descriptive Statistics***

Variables	Obs	Mean	Std.Dev	Min	Max	Skew	Kurt
Efficiency score	144	0.669857	0.3440081	.029004	1	-0.7748388	2.141142
Bureau efficiency	144	0.775512	0.217729	0.38889	1	-0.6869768	1.789165

Volume. 4 Issue No. 3 (2025)
Online ISSN: 3006-2047
Print ISSN: 3006-2039

Rent-seeking	144	68.15486	9.769331	48	84.2	-0.4007545	1.778738

4.2 DEA

The efficiency scores reflect each country's ability to utilize its resources effectively. A score of 1 indicates optimal efficiency, while lower values suggest inefficiency in the use of resources. Sweden, Finland and Switzerland have consistently achieved a perfect efficiency score of 1 across all years. This indicates that these countries are operating at the maximum level of efficiency relative to their inputs. As a result, all countries hold the rank of 1 in the analysis, indicating top-tier efficiency. In contrast, South Africa and India exhibit much lower efficiency scores, with values of 0.0569 and 0.1060, respectively. These scores place them at the lower end of the ranking, indicating significant inefficiencies in their public service systems or economic frameworks. Moderate efficiency scores display by Brazil 0.74599, China 0.249222 and Germany 0.746492 and based of which Brazil ranks 5th, China 8th, and Germany 4th. These countries perform better than South Africa and India as suggested by scores. South Africa and India still have room for improvement in maximizing the use of their resources. On the higher end of the spectrum, Denmark and Norway have scores of 0.897614 ranked 3rd and 0.919666 ranked 2nd, respectively. The results presented in Table 4 represent the average DEA efficiency scores of various countries across the years analyzed. To facilitate comparison and highlight the overall performance, the average efficiency score for each country was calculated over the entire period.

Table 4: ***VRS INPUT Oriented DEA Efficiency***

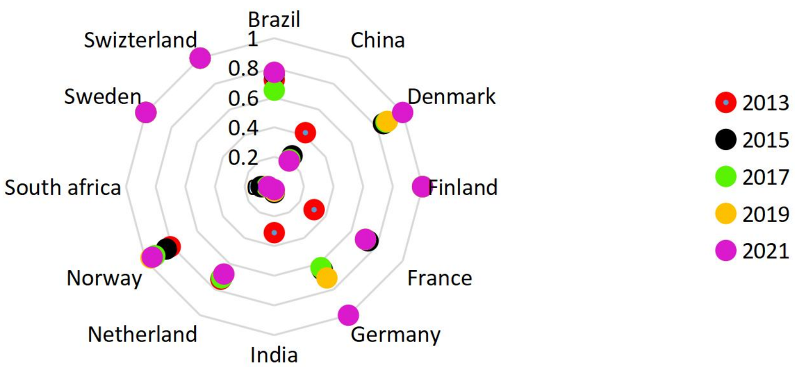
Country Code	Country Name	Efficiency Score	Rank
BRA	Brazil	0.74599	5
CHN	China	0.249222	8
DNK	Denmark	0.897614	3
FIN	Finland	1	1

Volume. 4 Issue No. 3 (2025)
Online ISSN: 3006-2047
Print ISSN: 3006-2039

FRA	France	0.613536	7
DEU	Germany	0.746492	4
IND	India	0.106044	9
NLD	Netherlands	0.702802	6
NOR	Norway	0.919666	2
ZAF	South Africa	0.056925	10
SWE	Sweden	1	1
CHE	Switzerland	1	1

To analyze efficiency over time, Window Analysis **(**Sequential DEA**)** is applied, calculating annual DEA efficiency scores and combining them into a time-series dataset. The graph in the following section will present the distribution of efficiency scores over time, providing further insight into the year-to-year variation for each country.

Public Fund Efficiency



4.3 Correlation Analysis

There is a highly positive correlation of Burecracy efficiency and negative correlation of rent seeking behavior with public fund efficiency. This means individuals or groups seek to gain benefits through manipulation of public policies rather than gainful pursuits is negatively affect public funds management and when there is accountability and good governance it positive impact efficiency, the result is present in Table 4.

Journal of Management Science Research Review
https://jmsrr.com/index.php/Journal/about

Volume. 4 Issue No. 3 (2025)

Online ISSN: 3006-2047
Print ISSN: 3006-2039

Table 4: ***Correlation Analysis***

	Efficiency score	Bureau efficiency	Rent-seeking
Efficiency score	1.0000		
Bureau efficiency	0.7458	1.0000	
Rent-seeking	-0.7507	-0.8751	1.0000

4.4 Regression Analysis

This approach directly aligns with the study objective of how bureaucratic efficiency and rent-seeking behavior impact the efficiency of public funds. As presented in Table 4, the robust regression results reveal that bureaucratic efficiency has a positive and statistically significant effect on public sector efficiency ($\beta = 0.1305$, $p = 0.004$). This suggests that improvements in bureaucratic practices contribute to better performance outcomes. In contrast, rent-seeking behavior exhibits a negative and highly significant relationship with efficiency ($\beta = -0.1441$, $p < 0.001$), indicating that higher levels of rent-seeking are associated with reduced efficiency in the public sector. As a highly correlation so robust regression is utilizing so to remove the effect of heteroscadicity.

$$\boldsymbol{PFE_{it} = \alpha + \beta_1 BE_{it} + \beta_2 RS_{it} + \epsilon_{it}}$$

The model explains approximately 59.7% of the variation in efficiency scores ($R^2 = 0.597$, Adjusted $R^2 = 0.592$), which is substantial for cross-sectional governance studies. The F-statistic ($F(2, 141) = 68.62$, $p < 0.000$) confirms the overall model significance. These findings reinforce the argument that governance quality—particularly minimizing rent-seeking and enhancing bureaucratic functionality—is crucial for improving public sector performance. These findings are presented in Table 5.

Volume. 4 Issue No. 3 (2025)
Online ISSN: 3006-2047
Print ISSN: 3006-2039

Table 5: Regression Analysis Predicting Efficiency Score

	Beta	SE	t	p	[95% Conf. Interval]	
Bureau efficiency	0.1305	0.04405	2.96	0.004	0.043397	0.21759
Rent-seeking	-0.1441	0.038937	-3.70	0.000	-0.22102	-0.0670
_cons	15.074	3.89182	3.87	0.000	7.380879	22.7686

Note: N = 144. $R^2 = .597$, Adjusted $R^2 = 0.592$, $F(2, 141) = 68.62$, $p < .000$.

The Figure 2 show that countries with higher rent-seeking behavior tend to have lower efficiency scores, while those with higher bureaucratic efficiency exhibit better public sector performance, highlighting how governance quality strongly influences efficiency outcomes.

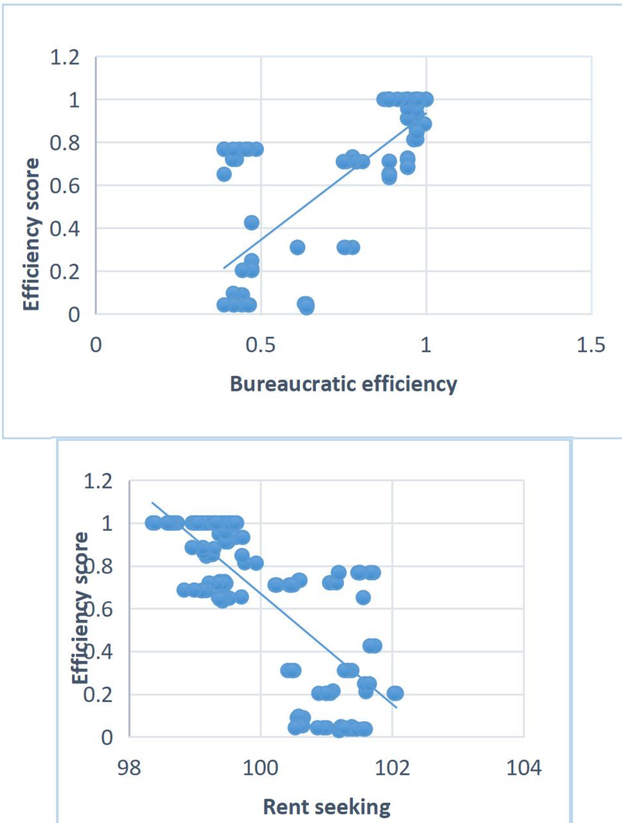


Figure 2

Volume. 4 Issue No. 3 (2025)
Online ISSN: 3006-2047
Print ISSN: 3006-2039

4.5 Quantile Regression

This study adopt the quantile regression estimation technique ,over the conventional technique conventional ordinary least squares (OLS) and panel data regression techniques, this decision is supported by studies of (Singh and Jha 2016) and(Moutinho et al. 2017).These studies highlights critical limitations of traditional approaches, such as inclination to under/overestimate relationship in heterogeneous distributions(Singh & Jha ,2016) and their inadequacy in addressing issues related to DEA efficiency score dependencies(Moutinho et al., 2017). In contrast, quantile regression, initially developed by (Koenker and Basset, 1978), accommodates non-normal data distributions and enables a more comprehensive analysis by exploring relationships at multiple quantiles (Negri & Dina, 2021). This strength of the method fits well with the goals of this study, as it helps to better understand the differences that exist across various levels of public sector efficiency and governance quality.

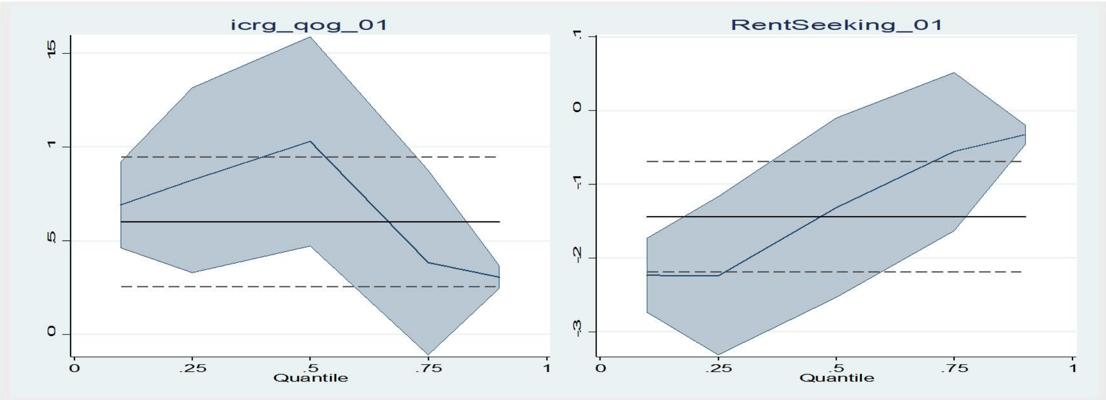
The quantile regression analysis applied at the 10th, 25th, 50th, 75th, and 90th percentiles allows for a nuanced understanding of how bureaucracy efficiency and rent-seeking behavior impact public funds efficiency across different levels of efficiency. The analysis reveals that bureaucracy efficiency consistently has a positive and significant effect on public funds efficiency. The coefficient for bureaucracy efficiency at the 50th percentile is 0.2243 indicating that at the median level of public funds efficiency, an increase in bureaucracy efficiency is associated with a significant improvement in efficiency scores. At the 10th, 25th, and 90th percentiles, the coefficients remain positive (0.1507 at Q10, 0.1791 at Q25, and 0.066 at Q90), all significant at the 1% level, suggesting a generally positive relationship across lower to higher quantiles. However, at the 75th percentile, the effect weakens to 0.083 and is no longer statistically significant, indicating that the influence of bureaucracy efficiency may diminish at higher efficiency levels. In contrast, rent-seeking behavior has a negative relationship with public funds efficiency,

Volume. 4 Issue No. 3 (2025)

Online ISSN: 3006-2047
Print ISSN: 3006-2039

especially at the lower quantiles. The coefficient for rent-seeking behavior is -0.224 at both the 10th and 25th percentiles, and -0.132 at the 50th percentile, all significant at the 1% or 5% level. However, the negative effect weakens at higher efficiency levels, as evidenced by the smaller, statistically insignificant coefficients at the 75th percentile (-0.056) and 90th percentile (-0.033). The constant term decreases from 22.242 at Q10 to 4.208 at Q90. Pseudo R^2 values start at 0.5559 at Q10 and decrease to 0.2063 at Q90, indicating a stronger model fit at lower quantiles. These results underscore the heterogeneity of the effects of bureaucracy efficiency and rent-seeking behavior across different levels of public funds efficiency, suggesting that the relationships are stronger at lower levels of efficiency and become less pronounced at higher efficiency levels.

The quantile regression plots reveal that bureaucratic efficiency has a consistently positive impact on public funds efficiency, with the effect being stronger in less efficient countries and tapering at higher quantiles. Conversely, rent-seeking behavior exerts a significant negative influence, particularly in lower quantiles, indicating that its adverse effects are more pronounced in countries with weaker public sector efficiency.



These results underscore the heterogeneity of the effects of bureaucracy efficiency and rent-seeking behavior across different levels of public funds efficiency, suggesting that the relationships are stronger at lower levels of efficiency and become less pronounced at higher efficiency levels. These

Volume. 4 Issue No. 3 (2025)
Online ISSN: 3006-2047
Print ISSN: 3006-2039

results are summarized in Table 6 below

Table 6: Dependent Variable: Efficiency Score

Independent variable	Q10	Q25	Q50	Q75	Q90
Burecracy efficiency	0.150743***	.179199***	.22433***	.08345	0.06661***
	(0.02540)	(0.05430)	(.06149)	(.054287)	(0.00651)
Rent seeking	-0.22351***	-0.22408***	-0.13188**	-0.05572	-0.03283***
	(0.02540)	(0.05430)	(0.06149)	(0.05428)	(0.00651)
Constant	22.7785***	22.9040***	13.8602**	6.45857	4.2083***
	(2.54015)	(5.4304)	(6.14990)	(5.4288)	(.65135)
Observation	144	144	144	144	144
Pseudo R2	0.5559	0.5541	0.3998	0.2472	0.2063

Pooled Quantile Regression

Note: Standard errors in parentheses

*** p<0.01

** p<0.05

* p<0.1

Table 7 represents moderate multicollinearity between Rent-Seeking and bureaucratic efficiency, but it is within acceptable limits (below 5), suggesting that multicollinearity is not a serious concern in the model.

Table 7: ***VIF***

Variance	VIF	1 / VIF
Rent-seeking	4.27	0.234233
Burecracy efficiency	4.27	0.234233
Mean VIF	4.27	

5. Discussion

Public debates increasingly highlight concerns regarding the inefficient utilization of public funds worldwide, prompting a deeper inquiry into the

Volume. 4 Issue No. 3 (2025)
Online ISSN: 3006-2047
Print ISSN: 3006-2039

factors undermining optimal allocation and use of these resources. A critical review of the literature underscores two prominent areas frequently discussed separately: bureaucratic efficiency and rent-seeking behaviors. However, the intersection and combined impact of these governmental and private sector dynamics have received relatively limited attention. Historically bureaucratic efficiency studied within institutional frameworks that highlights that government quality, transparency and administrative competence are key factors in enhancing public sector performance (Mauro, 1995; Afonso et al., 2013; Knack & Keefer, 1995).Likewise (Mauro, 1995) explained that one of the barrier in economic growth and effective resources use is corruption and bureaucratic inefficiency .Similarly, studies by (Fonchamnyo and Sama, 2016) and (Negri and Dina ,2023) also support this idea but these analysis solely focused on governance without explicitly addressing the broader economic landscape. Public choice theorists (Tullock 1991, Buchanan et al,1984) and recent study of Dinca et al 2021 have agreed that rent-seeking behaviors significantly distort resource allocation. Rent seeking behavior widely discussed in economic freedom indices and theoretical literature captures private sector manipulation that divert public resources to unproductive use. Moreover, most empirical analysis persists in using ordinary least squares regressions, which only capture average effects, neglecting variations across countries with differing efficiency levels and (Moutinho et al.,2017) and Negri & Dina ,2023) have emphasized this gap, advocating for more detailed methods like quantile regression. This study addresses, these shortcomings firstly by integrating governance and economic perspectives into a unified empirical model, assessing the simultaneous influence of both public and private sector factors on fund efficiency. Second, by applying both OLS and quantile regression techniques, it reveals how institutional and policy impacts vary across different levels of public sector efficiency, offering deeper, more precise insights. It not only enriches academic discussions but also provides

Volume. 4 Issue No. 3 (2025)
Online ISSN: 3006-2047
Print ISSN: 3006-2039

policymakers with practical, context-sensitive insights for improving public expenditure outcomes.

This paper assesses the efficiency of public funds allocation across 12 diverse countries from 2012 to 2023.Using DEA methodology, efficiency score varied significantly, with Finland, Sweden, and Switzerland achieving perfect efficiency scores 1, indicating optimal use of resources in generating societal outcomes. Whereas South Africa (0.0569) and India (0.1060) displayed notably lower efficiency, suggesting public resources are not translated into productive use. Regression analysis provided further insights, revealing a statistically significant positive impact of bureaucratic efficiency ($\beta = 0.1305$, $p = 0.004$) on public funds efficiency. This aligns closely with foundational theories and empirical findings by Mauro (1995), Knack and Keefer (1995), and studies like Afonso et al. (2013) and Negri and Dina (2023), highlighting that efficient bureaucracy enhances resource allocation effectiveness, means resources are utilized in areas where it creates value for society Conversely, rent-seeking behavior exhibited a significant negative effect ($\beta = -0.1441$, $p < 0.001$) on efficiency. This result aligns with public choice theories articulated by (Buchanan et al. ,1984, Tullock ,1991), who argued that rent-seeking diverts resources from productive public investments toward less productive or self-interested ends and also aligning with empirical findings by (Dina et al.,2021) and (Fonchamnyo and Sama,2016), who similarly reported adverse impacts of corruption and rent-seeking on public sector outcomes. The quantile regression results offered detailed understanding, that bureaucratic efficiency and rent-seeking have heterogeneous effects across different efficiency levels. For instance, bureaucratic efficiency had the strongest positive effects at median efficiency (Q50: $\beta = 0.224$, $p < 0.001$) compared to higher efficiency quantiles (Q90: $\beta = 0.067$, $p < 0.001$). This finding reveals that governance improvements might yield substantial marginal returns particularly for moderately efficient countries, a previously highlighted by Moutinho et al. (2017) but not explicitly quantified. The negative impact of rent-seeking was

Volume. 4 Issue No. 3 (2025)
Online ISSN: 3006-2047
Print ISSN: 3006-2039

strongest at lower efficiency quantiles (Q10: $\beta = -0.2235$, $p < 0.001$; Q25: $\beta = -0.2241$, $p < 0.001$), emphasizing that less efficient countries suffer disproportionately from corruption and rent-seeking practices. This finding echoes Mauro's (1995) original insights that corruption has particularly adverse effects on less developed or institutionally weaker countries. Interestingly, at higher quantiles , rent-seeking exhibited smaller negative impacts Q90: $\beta = -0.0328$, $p < 0.001$ and also bureaucratic efficiency have less positive impacts Q90: $\beta = 0.067$, $p < 0.001$,because countries like Sweden, Finland and Denmark have matured rooted institutions with deep-rooted governance practices that rent seeking behavior have limited room to limited room to operate so its damaging effect becomes minimal and bureaucratic efficiency cannot improve much further This result introduces novel empirical evidence, indicating that high-quality institutions may partially buffer against the adverse effects of rent-seeking, a point underexplored in existing literature. At the Q75 the coefficient for bureaucratic efficiency is positive (0.083), but statistically non-significant. Similarly, rent-seeking also shows no significant impact at this quantile. This indicates that countries positioned in the upper-middle range of public funds efficiency those that are performing above average but are not yet top-tier further improvements in bureaucratic quality or reductions in rent-seeking behaviors do not translate into statistically meaningful gains in efficiency. This finding aligns with observations by Negri and Dina (2023), they found that anti-corruption efforts and economic freedom enhancements had a strong impact at the lower and highest ends of the efficiency distribution, but their influence weakened or became insignificant in the middle-to-upper quantiles Q75, because these countries have already achieved the basic institutional standards required for efficiency that general improvements in governance or market freedom produce diminishing returns and efficiency gains at this stage are more dependent on innovative governance practices, advanced policy mechanisms, and sector-specific reforms rather than broad institutional upgrades. The significance of

Volume. 4 Issue No. 3 (2025)
Online ISSN: 3006-2047
Print ISSN: 3006-2039

these factors reappears at the 0.90 quantile (Q90), suggesting a threshold effect. At this elite level of efficiency, the fine-tuning of bureaucratic processes and strict control over rent-seeking behavior once again becomes crucial. This is because, in high-performing governance environments, marginal improvements in institutional quality can still yield meaningful efficiency gains, especially when systems are already optimized. Conversely, in mid-high efficiency countries, other structural or macroeconomic factors might overshadow these governance nuances, making their statistical impact less visible.

This nuanced dynamic not only reinforces the context-dependent nature of governance impacts but also adds novel empirical evidence to the literature. By demonstrating that the influence of bureaucratic efficiency and rent-seeking is non-linear and quantile-sensitive, your study offers practical insights for policymakers: knowing where along the efficiency spectrum governance reforms are most effective is essential for targeted public sector improvements. This study involves various sector health, education and infrastructure, there is chance that a large input from one sector could unfairly influence the overall efficiency score. But these input were chosen on the base of established method used in previous research aiming to capture broad nature of government spending. Likewise, the use of the economic freedom index indirectly capture rent seeking behavior, in further direct measure must be utilize. Still, EFI is a commonly used and trusted measure that effectively shows how regulations and government interventions can create opportunities for rent-seeking. This research contributes significantly through two distinct dimensions of public sector performance: the internal efficiency of government institutions and the external pressures of rent-seeking behavior. Distinguishing from past studies that focus on bureaucratic efficiency or corruption in isolation, this study offers a holistic perspective by simultaneously examining both factors and their combined impact on the effective allocation of public funds. The application of Data Envelopment

Volume. 4 Issue No. 3 (2025)
Online ISSN: 3006-2047
Print ISSN: 3006-2039

Analysis (DEA) for efficiency measurement, alongside the use of quantile regression, provides a greater clarity on how these effect fluctuate across countries with different efficiency levels, an aspect often overlooked in traditional mean-based analyses. This methodological advancement not only enriches the academic discourse but also equips policymakers with evidence that governance reforms cannot use a blanket approach. For less efficient countries, the findings suggest that improving bureaucratic capacity and licensing requirement and restrictive regulatory environment must be relaxed that lower the rent seeking behavior can yield substantial gains in public funds utilization. For nations already optimized, the study underscores the need for continuous innovation and vigilant regulatory oversight to sustain high performance. It also supports more targeted, context-specific policy interventions, thereby contributing to more transparent, accountable, and effective public spending worldwide.

6. Conclusion

This research explored the impact of bureaucratic efficiency and rent-seeking behavior on the efficiency of public fund utilization extending across 12 countries from 2012 to 2023. Our research was based on H1: that higher bureaucratic efficiency improves public fund efficiency, H2: rent-seeking undermines public fund efficiency, H3: these effects vary across countries with different efficiency level and H4: the negative impact of rent-seeking is strongest in low-efficiency contexts. Using Data Envelopment Analysis (DEA) to measure public funds efficiency, along with OLS and quantile regression models, the study found strong support for all four hypotheses. The DEA results revealed a marked contrast in how efficiently countries use their public funds. High-income countries with strong governance — notably Finland, Sweden, and Switzerland with Norway and Denmark close behind — achieved the highest efficiency scores of 1.0, indicating they are on the efficiency frontier, along lower-income or governance-challenged countries like India and South Africa had the lowest scores approximately 0.10 or less. For instance, South Africa's efficiency score ~0.06 was only a fraction of Finland's 1.0, underscoring the magnitude of the gap between the least and most efficient performers. Countries in the middle of the range such as Brazil with ~0.74 or China around 0.25 fell between these extremes, reflecting partial progress and ongoing challenges. This confirms that well-functioning bureaucracies and clean governance correlate with better public spending outcomes. OLS regression further reinforced H1 and H2: bureaucratic efficiency showed a positive, significant effect on public fund efficiency, whereas rent-seeking had a significant negative effect. Together, these two factors explained a large share of the variance in efficiency scores nearly 60%, underscoring that governance quality is a key driver of how effectively public resources are used. Crucially, the quantile regression analysis demonstrated that the impact of bureaucracy and rent-seeking is not uniform across all countries, supporting H3. In less efficient countries (lower quantiles of the efficiency distribution), rent-seeking had a particularly strong negative effect on public fund efficiency, confirming H4. For instance, at the 10th percentile (the most inefficient group), an increase in corruption had roughly double the adverse effect on efficiency compared to the median country. By contrast, in the most efficient countries upper quantiles, the detrimental impact of rent-seeking was much smaller and sometimes statistically insignificant. The positive influence of bureaucratic quality was observed across quantiles but was most pronounced in low-to-middle efficiency countries, suggesting that improving bureaucracy yields the greatest marginal gains in those environments. In summary, countries starting with lower efficiency stand to benefit the most from anti-corruption efforts and administrative improvements, whereas very high-efficiency countries see more modest returns from further governance gains. From insight into impact, low-efficiency countries should take concrete steps like streamline administrative processes, invest in civil service reforms providing adequate training, and instituting performance accountability can make the bureaucracy more effective and responsive, thus improving the execution of public projects. Policymakers should prioritize reducing excessive regulatory burdens, simplifying business procedures, and limiting discretionary powers that become a reason for rent seeking behavior. Build a system that promoting openness and competitive economic environment, governments can discourage private actors from manipulating policies for personal gain. Encourage open data on government spending and involve citizens and civil society in monitoring public projects. Public reporting of expenditures and results creates pressure for officials to use funds efficiently. External audits and community oversight can help catch and prevent inefficiencies or misuse early on. he implementation of contemporary public financial management tools like budget tracking or performance based budgeting and proven anti-corruption practices can be a means of improving governance as well as resource utilization. Through the analysis of countries with varying economic states, from developing economies to advanced democracies, this research indicates that the governance-efficiency link persists across diverse contexts. A unique amalgam of DEA and quantile regression revealed heterogeneity that is not captured by mean effects, like the shifts in the governance-efficiency relationship at various levels of performance. This is a noteworthy leap forward from existing knowledge as it signifies that enhancing bureaucracy and managing rent seeking behaviors are essential for countries that are lagging in efficiency. In a world of tight public budgets, the message of this research is the strengthening of institutions and reducing rent-seeking behaviors through effective approaches in order to maximize the impact of public expenditures.

Future studies need to explain the dynamics through which rent-seeking behavior influences public funds allocation, while acknowledging that it is a compound, dynamic and layered process. They should also prioritize the investigation of rent-seeking behavior as it often begins in one sector and gradually makes its way into influencing other areas of public spending through networks of vested interest and policy manipulation rather than viewing this behavior as just a one-time occurrence. Examining these transmission channels, and seeing how rent-seeking behavior flows from one domain to another, will help shed light on unrevealed dynamics that stimulate inefficiency. Advanced approaches of modelling, like network analysis or path dependency frameworks assist in mapping the influence routes, hence providing a better understanding of how rent seeking systematically contorts resource allocation at multiple governance levels. This might facilitate in gaining guidance for designing holistic anti-rent-seeking policies that target not just the effects but also the basis and systematic underpinning of influence.

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