THE IMPACT OF BUDGET ALLOCATION
ON ROAD INFRASTRUCTURE QUALITY IN INDONESIA

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Abstract

Financial reports in the context of government are a means of accountability for regional financial management during a certain period. This study aimed to examine whether components of local government financial statements can be effectively used to evaluate performance in managing spending and revenue collection. To achieve the aim, the association of road quality with infrastructure spending and motor vehicle tax revenue was investigated, using fiscal independence as a moderating factor. The investigation was conducted using data from 341 regencies across Indonesia from 2017 to 2022. The result showed that infrastructure spending was negatively associated with improvements in road quality. Meanwhile, motor vehicle tax revenue was not associated with the improvements in road quality. The relationship between spending and road quality was particularly pronounced in Eastern Indonesia compared to Western regions, and regions with lower fiscal independence.

Keywords: Decentralization; Infrastructure Spending; Motor Vehicle Tax; Road Quality; Indonesia.

Abstrak

Laporan keuangan dalam konteks pemerintahan merupakan alat pertanggungjawaban atas pengelolaan keuangan daerah selama periode tertentu. Penelitian ini memiliki tujuan untuk melihat apakah komponen dalam laporan keuangan pemerintah, khususnya pemerintah daerah dapat digunakan dalam hal evaluasi kinerja pemerintah daerah dalam hal efisiensi serta efektivitas penggunaan anggaran. Penelitian ini melihat apakah belanja infrastruktur jalan dan pendapatan pajak kendaraan bermotor berhubungan dengan kualitas infrastruktur jalan pada suatu daerah yang sama, dengan dimoderasi oleh kemandirian fiskal. Dengan menggunakan data 341 kabupaten/kota di Indonesia selama tahun 2017-2022, penelitian ini menemukan bahwa pengeluaran belanja infrastruktur jalan oleh pemerintah kabupaten/kota di Indonesia berhubungan negatif dengan peningkatan kualitas jalan kabupaten/kota, sementara penerimaan pajak kendaraan bermotor oleh pemerintah daerah di Indonesia tidak berhubungan dengan peningkatan kualitas jalan kabupaten/kota terkait pada tahun tersebut. Hasil ini terbukti lebih kuat pada kabupaten/kota yang berada di Indonesia bagian timur dibandingkan Indonesia bagian barat, dan lebih kuat pada daerah yang belum mandiri dibandingkan daerah yang sudah mandiri.

Kata Kunci: Desentralisasi; Belanja Infrastruktur; Pajak Kendaraan Bermotor; Kualitas Jalan; Indonesia

INTRODUCTION

Financial statements are means for an entity to show accountability to various stakeholders and support decision-making. In the context of government, financial reports are a tool for accountability for regional financial management over a specific period. According to *Peraturan Pemerintah (PP) Nomor 8 Tahun 2006 Tentang Pelaporan Keuangan Dan Kinerja Instansi Pemerintah* (Government Regulation No. 8 of 2006 on Financial Reporting and Performance of Government Agencies), financial reports of both central and regional governments need to include a minimum of four key components, such as Budget Realization Report (LRA), balance sheets, cash flow reports, and notes to the financial statements. In the current Government Accounting and Standard (SAP), operational reports and balance sheets are prepared on an accrual basis, while cash flow reports and LRA continue to use a cash basis. Specifically, LRA provides comprehensive data on budget realization, which serves as a critical tool for evaluating the efficiency and effectiveness of regional governments in utilizing budget (Komite Standar Akuntansi Pemerintahan, 2022). Research by Fahlevi et al. (2022) revealed that the accrual basis in the preparation of accounting information in local governments in Indonesia is only "ceremonial" to meet the demands of donor agencies. Budgeting is still the most important financial information for public managers and is related to government performance measurement schemes.

Budget efficiency is closely associated with quality government spending, which should ideally lead to a reduction in poverty rates and an improvement in human development index (HDI) (Masduki et al., 2022). Based on *Undang-Undang Nomor 1 Tahun 2022 Tentang Hubungan Keuangan Antara Pemerintah Pusat Dan Pemerintah Daerah* (Law Number 1 of 2022 concerning Financial Relations between Central and Regional Governments), tax is the primary source of government revenue allocated to fund regional spending in providing services for the greatest prosperity of people. Previous studies conducted in Nigeria showed that government spending on transportation and communication infrastructure, education, and health significantly contributed to economic growth (Barra et al., 2020). Studies in Nigeria and 29 other developing countries found that tax is generally associated with increased economic growth (Adefolake & Omodero, 2022; Ho et al., 2023). However, a global study across 75 countries revealed that higher tax revenues had a significant negative relationship with HDI (Asawasakulkrai, 2022).

Fiscal federalism theory by Richard A. Musgrave suggests that government efficiency and resource management practices vary across regions. Typically, traditional fiscal federalism theory views the government as a benevolent entity and states that decentralization enhances allocative efficiency and promotes better government policies through the provision of goods and services (Miao et al., 2021). On the other hand, second-generation fiscal federalism theory by Wallace E. Oates assumes that government agents are often motivated by self-interest and political agendas, which can impact the decision-making process (Majocchi, 2008). Even though the advantages of fiscal decentralization require further exploration, Law Number 1 of 2022 concerning Financial Relations between Central and Regional Governments emphasizes the aim to improve government performance in providing

more appropriate services to meet community needs.

Government performance assessment is carried out on activities that use public resources, particularly budget. According to fiscal federalism theory, decentralized regions allow governments to allocate resources more efficiently. However, second-generation theory shows that decentralization leads to inefficiency, as government may prioritize personal or political interests over public welfare. This implies that the efficiency of government resource management varies based on the extent of decentralization. Following this discussion, resource management practices are documented in financial statements, which serve as a basis for evaluating performance (Komite Standar Akuntansi Pemerintahan, 2022). Currently, the quality of government performance is assessed through various metrics, one of which is infrastructure development.

Good infrastructure is very important in attracting investment to Indonesia, as it creates new job opportunities. Data from the Ministry of Public Works and Public Housing (PUPR) highlights that completed infrastructure projects positively impacted economic growth at both regional and national levels. Despite these benefits, the average stability of roads in 2023 was only 53% (P. PUPR, 2024). A widely publicized case of damaged roads in Bandar Lampung City that went viral in 2023 (Jaya & Wismabrata, 2023) emphasized the persistent issues. This example shows that the provision and maintenance of road infrastructure in various regions in Indonesia are still far from optimal.

Previous studies explored the relationship between road infrastructure spending and its quality. In developing countries, the World Bank reports that road budgets are crucial for funding maintenance, as they improve funding adequacy and reduce capital bias in road sector spending. However, there is limited evidence to prove that road budgets lead to greater efficiency (Foster et al., 2022). In the United States, highway maintenance spending plays a significant role in improving bridges and road quality (Chen, 2017). Moreover, increasing government spending does not necessarily reflect better infrastructure quality. In some cases, higher spending can lead to inefficiency, resulting in no substantial improvement in infrastructure quality (Asuquo et al., 2021). However, in Indonesia, there are limited studies that examine the relationship between these two variables.

Studies on the relationship between motor vehicle tax and road infrastructure quality showed that vehicle tax can serve as a reliable source of funding for road repairs in Iowa County, USA (Owusu-Ababio et al., 2023). In Indonesia, there are limited studies that discuss this relationship, as existing ones only showed that local government revenue does not significantly improve the quality of damaged roads. This issue is attributed to a greater focus on constructing new roads rather than maintaining existing ones, leading to suboptimal road maintenance quality (Saragih & Khoirunurrofik, 2022). On the other hand, studies have shown that increasing the allocation of local tax funds positively impacts road quality index. This implies that government investment in road infrastructure has a real positive impact (Adrian, 2024). However, the investigations are only limited to specific regions and do not cover the broader context in Indonesia.

This study seeks to fill the research gaps by using the information of local government financial reports (LKPD), specifically focusing on income and expense stated in LKPD, to determine whether they can be used as an indicator for assessing

local government performance. In line with the theory explained earlier, this study will also use the moderating variable of fiscal independence to see the role of fiscal decentralization in explaining government efficiency in infrastructure provision.

This research aims to provide a clearer picture of the relationship between financial statement information, as measured by two independent variables (road infrastructure spending and vehicle tax revenue) and one moderating variable (fiscal dencentralization), with local government performance as measured by road quality in districts/cities in Indonesia. This study uses secondary data derived from local government financial reports and road quality data in all districts/cities in Indonesia in 2017-2022.

LITERATURE REVIEW

Fiscal Federalism Theory

Traditional fiscal federalism theory assumes the government is a benevolent agent and argues that decentralization allows for the provision of public goods and services adjusted to local needs. This leads to more efficient allocation of resources and better government policies (Miao et al., 2021). Additionally, decentralization helps the central government, which often faces challenges and higher costs in gathering information about local communities. Since local governments are closer to constituents, local demands can be addressed, resulting in more targeted and effective government spending (Oates, 2008). In cities with high fiscal decentralization, efficient allocation of resources has been associated with improvements in infrastructure, such as better bridges and highways in the United States and increased wastewater treatment capacity in Chinam (Escaleras & Calcagno, 2018; Liu & Zhang, 2013). On the other hand, second-generation fiscal federalism theory suggests that local governments are often driven by political interests and agendas. With decentralization, local governments have the authority to determine spending allocations, which can sometimes lead to decisions that prioritize local benefits over broader public needs (Majocchi, 2008). For example, studies have shown that fiscal decentralization in US has led to inefficient protection against natural disasters across levels of government (Miao et al., 2021).

Local Government Financial Statement (LKPD)

The issuance of Government Regulation No. 71 of 2010 on SAP and Regulation of the Minister of Home Affairs No. 64 of 2013 concerning the Implementation of Accrual-Based SAP in Regional Governments is one of the steps of the Indonesian Government's commitment to starting the full implementation of the accrual basis in local government accounting practices. Currently, budgeting is still the most important financial information for public managers and is related to the government's performance measurement scheme (Fahlevi et al., 2022). In Indonesia, government financial reports are prepared based on SAP. Operational reports and balance sheets are prepared on an accrual basis, while cash flow reports and LRA still use a cash basis. LRA provides information related to total budget realization, which is useful for assessing the performance of local governments in terms of efficiency and effectiveness of budget use. The elements of LRA consist of revenue, spending, transfers, and financing. Revenue-LRA item reflects revenue

from other governments that increases the Excess Budget Balance for the relevant fiscal period, which is the government's right (Komite Standar Akuntansi Pemerintahan, 2022). This revenue includes Local Original Revenue (PAD), Transfer Revenue, and Other Legitimate Local Revenue, with local tax being part of PAD.

Road Infrastructure Spending

Spending is all payments made by the Government General Treasurer that reduce the Excess Budget Balance during budget year (Komite Standar Akuntansi Pemerintahan, 2022). Generally, spending is categorized into employee expenses, goods and services, and capital spending. Among these categories, capital spending comprises spending on the acquisition of tangible fixed assets with a benefit value of more than 12 (twelve) months, intended for use in government activities (Kemenkeu, 2017). Road infrastructure spending specifically relates to budget allocations for procuring road and bridge infrastructure, irrigation systems, and associated networks until they are ready for use. According to Peraturan Menteri Keuangan (PMK) Nomor 101/PMK.02/2011 Tentang Klasifikasi Anggaran, this category of spending includes acquisition or construction costs, as well as all other related expenses incurred to ensure the infrastructure becomes functional. In other contexts, spending on highway maintenance has been shown to significantly improve quality of state highways in the United States (Chen, 2017). However, increased government spending does not always reflect better infrastructure. In some cases, higher spending can lead to inefficiencies, preventing improvements in infrastructure quality despite the additional funding (Asuquo et al., 2021).

Motor Vehicle Tax

Motor vehicle tax refers to a fiscal obligation imposed on owners and/or users of motor vehicles. The subject of this obligation is an individual or legal entity that owns a motor vehicle. The determination of the tax amount is made by the Motor Vehicle Selling Value (NJKB) multiplied by a weighting factor that describes the level of road damage and/or environmental pollution caused by the use of the vehicle. This tax is a type of local tax that is regulated and collected by provincial government authorities. Local governments use increased taxes to provide more infrastructure than when they are faced with the same amount of increased transfer revenue. This is particularly true in regions where citizens are knowledgeable about the use of the taxes they pay. In this context, physical infrastructure can be seen and benefited directly by taxpayers, so local governments are under greater demand to provide better infrastructure when collecting higher taxes (Gadenne, 2017).

Hyphotesis Development

Previous studies on the relationship between provincial government infrastructure spending and road infrastructure quality are still limited and have not been concluded. According to the theory of fiscal federalism, in countries that adopt fiscal decentralization, the efficiency in managing resources can differ across regions. For instance, in the United States, highway maintenance spending plays an important role in improving bridges and road quality (Chen, 2017). This indicates a positive relationship between road infrastructure spending and road quality. On the other hand, higher government spending does not necessarily reflect better

infrastructure quality. Sometimes, higher spending can result in inefficiency, leading to stagnation in infrastructure quality despite the increase in spending (Asuquo et al., 2021). This result indicates a negative relationship between road infrastructure spending and quality. In the context of Indonesia, studies examining the relationship between these two variables are still limited. Therefore, the first hypothesis built in this study is as follows.

H$_1$: Road infrastructure spending is related to road quality.

Based on Undang-Undang Nomor 28 Tahun 2009 Tentang Pajak Daerah Dan Retribusi Daerah, motor vehicle tax is a fiscal obligation imposed on owners and/or users of motor vehicles. This tax falls under the category of regional tax which is regulated and collected by the provincial governments. Regional governments often utilize tax increases to provide more infrastructure than when faced with an increase in transfer income of the same amount. This scenario is more prevalent in regions where residents have a clear knowledge of how tax contributions are used (Gadenne, 2017).

A study conducted in Iowa County, USA, showed that motor vehicle tax is a viable option to generate additional funds to complete pending road repairs and meet the matching fund requirements for other external grants (Owusu-Ababio et al., 2023). Similarly, in Indonesia, studies have shown that increasing local tax allocations positively impacts road quality indices, indicating the significant role of government investment in road infrastructure (Adrian, 2024). However, the current study only considered the context of Medan City and did not explore the broader implications across Indonesia. These results suggest a positive relationship between motor vehicle tax and road infrastructure quality.

In the Indonesian context, other studies have found that local governments' revenue does not significantly improve quality of damaged roads. This may be because the current government is more focused on constructing new roads than maintaining the existing roads, hence the level of maintenance is still not optimal (Saragih & Khoirunurrofik, 2022). With these conflicting results, the second hypothesis built into this study is as follows.

H$_2$: Motor vehicle tax is related to road infrastructure quality.

Fiscal decentralization refers to the process of transferring fiscal decision-making authority from the central government to local governments while ensuring accountability to the constituents. This process includes two main components, namely the transfer of responsibility for public service provision from national ministries to local governments, and granting local governments the authority to raise the revenues needed to fund services that meet local needs (Menon, 2006). In Indonesia, fiscal decentralization was initially regulated in Law Number 33 of 2004 on the Fiscal Balance between the Central and Regional Governments. Subsequently, it was updated through the issuance of Law Number 1 of 2022 concerning HKPD Law. Despite its implementation, the benefits of fiscal decentralization are still debated. In traditional and second-generation fiscal federalism theories, fiscal decentralization can enable better adjustment of local services to heterogeneous local demand, resulting in allocative efficiency and better government policies. However, fiscal decentralization also allows governments to act based on political

interests and agendas (Miao et al., 2021). Previous studies showed that cities with fiscal decentralization improved quality of bridge and highway infrastructure in the United States and built more wastewater treatment capacity in China (Escaleras & Calcagno, 2018; Liu & Zhang, 2013). Meanwhile, other studies have shown that fiscal decentralization leads to inefficient protection against natural disasters across different levels of government in the US federal system (Miao et al., 2021).

Decentralization is expected to increase public investment in infrastructure, particularly through increased tax revenue. This implies that higher regional autonomy is correlated with increased infrastructure investment (Kappeler et al., 2013). However, the increase in investment is not in line with the level of efficiency. In the context of inefficiency, spending may not be consistent with the expected output. Regions that rely on tax revenues tend to allocate spending more efficiently. Empirical evidence suggests that fiscal decentralization improves infrastructure quality, specifically roads and bridges in US states. This is because local governments have better knowledge of regional needs and can allocate budgets to deliver higher-quality public services. Other studies have shown that fiscal decentralization can result in more inefficient spending. For example, decentralization provides public services in the form of inefficient protection against natural disasters in the United States. Although fiscal decentralization provides freedom or autonomy to local governments, this freedom will be seen as an opportunity for political agendas for local leaders, which then leads to inefficient services (Miao et al., 2021). Despite the previous investigation, there is still limited study on the relationship between fiscal decentralization and road infrastructure quality, particularly in the Indonesian context. Therefore, the third hypothesis proposed is as follows.

H$_3$: Fiscal decentralization moderates the relationship between local government road infrastructure spending and road infrastructure quality.

Decentralization increases the enthusiasm of local governments to collect more tax (Frank & Martinez-Vazquez, 2014). In the context of road infrastructure, motor vehicle tax has proven to be a sustainable option to raise additional funds to complete pending road repair projects (Owusu-Ababio et al., 2023). On the other hand, the efficiency of increased revenue driven by fiscal decentralization policies has become a new problem. In Indonesia, evidence suggests that regions with a higher capacity to fund spending using local revenues show greater efficiency in resource allocation (Kurnia, 2012). Another study in 36 OECD countries shows that decentralization of tax revenues can reduce public sector efficiency (Afonso et al., 2023). Based on these contrasting results, the fourth hypothesis is formulated as follows.

H$_4$: Fiscal decentralization moderates the relationship between motor vehicle tax revenue and road infrastructure quality.

RESEARCH METHODOLOGY

The population used were all regencies or cities in all provinces in Indonesia from 2017 to 2022. This is because the availability of data provided by the Ministry of Finance and the Ministry of Public Works and Housing is only available for that

year. However, the data provided is still potentially incomplete because the data is collected from all regencies/cities governments in Indonesia. Therefore, the sample was selected by examining local governments that presented complete financial reports and road condition reports in all observation years. Among 508 regencies/cities in the country during the observation period, 341 regencies/cities presented complete data. Consequently, the number of observations for 6 years was 2,046 observations. This study used secondary data in the form of LRA and regional road condition data from 2017 to 2022, which were obtained from the Directorate General of Fiscal Balance of the Ministry of Finance and the Data and Information Technology Center of the Ministry of PUPR.

The dependent variable used was quality of regency/city road infrastructure, which was under the authority of the Regency/City Regional Government (Undang-Undang Republik Indonesia Nomor 2 Tahun 2022 Tentang Perubahan Kedua Atas Undang-Undang Nomor 38 Tahun 2004 Tentang Jalan). In the context of this study, good roads were defined as roads in good and moderate condition (PUPR, 2024). Following this discussion, dependent variable was measured using changes in the length of regency/city roads in good condition (Chen, 2017) each year.

Independent variable used in this study was Regional Government Road Infrastructure Spending of Regency/City, measured by the total realization of Transportation Infrastructure Spending related to roads in each Regency/city each year (Chen, 2017). The second independent variable used was motor vehicle tax, measured by the total realization of motor vehicle tax revenue each year (OECD, 2019).

This study also examined the moderation of fiscal decentralization. According to Yimenu (2023), fiscal decentralization was measured by dividing the total Original Regional Income (PAD)of the regency/city by the total annual income. Therefore, a higher division result showed greater regional independence. As explained earlier, the moderating role of fiscal decentralization is expected to strengthen or weaken the relationship between the independent variable and the dependent variable due to the conflicting theories of first and second generation fiscal federalism.

Previous studies attempted to control other variables that were considered to influence government efficiency in providing services to the community, including economic growth, population, Gini coefficient, high school completion rate, and life expectancy at birth (Liu & Zhang, 2013). These variables were used as indicators of public sector performance across demographic, economic, educational, and health aspects (Afonso et al., 2023), allowing for the control of differences in region characteristics.

Data processing in this study will be conducted by Stata, because the software has various analytical capabilities with personalized usage according to the commands given by the user. In addition, Stata has a large user community, therefore researchers can easily find tutorials, discussion forums, and other resources to help solve problems. Classical assumption tests were also conducted to assess quality of the measurements. The multicollinearity tests were conducted by examining VIF (Variance Inflation Factor) values. Following this discussion, VIF value was below the limit of 10, at 1.33, indicating that there was no multicollinearity problem in the variables used.

Heteroscedasticity was tested by using Breusch–Pagan/Cook–Weisberg test. The results of Breusch–Pagan/Cook–Weisberg test showed that there was a heteroscedasticity problem, with a chi-squared prob. value lower than 0.05, specifically 0.000. Therefore, regression testing was carried out by adding the "robust" command to the Stata software to provide additional robustness to the standard error. Autocorrelation was assessed by analyzing Breusch–Godfrey LM test statistics, where a p-value below 0.05 indicated an autocorrelation problem. Based on the results of Breusch–Godfrey LM test, the chi-squared prob. value was 0.000, which was lower than 0.05. Moreover, there was an autocorrelation problem in the study model used, which was addressed by using "cluster" command in the Stata software.

Hypothesis testing was conducted using a regression test with *fixed effects*. This was carried out because, based on the Hausman test, the difference between coefficients was not systematic, allowing for the use of either random or *fixed effects*. The regression model used to answer the study question was adopted from Chen (2017), as follows:

$$ROAD_{it} = \beta_0 + \beta_1 EXP_{it} + \beta_2 VHT_{it} + \beta_3 FD_{it} + \beta_4 EXP_{it}*FD_{it} + \beta_5 VHT_{it}*FD_{it}$$

$$+ \beta_6 EG_{it} + \beta_7 POP_{it} + \beta_8 GNI_{it} + \beta_9 HS_{it} + \beta_{10} UHH_{it} + \varepsilon_{it}$$

With

ROAD	: Road infrastructure quality
EXP	: Road infrastructure spending
VHT	: Motor vehicle tax
FD	: Fiscal decentralization
EG	: Economic growth
POP	: Population
GNI	: Gini coefficient
HS	: Level of completion of education (high school)
UHH	: Life expectancy at birth

RESULT AND DISCUSSIONS

Table 1 showed that road infrastructure quality, assessed through the change in the length of regency/city roads in good condition (km), had an average increase of 6.9 km, where the maximum value reaches 1,112km. Then, the minimum value of changes in the length of regency/city roads in a stable condition reaches -1,454km, which means that the regency/city roads in a stable condition actually decrease. Despite the decrease in Steady Condition roads, the average local government road infrastructure spending was IDR 63,126,068,562.07. In fact, the maximum value of road infrastructure spending reached Rp1,697,555,704,337.34. The average provincial motor vehicle tax revenue was IDR 1,873,524,803,388.12. During 2017-2022, provinces that have above-average motor vehicle tax revenues are North Sumatra Province, Central Java Province, West Java Province, East Java Province, and Banten Province. Additionally, the average value of fiscal decentralization moderation variable was 11.3%, implying that the level of independence among regencies/cities was generally low.

Table 1. Descriptive Statistics

Variables	Observation	Mean	Std. Dev	Min	Max
Dependent					
ROAD (km)	2,046	6.98	127.11	-1,454.61	1,112.81
Independent					
EXP (ln Rp)	2,046	23.86	1.69	13.04	27.14
VHT (ln Rp)	2,046	27.27	1.45	24.42	30.55
Moderation					
FD	2,046	0.11	0.08	0.00	0.84
Control					
EG	2,046	10.78	0.43	9.75	12.38
GNI	2,046	0.35	0.03	0.24	0.45
HS	2,046	0.60	0.10	0.27	0.87
UHH	2,046	0.69	0.03	0.56	0.77

Source: Processed by Researchers (2024)

Table 2 showed the regression results, implying that the relationship between road infrastructure spending and road quality was significant ($p < 0.05$), hence, H0 is rejected. Therefore, road infrastructure spending by regency/city governments in Indonesia was negatively related to the improvement in quality of related regency/city roads.

The results showed that high spending on road infrastructure by local governments was not commensurate with the increase in the length of quality regency/city roads in the corresponding year. Therefore, local government spending was still inefficient because high spending did not correlate positively with the increase in length of quality regional roads. The results were also similar to the previous study by Asuquo et al. (2021) in Nigeria, stating that higher spending actually led to inefficiency. This scenario caused insignificant improvement in infrastructure quality despite increased spending. Following this discussion, results showed a negative relationship between road infrastructure spending and quality.

This study showed that road infrastructure spending component in LKPD served as an indicator for assessing government performance, despite the negative relationship observed in this hypothesis test. In line with the purpose of road infrastructure spending account in LKPD, this spending was intended to secure road and bridge infrastructure, irrigation systems, and related networks until they were ready for use. In other words, an increase in this spending should be appropriate to the increase in road infrastructure to a ready-to-use condition. Moreover, the government focused more on physical road construction than maintenance, which resulted in suboptimal road maintenance level and quality (Saragih & Khoirunurrofik, 2022). If we refer to the data from PUPR, the average length of regency/city roads in good condition each year tends to fluctuate, where road construction increases, but is not followed by maintenance, resulting in decreased road quality. The data is illustrated in the following figure 1.

**Table 2. Hypothesis Testing, Dependent Variable: ROAD**

Variables	Model 1	Model 2
EXP	-1,319	-8,746**
	(1,669)	(3,579)
VHT	1,622	2,057
	(2,433)	(11,66)
FD	43,09	-893,7
	(39,98)	(1,777)
EXP_FD		43,25*
		(23,80)
VHT_FD		1,566
		(68,48)
EG	-17,72***	-130,8***
	(6,570)	(33,48)
GNI	-46,20	-507,3**
	(84,15)	(200,4)
HS	-5,500	-43,91
	(26,93)	(70,86)
UHH	-8,200	2,983***
	(107,1)	(897,2)
Constant	205,6*	-314,5
	(106,4)	(436,3)
Observations	2.046	2.046
R-squared	0,006	0,025

Description: Model 1: testing with independent variables EXP, VHT, FD. Model 2: testing with independent variables EXP and VHT; moderating variables EXP_FD and VHT_FD.
Robust standard errors, clustered by local government, in parentheses. ***$p<0.01$,**$p<0.05$,*$p<0.1$
Source: Processed by Researchers (2024)

Figure 1. Average Total and Good Condition Length of District Roads in Indonesia
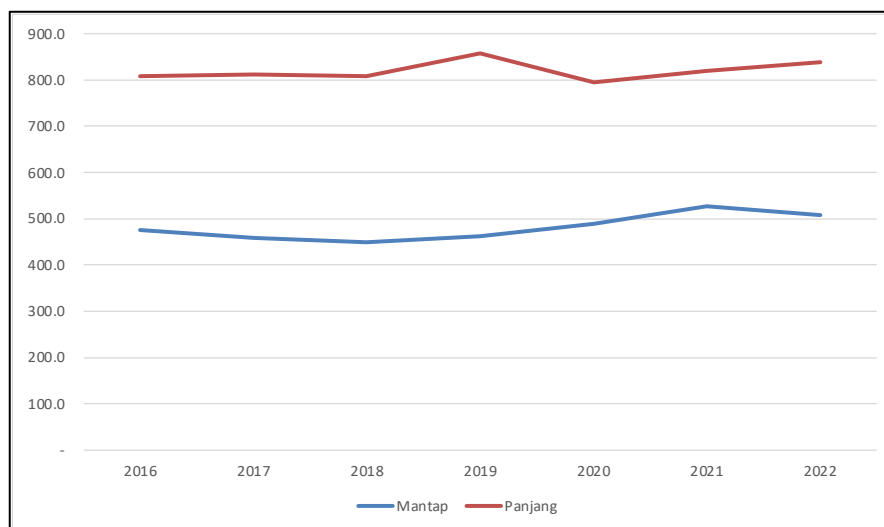
Source: Pusdatin PUPR (2024)

Table 2 showed that the relationship between road infrastructure spending

and quality had insignificant results (p 0.860), hence, H2 was rejected. This implied that motor vehicle tax revenues by local governments in Indonesia were not related to improvements in quality of related regency/city roads. The results were consistent with the previous study in the Indonesian context, indicating that the income held by local governments did not significantly improve quality of damaged roads. A previous study showed that government was more focused on physical road construction than maintenance, resulting in a less optimal level of maintenance (Saragih & Khoirunurrofik, 2022). This assumption was proven by observing data obtained from PUPR. The data showed that changes in the length of roads in stable conditions tended to fluctuate every year. During this period, road construction increased but was not balanced by maintenance, leading to a decrease in road quality.

The outcome of H2 test was inconsistent with the previous study (Gadenne, 2017), implying that decentralized local governments (more independent by collecting more tax) faced greater pressure from taxpayers to provide better infrastructure, compared to when they relied on transfer revenues from the central government. These results also contradicted previous studies in Iowa County, USA, and Medan City, where vehicle tax was a viable option to raise additional funds for road repairs (Adrian, 2024; Owusu-Ababio et al., 2023).

Table 2 showed that the relationship between the interaction variables of road infrastructure spending and fiscal decentralization with road quality produced significant results at the 10% level (p 0.070), hence, H3 was accepted. This signified that fiscal decentralization could moderate the relationship between road infrastructure spending and quality, even though this moderation effect tended to weaken the relationship. In other words, regions that had a higher level of fiscal independence managed road infrastructure spending better than regions with a low level of fiscal independence.

The outcome of this study was consistent with the theory of first-generation fiscal federalism, where fiscal decentralization allowed local governments to provide better services. Furthermore, the result was in line with arguments from previous studies, suggesting that higher regional autonomy would increase investment in infrastructure (Kappeler et al., 2013). Following this discussion, decentralized regions have more efficient spending in the context of relying on tax revenues. The more efficient spending made the best use of budget and led to improved infrastructure quality, particularly in quality of highways and bridges in US. Therefore, fiscal decentralization could reduce the inefficiency of road infrastructure spending management in improving road quality in local governments in Indonesia. To achieve the expected level of spending efficiency, this result similarly suggested the need for support in increasing institutional capacity and fiscal governance at the regional level (Asuquo et al., 2021). Strengthening the regulatory and supervisory framework was also needed, hence, the potential of fiscal decentralization could truly be reflected in the main pillars underlying HKPD Law, particularly in the pillar of improving quality of regional spending.

H4 testing was conducted using a moderated regression analysis test with fixed effects, similar to the regression test in the previous hypothesis. Table 3 showed that the relationship between the interaction variables of motor vehicle tax and fiscal decentralization with road quality produced insignificant results (p

0.982), hence, H4 was rejected. In this context, fiscal decentralization did not moderate the relationship between motor vehicle tax revenue by local governments and road quality. This implied that regions had the same characteristics in allocating motor vehicle tax revenue to improve road infrastructure quality, regardless of decentralization level. The result was not consistent with both first and second-generation theories of fiscal federalization, as fiscal decentralization did not have significant differences among regencies/cities in Indonesia.

The results of this study indicate that the components in the financial statements do not solely describe good government performance. The results of this study also reinforce that in budgeting, the government is expected to be more careful not to always increase the budget. This is because a high budget is not solely followed by high performance as well. The results of this study are also able to encourage local governments to be more independent, so as to achieve more equitable independence between regions in Indonesia.

Sensitivity Test

Sensitivity tests were conducted by dividing the sample into two subsamples based on location (western and eastern Indonesia) and level of fiscal independence. This was performed to examine whether differences in characteristics between regencies/cities affected the results of the previous test. The first test was conducted by dividing the sample into two location subsamples, namely regencies/cities located in western and eastern Indonesia, with the aim of observing differences in characteristics between the two areas. A study by Nugraha & Prayitno (2020) showed that inequality between western and eastern Indonesia still existed. To reduce this inequality, increasing electricity distribution and investment had a significant effect on reducing inequality in West, while road infrastructure development actually increases inequality in East.

Table 3 showed that the characteristics of regencies/cities located in western and eastern Indonesia were different. By conducting the same test as the main hypothesis, the significant negative relationship between road infrastructure spending and road quality was stronger in East. Meanwhile, in West, the relationship between all independent variables, namely road infrastructure spending, motor vehicle tax revenues, and road infrastructure quality was not significant. This result was in line with (Nugraha & Prayitno, 2020), stating that the inequality currently existing in East was due to inefficient management of road infrastructure spending. Therefore, more efficient spending management that led to improvements in road quality would reduce the inequality between the regions.

Sensitivity test result also showed that the relationship between road infrastructure spending and quality moderated by fiscal independence was significant in the sample located in eastern Indonesia. However, the relationship was positive, which was contrary to the main test. When testing the eastern Indonesia subsample, the relationship between motor vehicle tax revenue and road quality moderated by fiscal independence was significantly negative. Meanwhile, the test with the western subsample was not significant. Based on the location subsample test, these results showed road infrastructure spending component could be used as an indicator of measuring quality of government performance, specifically road infrastructure quality.

Table 3. Sensitivity Test, Location Subsample, and Dependent Variable: ROAD

Variable	Western Indonesia	Eastern Indonesia
EXP	-2.134	-15.56***
	-4.893	-5.308
VHT	31.06	-16.76
	(21.22)	(17.61)
FD	-1.154	3.094
	(2.877)	(2.854)
EXP_FD	10.94	75.94**
	(33.61)	(35.91)
VHT_FD	37.22	-173.7*
	(114.5)	(101.9)
EG	-253.1***	-53.20
	(61.06)	(38.83)
GNI	-41.10	-1.025***
	(209.6)	(293.1)
HS	6.843	-158.9
	(89.26)	(117.4)
UHH	4.268***	3.211***
	(1.466)	(1.170)
Constant	-1.086	-343.0
Observations	1.278	810
R-squared	0.024	0.054

Description: Testing with independent variables EXP and VHT; moderating variables EXP_FD and VHT_FD.

Robust standard errors, clustered by local government, in parentheses.
***$p<0,01$,**$p<0,05$, * $p<0,1$
Source: Processed by Authors, 2024

The second sensitivity test was conducted by dividing the group into two subsamples based on Fiscal Independence Index (IKF). According to Audit Board of Indonesia (BPK), the level of regional fiscal independence could be divided into four groups, namely Not Yet Independent (IKF <0.25), Towards Independence (0.25 ≤ IKF <0.50), Independent (0.50 ≤ IKF <0.75), and Very Independent (IKF ≥ 0.75). To conduct sensitivity test, the sample was categorized into two subsamples, namely Not Yet Independent (IKF <0.50) and Already Independent (IKF ≥ 0.50).

Table 4 showed differences in the characteristics of regencies/cities that were not yet independent and those already independent according to IKF. By conducting the same test as the main hypothesis, a significant negative relationship was found between infrastructure spending and road quality, only in the category of not yet independent. Meanwhile, motor vehicle tax revenue showed a significant positive relationship with road quality in the subsample that was already independent. Therefore, regencies/cities that were not yet independent were unable to manage resources efficiently.

Table 4. Sensitivity Test, IKF Subsample, Dependent Variable: ROAD

Variables	Not Yet Independent	Already Independent
EXP	-9,359**	-18,29
	-3,787	(938,9)
VHT	1,915	9,434*
	(11,63)	(4,846)
FD	-929,0	-16,138
	(1,774)	(96,535)
EXP_FD	48,91*	-49,46
	(26,61)	(1,148)
VHT_FD	-1,521	550,3
	(69,55)	(2,389)
EG	-126,3***	-6,648***
	(33,11)	(794,3)
GNI	-539,4***	145,124
	(199,6)	(95,206)
HS	-23,96	37,369
	(70,76)	(24,482)
UHH	2,893***	-201,709
	(893,4)	(162,131)
Constant	-282,3	-121,878***
	(436,7)	(35,982)
Observations	2.034	12
Number of Kodepemdanum	339	2

Description: Testing with independent variables EXP and VHT; moderation EXP_FD and VHT_FD.
Robust standard errors, clustered by local government, in parentheses.
***$p<0,01$,**$p<0,05$, * $p<0,1$
Source: Processed by Authors, 2024

In line with the main test, sensitivity test results similarly showed that the relationship between road infrastructure spending and quality moderated by fiscal independence was significantly positive in the sample that was not yet independent. Meanwhile, testing with an independent subsample showed that no variables had significant results. This outcome showed that regions with a higher level of independence were more able to manage resources efficiently, despite being included in the not-yet-independent group. The results did not generally describe the truth, specifically in the Already Independent subsample because the average fiscal independence was only 11%. Therefore, more samples were not yet independent and the data was less varied.

CONCLUSION

In conclusion, this study focused on examining the relationship between road infrastructure spending and motor vehicle revenue, with road quality in Indonesia moderated by the level of fiscal decentralization. Specifically, this study was

conducted on 341 regencies/cities recorded in DJPK Ministry of Finance during 2017-2022, resulting in a total of 2,046 observations. The results showed that road infrastructure spending was negatively associated with improving road quality, while motor vehicle tax revenues by local governments did not improve quality. Regency/city governments with a higher level of fiscal independence managed road infrastructure spending to improve quality better than regions that had a low level of fiscal independence. In terms of motor vehicle tax revenue, regions with and without decentralized, had no different characteristics in allocating motor vehicle tax revenue to improve road quality. Therefore, motor vehicle tax revenue had no significant relationship with road infrastructure quality, regardless of whether the regions were decentralized or not.

Based on the research benefits to be achieved through this research, the implication of this research is that it can be used as a reference for the government in formulating policies, especially in the field of budget preparation, both APBN and APBD. The results of this study indicate that the components in the financial statements do not solely describe good government performance. Thus, the government can also consider other performance measurements that can describe the actual performance of the government. The results of this study also reinforce that in preparing the budget, the government is expected to be more careful not to always increase the budget. This is because a high budget is not solely followed by high performance as well. The results of this study are also able to encourage local governments to be more independent, so as to achieve more equitable independence between regions in Indonesia.

The limitation of this study was in the completeness of secondary data used as a measurement of the main variables obtained from PUPR Data Center. Data were collected from all regencies/cities in Indonesia between 2017 to 2022. Some local governments did not provide data, which reduced the number of observations and affected the results. Based on these limitations, studies could use other measurements with more complete data available, allowing observations to cover the entire local government without reducing the number of observations. Additionally, further studies could use other components in LKPD to measure other government performance variables, for example social, health, and education infrastructures.

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