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Fiscal Decentralization, Institutions, and Politics: Determinants of Road Quality in Indonesia

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Abstract
Roads are strategic infrastructure that support connectivity and regional development. The deterioration of road quality can hinder mobility and suppress economic activity. This study analyzes the factors affecting road quality, particularly those related to road damage, by emphasizing the role of the Special Allocation Fund (DAK), institutional quality measured through the democracy index and corruption cases, and political competition. A quantitative approach using panel data regression was applied to 33 provinces in Indonesia over the 2021-2023 period. The visualization results reveal disparities in road quality between Java and non-Java regions. Statistical tests show that DAK and institutional quality do not have a significant effect on road quality. Conversely, political competition has a significant effect, indicating that healthy political competition promotes accountability and efficiency in infrastructure management. The study also finds that the control variables–vehicle volume and per capita income–have a positive and significant relationship with the ratio of damaged roads. The implications of this study highlight the need to improve Indonesia's road infrastructure quality by strengthening political competition and enhancing budget governance.
Keywords: Special Allocation Funds, Infrastructure, Institutions, Politics

Abstrak
Jalan adalah infrastruktur strategis yang mendukung konektivitas dan pembangunan regional. Penurunan kualitas jalan dapat menghambat mobilitas dan menekan aktivitas ekonomi. Penelitian ini menganalisis faktor-faktor yang memengaruhi kualitas jalan khususnya yang mengalami kerusakan, dengan menyoroti peran Dana Alokasi Khusus (DAK), kualitas kelembagaan yang diukur dengan indeks demokrasi dan kasus korupsi, dan kompetisi politik. Penelitian ini menggunakan pendekatan kuantitatif dengan regresi data panel dari 33 provinsi di Indonesia selama periode 2021 hingga 2023. Hasil visualisasi data penelitian menunjukkan adanya disparitas kualitas jalan antara wilayah Jawa dan luar Jawa. Uji statistik membuktikan bahwa DAK dan kualitas kelembagaan tidak memiliki pengaruh yang signifikan terhadap kualitas jalan. Sebaliknya, kompetisi politik memiliki pengaruh yang signifikan terhadap kualitas jalan, yang menunjukkan bahwa kompetisi politik yang sehat mendorong akuntabilitas dan efisiensi dalam pengelolaan infrastruktur. Penelitian ini juga menemukan bahwa variabel kontrol berupa volume kendaraan dan pendapatan per kapita memiliki hubungan positif yang signifikan dengan rasio kualitas jalan rusak. Implikasi dari penelitian ini menekankan perlunya peningkatan kualitas infrastruktur jalan di Indonesia dengan memperkuat kompetisi politik dan memperbaiki tata kelola anggaran.
Kata Kunci: Dana Alokasi Khusus, Infrastruktur, Kelembagaan, Politik

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INTRODUCTION

The development of connectivity infrastructure, including roads, is part of the National Priority Program as a spatial development strategy outlined in the National Long-Term Development Plan (2025-20x`45). The government's commitment to road infrastructure development is also manifested through budget allocation policies in the form of Transfers to Regions (TKD), distributed via the Physical Special Allocation Fund (Physical DAK) for the Road Sector. This fund serves as one of the components of fiscal decentralization, aimed at strengthening the role of the road network as an integrated access system connecting potential areas within regional jurisdictions. Road construction represents an effort to promote economic development, as several studies have demonstrated that the quality of connectivity infrastructure can generate spillover effects in the process of regional economic growth (Mačiulytė-Šniukienė *et al.*, 2022; Shi *et al.*, 2024; Tarigan *et al.*, 2021; Wang *et al.*, 2020).

In terms of budget allocation, the Physical DAK for the Road Sector is one of the sectors receiving the largest share of funding, compared to other physical financing areas such as Irrigation, Forestry, and Environment. According to data from the Directorate General of Fiscal Balance, since 2021, the budget allocation for the Road Sector has accounted for 20 percent of the total Physical DAK budget (Sirait, 2024). In 2025, the budget for the Road Sector reached IDR 14.26 trillion, representing a 40 percent increase compared to the allocation four years earlier.

The substantial budget allocation, as mentioned before, has resulted in tangible outputs, one of which is the increase in the total length of regional roads at the district/city and provincial levels, reaching 460 thousand kilometers in 2023, up from 423 thousand kilometers in 2021. However, according to several indicators reported by the Ministry of Public Works and Public Housing (PUPR) of the Republic of Indonesia, the large budget allocation contrasts with the quality of road infrastructure. First, of the 460 thousand kilometers of regional roads in 2023, 60 thousand kilometers were classified as slightly damaged roads, while 126.7 thousand kilometers were severely damaged. Second, the depreciation in quality is also evident from the declining trend in the percentage of Steady Roads (roads in good condition) at both the district/city and provincial levels, as illustrated in Figure 1.

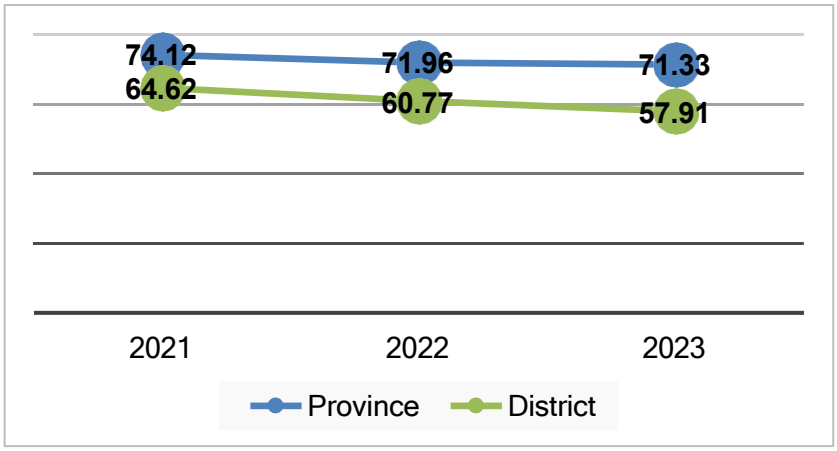

Figure 1.
Trend of Steady Road Conditions
Source: Data Processed, 2025

Road infrastructure is a vital facility that has a crucial impact not only on the economic aspect, but also affects health aspect (Iimi, 2021), education aspects (Suraharta, 2021), and even the political participation aspects (Gayen, 2018). According to Saragih & Khoirunurrofik (2022), the

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quality level of roads constructed using the Physical DAK can serve as an evaluation tool for the implementation of fiscal decentralization in a given region. Given the broad role of road infrastructure, the contradictory phenomenon between the allocation of the Road Sector DAK and the actual quality of regional roads needs to be further analyzed to identify the factors influencing the quality of regional road infrastructure.

To make this study more comprehensive, the focus extends beyond budget factors to include other factors that are predicted to impact the quality of road infrastructure. First, institutional quality, as stated by Cavalieri *et al.* (2020), has a positive correlation with the effectiveness of infrastructure management. Strong institutions can design, implement, and maintain infrastructure efficiently, thereby supporting the effectiveness of road management. Institutional quality, according to the World Bank's Policy Paper (Islam & Montenegro, 2002) can be measured from the dimensions of Voice and Accountability, Political Stability, Government Effectiveness, Regulatory Quality, Rule of Law, and Control of Corruption. Meanwhile, in the Indonesian context, researchers measure institutional quality using the democracy index and corruption cases (Digdowiseiso & Sugiyanto, 2021). In addition, the degree of political competition, according to Shen (2023), plays a role in influencing the quality of public goods procurement and budget allocation. With healthy political competition, the supervision process for managing infrastructure projects becomes more effective, thereby encouraging accountability and optimizing resource allocation. Therefore, institutional quality and political competition are crucial dimensions that need to be examined to understand the factors that influence road quality.

This study fills a research gap in the existing literature concerning road infrastructure quality in relation to fiscal decentralization, local institutional quality, and political competition in Indonesia. Previous studies on fiscal decentralization and institutional governance have predominantly focused on non-physical aspects, such as the improvement of public services, bureaucratic efficiency, and regional socio-economic performance. Research involving Special Allocation Funds (DAK) has also tended to focus on education (Hadi & Mahi, 2024; Hermansyah *et al.*, 2024; Pambudi *et al.*, 2021) and healthcare improvement (Apriliani & Khoirunurrofik, 2020; Damayanti & Bashabih, 2024; Raihan & Silvia, 2021), with limited attention to road infrastructure. This study contributes new insights by broadening the analytical scope of fiscal decentralization, institutional quality, and politics to encompass the domain of physical infrastructure at the regional level.

METHODOLOGY

This quantitative analysis employed secondary data derived from panels in 33 provinces in Indonesia (DKI Jakarta Province was excluded due to insufficient data), based on observations from 2021 to 2023. The observation period was selected because, in 2020, the government conducted a major refocusing of the Physical DAK for the COVID-19 pandemic response, in accordance with Minister of Finance Regulation (PMK) No. 35/PMK.07/2020 concerning the Management of Transfers to Regions and Village Funds for Fiscal Year 2020 in the Context of Handling the COVID-19 Pandemic. As a result, infrastructure activities during that year did not operate under normal conditions. Starting in 2021, the government entered a phase of recovery and normalization in the management of intergovernmental transfers. Data after 2023 were not yet fully accessible, as they have not been officially released or are still under curation by government institutions. Therefore, the three-year period was chosen because it is considered the most representative and reliable timeframe to maintain the validity of the analytical results.

This study employs panel data regression analysis utilizing the Stata-17 application. This study

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also visualizes road quality in the form of maps, which were created using the GeoDa Application. The map-based visualization provides a spatial overview that facilitates the identification of areas requiring greater policy intervention (Yunitasari *et al.*, 2023). The model used in this study can be explained by the following equation (1):

$$ROADQ_{it} = \beta_0 + \beta_1 DAK_{it} + \beta_2 ln_IDI_{it} + \beta_3 ln_CORRUPT_{it} + \beta_4 ln_POLCOM_{it} + \beta_5 ln_VEHICLE_{it} + \beta_6 ln_INCOME_{it} + \varepsilon_{it} \quad (1)$$

This study examines damaged road quality ratio (ROADQ) as the dependent variable, involving three independent variables: fiscal decentralization, proxied by the Physical Special Allocation Fund (DAK); institutional quality, proxied by the Indonesia Democracy Index (IDI) and the number of corruption cases (CORRUPT); and political competition, proxied by the Effective Number of Parties (POLCOM). Additionally, the study includes two control variables, which are the number of motor vehicles (VEHICLE) and per capita income (INCOME) within each province. The natural logarithm (LN) transformation was applied to the variables IDI, CORRUPT, POLCOM, VEHICLE, and INCOME to normalize the distribution and stabilize data variance.

Table 1.
Operational Definition of Variables

Variable	Measurement	Data Source	Relation
Road Quality (*ROADQ*)	Damaged Road Quality Ratio, defined as the proportion of damaged district/city roads (both severely and slightly damaged) to the total length of district/city roads within a province.	Ministry of Public Works and Housing of	
Special Allocation Fund (*DAK*)	Ratio of realized Physical Special Allocation Fund (DAK) for the Road Sector to the total allocated DAK budget for the Road Sector, which reflects a province's capacity in managing public finances.	Information System for Transfers to Regions and Village Funds (SIMTRADA), Directorate General of Financial Balance, Ministry of Finance	(-)
Indonesian Democracy Index (*IDI*)	Assessment of the democratic condition within a province, measured through 22 indicators covering the aspects of freedom, equality, and institutional capacity of democracy.	Statistics Indonesia	(-)
Corruption Cases (*CORRUPT*)	The accumulation of corruption cases that occurred in one province in the current year.	Indonesia Corruption Watch (ICW)	(+)
Political Competition (*POLCOM*)	Level of political competition occurring in district/city legislative (DPRD) elections within a province, measured using the ENP	Indonesian General Election Commission	(-)
Vehicle (*VEHICLE*)	Number of motor vehicles within a province. Indicates the intensity of road use.	Statistics Indonesia	(+)
Income Per Capita (*INCOME*)	Per capita income of a province based on Gross Regional Domestic Product (GRDP) at current prices, reflecting the influence of income levels on road usage and economic activity.	Statistics Indonesia	(+)

The political competition variable, calculated using the Effective Number of Parties (ENP) equation, refers to the study by Kailthya & Kambhampati (2022), which assesses the strength of

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political competition based on the accumulation and proportion of votes obtained by political parties participating in regional legislative elections (DPRD). A higher ENP score indicates tighter political competition within a region. Since legislative elections in Indonesia are held every five years, the party and vote share data were taken from the most recent legislative election relative to the study's observation period, namely the 2019 legislative election. The equation for calculating ENP is as follows, by equation (2):

$$ENP = \frac{1}{\sum_{j=1}^{N} s_j^2} \quad (2)$$

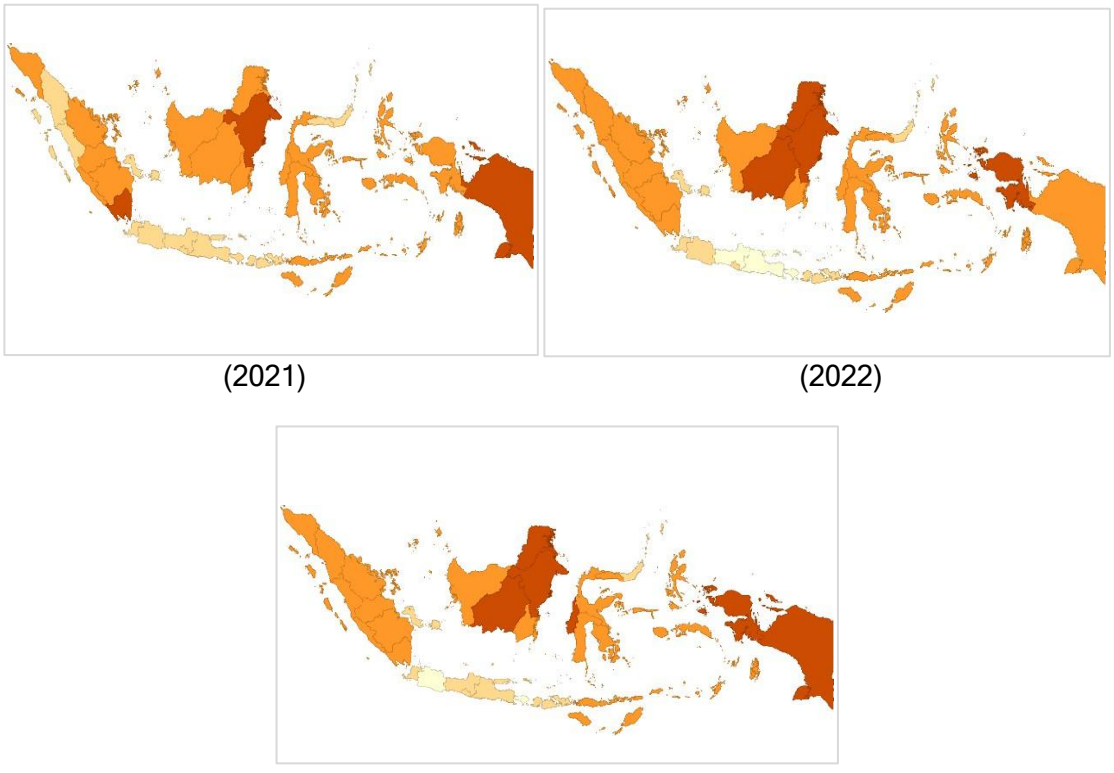
Based on Equation (2), s_j represents the vote share of the *j*-th political party in the legislative election, while *N* denotes the total number of parties contesting seats.

DISCUSSION AND FINDINGS

Visualization of the Distribution of Road Conditions in Indonesia

Figure 2 below presents the map of damaged road quality ratio distribution in Indonesia for 2021, 2022, and 2023, respectively, based on the results processed using the GeoDa Application. This ratio illustrates the proportion of damaged roads (both slightly and severely damaged) to the total length of district/city roads in each province. To facilitate map interpretation, the ratio is classified into four categories, represented by different colors:

< 0.200	:	indicates regions with the lowest proportion of damaged roads.
0.200 – 0.400	:	represents regions with a moderate proportion of damaged roads
0.400 – 0.600	:	indicates provinces with a higher level of road damage.
> 0.600	:	represents regions with a very high level of road damage.



(2021) (2022)

(2023)

Figure 1.
Distribution Map of Indonesian Road Quality in 2021, 2022, and 2023
Source: GeoDa Output, 2025

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The comparison of the damaged road quality ratio in Indonesia over the three-year period (2021–2023) reveals varying dynamics across regional areas of the country. In 2021, regions with a high road damage ratio were concentrated in eastern Indonesia, as well as parts of Sumatra and Kalimantan. In contrast, Java and Bali exhibited the best and most evenly distributed road conditions. In 2022, road damage increased in several provinces in Kalimantan and Sulawesi, while Java and Bali maintained their status as regions with the best road conditions. Meanwhile, roads in eastern regions, particularly Papua, showed signs of improvement. By 2023, road quality conditions remained relatively similar to the previous year, yet a significant disparity in road infrastructure development persisted between Java and non-Java regions.

An interesting point derived from this spatial distribution is that regions with the highest damaged roads are generally those with challenging topographies, such as mountainous and forested areas. As noted by Saktina & Khoirunnurrofik (2022) research, such that geographical constraints not only complicate road construction but also increase maintenance costs, thereby raising the likelihood of poor road quality. In addition to geographical factors, Indonesia's historical development patterns show that Java has consistently been prioritized in terms of investment and infrastructure development, including roads, ports, and other facilities facilities facilities (Nugraha & Prayitno, 2020). Consequently, its connectivity infrastructure has long been better planned and more mature, compared to other regions that, as reflected in the map, continue to face serious road damage issues.

The observed disparities in road quality not only indicate uneven accessibility and connectivity among regions but also reflect the performance of fiscal decentralization, particularly in the use of the Physical Special Allocation Fund (DAK) for the Road Sector, whose outcomes vary across regions. It should be emphasized that regions with a high damaged road quality ratio are more likely to lag in economic development, thereby exacerbating regional development inequality (Wang *et al.*, 2020). Therefore, greater government attention should be directed toward regions with poor road infrastructure conditions.

Panel Data Regression Test Results

Table 2 presents the results of the panel data regression analysis. To determine the most appropriate panel data model, a series of model specification tests was conducted. First, the Chow test was performed, yielding a probability value of 0.3270 ($p > 0.05$), indicating that the Common Effect Model (CEM) is more suitable than the Fixed Effect Model (FEM). Since the FEM was not superior to the CEM, the Hausman test was not conducted in this study. Next, the Lagrange Multiplier (LM) test produced a probability value of 0.2587 ($p > 0.05$), suggesting that the Random Effect Model (REM) also did not provide a better fit than the CEM. Based on these results, it can be concluded that the CEM is the most appropriate model for this study. This model selection is further supported by the short observation period (2021–2023), which results in smaller variation over time compared to cross-provincial variation, making the assumption of homogeneous intercepts across provinces still acceptable.

The results of the CEM analysis showed that fiscal decentralization, proxied by the ratio of the Physical Special Allocation Fund for the Road Sector (*DAK*), had a negative relationship with the damaged road quality ratio (*ROADQ*). However, when analyzed based on its significance value, fiscal decentralization did not have a significant effect on the quality of regional roads at the district/city level in Indonesia. This result was consistent with the findings of Pambudi *et al.* (2022), who revealed that several local governments, particularly in Papua, lacked understanding of the technical guidelines and accountability mechanisms related to the DAK. They assumed

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that infrastructure projects funded through the DAK were the responsibility of the central government, since the funds originated from it; therefore, the quality of the constructed infrastructure was not considered a local priority. Saragih & Khoirunurrofik (2022) also found the evidence of misprioritization in the allocation of the DAK for the Road Sector, as it was more often allocated to new road construction rather than maintenance of existing roads.

Table 2.
Panel Data Regression Result

VARIABLES	CEM	FEM	REM	
		ROADQ		
DAK	-0.2149423 (0.1818358)	-0.1459789 (0.1805896)	-0.0895006 (0.1596099)	
LN_IDI	-0.1368160 (0.2149238)	-0.3451385 (0.2792108)	-0.3156095 (0.2084991)	
LN_CORRUPT	0.0048496 (0.0147014)	0.0139501 (0.0146859)	0.0059225 (0.0128252)	
LN_POLCOM	-0.1219011** (0.0506922)	-	-0.148516** (0.070734)	
LN_VEHICLE	0.0722839*** (0.0138161)	0.0788666* (0.0489777)	0.0525466*** (0.0181728)	
LN_INCOME	0.1188717*** (0.0201812)	0.0539132* (0.1041935)	0.1156095*** (0.0272322)	
Cons	-1195.359 (848.0515)	-2308.678 (1773.66)	-414.0219 (992.2333)	
R-Squared	0.5686	0.4108	0.5565	
Prob. Chow Test				0.3270
Prob. Lagrange Multiplier				0.2587

Numbers in parentheses are standard errors
*** significant at 1%, ** significant at 5%, * significant at 10%
The LN_POLCOM variable was omitted in the Fixed Effect Model (FEM) due to time-invariant data across the observation period.
Source: Secondary Data Analysis, 2025 (STATA 17 output).

Such ineffectiveness and inefficiency implied that a larger DAK allocation did not lead to significant improvements nor to a reduction in the damaged road quality ratio. Supporting these findings, the author's tabulation results showed that provinces in Java and Bali had lower ratios of Physical DAK realization compared to other regions, yet experienced lower levels of road damage. This condition was not attributed to the amount of DAK received during the study period, but rather to the fact that the infrastructure networks in these regions had long been more developed and better managed (Ananda *et al.*, 2023). Hence, the realization of Physical DAK did not necessarily reflect road quality, as regions with well-established infrastructure required lower maintenance expenditure burdens than those whose basic infrastructure was still developing.

Furthermore, the institutional quality variables, proxied by the Indonesian Democracy Index (*IDI*) and the number of corruption cases (*CORRUPT*), were also found to have no significant effect on the damaged road quality ratio (*ROADQ*). Statistics Indonesia measures the IDI based on the dimensions of civil liberties, political rights, and democratic institutions. Since road construction and maintenance are more closely related to budget management and technical aspects, the focus on these different dimensions explains why the level of democracy does not necessarily influence road quality. Saragih & Khoirunurrofik (2022) further explained that democratic quality

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may not directly affect road quality, and its influence may only emerge when mediated by other variables.

Corruption, as a form of misappropriation of development funds, can potentially cause significant inefficiency in infrastructure development and maintenance. The results showed a positive relationship between corruption and the damaged road quality ratio, meaning that higher corruption levels were associated with more road damage. However, this relationship was not statistically significant. According to the Indonesia Corruption Watch (2024) report, as of 2023, corruption in Indonesia has been dominated by the misuse of Village Funds at the village level, with relatively few recorded cases of corruption in regional infrastructure projects. Consequently, this study did not reveal a strong relationship between corruption cases and the damaged road quality ratio. Moreover, infrastructure development, including road projects, does not immediately reflect its quality in the short term. As noted by Wijayanti & Khoirunurrofik (2022), road quality can only be observed several years after project completion, suggesting that the impact of corruption cases may not directly or immediately affect road quality.

Political Competition (*POLCOM*) was found to be the only independent variable that significantly affected the damaged road quality ratio. The relationship was negative, indicating that higher political competition led to a lower proportion of damaged roads. This study employed the Effective Number of Political Parties (ENP) as the measurement unit for political competition. The results also showed that a higher ENP value implies a greater number of political parties gaining votes, which consequently influences the behavior of legislative members in maintaining voter support. They become more motivated to demonstrate better performance and to be more responsive to public needs, including in managing road infrastructure quality. Consistent with this finding, Wu *et al.* (2024) explained that political competition drives infrastructure management to serve as a strategy for improving political reputation and increasing the likelihood of re-election. Therefore, as political competition intensifies, the proportion of poor-quality roads tends to decline.

The two control variables included in this study, namely the number of motor vehicles (*VEHICLE*) and per capita income (*INCOME*), have a positive and significant effect on the damaged road quality ratio. First, the results of this study show that the higher the volume of motor vehicles, the higher the ratio of road damage in the province. Wahidin (2019) explained that roads frequently traversed by vehicles, especially heavy vehicles, are prone to material fatigue due to repeated pressure. Therefore, the higher the volume of moving vehicles, the greater the likelihood of road damage. The results of this study also explain that the higher the per capita income of the population, the higher the damaged road quality ratio. Regions with high per capita income tend to have denser economic activities with higher mobility of goods and people (Pereira & Moura, 2023). This condition can affect the high density of traffic flow, which, if the road infrastructure is unable to withstand the load, can cause road damage to occur more quickly.

CONCLUSION

Conclusion

This study highlights that although the Special Allocation Fund (DAK) serves as one of the main instruments of fiscal decentralization in Indonesia, its effectiveness in influencing the quality of regional road infrastructure remains limited. The empirical findings also confirm that institutional quality, proxied by the Indonesian Democracy Index and corruption cases, does not significantly affect the reduction or increase of road damage. Conversely, political competition emerges as the most significant variable, where higher levels of competition reduce the proportion of damaged

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roads. In addition, the control variables indicate that higher vehicle volumes and per capita income contribute significantly to increased road damage. These results suggest that the quality of regional road infrastructure is not merely a matter of budget allocation but is also strongly shaped by political dynamics and the intensity of road usage.

Limitation

This study has several limitations. First, the research period is relatively short, covering only three years of observation (2021–2023), which may not fully capture the long-term impact of fiscal decentralization and institutional quality on infrastructure outcomes. Second, the measurement of institutional quality is limited to the Democracy Index and corruption cases, which may not accurately reflect the broader dimensions of governance, such as bureaucratic efficiency or regulatory quality. Third, the analysis focuses on the provincial level, so variations at the district/city level are not fully explored.

Suggestion

Future research should extend the observation period to include a longer time span, capturing the delayed effects of infrastructure policy. In addition, incorporating more comprehensive indicators of institutional quality, such as government effectiveness or budget accountability, would enrich the analysis. At the practical level, policymakers need to prioritize enhancing the technical capacity of local governments in managing DAK, ensuring that allocations are directed not only to new construction but also to the maintenance of existing roads. Strengthening supervisory mechanisms, alongside fostering healthy political competition, will be crucial to reducing disparities in road quality and supporting more equitable and sustainable regional development.

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