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THE IMPACT OF URBAN AGGLOMERATION ON FISCAL DECENTRALIZATION IN INDONESIA: EVIDENCE FROM NATIONAL PRIORITY METROPOLITAN AREAS

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Abstract

Urban agglomeration is a spatial phenomenon that reflects the concentration of population, economic activity, and rapidly developing infrastructure in Indonesia's metropolitan areas. The government has designated ten National Priority Metropolitan Areas (KMPN) in the National Spatial Plan and the National Medium-Term Development Plan (RPJMN) for 2020-2024 and 2025-2029 as centers of national economic growth; however, this designation has not been accompanied by an empirical study on its impact on fiscal decentralization as mandated by Law No. 33 of 2004. This study aims to analyze the impact of urban agglomeration on the Degree of Fiscal Decentralization (DDF) in 514 regencies and cities across Indonesia in 2022, both directly and through interactions with metropolitan status. Using an explanatory quantitative approach and a census method, urban agglomeration was measured across four dimensions (social, economic, environmental, and infrastructure) and then analyzed using a t-test, simple linear regression, and interaction regression. The results show that the average DDF for metropolitan areas (27.54%) is significantly higher by 18.22 percentage points than that of non-metropolitan areas (9.31%). All four dimensions of agglomeration have a positive and significant effect on DDF, with the infrastructure dimension being the strongest factor ($\beta = 0.163$). The interaction model reveals that metropolitan status alone does not necessarily increase DDF; rather, it is highly dependent on the intensity and quality of agglomeration (interaction $\beta = 0.1795$; $p < 0.001$). These findings recommend intensifying infrastructure development, fostering agglomeration-based economic clusters, strengthening cross-regional metropolitan governance, and establishing a national agglomeration monitoring system to enhance local fiscal autonomy.

Keywords: urban agglomeration; fiscal decentralization, metropolitan areas, fiscal autonomy, evidence-based policy

INTRODUCTION

Urban agglomeration is a spatial phenomenon that reflects the concentration of population, economic activity, and infrastructure that are functionally interconnected within a given region. This phenomenon generates externalities in the form of broader access to labor, more intensive information exchange, and production efficiencies resulting from the spatial proximity of economic actors (Fujita & Thisse, 2002; Duranton & Puga, 2004). In the Indonesian context, agglomeration is developing rapidly in metropolitan areas as a result of natural population growth and the direction of national development policies, making it a key factor in regional planning and the strengthening of local fiscal capacity.

Based on the National Spatial Plan (RTRWN), the 2020–2024 National Medium-Term Development Plan (RPJMN), and the 2025–2029 National Medium-Term Development Plan (RPJMN), the Indonesian government has designated ten National Priority Metropolitan Areas (KMPN), namely Jabodetabekpunjur, Greater Bandung, Kedungsepur, Gerbangkertosusila, Mebidangro, Patungraya Agung, Banjarbakula, Sarbagita, Mamminasata, and Bimindo, which play a strategic role as centers of economic growth, human mobility, and interregional connectivity (Ministry of National Development Planning/Bappenas, 2023). Although these ten regions account for only about 10 percent of Indonesia's total land area, they contribute more than 60 percent of the national Gross Domestic Product (GDP), reflecting a very high concentration of economic activity.

On the other hand, the regional autonomy policy stipulated in Law No. 33 of 2004 on Fiscal Balancing between the Central Government and Regional Governments grants regional governments the authority to manage regional revenues and expenditures independently. One commonly used measure to assess a region's level of fiscal autonomy is the ratio of Local Original Revenue (PAD) to total local revenue, known as the Degree of Fiscal Decentralization (DDF) (Tiebout, 1956; Halim, 2007; Adisasmita, 2011).

Various international studies indicate that urban agglomeration contributes to increased local fiscal capacity through the expansion of the local economic base. Wu, Ye, and Li (2018) found a correlation between patterns of fiscal decentralization and the dominance of urban agglomerations in the case of China, while Martinez-Vazquez and McNab (2003) confirmed that fiscal decentralization is closely linked to economic efficiency and the interregional distribution of resources. Cities with high levels of agglomeration tend to have larger local revenue (PAD) and stronger fiscal capacity, as the concentration of economic activity broadens the tax and fee base (Litvack et al, 1998; Bird & Vaillancourt, 1998).

Nevertheless, the designation of ten KMPNs in national planning documents has not been accompanied by empirical studies specifically examining their impact on the degree of fiscal decentralization in Indonesia. Most of the available literature still focuses on spatial planning, regional economics, or metropolitan governance, while its relationship with local fiscal capacity at the regency/city level has not been systematically explored. This gap is important to address, given that the design of adaptive fiscal policies oriented toward sustainable regional development requires strong empirical evidence, in line with the principle of evidence-based policy (Davies, 2004).

Based on this discussion, this study is designed to answer the following questions: How does urban agglomeration influence the degree of fiscal decentralization in Indonesia's metropolitan areas both directly and as moderated by metropolitan status and how can evidence-based policy recommendations be formulated to strengthen this relationship? The objective of this study is to understand the role of agglomeration characteristics in strengthening or limiting the effectiveness of fiscal decentralization, as well as to formulate relevant policies to optimize the interrelationship between the two in regional development. Specifically, this study has four objectives, namely: (1) to describe and identify the characteristics of urban agglomerations in Indonesia's metropolitan areas based on four main dimensions; (2) to analyze the influence of metropolitan status on the degree of fiscal decentralization in Indonesian regencies and cities and to compare the strength of the influence of each dimension of agglomeration; (3) to analyze the impact of the interaction between agglomeration intensity and metropolitan status on the degree of fiscal decentralization; and (4) to formulate evidence-based policy recommendations to strengthen the positive relationship between urban agglomeration and fiscal decentralization.

METHODOLOGY

This study employs a quantitative approach with an explanatory research design, as it aims to test hypotheses and draw conclusions regarding the relationships among variables that have been formulated in previous studies. The approach used is supply-oriented, as the primary focus of the study is to analyze how the objective conditions of a region as the supply side of agglomeration influence local fiscal capacity; it is also deductive in nature, as it builds upon existing theories and conceptual models of urban agglomeration and fiscal decentralization, which are then empirically tested using the collected data. The study population includes all regencies and cities in Indonesia that met the data completeness criteria in 2022. Using a census approach, all 514 regencies and cities were treated as units of analysis without sampling, with the aim of producing comprehensive generalizations and minimizing bias. The dependent variable in this study is the Degree of Fiscal Decentralization (DDF), measured by the ratio of Local Original Revenue (PAD) to total local revenue. The independent variable is urban agglomeration, measured through four main dimensions based on the principle that agglomeration involves complex interactions among people, productive activities, the environment, and the region's physical system (OECD, 2015), namely: the social dimension through population density per hectare (Fujita & Thisse, 2002; Glaeser, 1998), the economic dimension through regional gross domestic product (GRDP) (Duranton & Puga, 2004; Rosenthal & Strange, 2004), the environmental dimension through environmental quality indices and access to clean water (Mori & Smith, 2015; Song et al., 2008), and the infrastructure dimension through the proportion of habitable housing (World Bank, 2009; Cervero, 1998). This study also uses a dummy variable for metropolitan status (D=1 for metropolitan areas, D=0 for non-metropolitan areas). To address the first objective, the regional agglomeration index was calculated using the Urbanization Advantage (UA) formula developed by Wu et al. (2018), which is built upon the Concentration Index (IC) defined by Glaeser and Gottlieb (2009):

$$\mathrm{UA} = \frac{IC}{P}$$

Where:

$$IC = \frac{\Sigma Ai}{N} \qquad\qquad P = \frac{n}{N}$$

Ai = The agglomeration indicator value for region i
N = The total number of regions nationwide (514 Regencies/Cities)
n = The number of regions within the specific metropolitan area

The calculated UA value provides critical insights into regional dominance and spatial concentration

- UA > 1 (High Dominance): Indicates a higher-than-expected agglomeration intensity, meaning the metropolitan area disproportionately concentrates population, economic activity, and infrastructure relative to its physical size.
- UA = 1 (Proportional Concentration): Indicates a balanced concentration that is exactly proportional to the number of administrative regions it contains.
- UA < 1 (Low Dominance): Indicates that the metropolitan area is less dominant in agglomeration concentration relative to its administrative scale, suggesting under-utilized growth potential.

Cities with high levels of agglomeration tend to have larger local revenue (PAD) and stronger fiscal capacity, as the concentration of economic activity broadens the tax and fee base (Bird & Vaillancourt, 1998). Nevertheless, the designation of ten KMPNs in national planning documents has not been accompanied by empirical studies specifically examining their impact on the degree of fiscal decentralization in Indonesia. Most of the available literature still focuses on spatial planning, regional economics, or metropolitan governance, while its relationship with local fiscal capacity at the regency/city level has not been systematically explored. This gap is important to address, given that the design of adaptive fiscal policies oriented toward sustainable regional development requires strong empirical evidence, in line with the principle of evidence-based policy (Davies, 2004).

Based on this discussion, this study is designed to answer the following questions: How does urban agglomeration influence the degree of fiscal decentralization in Indonesia's metropolitan areas both directly and as moderated by metropolitan status and how can evidence-based policy recommendations be formulated to strengthen this relationship? The objective of this study is to understand the role of agglomeration characteristics in strengthening or limiting the effectiveness of fiscal decentralization, as well as to formulate relevant policies to optimize the interrelationship between the two in regional development. Specifically, this study has four objectives, namely: (1) to describe and identify the characteristics of urban agglomerations in Indonesia's metropolitan areas based on four main dimensions; (2) to analyze the influence of metropolitan status on the degree of fiscal decentralization in Indonesian regencies and cities and to compare the strength of the influence of each dimension of agglomeration; (3) to analyze the impact of the interaction between agglomeration intensity and metropolitan status on the degree of fiscal decentralization; and (4) to formulate evidence-based policy recommendations to strengthen the positive relationship between urban agglomeration and fiscal decentralization.

RESULTS AND DISCUSSION

Characteristics of Metropolitan Area Agglomerations in Indonesia

Indonesia's National Priority Metropolitan Areas (KMPN) exhibit varying levels of agglomeration across social, economic, environmental, and infrastructure dimensions. These differences reflect the unique development characteristics, urbanization patterns, and regional capacities of each metropolitan area. By examining the agglomeration index across these four dimensions, this study provides a comprehensive overview of the relative strengths and disparities among Indonesia's major metropolitan regions, highlighting the multidimensional nature of metropolitan development. The results of the agglomeration index calculations for the ten National Priority Metropolitan Areas (KMPN) show that all areas have index values above 1 or close to 1 across the four dimensions measured, as presented in Table 1.

Table 1. Agglomeration Index of Indonesia's Priority Metropolitan Areas Based on 4 Key Dimensions

Metropolitan Area	Social Index	Economic Index	Environmental Index	Infrastructure Index
Jabodetabekpunjur	2,965	1,595	1,499	1,369
Bandung Raya	2,339	1,446	1,332	1,214
Kedungsepur	1,171	1,201	1,108	1,120
Gerbangkertosusila	1,671	1,075	0,901	0,917
Mebidangro	2,677	0,807	0,720	0,989
Patungraya Agung	3,508	1,230	2,178	1,085
Banjarbakula	3,066	1,383	1,249	1,194
Sarbagita	3,143	2,286	1,694	1,657
Mamminasata	3,786	1,175	0,993	1,083
Bimindo	1,639	0,909	0,843	0,991

Source: Author's Analysis, 2025

In the social dimension, all regions showed high indices, indicating dense population concentrations, with Mamminasata recording the highest index (3.79) and Kedungsepur the lowest (1.17). In the economic dimension, all regions continue to show GRDP growth concentrated in metropolitan centers despite some variation, with Sarbagita recording the highest index (2.29). In the environmental dimension, the index continues to indicate pressure on environmental quality due to concentrated development, while in the infrastructure dimension, the index shows the development of physical facilities that support the existence of agglomerations in each region.

Table 2. Agglomeration Index of Indonesia's Priority Metropolitan Areas

Metropolitan Area	Regional Agglomeration Index
Jabodetabekpunjur	1,857
Bandung Raya	1,583
Kedungsepur	1,150
Gerbangkertosusila	1,141
Mebidangro	1,298
Patungraya Agung	2,000
Banjarbakula	1,723
Sarbagita	2,195
Mamminasata	1,759
Bimindo	1,095

Source: Author's Analysis, 2025

Overall, all priority metropolitan areas have a regional agglomeration index value above 1 (Table 2), with Sarbagita (2.19) and Patungraya Agung (2.00) exhibiting the highest agglomeration intensity, while Bimindo (1.10) exhibits the lowest. These findings confirm that all national priority metropolitan areas exhibit significant urban agglomeration, albeit with considerable variations in intensity across regions a condition that calls for a more contextual and non-uniform approach to regional management.

The Influence of Metropolitan Status and Agglomeration Dimensions on the Degree of Fiscal Decentralization

To examine whether metropolitan status is associated with differences in fiscal decentralization, this study compares the Degree of Fiscal Decentralization (DDF) between metropolitan and non-metropolitan regencies/cities. The analysis aims to determine whether metropolitan areas, which generally benefit from stronger agglomeration economies, higher economic activity, and better infrastructure, also demonstrate greater fiscal capacity than non-metropolitan areas. The comparison provides initial evidence of the relationship between metropolitan development and local fiscal performance before further examining the influence of individual agglomeration dimensions through regression analysis.

The results of the mean difference test show that regencies/cities with metropolitan status (n=58) have an average DDF of 27.54%, far higher than non-metropolitan areas (n=456), which have an average DDF of only 9.31% (Table 3). This average difference of 18.22 percentage points is statistically significant ($t=15.43$; $df=512$; $p<0.001$), indicating that metropolitan areas consistently have higher fiscal capacity than non-metropolitan areas.

Table 3. Results of the Test for Differences in Means Between Metropolitan and Non-Metropolitan DDFs

Metropolitan Status	n	Average DDF	Standard Deviation	Minimum	Maximum
Non-Metropolitan (D=0)	456	9,31%	6,35%	0,11%	47,5%
Metropolitan (D=1)	58	27,54%	17,97%	5,17%	85,5%

Source: Author's own Analysis using STATA, 2025

These results were confirmed through simple linear regression (Table 4), in which metropolitan status was found to have a positive and significant effect on DDF ($\beta=0.1822$; $p<0.001$), with the model explaining approximately 31.7% of the variation in DDF ($R^2=0.3173$; $F=237.97$; $p<0.001$). These findings are consistent with urban agglomeration theory, which states that the concentration of economic activity, population density, and infrastructure in metropolitan areas creates greater economies of scale and fiscal efficiency (Duranton & Puga, 2004), while also confirming that metropolitan status plays a crucial role in strengthening regional fiscal autonomy and is an important consideration in the design of fiscal policy in Indonesia.

Table 4. Simple Linear Regression Results: Metropolitan Status vs. DDF

Variable	Coefficient	Std. Error	t-Statistik	p-value	CI 95%
Metropolitan Status (D)	0,1822	0,0118	15,43	0,000	0,1590 - 0,2054
Constant	0,0931	0,0039	23,47	0,000	0,0853 - 0,1009

Source: Author's own Analysis using STATA, 2025

To further examine the role of urban agglomeration in shaping fiscal decentralization, separate simple linear regression analyses were conducted for each agglomeration dimension, namely the social, economic, environmental, and infrastructure dimensions. This analysis aims to compare the relative contribution of each dimension to the Degree of Fiscal Decentralization (DDF) and to identify which aspect of urban agglomeration has the greatest influence on local fiscal capacity. The regression results for each dimension are presented in Table 5.

Table 5. Results of Simple Linear Regression for Each Agglomeration Index on the DDF

Agglomeration Dimension	Coefficient (β)	Intercept (α)	R²	p-value
Infrastructure	0,1630	0,0918	0,3702	0,000
Economic	0,1430	0,0919	0,3851	0,000
Environmental	0,1406	0,0934	0,3379	0,000
Social	0,0678	0,0940	0,3208	0,000

Source: Author's own Analysis using STATA, 2025

The regression results indicate that all four agglomeration dimensions have a positive and statistically significant effect on the DDF ($p < 0.001$). Among them, the infrastructure dimension exhibits the strongest influence, with each one-unit increase in the infrastructure agglomeration index associated with a 16.30 percentage point increase in the DDF ($\beta = 0.163$; $R^2 = 0.370$). This is followed by the economic dimension ($\beta = 0.143$; $R^2 = 0.385$), the environmental dimension ($\beta = 0.141$; $R^2 = 0.338$), and the social dimension, which has the smallest effect ($\beta = 0.068$; $R^2 = 0.321$). These findings suggest that while population concentration contributes to fiscal decentralization, improvements in infrastructure and economic activity play a substantially greater role in strengthening local fiscal capacity. In other words, urban density alone is insufficient to enhance fiscal decentralization unless it is supported by adequate infrastructure development and productive economic activities.

The Effect of the Interaction Between Agglomeration Intensity and Metropolitan Status on the Degree of Fiscal Decentralization

To test whether the effect of agglomeration on the DDF depends on metropolitan status, an interaction regression model was conducted (Table 6). The results show that when the agglomeration index is zero, regencies/cities with metropolitan status actually have a DDF that is 10.45 percentage points lower than that of non-metropolitan areas ($\beta = -0.1045$; $p = 0.037$). This finding indicates that administrative status as a metropolitan area does not necessarily increase a region's fiscal autonomy.

Table 6. Results of the Interaction Regression Test of Metropolitan Status and Agglomeration Index on DDF

Variable	Coefficient	Std. Error	t-Statistik	p-value	CI 95%
Metropolitan Status (D)	-0,1045	0,0499	-2,10	0,037	-0,2025 - (-0,0061)
Interaction (D × Agglomeration Index)	0,1795	0,0304	5,91	0,000	0,1198 - 0,2391
Intercept	0,0931	0,0038	24,24	0,000	0,0856 - 0,1007

Source: Author's own Analysis using STATA, 2025

R^2=0.3609; Adjusted R^2=0.3584; F(2,511)=144.31; Prob>F=0.000; N=514.

In contrast, the interaction coefficient between metropolitan status and the agglomeration index indicates a positive and highly significant effect ($\beta=0.1795$; $p<0.001$): each one-unit increase in the agglomeration index in a metropolitan area is associated with a 17.95 percentage point increase in the DDF. This interaction model explains 36.1% of the variation in DDF ($R^2 = 0.3609$), which is higher than that of the simple regression model used in the previous analysis. Thus, metropolitan districts/cities with higher levels of urban agglomeration tend to have better fiscal decentralization, confirming that it is not merely metropolitan administrative status that determines a region's fiscal capacity, but rather the intensity and quality of urban agglomeration itself.

Evidence-Based Policy Formulation

Based on a synthesis of the findings from Objectives 1 through 3, four key evaluation findings were identified: (1) urban agglomeration has a proven positive effect on the Degree of Fiscal Decentralization (DDF); (2) the infrastructure dimension has the strongest influence on increasing DDF; (3) metropolitan status consistently increases DDF compared to non-metropolitan areas; and (4) increased fiscal autonomy remains highly dependent on the intensity and quality of agglomeration rather than on administrative status alone. These findings suggest that strengthening fiscal decentralization requires not only the designation of metropolitan areas but also policies that enhance the underlying economic, social, environmental, and infrastructure characteristics that support urban agglomeration.

These findings are consistent with previous studies demonstrating that urban agglomeration promotes economic efficiency, expands the local tax base, and ultimately strengthens fiscal decentralization (Wu et al., 2018; Martinez-Vazquez & McNab, 2003). However, the results also indicate that the benefits of agglomeration are unevenly distributed across Indonesia's metropolitan areas. While some metropolitan regions have developed strong agglomeration characteristics and relatively high fiscal autonomy, others still exhibit weaker agglomeration intensity despite having the same administrative status. This disparity implies that metropolitan designation alone is insufficient to improve local fiscal performance without complementary investments in infrastructure, productive economic activities, and regional connectivity. In particular, the dominant influence of the infrastructure dimension highlights the importance of adequate public facilities and basic urban services in supporting sustainable metropolitan development and enhancing local revenue generation.

Based on these findings, this study proposes four evidence-based policy recommendations. First, infrastructure development should be prioritized in metropolitan areas, particularly in regions with relatively low infrastructure agglomeration indices, to strengthen connectivity, accessibility, and the provision of basic public services. Second, local governments should encourage the development of agglomeration-based economic clusters, particularly in the industrial and service sectors, to increase productivity, stimulate investment, and broaden the local tax base. Third, regional fiscal capacity should be reinforced through regulatory reforms, greater fiscal transparency, digitalization of local tax administration, and diversification of local revenue sources to improve the contribution of locally generated revenue (PAD). Finally, stronger metropolitan governance should be established through cross-regional institutional collaboration, coordinated spatial planning, and fiscal cooperation mechanisms, supported by a national monitoring and evaluation system capable of regularly assessing agglomeration performance and its contribution to fiscal decentralization. These policy measures are expected to reduce regional disparities while strengthening the long-term sustainability of fiscal decentralization across Indonesia's metropolitan areas.

CONCLUSION

This study yielded several key findings. First, all national priority metropolitan areas in Indonesia exhibit the existence of distinct urban agglomerations, with above-average concentrations of social, economic, environmental, and infrastructure activities, although variations in intensity call for a more context-specific approach to regional management. Second, metropolitan status was found to have a positive effect on DDF, with metropolitan regencies and cities consistently having higher DDF than non-metropolitan areas, and the infrastructure dimension was identified as the agglomeration dimension with the strongest influence on DDF, followed by the economic, environmental, and social dimensions. Third, agglomeration intensity was found to interact positively with metropolitan status in strengthening DDF, indicating that the quality of agglomeration is a more decisive factor in regional fiscal capacity than administrative status alone. Fourth, these findings lead to policy recommendations that include the development of basic infrastructure, the optimization of agglomeration-based economic sectors, reform of the local revenue system to strengthen local own-source revenue (PAD), the strengthening of cross-regional metropolitan governance, and the development of a national agglomeration monitoring system.

This study has several limitations that should be addressed in future research. The data used are cross-sectional for the year 2022 and therefore cannot capture the dynamics of the relationship between agglomeration and fiscal decentralization over time. The regression model used is also linear and simple; it does not account for potential nonlinear relationships or more complex moderating effects, nor does it include other control variables that could potentially influence the DDF. Furthermore, this study did not utilize primary data or qualitative methods that could delve deeper into variations in regional characteristics and local socioeconomic factors.

Therefore, future research is advised to use panel or longitudinal data to capture the dynamics of changes in the relationship between urban agglomeration and fiscal decentralization over a longer time period; apply spatial econometric approaches or nonlinear relationship models to capture the complexity of interactions within dynamic urban systems; incorporate relevant control variables to improve the accuracy of estimates and reduce the risk of bias due to unobserved external factors; and include primary data collection through qualitative methods to deepen the understanding of fiscal-spatial variations in Indonesia.

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