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Place-Based Fiscal Transfers and Sustainable Regional Development: Delayed and Uneven Effects of Korea's Special Account for Balanced Development

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Abstract

Place-based fiscal transfers are widely used to promote sustainable regional development, yet their effects may vary across territories with different economic structures, fiscal capacities, infrastructure endowments, and absorptive capacity. This study examines Korea's Special Account for Balanced Development (SABD) using panel data for 226 basic local governments. Baseline feasible generalized least squares estimates indicate a negative contemporaneous association and a positive one-year lag-effect association with per capita gross regional domestic product, with the latter substantially larger in metropolitan areas. Annual Global Moran's I statistics reveal persistent positive clustering in local economic performance and current-year SABD, while clustering in the lag-effect measure is episodic. Fixed-effects spatial lag, spatial error, and Spatial Durbin models identify statistically significant spatial dependence, but the local current-year and lag-effect SABD coefficients become statistically insignificant. The Spatial Durbin model identifies only marginally positive indirect and total lag-effect associations, and cross-lag tests provide no evidence that the SABD lag-effect measure predicts subsequent per capita GRDP after local and year effects are controlled. The results therefore support a cautious interpretation: the baseline temporal and territorial pattern is descriptively important, but it is not sufficient to establish a causal or spatially robust local growth effect. Sustainable balanced-development finance should combine need-based allocation with local capacity building, spatial coordination, and multidimensional evaluation encompassing economic performance, demographic resilience, and public-service accessibility.

Keywords: sustainable regional development; place-based fiscal transfers; special account for balanced development; regional inequality; South Korea



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1. Introduction

Regional inequality has become a central issue in sustainability research because it affects not only the spatial distribution of income and production but also the long-term viability of territories. When population, firms, skilled workers, infrastructure, fiscal resources, and administrative capacity become concentrated in a limited number of metropolitan regions, lagging territories may experience declining economic opportunities, weakened public-service accessibility, demographic fragility, and reduced institutional resilience. In this sense, sustainable regional development is not limited to environmental sustainability;

it also concerns whether regions can maintain viable economic bases, stable populations, effective public institutions, and legitimate development pathways over time. Recent studies argue that persistent territorial inequality can produce social fragmentation, political discontent, and declining trust in national development strategies [1,2]. Regional convergence research further shows that territorial gaps are shaped by spatial dependence, labor mobility, agglomeration, housing constraints, infrastructure, human capital, and local institutional capacity rather than by market adjustment alone [3–9]. These debates suggest that the territorial allocation of public investment is a core question for sustainable development.

Place-based fiscal transfers are one of the most widely used policy instruments for addressing uneven development. Unlike spatially neutral growth policies, place-based transfers explicitly recognize that regions differ in economic structure, infrastructure endowment, demographic trajectory, fiscal capacity, and administrative capability. Their purpose is to channel public resources to territories whose development potential is constrained by weak private investment, limited public infrastructure, population decline, and low fiscal autonomy. In principle, such transfers can support sustainable regional development by enabling lagging regions to build public goods, strengthen local economies, and improve territorial equity. However, the international literature provides a cautious lesson: fiscal transfers do not automatically reduce regional disparities. Their effects may vary depending on regional absorptive capacity, governance quality, transfer intensity, agglomeration economies, fiscal decentralization arrangements, and political allocation mechanisms [10–40]. Therefore, the sustainability of place-based finance depends not only on the size of transfers but also on whether recipient regions can transform fiscal resources into durable economic and institutional outcomes.

South Korea provides an important case for examining this issue in a highly centralized unitary state. Since the early 1960s, Korea's state-led development strategy has generated rapid national growth while concentrating economic activity, employment opportunities, firms, universities, and high-value services in metropolitan areas. This growth model contributed to national industrialization but also produced persistent territorial divides between metropolitan and non-metropolitan areas. Non-metropolitan regions increasingly face population aging, youth outmigration, weaker labor markets, shrinking fiscal bases, and rising public-service provision costs. To address these imbalances, successive Korean governments have introduced national balanced-development policies. Among these instruments, the Special Account for Balanced Development (SABD) has become one of the central fiscal accounts for financing regional development projects and supporting local self-reliance [41–43].

SABD is therefore more than a domestic budget program. It is a national place-based fiscal transfer scheme through which Korea attempts to reconcile economic growth with territorial equity. The account was established to consolidate fragmented ministry-led regional development projects and to provide financial support for local development initiatives. Its institutional structure has changed across administrations, and its balance between locally autonomous planning and central-ministry-led project support has shifted over time. The budget trend presented in this study indicates that Korea has devoted substantial fiscal resources to balanced development: the total SABD budget increased from 5.4 trillion KRW in 2005 to 11.7 trillion KRW in 2023. Despite this sustained fiscal commitment, the persistence of metropolitan and non-metropolitan disparities raises a fundamental question: does SABD function as an equalizing fiscal instrument for sustainable regional development, or are its economic returns amplified in already advantaged territories?

Existing Korean research has examined SABD's institutional design, operational problems, fiscal autonomy, allocation rules, and political determinants [43–49]. Empirical studies on its economic effects, however, remain limited and mixed. Some studies find no statisti-

cally significant effect on regional growth, whereas others identify positive lagged effects after one or two years [42,49]. Moreover, previous studies have not sufficiently compared metropolitan and non-metropolitan local governments, although this distinction is central to the policy objective of balanced development. If SABD is designed to mitigate territorial disparities, its effects should be assessed not only in the aggregate but also in terms of whether non-metropolitan regions—the intended beneficiaries of balanced-development finance—generate stronger economic returns from the transfers.

This study addresses that gap by examining whether SABD allocations are associated with local economic performance and whether the effects differ between metropolitan and non-metropolitan regions. The analysis is informed by four strands of the literature. First, EU Cohesion Policy studies show that place-based transfers can support regional growth and convergence, but their effects are heterogeneous and conditional on governance quality, regional capacity, policy design, and transfer intensity [27–39]. Second, fiscal decentralization studies show that intergovernmental fiscal arrangements can either promote growth or reinforce disparities depending on revenue autonomy, accountability, and institutional quality [10–19]. Third, regional convergence and agglomeration studies suggest that metropolitan regions may generate larger returns from public investment because they possess denser labor markets, stronger infrastructure, deeper firm networks, and greater knowledge spillovers [3–9,50–54]. Fourth, political economy studies demonstrate that intergovernmental grants may be shaped by electoral incentives, partisan alignment, and political bargaining rather than by objective territorial need alone [20–26]. Together, these studies suggest that SABD's effects may be delayed, conditional, and spatially uneven.

Using panel data for 226 basic local governments from 2015 to 2021, this study estimates feasible generalized least squares models that address heteroscedasticity and first-order autocorrelation. The models distinguish between current-year and one-year lagged SABD allocations to capture the budget-execution process through which central transfers are translated into local projects and economic outcomes. Separate models are estimated for all basic local governments, metropolitan local governments, and non-metropolitan local governments. By doing so, this study makes three contributions. First, it reframes Korea's SABD as a place-based fiscal transfer instrument for sustainable regional development. Second, it evaluates whether SABD has delayed economic effects rather than only contemporaneous effects. Third, it tests whether SABD's returns are stronger in non-metropolitan regions, as the balanced-development rationale would imply, or stronger in metropolitan regions, as agglomeration and absorptive-capacity theories would predict.

2. Theoretical Background

2.1. Korea's SABD as a Place-Based Fiscal Transfer for Sustainable Regional Development

SABD is Korea's major fiscal instrument for addressing territorial inequality through intergovernmental transfers. It was established to consolidate fragmented, ministry-specific regional development projects and to provide fiscal resources for local development initiatives. Its stated purpose is not merely to support local projects, but to mitigate excessive metropolitan concentration, promote self-reliant regional development, and enhance balanced national development [41–43]. In this study, SABD is conceptualized as a place-based fiscal transfer scheme because it allocates public resources territorially in order to improve the development conditions of specific regions.

SABD is particularly important from the perspective of sustainable regional development. Sustainability in this context refers not only to environmental protection but also to the long-term capacity of regions to maintain viable economic bases, stable populations, public-service accessibility, and effective local institutions. Non-metropolitan regions in Korea face structural disadvantages, including population aging, youth outmigration,

weaker fiscal bases, smaller local labor markets, and higher public-service delivery costs. SABD is intended to address these disadvantages by financing infrastructure, regional innovation, local development projects, and public services. Therefore, its effectiveness should be evaluated in terms of whether it helps lagging regions improve their economic and institutional capacity, rather than merely whether funds are disbursed.

The institutional character of SABD is hybrid. The Autonomous Account gives local governments comparatively greater discretion to design projects within predetermined ceilings, whereas the Support Account finances projects that are more strongly structured and reviewed by central ministries. These institutional differences may influence project fit, timing, accountability, and local multiplier effects. However, the municipality-level fiscal data available for all 226 basic local governments combine the two accounts; account-specific allocations cannot be consistently separated at this unit of analysis. The empirical models therefore estimate the aggregate SABD association, and the inability to distinguish centrally directed from locally planned projects is explicitly treated as a limitation. Korean studies have also criticized ambiguous allocation criteria, limited disclosure, weak evaluation systems, and insufficient basic-local-government autonomy [44–49].

The institutional evolution of SABD also shows that balanced-development finance in Korea has been highly sensitive to changes in national administrations. The name, account structure, and operational emphasis of SABD have changed across governments. Although the core policy objective of mitigating metropolitan concentration has remained, frequent changes in objectives, eligible projects, and account structures may weaken policy continuity. This matters for sustainability because regional development requires long-term investment cycles, cumulative capacity-building, and stable policy commitments.

Table 1 summarizes the budget trend of SABD from 2005 to 2023. The total budget increased from 5.4 trillion KRW in 2005 to 11.7 trillion KRW in 2023. Since 2010, the account has generally operated at around or above 10 trillion KRW annually. However, the internal structure of the account has changed substantially. The Autonomous Account declined from 5.5 trillion KRW in 2019 to 2.3 trillion KRW in 2020, while the Support Account increased from 4.8 trillion KRW to 6.6 trillion KRW over the same period. This shift suggests that SABD has increasingly relied on central-ministry-led support mechanisms, even though balanced-development policy rhetorically emphasizes local autonomy and place-based planning.

Table 1. Trends in the budget size of the SABD (Unit: trillion KRW).

Year	Support Account	Autonomous Account	Jeju & Sejong	Total	Year	Support Account	Autonomous Account	Jeju & Sejong	Total
2005	1.3	4.1	-	5.4	2015	5.4	4.5	0.5	10.4
2006	1.4	4.5	-	5.9	2016	4.9	4.6	0.5	10
2007	1.5	5	0.3	6.8	2017	4.7	4.7	0.4	9.8
2008	1.7	5.8	0.4	7.9	2018	4.3	5.2	0.4	9.9
2009	5.4	3.8	0.4	9.6	2019	4.8	5.5	0.4	10.7
2010	5.8	3.7	0.4	9.9	2020	6.6	2.3	0.3	9.2
2011	5.8	3.6	0.4	9.8	2021	7.5	2.5	0.3	10.3
2012	5.5	3.5	0.4	9.4	2022	8.2	2.3	0.3	10.9
2013	6.2	3.4	0.3	9.9	2023	9	2.4	0.3	11.7
2014	5.5	3.5	0.3	9.4					

Source: Adapted and partially revised by the authors based on the National Balanced Development Information System (NABIS) of the Republic of Korea.

The budget trend indicates that Korea has invested substantial public resources in balanced development. Yet the persistence of metropolitan concentration suggests that the existence of a large fiscal account does not necessarily guarantee equalizing outcomes. Ko-

rean empirical studies provide mixed findings. Kim and Park [46] show that political factors influence SABD allocation. Cho and Yang [43] find that regional development indicators are not always sufficiently reflected in allocation decisions, whereas political variables, such as the re-election status of local government heads and the number of National Assembly members, matter. Choi and Kwon [48] emphasize the role of administrative and political capacity in grant allocation. Kim and Kang [47] show that SABD affects local expenditure patterns, indicating that the account influences local fiscal behavior even if its final economic effects remain uncertain. Pai [42] finds no significant effect on regional growth rates, whereas Lim [49] reports positive lagged effects in depopulation areas. These mixed findings justify an empirical approach that incorporates lag structure, administrative-fiscal controls, political controls, and metropolitan/non-metropolitan heterogeneity.

2.2. Fiscal Transfers, Cohesion Policy, Decentralization, and Political Allocation

The international literature on place-based fiscal transfers provides a broader theoretical foundation for evaluating SABD. EU Cohesion Policy is the most relevant comparative case because it uses territorially targeted public investment to support lagging regions and promote convergence. Studies of EU Structural Funds and Cohesion Funds show that targeted transfers can improve regional performance under certain conditions. Becker et al. [28] find positive effects of Objective 1 support on regional performance, while Mohl and Hagen [30], Bouayad-Agha et al. [31], Maynou et al. [35], and Di Cataldo [38] report positive effects depending on the policy period, territorial context, and empirical strategy. These studies support the expectation that place-based transfers can contribute to sustainable regional development when they are sufficiently targeted and effectively implemented.

However, the EU literature also warns that place-based transfers do not automatically produce convergence. Dall’Erba and Le Gallo [32] and Antunes et al. [40] show that the impact of Structural Funds may become limited or insignificant once spatial dependence is considered. Becker et al. [29] and Cerqua and Pellegrini [39] demonstrate that transfer intensity may have nonlinear effects, implying diminishing returns when funding exceeds an efficient threshold. Rodríguez-Pose and Fratesi [33] argue that Structural Funds may be caught between development and social policy objectives, while Ederveen et al. [34] show that institutional conditions shape the effectiveness of cohesion expenditure. Rodríguez-Pose and Garcilazo [36] and Crescenzi and Giua [37] further emphasize that government quality and national-regional context condition the returns to public investment. These findings suggest that SABD should be evaluated not only by allocation volume but also by whether recipient regions possess the capacity to convert transfers into sustainable economic outcomes.

Recent evidence reinforces this concern. Liao et al. [55] find that a green place-based policy in China widened inter-city economic divergence because cities with stronger initial economic and ecological-industrial foundations captured larger gains. This result is directly relevant to SABD: territorially targeted spending may be redistributive in budgetary terms while still producing unequal growth returns when complementary assets and implementation capacities are spatially concentrated.

The fiscal decentralization literature offers a second perspective. The classic argument is that decentralization improves allocative efficiency because local governments better understand local needs and can tailor policies to local conditions. Akai and Sakata [10] and Iimi [12] provide evidence that fiscal decentralization can contribute to economic growth. However, other studies show that decentralization effects are conditional. Davoodi and Zou [11], Gemmell et al. [13], and Baskaran and Feld [14] find that the relationship between decentralization and growth depends on expenditure assignments, revenue autonomy,

institutional accountability, and country context. Lessmann [16] and Rodríguez-Pose and Ezcurra [15] further show that decentralization can either reduce or increase regional disparities depending on development level and redistributive capacity.

Governance quality is central to this debate. Kyriacou et al. [17] show that fiscal decentralization and government quality jointly shape regional inequalities. Charron et al. [18] demonstrate that subnational governance quality varies substantially within countries and influences regional development outcomes. Enikolopov and Zhuravskaya [19] show that political institutions condition the effects of decentralization. Applied to Korea, this literature implies that SABD's effect depends on more than the amount of transfer. Korea remains a highly centralized unitary state, and local governments depend heavily on central transfers. If local governments have limited discretion, weak fiscal autonomy, or insufficient implementation capacity, SABD may not produce the equalizing effects expected from a place-based fiscal instrument. Conversely, regions with stronger fiscal and administrative capacity may use the same transfers more effectively.

The political economy literature adds another important mechanism. Intergovernmental grants are formally justified by fiscal need, regional inequality, or public-service gaps, but they may also be shaped by political incentives. Grossman [20] theorizes grants as political instruments used by higher-level governments. Levitt and Snyder [21], Johansson [22], Arulampalam et al. [23], Solé-Ollé and Sorribas-Navarro [24], Brollo and Nannicini [25], and Veiga and Pinho [26] show that grants may be influenced by partisan alignment, electoral competition, swing voters, constituency politics, and central-local bargaining. These mechanisms do not necessarily imply intentional bias, but they suggest that fiscal allocation may deviate from objective territorial need.

This insight is relevant to Korea because previous SABD studies identify political variables in both allocation and local outcomes [43,46,48,49]. The number of National Assembly members, Budget and Accounts Committee membership, party alignment, local government head re-election, and election years may influence either the capacity to secure fiscal resources or the broader economic environment in which transfers are used. Therefore, a sustainability-oriented evaluation of SABD must consider whether balanced-development finance is protected from short-term political incentives and whether allocation criteria transparently prioritize regions with objective development needs.

2.3. Regional Convergence, Agglomeration, Absorptive Capacity, and Hypotheses

Regional convergence theory provides the third foundation for this study. Convergence research asks whether poorer regions catch up with richer regions over time. Sala-i-Martin [3] and Quah [4] show that convergence is neither automatic nor spatially uniform. Rey and Montouri [5], Fingleton and López-Bazo [6], and LeSage and Fischer [7] demonstrate that spatial dependence and spillovers matter for regional growth models. Ganong and Shoag [8] show that convergence can slow when housing and migration constraints limit labor mobility. Gennaioli et al. [9] emphasize that local human capital and regional characteristics strongly shape growth trajectories. These studies imply that fiscal transfers may not close territorial gaps unless they interact with broader demographic, institutional, and spatial-economic conditions.

Agglomeration theory helps explain why the same fiscal transfer may generate larger returns in metropolitan areas. Glaeser and Gottlieb [50] and Brühlhart and Sbergami [51] emphasize that density, thick labor markets, knowledge spillovers, and firm networks can increase productivity. Duranton and Turner [52] and Martin and Rogers [53] show that transportation and infrastructure can reinforce urban growth and industrial location advantages. Crescenzi and Rodríguez-Pose [54] caution, however, that infrastructure alone does not guarantee regional growth if complementary conditions such as human

capital, innovation capacity, and institutional quality are weak. In Korea, metropolitan local governments may therefore convert SABD allocations into output more effectively because they possess denser infrastructure, more diversified industries, larger fiscal resources, and stronger private-sector linkages.

Classic New Economic Geography provides a sharper mechanism for this possibility. Under increasing returns, mobile firms and workers, and declining transport costs, improvements in connectivity can strengthen core–periphery concentration rather than automatically disperse activity [56,57]. Infrastructure financed in a peripheral locality may reduce local isolation, but it can also lower the cost of commuting, migration, procurement, and capital movement toward a metropolitan core. SABD can therefore operate through two opposing channels: a local-capacity channel that raises productivity and service accessibility within the recipient region, and a leakage or backwash channel that connects local resources more efficiently to already dominant markets. Whether a project produces endogenous local growth depends on local supplier networks, labor-market depth, innovation capacity, and the degree to which expenditure is anchored in the recipient territory.

The concept of absorptive capacity bridges fiscal transfer theory and spatial economic theory. Absorptive capacity refers to the ability of a local government and local economy to plan, co-finance, implement, and leverage public investment. A non-metropolitan region may receive larger per capita transfers but still produce smaller economic returns if it has limited matching funds, aging populations, weak private investment, thin labor markets, and few complementary industries. A metropolitan region may receive smaller per capita transfers but generate larger returns because projects are connected to existing infrastructure, firms, workers, and markets. This mechanism is directly relevant to SABD because its policy objective is equalization, whereas its economic returns may be amplified by pre-existing metropolitan advantages.

A sustainability-oriented theory of place-based fiscal transfers therefore requires a distinction between fiscal need and development capacity. Fiscal need refers to the degree to which a region lacks economic resources, infrastructure, demographic vitality, and own-source revenue. Development capacity refers to the ability to transform additional public resources into productive, inclusive, and durable outcomes. These two dimensions do not always move together. A region may have high need but low capacity, while another may have lower need but high capacity. If allocation is based only on need, funds may fail to generate measurable economic returns unless accompanied by capacity-building. If allocation is based only on expected returns, funds may concentrate in already advantaged territories. Sustainable regional development requires an institutional design that recognizes both need and capacity.

This distinction helps explain why regional policy studies often report mixed findings. In the EU context, positive effects of cohesion spending appear when transfers are well-targeted and embedded in supportive institutional settings [28,30,31,35,38]. Limited or insignificant effects appear when spatial dependence, weak governance, or unsuitable transfer intensity reduces the capacity of funds to generate growth [32,34,36,37,40]. In the fiscal decentralization literature, similar ambiguity arises because decentralization improves responsiveness only when local governments have sufficient authority, incentives, and accountability [10–19]. Thus, theory does not predict a simple positive effect of SABD. It predicts a conditional effect mediated by timing, institutional design, regional capacity, and political environment.

Based on this theoretical discussion, three hypotheses are proposed. First, current-year SABD allocations are not expected to produce immediate positive effects because transfers must pass through budget approval, local matching, procurement, and implementation before influencing economic output. Second, one-year lagged SABD allocations are ex-

pected to have positive effects because public projects require time to be incorporated into local budgets and implemented. Third, the positive lagged effect is expected to be stronger in metropolitan local governments than in non-metropolitan local governments because metropolitan regions have stronger economic bases, denser infrastructure, larger fiscal resources, and higher absorptive capacity.

Hypothesis 1. *Current-year SABD allocations do not generate an immediate positive effect on local economic performance.*

Hypothesis 2. *One-year lagged SABD allocations have a positive effect on local economic performance.*

Hypothesis 3. *The positive lagged effect of SABD is stronger in metropolitan local governments than in non-metropolitan local governments because metropolitan regions have stronger economic bases, denser infrastructure, larger fiscal resources, and higher absorptive capacity.*

Taken together, these hypotheses place the Korean case within a broader debate about whether place-based fiscal transfers can promote sustainable regional development when institutional and spatial conditions are unequal. If SABD works as an equalizing fiscal instrument, its lagged effects should be positive and at least as strong in non-metropolitan regions as in metropolitan regions. If its effects are stronger in metropolitan regions, SABD may still generate economic returns, but it would not fully perform an equalizing function.

3. Research Design

3.1. Data, Sample, and Analytical Strategy

This study examines whether Korea's SABD, conceptualized as a place-based fiscal transfer, contributes to local economic performance and whether its effects differ between metropolitan and non-metropolitan regions. The unit of analysis is the basic local government, including cities, counties, and districts. Korea has a two-tier local-government system composed of metropolitan local governments and basic local governments. This study focuses on basic local governments because SABD allocations, local fiscal indicators, demographic characteristics, and per capita gross regional domestic product (GRDP) can be observed at this level. Basic local governments are also the territorial units through which residents directly experience local infrastructure, public services, and economic opportunities.

The panel dataset covers 226 basic local governments from 2015 to 2021, producing 1582 local-government-year observations. SABD data from 2014 are additionally used to construct the one-year lagged SABD variable. The metropolitan sample consists of 71 basic local governments and 497 observations, while the non-metropolitan sample consists of 155 basic local governments and 1085 observations. This three-sample design—full sample, metropolitan sample, and non-metropolitan sample—is central to the research question. If SABD functions as an equalizing fiscal instrument for sustainable regional development, its economic returns should be at least as strong in non-metropolitan regions as in metropolitan regions. Conversely, if its effects are stronger in metropolitan areas, this would suggest that the returns to place-based transfers are conditioned by pre-existing agglomeration, fiscal resources, infrastructure, and absorptive capacity.

The analytical strategy therefore does not treat SABD as a simple budgetary input. Rather, it evaluates whether a national fiscal transfer scheme designed for balanced development is associated with local economic performance under different territorial conditions. This approach is consistent with the theoretical argument that place-based fiscal transfers may have delayed and spatially uneven effects when institutional capacity and regional economic structures differ across territories.

3.2. Variable Construction and Measurement

The dependent variable is per capita GRDP, measured in million KRW. Per capita GRDP is used as a proxy for local economic performance because the economic dimension has been central to Korea's balanced-development policy and because previous Korean studies commonly use GRDP to assess regional economic capacity [42,49]. This measure also enables comparison across local governments with different population sizes. However, this study recognizes that per capita GRDP captures only one dimension of sustainable regional development. It does not directly measure environmental sustainability, social well-being, demographic resilience, or convergence. Therefore, the results are interpreted as evidence on the economic dimension of territorial sustainability, complemented by demographic, fiscal, infrastructural, and political controls.

The main independent variables are current-year per capita SABD allocations and one-year lagged per capita SABD allocations. The current-year variable captures the contemporaneous association between SABD and local economic performance. The one-year lagged variable captures delayed effects that may occur after central budget allocation, National Assembly approval, local budget incorporation, matching procedures, procurement, project execution, and private-sector response. This lag structure is theoretically meaningful because public investment effects rarely materialize immediately within the allocation year. It is also consistent with previous Korean studies suggesting that SABD may influence regional economies after a one- or two-year delay [42,49].

The control variables are selected to reflect administrative-fiscal, demographic, and political conditions that may affect both local economic performance and the capacity to transform transfers into economic outcomes. Administrative-fiscal controls include per capita urban area and per capita total expenditure. Per capita urban area captures density-related development conditions and is closely related to agglomeration economies. Per capita total expenditure captures the fiscal scale of local government action and the broader capacity to implement development projects. These variables are included because agglomeration, infrastructure, and fiscal capacity are expected to shape the returns to public investment [50–54].

Demographic controls include population growth rate and elderly population ratio. Population growth reflects demographic vitality and labor-market potential, whereas elderly population ratio captures aging-related constraints on production, consumption, fiscal sustainability, and local implementation capacity. These variables are particularly important in the Korean context because non-metropolitan regions face population decline, youth outmigration, and rapid aging.

Political controls include the political orientation of the national administration, the number of National Assembly members in each region, the number of election wins by regional National Assembly members, Budget and Accounts Committee membership, alignment between the mayor and the ruling party, mayoral re-election status, and election year. These variables reflect the possibility that fiscal transfers and regional economic outcomes are influenced by political representation, electoral incentives, central-local networks, and leadership capacity. The political economy literature shows that intergovernmental grants may be shaped by partisan alignment, electoral competition, constituency politics, and political bargaining [20–26]. Korean studies similarly find that SABD allocation and local fiscal outcomes are affected by political and administrative factors [43,46,48,49]. Table 2 summarizes the panel regression variables, measurement periods, data sources, and expected signs used in this study.

Table 2. Panel regression model variables.

Category	Variable	Variable Description (Period)	Source (Unit)	Expected Sign	
Dependent variable	Regional economy (GRDP)	Per capita GRDP (2015–2021)	National Statistics Portal (KOSIS) (million KRW)		
Independent variable	SABD	Per capita SABD grants for the current year (2015–2021)	Consolidated Fiscal Summary (million KRW)	+	
		Per capita SABD grants for the previous year (2014–2021)			
Control variables (X)	Public administrative and fiscal factors	Per capita urban area (2015–2021)	National Statistics Portal (KOSIS) (m ²)	+	
		Population growth rate (2015–2021)	National Statistics Portal (KOSIS) (%)	+	
		Elderly population ratio (2015–2021)	National Statistics Portal (KOSIS) (%)	-	
		Per capita basic local government expenditure (2015–2021)	Consolidated Fiscal Summary (million KRW)	+	
	Political factors	Government	Political orientation of the administration (Progressive = 1, Conservative = 0)	National Election Commission (NEC) (Election Statistics System)	+
		National Assembly	Number of National Assembly members in the region	National Election Commission (NEC) (Election Statistics System)	+
			Number of election wins by regional National Assembly members	National Election Commission (NEC) (Election Statistics System)	+
			Special Committee on Budget and Accounts membership (Member = 1, Non-member = 0)	History of Special Committee on Budget and Accounts	+
		Basic local government	Alignment of the mayor with the ruling party (Ruling party = 1, Opposition = 0)	National Election Commission (NEC) (Election Statistics System)	+
			Mayor’s re-election status	Whether the mayor has been re-elected (Re-elected = 1, Not re-elected = 0)	+
		Election	Election year	Indicator variable for election year (Election year = 1, Other years = 0)	+

3.3. Model Specification, Diagnostic Tests, and Scope of Inference

To estimate the relationship between SABD allocations and local economic performance, this study uses a panel regression model. The baseline specification is as follows:

$$GRDP_{it} = \alpha + \beta_1 SABD_{it} + \beta_2 SABD_{i(t-1)} + \gamma_k X_{it} + \mu_i + e_{it}$$

where $(GRDP_{it})$ denotes per capita GRDP in basic local government (i) in year (t). $(SABD_{it})$ denotes current-year per capita SABD allocation, and $(SABD_{i(t-1)})$ denotes one-year lagged per capita SABD allocation. (X_{it}) is a vector of administrative-fiscal, demographic, and political control variables. (μ_i) captures time-invariant local characteristics, and (e_{it}) is the idiosyncratic error term. The model is estimated separately for all basic local governments, metropolitan local governments, and non-metropolitan local governments.

Diagnostic tests were conducted before selecting the final estimator. First, heteroscedasticity was examined using a likelihood-ratio (LR) test. The LR test compares an unrestricted model that allows error variances to differ across panel units with a restricted model that assumes equal error variances. The test yielded a p -value of 0.0000, rejecting the null hypothesis of homoscedasticity at the 1% significance level and indicating the presence of panel-level heteroscedasticity. Second, serial correlation was assessed using the Wooldridge test for autocorrelation in panel data. The resulting F-statistic rejected the null hypothesis of no first-order autocorrelation at the 1% significance level, indicating first-order serial correlation in the panel error structure. Because the present dataset is a short panel with 226 cross-sectional units and seven annual observations, the Wooldridge test is an appropriate diagnostic for detecting first-order autocorrelation in this empirical setting. In addition, all variance inflation factor values were below the conventional threshold of 10, suggesting that multicollinearity was not a serious concern. Taken together, these diagnostic results justify the use of feasible generalized least squares (FGLS), which provides more efficient estimates when heteroscedasticity and first-order autocorrelation are present. FGLS is appropriate for this study because the dataset is a short panel with many local-government units and a limited time dimension [58].

The empirical claims are interpreted with caution because SABD allocation may be endogenous to prior local economic conditions. A negative contemporaneous coefficient may reflect compensatory targeting toward weaker economies, whereas stronger local governments may also possess greater capacity to secure and implement projects. A conventional instrumental-variable strategy was considered, including the geography-based approach used in cross-country fiscal-decentralization research [59]. In the Korean municipal context, however, area, terrain, and spatial fragmentation can directly affect productivity, settlement patterns, infrastructure costs, and public-service delivery, making the exclusion restriction difficult to defend. The revised analysis therefore does not claim causal identification. Instead, it combines panel cross-lag tests with fixed-effects spatial models to examine temporal ordering and spatial robustness, and it interprets the resulting estimates as conditional associations.

3.4. Endogeneity Diagnostics and Spatial Robustness

First, two fixed-effects temporal-order equations are estimated as an exploratory Granger-style diagnostic. The local economic equation includes one-year-lagged per capita GRDP and the SABD lag-effect variable. The reverse equation uses the SABD lag-effect variable as the dependent variable and includes its own first lag and one-year-lagged per capita GRDP. Local-government and year fixed effects are included, and standard errors are clustered by local government. These tests assess predictive ordering, not definitive structural causality.

Second, spatial dependence is evaluated using a row-standardized four-nearest-neighbor matrix constructed from the reference centroids of the 226 local governments. The KNN(4) specification avoids isolated units and provides a common neighborhood definition across the panel. Global Moran's *I* is calculated annually for per capita GRDP, current-year per capita SABD, and the SABD lag-effect measure.

Third, four specifications are compared: a non-spatial local-government fixed-effects model, a spatial autoregressive model (SAR) with a spatially lagged dependent variable, a spatial error model (SEM), and a Spatial Durbin model (SDM) including spatial lags of current-year SABD, the SABD lag-effect measure, and the main administrative-fiscal and demographic controls. Statistical significance of spatial parameters indicates interdependence across neighboring local economies, whereas direct, indirect, and total SDM effects distinguish local associations from cross-boundary spillovers.

4. Results

4.1. Descriptive Statistical Analysis

Table 3 reports the descriptive statistics for the variables used in the analysis. The dataset consists of 1582 local-government-year observations, covering 226 basic local governments over seven years from 2015 to 2021. The metropolitan subsample includes 497 observations from 71 basic local governments, whereas the non-metropolitan subsample includes 1085 observations from 155 basic local governments. The descriptive results reveal an important empirical stylized fact: non-metropolitan regions receive higher per capita SABD allocations, but they also face weaker economic, demographic, and infrastructural conditions than metropolitan regions.

The mean per capita GRDP is 38.2 million KRW for all basic local governments. However, the mean is 44.5 million KRW in metropolitan areas and 35.4 million KRW in non-metropolitan areas. This confirms that metropolitan local governments have stronger economic bases. The maximum value of per capita GRDP is also higher in the metropolitan sample, indicating that high-output localities are concentrated in metropolitan areas. This pattern is consistent with regional convergence and agglomeration studies, which emphasize that density, labor-market depth, firm networks, infrastructure, and knowledge spillovers can support higher local productivity [3–9,50–54]. It also shows why the Korean case should be understood as a problem of sustainable regional development rather than as a narrow fiscal-transfer issue.

The mean per capita SABD allocation is 0.3 million KRW for all local governments, 0.1 million KRW in metropolitan areas, and 0.4 million KRW in non-metropolitan areas. At the input level, this indicates that SABD is allocated more heavily to non-metropolitan regions on a per capita basis. This pattern appears consistent with the formal purpose of balanced development. However, the descriptive statistics also show that allocation volume alone cannot demonstrate policy effectiveness. If non-metropolitan regions receive larger transfers but generate smaller economic returns, the central issue becomes whether fiscal inputs are converted into sustainable development outcomes.

The demographic indicators clarify this point. Population growth is positive in metropolitan areas but negative in non-metropolitan areas. The elderly population ratio is 14.1% in metropolitan areas and 23.0% in non-metropolitan areas. These figures indicate that non-metropolitan regions face simultaneous economic, demographic, and service-delivery challenges. Aging and population decline may reduce local labor supply, weaken consumption, increase welfare expenditure pressures, and limit the capacity of local economies to absorb public investment.

Table 3. Descriptive statistics.

Category (Unit)	Mean			Standard Deviation			Min			Max		
	All	Metro Politan	Non-Metropo Litan	All	Metro Politan	Non-Metropo Litan	All	Metro Politan	Non-Metropo Litan	All	Metro Politan	Non-Metropo Litan
Per capita GRDP (million KRW)	38.2	44.5	35.4	38.9	53.5	29.6	3.5	3.9	3.5	445.0	445.0	293.2
Per capita SABD (million KRW)	0.3	0.1	0.4	0.4	0.1	0.4	0.0	0.0	0.0	2.4	1.1	2.4
Per capita urban area (m ²)	514.1	324.8	600.9	524.1	507.6	508.7	24.2	24.2	57.1	3322.8	3322.8	2836.4
Population growth rate (%)	−0.3	0.3	−0.5	2.3	2.9	1.9	−9.8	−9.8	−6.4	26.4	26.4	17.8
Elderly population ratio (%)	20.2	14.1	23.0	8.3	4.3	8.1	6.4	6.4	7.2	43.2	34.1	43.2
Per capita total expenditure (million KRW)	6.7	3.7	8.1	5.3	4.2	5.2	0.6	0.6	0.8	32.1	26.5	32.1
Political orientation of administration	0.6	0.6	0.6	0.5	0.5	0.5	0.0	0.0	0.0	1.0	1.0	1.0
Number of National Assembly members	1.5	1.9	1.3	0.8	0.9	0.6	1.0	1.0	1.0	6.0	6.0	5.0
Number of election wins by National Assembly members	3.1	4.3	2.5	2.4	2.8	1.9	1.0	1.0	1.0	16.0	16.0	14.0
Special Committee on Budget and Accounts Membership	0.3	0.3	0.2	0.4	0.4	0.4	0.0	0.0	0.0	1.0	1.0	1.0
Alignment of mayor with ruling party	0.6	0.7	0.5	0.5	0.5	0.5	0.0	0.0	0.0	1.0	1.0	1.0
Mayor's re-election status	0.5	0.5	0.4	0.5	0.5	0.5	0.0	0.0	0.0	1.0	1.0	1.0
Election year	0.6	0.6	0.6	0.5	0.5	0.5	0.0	0.0	0.0	1.0	1.0	1.0
Observations (groups/time periods)	All basic local governments: 1582 (226/7)/Metropolitan area: 497 (71/7)/Non-metropolitan area: 1085 (155/7)											

Per capita total expenditure is higher in non-metropolitan areas than in metropolitan areas: 8.1 million KRW compared with 3.7 million KRW. This does not necessarily imply that non-metropolitan governments have greater fiscal capacity. Rather, it may reflect the higher per capita cost of maintaining public services in less dense, aging, and geographically dispersed territories. Therefore, higher per capita expenditure in non-metropolitan regions may indicate fiscal burden as much as development capacity.

Political variables also differ across regions. Metropolitan areas have a higher average number of National Assembly members and a higher average number of election wins by National Assembly members. This suggests stronger political representation and potentially greater capacity to secure or complement national fiscal resources. This pattern is consistent with the political economy literature, which shows that intergovernmental grants may be embedded in electoral incentives, partisan alignment, constituency politics, and central-local bargaining [20–26]. Korean studies on SABD also suggest that political and administrative factors affect allocation and local fiscal outcomes [43,46,48,49].

Overall, Table 3 shows that SABD operates in a context where non-metropolitan regions receive larger per capita transfers but face weaker economic bases, lower infrastructure coverage, negative population growth, higher aging, and potentially weaker political representation. These conditions suggest that the equalizing function of SABD cannot be assessed only by allocation size. The key empirical question is whether non-metropolitan regions can transform fiscal transfers into economic outcomes comparable to those generated in metropolitan regions.

4.2. FGLS Estimation Results

Table 4 presents the FGLS estimation results for all basic local governments, metropolitan local governments, and non-metropolitan local governments. The results show a consistent temporal pattern across the three models. The coefficient of current-year per capita SABD is negative and statistically significant in the full sample, the metropolitan model, and the non-metropolitan model. Specifically, the coefficient is -6.716 in the full sample, -20.622 in the metropolitan model, and -5.958 in the non-metropolitan model. These results support Hypothesis 1, which expected that current-year SABD allocations would not generate an immediate positive effect on local economic performance.

The negative contemporaneous coefficient should be interpreted with caution. It does not necessarily imply that SABD reduces local economic performance. Instead, it may reflect three mechanisms. First, SABD may be allocated to regions facing weaker current economic conditions, producing a negative contemporaneous association. Second, the budget cycle may delay the economic realization of SABD projects because allocations are finalized through central budget procedures and National Assembly approval before being incorporated into local budgets. Third, public investment projects require planning, procurement, construction, implementation, and private-sector response before they affect GRDP. This interpretation is consistent with the broader place-based policy literature and with Korean studies suggesting that SABD effects may emerge after a one- or two-year lag [27–39,49].

The one-year lagged SABD coefficient is positive and statistically significant in all three models. The coefficient is 2.658 in the full sample, 10.690 in the metropolitan model, and 2.192 in the non-metropolitan model. These findings support Hypothesis 2, which expected a positive association between one-year lagged SABD allocations and local economic performance. This result suggests that SABD may generate economic benefits after the budget-execution process has progressed. It also indicates that SABD should be evaluated through a multi-year performance framework rather than a narrow annual execution framework.

Table 4. Empirical results of the regional economic effects of SABD.

Category			All Basic Local Governments Model	Metropolitan Area Model	Non-Metropolitan Area Model
Dependent variable (Regional economy: per capita GRDP)			Coef. (Std. err.)	Coef. (Std. err.)	Coef. (Std. err.)
Independent variable	SABD	Per capita SABD (current year)	−6.716 *** (0.850)	−20.622 *** (5.183)	−5.958 *** (1.116)
		Per capita SABD (1-Year Lag-Effect)	2.658 *** (0.559)	10.690 *** (4.083)	2.192 *** (0.763)
Control variables	Public administrative and fiscal Factors	Per capita urban area	0.012 *** (0.001)	0.021 *** (0.003)	0.012 *** (0.001)
		Population growth rate	−0.081 (0.052)	−0.144 (0.088)	0.107 (0.088)
		Elderly population ratio	−0.274 *** (0.050)	0.133 (0.132)	−0.363 *** (0.064)
		Per capita total expenditure	0.936 *** (0.085)	1.375 *** (0.228)	1.077 *** (0.117)
	Political factors	Political orientation of administration	0.634 *** (0.192)	0.994 ** (0.394)	0.541 * (0.281)
		Number of national assembly members	1.126 *** (0.357)	1.252 * (0.656)	0.757 (0.559)
		Number of election wins by national assembly members	0.031 (0.073)	0.121 (0.125)	0.054 (0.115)
		Membership in budget and accounts committee	−0.092 (0.135)	−0.109 (0.272)	−0.037 (0.197)
		Alignment of mayor with ruling party	−0.100 (0.165)	0.018 (0.342)	−0.146 (0.245)
		Mayor's re-election status	0.408 * (0.241)	1.559 *** (0.537)	0.160 (0.327)
		Election year	0.363 *** (0.115)	0.134 (0.225)	0.361 ** (0.173)
	Constant		24.332 *** (1.237)	19.208 *** (2.697)	23.846 *** (1.550)
	Observations		1582	497	1085
	Groups		226	71	155
	Time periods (years)			7 (2015–2021)	
	Wald Chi-square		374.38 ***	160.43 ***	311.59 ***

Notes: Standard errors are shown in parentheses. Statistical significance is indicated as follows: * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

The most important finding is the difference between metropolitan and non-metropolitan lagged effects. The metropolitan coefficient is approximately five times larger than the non-metropolitan coefficient. This supports Hypothesis 3, which predicted that the positive lagged effect of SABD would be stronger in metropolitan local governments because they possess stronger economic bases, denser infrastructure, larger fiscal resources, and higher absorptive capacity. This result is particularly important because Table 3 shows that non-metropolitan regions receive larger per capita SABD allocations. In other words, SABD appears redistributive in terms of fiscal inputs but spatially uneven in terms of economic returns.

This pattern is consistent with agglomeration and absorptive-capacity theories [50–54]. Metropolitan local governments may convert fiscal transfers into economic output more effectively because they have denser labor markets, stronger firm networks, more advanced infrastructure, larger fiscal resources, and stronger private-sector linkages. A project funded by SABD in a metropolitan region may be connected more quickly to existing markets, infrastructure, and investment networks. In contrast, a similar fiscal input in a non-metropolitan region may face weaker local demand, smaller labor pools, limited complementary industries, lower matching capacity, and slower implementation.

The control variables reinforce this interpretation. Per capita urban area has a positive and statistically significant effect in all models. The coefficient is 0.012 in the full sample, 0.021 in the metropolitan model, and 0.012 in the non-metropolitan model. This indicates that urbanized spatial conditions support local economic performance. The stronger coefficient in the metropolitan model suggests that density-related advantages are more pronounced where urban systems are already consolidated. This finding is consistent with studies on agglomeration economies and urban productivity [50,51].

Per capita total expenditure is also positive and statistically significant in all models. The coefficient is 0.936 in the full sample, 1.375 in the metropolitan model, and 1.077 in the non-metropolitan model. This indicates that broader local fiscal scale is associated with higher per capita GRDP. However, the larger coefficient in the metropolitan model suggests that fiscal resources may be more productive when they are embedded in stronger economic systems. In non-metropolitan regions, higher per capita expenditure may partly reflect the cost of maintaining public services under conditions of low density, population aging, and spatial dispersion.

The elderly population ratio has a negative and statistically significant effect in the full sample and in the non-metropolitan model. In the non-metropolitan model, the coefficient is -0.363 . This result indicates that aging is a major constraint on local economic performance outside metropolitan areas. It also shows that the economic effect of balanced-development finance cannot be separated from demographic conditions. Where aging reduces labor supply, weakens local consumption, and increases fiscal pressure, additional fiscal transfers may have more limited economic effects unless they are accompanied by policies that address demographic and labor-market constraints.

Political variables also show statistically meaningful patterns. The political orientation of the national administration is positive and significant in all models. The number of National Assembly members is positive and significant in the full sample and the metropolitan model. Mayoral re-election is positive and significant in the full sample and metropolitan model, while election year is positive and significant in the full sample and non-metropolitan model. These findings do not prove political distortion in SABD allocation. However, they are consistent with the political economy literature showing that intergovernmental grants and local economic outcomes are embedded in political representation, electoral incentives, and central-local relations [20–26]. They also align with

Korean studies showing that political and administrative capacity can influence SABD allocation and regional fiscal outcomes [43,46,48,49].

Overall, the estimation results show a coherent pattern. SABD does not generate immediate positive economic effects within the allocation year. It has a positive one-year lagged association with local economic performance. However, this delayed positive effect is substantially stronger in metropolitan regions than in non-metropolitan regions. This does not mean that SABD is irrelevant to non-metropolitan economies, because the lagged coefficient remains positive and statistically significant in the non-metropolitan model. Rather, the result indicates that the effect is smaller than what would be expected if SABD were fully performing an equalizing function.

To facilitate a direct comparison of the magnitude, direction, and precision of the baseline FGLS estimates reported in Table 4, Figure 1 presents the coefficients and 95% confidence intervals for current-year and one-year lag-effect SABD across the three territorial samples. A consistent temporal contrast is evident: current-year SABD is negatively associated with per capita GRDP in all models, whereas the one-year lag-effect measure is positively associated with regional economic performance. The magnitudes of both associations are substantially larger in the metropolitan sample, where the current-year coefficient is -20.622 and the lag-effect coefficient is 10.690 , compared with -5.958 and 2.192 , respectively, in the non-metropolitan sample. The metropolitan estimates also have wider confidence intervals, indicating greater uncertainty despite their larger absolute magnitudes, whereas the full-sample and non-metropolitan estimates are comparatively more precise. Taken together, the figure visually reinforces two central findings: the association between SABD and regional economic performance changes direction over the budget-implementation cycle, and the magnitude of this temporal pattern varies markedly across territorial contexts. Nevertheless, these estimates should be interpreted as conditional associations rather than definitive causal effects because SABD allocations may respond to pre-existing regional economic conditions and unobserved differences in implementation capacity.

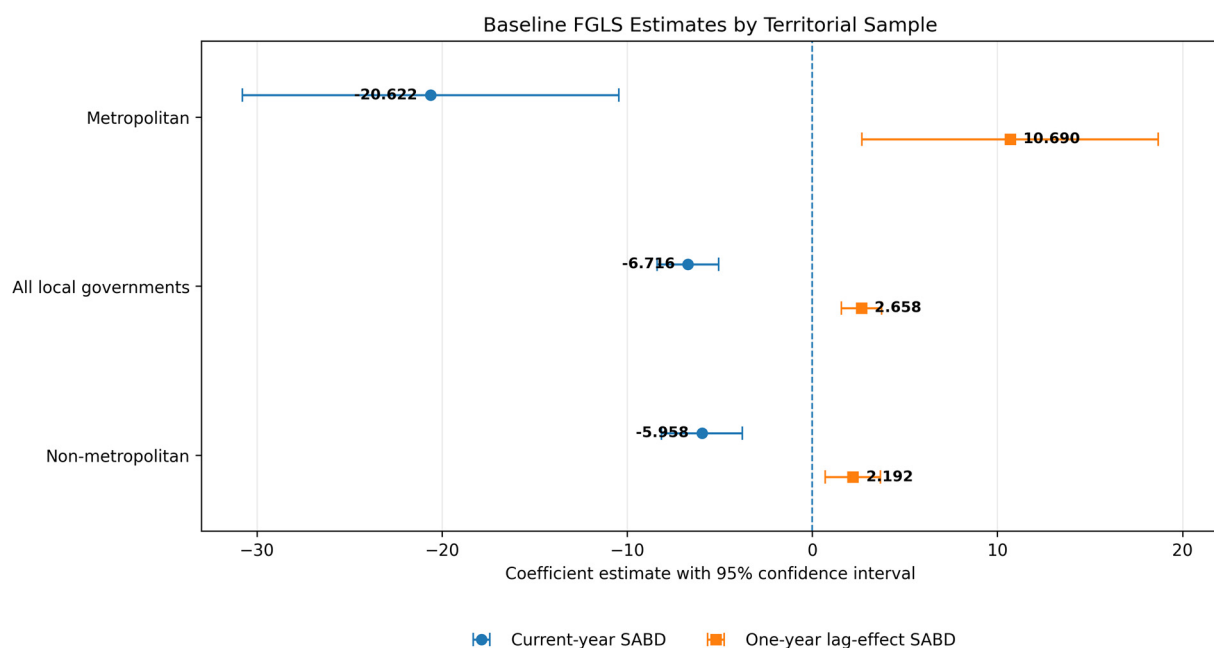


Figure 1. Baseline FGLS estimates of current-year and one-year lag-effect SABD associations by territorial sample. Note: Markers indicate coefficient estimates, horizontal bars indicate 95% confidence intervals, and the numerical estimates are printed next to the markers. All coefficients correspond to Table 4.

As shown in Figure 1, the delayed positive association is concentrated disproportionately in metropolitan local governments, providing visual support for the argument that pre-existing agglomeration advantages and absorptive capacity condition the economic returns to place-based fiscal transfers.

4.3. Spatial Dependence, Spatial-Panel Robustness, and Temporal-Order Tests

Table 5 reports annual Global Moran's I statistics. Per capita GRDP is positively and significantly clustered in every year, with Moran's I ranging from 0.129 to 0.142. Current-year SABD displays substantially stronger and more persistent clustering, ranging from 0.378 to 0.497. In contrast, the SABD lag-effect measure exhibits a time-varying spatial pattern: spatial autocorrelation is weak and statistically insignificant in 2015–2018 and 2021 but becomes positive and significant in 2019 ($I = 0.178$, $p = 0.001$) and 2020 ($I = 0.395$, $p = 0.001$). The delayed component of SABD is therefore spatially episodic rather than uniformly clustered throughout the study period.

Table 5. Global Moran's I for local economic performance and SABD allocations.

Year	Per Capita GRDP	Current-Year SABD	One-Year Lag-Effect SABD
2015	0.142 (0.004)	0.441 (0.001)	0.027 (0.354)
2016	0.137 (0.005)	0.411 (0.001)	0.005 (0.814)
2017	0.135 (0.008)	0.426 (0.001)	−0.007 (0.947)
2018	0.129 (0.007)	0.497 (0.001)	−0.028 (0.503)
2019	0.131 (0.005)	0.493 (0.001)	0.178 (0.001)
2020	0.132 (0.005)	0.378 (0.001)	0.395 (0.001)
2021	0.135 (0.005)	0.414 (0.001)	−0.028 (0.579)

Note: Moran's I is based on a row-standardized four-nearest-neighbor spatial matrix. Analytical p -values are reported in parentheses.

Table 6 compares the non-spatial and spatial fixed-effects models using the complete 2015–2021 panel. Spatial dependence in per capita GRDP is strong and stable: the spatial parameters are positive and highly significant in the SAR ($\rho = 0.257$, $p < 0.001$), SEM ($\gamma = 0.303$, $p < 0.001$), and SDM ($\rho = 0.282$, $p < 0.001$). After local fixed effects and spatial dependence are controlled, neither the current-year SABD coefficient nor the SABD lag-effect coefficient is statistically significant in the FE, SAR, SEM, or SDM specification. In the SDM, the spatially lagged SABD lag-effect term is positive and marginally significant (3.016, $p = 0.074$). The corresponding indirect effect (3.987, $p = 0.064$) and total effect (4.054, $p = 0.073$) are also significant only at the 10% level, whereas all current-year SABD impacts are insignificant. Thus, the spatial evidence does not confirm a robust local growth effect, but it suggests a limited possibility that delayed fiscal activity is transmitted across neighboring jurisdictions.

The temporal-order tests in Table 7 provide a complementary diagnostic. The SABD lag-effect measure does not significantly predict subsequent per capita GRDP after lagged GRDP, local-government effects, year effects, and controls are included ($\beta = 0.255$, $p = 0.751$). Conversely, lagged per capita GRDP does not significantly predict the SABD lag-effect measure ($\beta = -0.0005$, $p = 0.659$). The lag-effect measure is negatively related to its own first lag ($\beta = -0.375$, $p < 0.001$), indicating short-run mean reversion rather than persistent accumulation. These results do not support predictive causality in either substantive direction.

Table 6. Spatial-panel robustness checks for per capita GRDP.

Variable	FE	SAR-FE	SEM-FE	SDM-FE
Current-year SABD	−0.792 (1.280)	−0.513 (1.169)	−0.657 (1.208)	−0.304 (1.226)
One-year lag-effect SABD	1.033 (0.827)	0.761 (0.903)	0.438 (0.943)	−0.105 (0.957)
W × Current SABD	—	—	—	−1.420 (2.271)
W × Lag-effect SABD	—	—	—	3.016 * (1.689)
Spatial lag, ρ	—	0.257 *** (0.033)	—	0.282 *** (0.034)
Spatial error, γ	—	—	0.303 *** (0.034)	—
SDM direct effect: current SABD	—	—	—	−0.390 (1.214)
SDM indirect effect: current SABD	—	—	—	−2.009 (2.953)
SDM total effect: current SABD	—	—	—	−2.399 (3.124)
SDM direct effect: lag-effect SABD	—	—	—	0.067 (0.940)
SDM indirect effect: lag-effect SABD	—	—	—	3.987 * (2.157)
SDM total effect: lag-effect SABD	—	—	—	4.054 * (2.261)
Local-government fixed effects	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Observations	1582	1582	1582	1582
Local governments	226	226	226	226
Years	2015–2021	2015–2021	2015–2021	2015–2021

Note: Standard errors are in parentheses. The KNN(4) matrix is row-standardized. The SDM additionally includes spatial lags of per capita urban area, population growth, elderly share, and per capita expenditure. Direct, indirect, and total effects are derived from the SDM spatial multiplier. *** $p < 0.01$, * $p < 0.10$.

Table 7. Cross-lag fixed-effects tests of temporal ordering.

Predictor	Per Capita GRDP Equation	Lag-Effect SABD Equation
Lagged per capita GRDP	0.5554 *** (0.0799)	−0.0005 (0.0011)
One-year lag-effect SABD	0.2554 (0.8041)	−0.3752 *** (0.0605)
Local-government fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Controls	Yes	Yes
Observations	1356	1356

Note: Both equations include local-government and year fixed effects and the administrative-fiscal, demographic, and political controls used in the robustness specification. Standard errors clustered by local government are in parentheses. *** $p < 0.01$.

5. Discussion

The evidence produces a more qualified interpretation of Korea's SABD. The baseline FGLS estimates reveal a delayed and territorially uneven association, but the spatial and temporal-order analyses show that the pattern is not equivalent to a spatially robust local growth effect or a causal estimate. Current-year SABD and per capita GRDP are spatially clustered, while the spatial concentration of the SABD lag-effect measure is episodic. Once local fixed effects and spatial dependence are incorporated, the local current-year and lag-effect coefficients become statistically insignificant.

The temporal pattern in the baseline results should therefore be read as a budget-cycle association rather than proof of delayed causality. Planning, matching, procurement, and implementation can plausibly postpone observable outcomes, but compensatory allocation toward weaker economies and unobserved implementation capacity can also shape the coefficients. The cross-lag tests offer no evidence that the SABD lag-effect measure predicts subsequent GRDP or that lagged GRDP predicts the lag-effect measure. The negative persistence of the lag-effect series further suggests short-run adjustment or mean reversion.

The metropolitan–non-metropolitan contrast remains substantively important as a descriptive pattern. New Economic Geography clarifies why infrastructure and fiscal transfers can generate both local-capacity gains and core-oriented leakage. When transport costs fall and firms, skilled workers, and capital remain mobile, improved connectivity can expand access to the metropolitan core without creating a sufficiently dense local production system. The larger metropolitan FGLS coefficient is therefore consistent with cumulative causation and market-access mechanisms, but the spatial results caution against assigning this difference solely to SABD.

This interpretation also resonates with comparative place-based-policy research. The EU literature shows that returns depend on governance, transfer intensity, and complementary regional assets, while recent Chinese evidence reports that a green place-based policy widened inter-city divergence by disproportionately benefiting cities with stronger initial foundations [55]. The Korean case adds a centralized unitary-state setting in which fiscal targeting, local discretion, and spatial spillovers interact. Place-based finance may be necessary for territorial cohesion, but its equalizing effect depends on whether projects deepen endogenous local capabilities rather than merely improve access to already dominant markets.

The institutional composition of SABD is also consequential. Autonomous Account projects and centrally directed Support Account projects differ in local discretion and potentially in local fit, but the available 226-municipality dataset does not separate them. The aggregate coefficient may therefore combine heterogeneous project types and governance mechanisms. Future administrative-data access should permit account-specific and project-level analysis, including whether locally planned projects produce stronger local multipliers or whether centrally coordinated projects create broader cross-boundary spillovers.

Absorptive capacity likewise remains an incompletely measured mechanism. While expenditure scale, public staffing, and tax capacity reflect certain dimensions of local capability, they fail to directly account for educational attainment, professional and technical labor, project completion, procurement quality, or the ability to coordinate public and private investment. Consequently, future research should prioritize the development of direct capacity indicators and project implementation records.

A multidimensional sustainability interpretation is essential. Per capita GRDP captures the economic pillar but not the full social value of balanced-development spending. A project may have a weak short-run output effect while preserving service accessibility, reducing travel time, maintaining settlement viability, supporting elderly care, or slowing population loss. Future evaluation frameworks should jointly assess employment creation, population retention, demographic composition, access to health and education, fiscal resilience, environmental performance, and economic output. Such an integrated approach would reveal possible trade-offs between economic efficiency and social-territorial sustainability.

The policy implication is a shift from input-based redistribution to capacity-sensitive and spatially coordinated equalization. Allocation formulas should combine objective need with implementation support, but they should not reward existing capacity in a way that systematically diverts resources toward already advantaged regions. Multi-year project pipelines, technical assistance, differentiated matching requirements, intermunicipal

coordination, local supplier-development provisions, and monitoring of cross-boundary leakage can help convert transfers into locally retained benefits.

The Korean experience has wider international relevance. Developed countries with pronounced core–periphery polarization, including Japan and Italy, face similar questions about whether fiscal transfers sustain peripheral communities or reinforce metropolitan market access. Rapidly urbanizing countries in the Global South confront an even sharper version of the problem, because infrastructure expansion, administrative capacity, and urban concentration evolve simultaneously. The transferable lesson is institutional rather than program-specific: place-based transfers require credible local implementation capacity, transparent allocation, explicit spatial coordination, and multidimensional outcome monitoring.

Finally, the findings caution against a simple success-or-failure judgment. Figure 1 provides a transparent visual summary of the baseline pattern: all current-year coefficients are negative, all lag-effect coefficients are positive, and the metropolitan estimates are farthest from zero. The estimated metropolitan associations (-20.622 for current-year SABD and 10.690 for the lag-effect measure) are also accompanied by wider confidence intervals, indicating a larger but less precise territorial contrast. The full-sample and non-metropolitan estimates are smaller and more precise. This visualization strengthens the descriptive interpretation of delayed reversal and uneven magnitude, while the spatial models and temporal-order tests show why the pattern should not be interpreted as definitive causal evidence.

6. Conclusions

This study examined whether Korea's Special Account for Balanced Development is associated with local economic performance and whether its estimated associations differ between metropolitan and non-metropolitan local governments. Baseline FGLS estimates reproduce a negative current-year association and a positive lag-effect association, with the latter substantially larger in metropolitan areas. Figure 1 makes this territorial contrast explicit by displaying both point estimates and 95% confidence intervals.

Once local fixed effects and spatial dependence are incorporated, the local current-year and lag-effect SABD coefficients are statistically insignificant. The spatial parameters remain strongly positive, and the SDM identifies only marginally positive indirect and total associations for the lag-effect measure. The temporal-order tests likewise do not establish predictive causality between the SABD lag-effect measure and subsequent per capita GRDP. The conclusion is therefore that the baseline pattern is descriptively delayed and uneven, but not a spatially robust local causal effect.

Balanced-development finance should be redesigned as a capacity-sensitive and spatially coordinated fiscal platform. Need-based allocation should be combined with local planning assistance, project-management support, flexible matching arrangements, local supplier and workforce development, intermunicipal coordination, and monitoring of where project benefits are ultimately retained. Evaluation should extend beyond GRDP to population retention, employment, service accessibility, demographic resilience, fiscal capacity, and environmental outcomes.

This study has several limitations. The aggregate municipal data do not distinguish SABD's Autonomous and Support Accounts, and the panel does not contain direct measures of educational capacity, professionals per capita, procurement quality, or project completion. Per capita GRDP represents only the economic dimension of sustainability. Future research should obtain account- and project-level data, construct direct absorptive-capacity indicators, and evaluate employment, population retention, service accessibility, fiscal resilience, and environmental outcomes.

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