SUSTAINABLE: ACCOUNTING JOURNAL
Vol. 6, No.2, November, 2026
http://journal.um-surabaya.ac.id/index.php/sustainable/index
http://dx.doi.org/10.30651/stb.v6i2.34273
E-ISSN: 2807-7318, P-ISSN: 2808-3482

Village Fund, Population, Capital Expenditure, and Village Development: Mediating Role of Budget Realization Rate

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ABSTRACT

This study examines whether the budget realization rate mediates the relationship between the Village Fund, population, and capital expenditure and village development performance in Solok Regency, West Sumatra. Using secondary panel data from 31 nagari over 2023–2025 (93 observations), we estimate three panel data equations, with common effect (Model 1) and random effects (Models 2 and 3) specifications selected through specification tests, and test indirect effects using a bias-corrected bootstrap with 5,000 replications, resampled by nagari. The mediator is measured as the ratio of realized to budgeted expenditure, capturing only the implementation stage of budgeting. Development performance combines the Developing Village Index (IDM, 2023–2024) and the Village Index (ID, 2025), a change in instrument limiting comparability over time. Population is positively and significantly associated with development performance, whereas the Village Fund, capital expenditure, and the budget realization rate are not. None of the three indirect effects is supported, and the Village Fund estimate is sensitive to the inclusion of population. The results indicate associations rather than causal effects and apply to the observed nagari. Findings suggest that budget realization has limited explanatory power as a mechanism for nagari development, and that conclusions about the Village Fund depend on model specification.

Keywords: *Budget Realization Rate; Nagari; Panel Data; Village Development Index; Village Fund*

Submitted:October 21, 2026
Revised:November 12, 2026
Accepted: *November 17, 2026*

INTRODUCTION

Village autonomy requires village governments to manage their finances well so that development goals are achieved (Mardiasmo, 2021). The Village Fund, a transfer from the national budget (APBN), is the main instrument for financing village development (Pemerintah Republik Indonesia, 2014). In Solok Regency, the average IDM/ID score rose from 0.720 in 2023 to 0.772 in 2025, yet inequality among nagari remains large, and some nagari realize only about 30 percent of their budgeted expenditure even though the budget has been allocated. A larger allocation does not necessarily produce better development, so this study asks whether the level of budget realization links fiscal inputs and demographic characteristics to nagari development performance. Although the average Village Development Index (IDM/ID) score for nagari (villages) in Solok Regency increased from 0.720 (Advance) in 2023 to 0.772 (Independent) in 2025, disparities between nagari remain stark. In 2023, Nagari Cupak recorded the highest score at 0.944 (Independent), while Nagari Tanjung Balik Sumiso remained at 0.493 (Lagging). This gap is evident not only in

E-ISSN: 2807-7318, P-ISSN: 2808-3482

development outcomes but also in the effectiveness of budget execution. Data from the 2025 Village Budget (APBDes) reveals that several nagari in Solok Regency have programs with an execution rate of IDR 0 such as the Village-Owned Enterprise (BUMNAG) revitalization program and health outreach initiatives in Nagari Batu Banyak whereas other nagari achieved full implementation. Budget execution rates within the research sample range from 30% to 100% (with an average of 86.09%), indicating significant variation in the capacity for budget execution across different nagari. This situation demonstrates that the availability of substantial funds does not necessarily guarantee a nagari's ability to effectively execute its planned budget. Previous studies report inconsistent results. Aji & Qibthiyyah (2023) find a significant but small effect on village status, whereas Yulitasari & Tyas (2020) find no significant effect in Central Java. Hilmawan et al. (2023) find a mediating role of village original income. This inconsistency suggests that the relationship depends on other factors, such as the extent to which the budget is realized (Mahmudi, 2016), as well as the accountability and transparency of village financial governance (Febriyanto Riska & Mujiyati, 2022; Sofyani et al., 2022). Four research gaps can be distinguished. First, the evidence on the effect of the Village Fund remains inconsistent (Aji & Qibthiyyah, 2023; Yulitasari & Tyas, 2020). Second, budget realization is rarely tested as a mediator with village-level panel data, and some studies treat it as a dependent variable instead (Ariani & Gayatri, 2021; Premaswari & Suartana, 2021). Third, the shift from IDM to ID in 2025 raises a comparability problem that is rarely discussed in panel studies. Fourth, nagari-level panel evidence in Solok Regency is still limited. This study addresses four gaps that have not been simultaneously covered by previous research. First, findings regarding the impact of the Village Fund (Dana Desa) on village development remain inconsistent (Aji & Qibthiyyah, 2023; Yulitasari & Tyas, 2020). Second, the role of budget realization as a mediator between fiscal resources and development performance at the nagari (village) level—analyzed using panel data has been insufficiently explored; existing studies, such as those by Ariani & Gayatri (2021) and Premaswari & Suartana (2021), treat the effectiveness of financial management as a dependent variable rather than a mediating mechanism. This study positions the budget realization rate as a mediator, as it theoretically represents a critical stage that determines whether fiscal inputs are effectively transformed into development outputs a relationship that has not been explicitly tested at the nagari level using a panel data approach. Third, the transition from the Indeks Desa Membangun (IDM) to

E-ISSN: 2807-7318, P-ISSN: 2808-3482

the Indeks Desa (ID) in 2025 introduces issues of comparability that are rarely discussed in panel data research. Fourth, panel data-based research at the nagari level in Solok Regency remains very limited. Unlike previous studies, this research simultaneously examines the Village Fund, population size, and capital expenditure as independent variables, with the budget realization rate as a mediator; it utilizes a three-year panel dataset at the nagari level and explicitly addresses the comparability challenges between the IDM and ID indices.

LITERATURE REVIEW

Theoretical Framework

Public Finance Theory (Musgrave, 1959) is the main theory of this study. Good Governance and Agency Theory serve as supporting theories that explain how the budget is executed and how the relationship between the nagari government and the community shapes that execution. Public Finance Theory identifies allocation, distribution, and stabilization as the functions of public finance. The Village Fund and capital expenditure relate mainly to the allocation function because they finance infrastructure and basic services, and fiscal capacity must be translated into productive spending to generate benefits. Good governance (UNDP, 1997) and Agency Theory (Jensen & Meckling, 1976) support the mediation logic. Good governance holds that large resources alone do not guarantee results if management is weak (Mardiasmo, 2021). Agency Theory describes the relationship between principals (citizens and the central government) and agents (the village government), in which information asymmetry can hinder the conversion of fiscal inputs into outcomes, so the extent to which agents carry out what is budgeted becomes an observable indicator. Fiscal decentralization (Oates, 1999) and human capital (Becker, 1993; Schultz T.W, 1961) are used only for the population variable.

Budget Realization Rate as a Mediating Mechanism

This study retains the term budget realization rate for the mediator, but the construct boundary is narrow. The term refers to the extent to which budgeted expenditure is realized, which reflects the implementation stage of financial management. The construct does not capture planning quality, targeting accuracy, program outputs, or the benefits received by citizens. The hypothesized chain is that fiscal inputs and population characteristics shape how much of the budget the nagari executes, and that level of execution shapes development performance. This chain is a theoretical proposition to be tested, not an established result.

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Hypothesis Development

Village Fund and budget realization rate

From a public finance perspective, larger transfers increase the number of programs that must be planned, procured, and reported, and attract closer supervision and technical assistance, which may push the nagari government to realize a larger share of the budget. On the other hand, a larger budget may exceed limited administrative capacity and delay execution; delays in budget absorption are commonly linked to administrative and procedural factors (Wiansyah & Mulyani, 2021). Because all nagari in Solok Regency follow the same reporting cycle, differences in allocation size are a plausible factor explaining differences in implementation. **H1:** The Village Fund is positively associated with the budget realization rate.

Population and budget realization rate

Nagari with larger populations face greater demand for services and may have a broader base of participation and administrative capacity, which can support higher implementation through scale. A larger population can also bring more diverse demands and coordination problems, so the direction is partly an empirical question; the hypothesis follows the scale argument. From the perspective of economies of scale, nagari (villages) with larger populations generally possess a greater volume of transactions, more extensive administrative experience, a broader base for community participation, and a scale of management that facilitates efficiency all of which potentially enhance their capacity for budget execution (Firmansyah et al., 2025; Rambe et al., 2020). This study posits a positive relationship, with the caveat that existing empirical support is derived from the contexts of regencies/cities and sub-districts; therefore, this relationship is empirically tested here within the context of nagari. In this study, population may represent the size of public service demand, the nagari's human resource base, or other regional characteristics correlated with population size. These three interpretations have different implications, and this study does not distinguish among them empirically. It should be noted that in this study, population size can theoretically represent three distinct concepts: (1) the scale of demand for public services, (2) the human resource base of a nagari, or (3) other regional characteristics correlated with population size. While these three interpretations carry different implications, this study does not empirically distinguish between them. Therefore, the findings concerning this variable should be

E-ISSN: 2807-7318, P-ISSN: 2808-3482

interpreted as structural associations among nagari. **H2:** Population is positively associated with the budget realization rate.

Capital expenditure and budget realization rate

Capital projects require planning, procurement, and physical completion, and are more prone to delays than routine spending. Higher capital expenditure may therefore reduce the share of the budget realized in the current fiscal year. Because this reasoning predicts a negative relationship, the direction is stated in advance and not determined after the results are known. The principles of Public Finance Theory (Musgrave, 1959) state that the allocation function requires planned expenditures to be executed optimally. However, capital expenditures involve procurement processes, contracting, and physical implementation phases that are more time-consuming than those for operational expenditures, which can potentially hinder the overall realization of the budget. Wiansyah and Mulyani (2021) have empirically demonstrated that the procurement process for goods and services is a significant factor contributing to delays in the absorption of regional budgets, particularly regarding capital expenditure components. **H3:** Capital expenditure is negatively associated with the budget realization rate.

Budget realization rate and development performance

Through the lens of agency theory and good governance, nagari that execute their budgets as planned deliver the services and infrastructure they promised, which should be reflected in development indicators. However, realization alone does not guarantee quality or relevance. The principles of good governance (UNDP, 1997) emphasize that effective financial management ensures budget funds are utilized for their intended purposes and in a timely manner, thereby enhancing a village's progress status within the Village Development Index (IDM). Mahmudi (2016) states that the achievement of policy objectives in the public sector is heavily influenced by the effectiveness of fiscal management. Hilmawan et al. (2023) also find that the success of rural development funded by village grants depends significantly on how effectively these resources are managed by village officials. **H4:** The budget realization rate is positively associated with development performance.

Direct effects on development performance

Larger allocations should expand the nagari's capacity to build infrastructure and provide services, and a larger population provides a broader base of labor and economic activity. Firmansyah

E-ISSN: 2807-7318, P-ISSN: 2808-3482

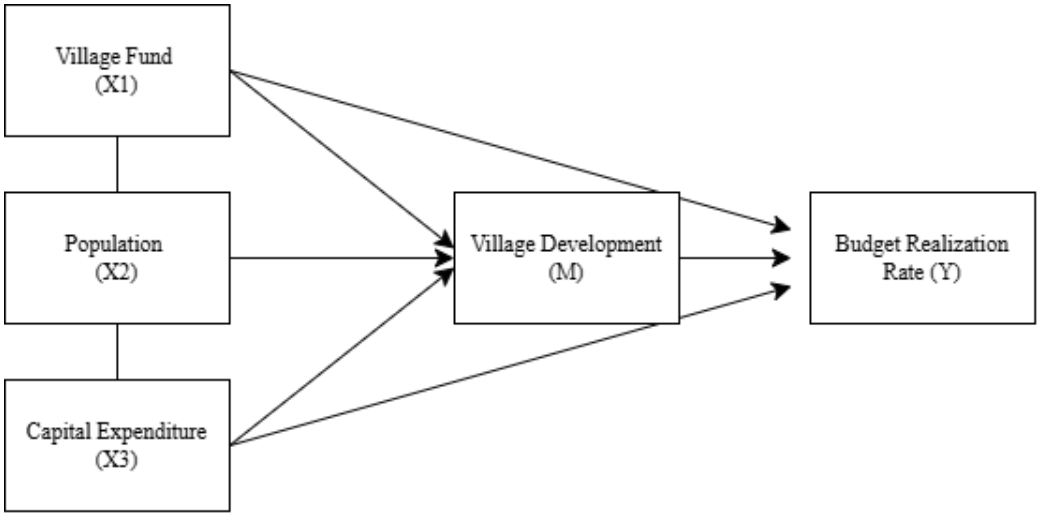
et al. (2025) and Rambe et al. (2020) report positive effects of population on village development and local government efficiency, respectively, in different contexts. Nevertheless, the Village Fund and capital expenditure may not yet be reflected in the index over a short time span, because of implementation delays, planning quality, and the time infrastructure needs to generate benefits. The hypotheses state the theoretically expected direction while acknowledging this possible lag. H5 is based on the allocation and distribution functions within Public Finance Theory (Musgrave, 1959), where in the Village Fund a fiscal transfer from the central government is intended to expand the capacity of a nagari (village) to provide infrastructure and basic services. Yusuf and Khoirunurrofik (2022) empirically found that the Village Fund fosters rural economic development, while Aji and Qibthiyyah (2023) identified a significant impact of the Village Fund on a village's status as measured by the Village Index (Indeks Desa). H6 is also rooted in the allocation function, where capital expenditure serves as a strategic outlay for the development of long-term fixed assets (Halim & Kusufi, 2014). Although Asher and Novosad (2020) note that the impact of physical infrastructure on well-being is not always immediate, infrastructure investment theoretically supports the improvement of composite indicators for rural development. H7 is grounded in Public Finance Theory which posits that the demand for public services is determined by population size as well as Human Capital Theory (Becker, 1993; Schultz T.W, 1961), which views the population as productive capital. Firmansyah et al. (2025) found a significant positive effect of population size on the Village Development Index (Indeks Desa Membangun or IDM), while Rambe et al. (2020) observed a positive influence of population density on local government efficiency in Sumatra. **H5:** The Village Fund is positively associated with development performance. **H6:** Capital expenditure is positively associated with development performance. **H7:** Population is positively associated with development performance.

Indirect effects

If the mechanism described above works, each independent variable should affect development performance partly through the budget realization rate. **H8:** The budget realization rate mediates the relationship between the Village Fund and development performance. **H9:** The budget realization rate mediates the relationship between population and development performance. **H10:** The budget realization rate mediates the relationship between capital expenditure and development performance. Testing mediation requires two paths: fiscal inputs are related to budget

E-ISSN: 2807-7318, P-ISSN: 2808-3482

realization (path a), and budget realization is related to development outcomes (path b). Path a and path b are tested with different data and variables, so the two paths need to be argued separately.



Source: Data processed by the author, 2026

Figure 1. Conceptual Framework

METHOD

This study is explanatory quantitative research with an associative approach using panel data. It is observational and uses secondary data, so the results are interpreted as associations, not causal effects. Model estimation and specification tests were carried out in EViews, whereas the bootstrap test for indirect effects was carried out in Python 3.

Population and Sample

The population is all 74 nagari in Solok Regency (Badan Pusat Statistik Kabupaten Solok, 2023). Purposive sampling yielded 31 nagari with complete data for 2023–2025. Budget data were taken from the village revenue and expenditure budget (APBDes) reports provided by the relevant agency in Solok Regency, and IDM and ID scores from (Kementerian Desa, 2023, 2024, 2025). The sampled nagari have a slightly higher average performance than the population, so selection bias may occur. Table 2 presents the sample selection criteria. Of 74 nagari in Solok Regency, 20 lacked complete capital expenditure data, 23 lacked complete APBDes realization reports for the full 2023–2025 period. These three exclusion groups do not overlap, leaving 31 nagari that met all criteria, yielding 93 observations (31 nagari × 3 years).

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Table 1. Sample selection criteria

Stage	Numer of Nagari
Total Population (Solok Regency)	(74)
Incomplete Capital Expenditure Data 2023-2025	(20)
Incomplete APBDes Realization Report 2023-2025	(23)
Final Sample	(31)
Total Observations (31 X 3 Years)	(93)

Source: Data processed by the author, 2026

The sampled nagari have a slightly higher average performance score than the full population of 74 nagari, indicating potential selection bias. Results should thefore be interpreted as applying to the observed nagari rather than generalized to all nagari in Solok Regency.

Variables and Measurement

Table 2. Operational definitions of variables

Variable	Type	Measurement	Scale
Village Fund (VF)	Independent	Natural logarithm of total Village Fund in the APBDes	Ratio
Population (POP)	Independent	Natural logarithm of population (inhabitants)	Ratio
Capital expenditure (CE)	Independent	Natural logarithm of total capital expenditure in the APBDes	Ratio
Budget realization rate (BRR)	Mediator	(Realized expenditure / budgeted expenditure), with values between 0 and 1	Ratio
Development performance (DP)	Dependent	IDM (2023–2024) and ID (2025), each divided by 100 so that the scale is 0–1	Ratio

Source: Data processed by the author, 2026

The budget realization rate is operationalized at the budget implementation stage. It is used because it comes from official documents, is available in a consistent format for all nagari, and is unitless, so it can be compared across nagari and years. At the nagari-year level, its values range from 0.30 to 1.00, so no value exceeds 100% and none is zero. The ratio captures only budget implementation, not planning quality, targeting accuracy, or program outputs. A realization of 100% does not mean that the programs were well targeted or beneficial, and lower realization does not always signal failure if it reflects justifiable efficiency or changing needs. The variable

E-ISSN: 2807-7318, P-ISSN: 2808-3482

name is retained for consistency with the theoretical framework, and every statement about it must be read within these limits.

Comparability of Development Indices

IDM is built on three main dimensions, whereas ID uses six. Dividing both scores by 100 aligns their numerical range but does not make them equivalent in indicators, weights, or meaning. A Spearman rank correlation of 0.92 between IDM 2024 and ID 2025 indicates that the relative order of nagari is fairly stable, but it does not show that the two indices share the same substantive scale. For Solok Regency as a whole, the average index rose from 0.720 in 2023 to 0.746 in 2024 and 0.772 in 2025 (Kementerian Desa, 2023, 2024, 2025), but the differences cannot yet be interpreted as development change because part of the movement between 2024 and 2025 may come from the change of index instrument. Year dummy variables are used to absorb common yearly shifts, but they do not resolve the problem of unequal measurement. Therefore, estimates using only IDM 2023–2024 are treated as the main sensitivity analysis, and results from both specifications are discussed even when they differ.

Model Specification and Selection

Three equations are estimated, where *i* denotes the nagari and *t* the year:

$$BRR_{it} = \alpha + \beta_1 VF_{it} + \beta_2 POP_{it} + \beta_3 CE_{it} + \varepsilon_{it} \quad (1)$$

$$DP_{it} = \alpha + \gamma_1 VF_{it} + \gamma_2 POP_{it} + \gamma_3 CE_{it} + \varepsilon_{it} \quad (2)$$

$$DP_{it} = \alpha + c'_1 VF_{it} + c'_2 POP_{it} + c'_3 CE_{it} + bBRR_{it} + \varepsilon_{it} \quad (3)$$

In these equations, BRR is the budget realization rate, DP development performance, VF the Village Fund, POP population, and CE capital expenditure; α is the constant, β, γ, c′, and *b* are regression coefficients, and ε is the error term. Equation (1) is the mediator equation, Equation (2) estimates the effect of the independent variables without the mediator, and Equation (3) is the outcome equation that includes the mediator. For each equation, the Chow test chooses between the common effect model (CEM) and the fixed effect model (FEM), and the Hausman test chooses between FEM and the random effect model (REM). The Breusch–Pagan LM test compares REM with CEM (Baltagi, 2005). The Pesaran CD test checks for cross-sectional dependence.

Mediation Testing

The indirect effect (a × b) is tested with a bootstrap of 5,000 replications. In each replication, 31 nagari are drawn with replacement (resampling at the nagari level), and all year data for the

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selected nagari are carried along so that the panel structure is preserved. Equation (1) and Equation (3) are re-estimated in each replication, with CEM and REM respectively, following the decision in the Model Specification and Selection subsection, and a × b is then computed. A 95% bias-corrected percentile confidence interval is formed from these 5,000 values. An effect is supported when the interval does not include zero. The Sobel test is reported as a complement.

RESULT AND DISCUSSION

The analysis uses secondary data from 31 nagari in Solok Regency over 2023–2025 (93 observations).

Descriptive Statistics

Table 2 presents the descriptive statistics. The budget realization rate averages 86.09%, ranging from 30% to 100%, and eight observations reach 100%. The Village Fund ranges from about IDR 618.3 million to IDR 1.95 billion, and population from 322 to 22,246 inhabitants.

Table 3. Descriptive statistics of research variables (n = 93)

Statistic	Ln VF	Ln CE	Ln POP	BRR	IDM/ID
Mean	20.690	19.280	8.096	0.861	0.749
Median	20.659	19.478	8.138	0.900	0.723
Maximum	21.389	20.484	10.010	1.000	0.948
Minimum	20.243	14.221	5.775	0.300	0.606
Std. deviation	0.259	1.040	1.031	0.138	0.088

Source: Data processed by the author, 2026

Model Selection Results

Table 4. Model selection results

Model	Chow (Chi-square prob.)	Hausman (prob.)	Breusch–Pagan LM (prob.)	Selected model
Model 1	0.0046	0.4793	0.2043	CEM (REM as robustness check)
Model 2	< 0,001	0.5714	< 0,001	REM
Model 3	< 0,001	0.4017	< 0,001	REM

Source: Data processed by the author, 2026

For Model 1, the Chow chi-square test rejects CEM (p = 0.0046), but the Chow F test (p = 0.0755) and the Breusch–Pagan LM test (p = 0.2043) do not reject CEM. The decision follows the F and LM tests because the chi-square test tends to over-reject in small samples. CEM is chosen as the

E-ISSN: 2807-7318, P-ISSN: 2808-3482

specification for Model 1 because the Chow F statistic and the LM test both find no significant individual effects. As a robustness check, Model 1 was also estimated with REM (the Hausman test, p = 0.4793, does not reject REM against FEM), and the result is the same: none of the three variables has a significant effect on the budget realization rate.

For Models 2 and 3, all tests point in the same direction: the Chow and LM tests reject the common effect model, and the Hausman test does not reject REM against FEM.

Classical Assumption Tests

Normality is met (Jarque–Bera p = 0.736). Multicollinearity is not severe by the VIF criterion: the Village Fund and population are correlated at 0.869, but their VIFs (4.23 and 4.16) are far below 10. However, a low VIF does not remove the problem, because high correlation widens estimation uncertainty and makes it harder to separate the partial effects of the two variables. This is evident in the change in the Village Fund coefficient: in the model with population, the coefficient is 0.0218 (standard error 0.0419; 95% CI about −0.060 to 0.104), whereas in the model without population it is 0.141 (p < 0,001). This change shows that conclusions about the Village Fund are sensitive to specification. Heteroskedasticity is not detected in Models 2 and 3. Model 1 shows mild heteroskedasticity, and robust standard errors do not change the conclusions. Cross-sectional dependence is found in Models 2 and 3, driven by common yearly shocks; after year dummy variables are added, the Pesaran CD statistic is no longer significant (p = 0.9202). Given T = 3, this result is indicative and not a guarantee that all assumptions are met.

Regression Results

Table 5. Partial effects (Models 1 and 3)

Hyp.	Path	Coef.	Std. error	Prob.	Decision
H1	VF → BRR	0.0808	0.1184	0.4982	Not supported
H2	POP → BRR	0.0014	0.0303	0.9625	Not supported
H3	CE → BRR	0.0108	0.0140	0.4435	Not supported (sign opposite to prediction)
H4	BRR → DP	−0.0074	0.0336	0.8259	Not supported (sign opposite to prediction)
H5	VF → DP	0.0218	0.0419	0.6042	Not supported
H6	CE → DP	0.0052	0.0044	0.2444	Not supported
H7	POP → DP	0.0576	0.0132	< 0,001	Supported

Source: Data processed by the author, 2026

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Only population shows a statistically significant association, namely with development performance. Its coefficient is almost unchanged when the budget realization rate is added (0.0577 in Model 2 to 0.0576 in Model 3), which indicates that the association does not run through budget realization. Substantively, because population enters in natural logarithm, a doubling of population is associated with a development score about 0.040 higher on the 0–1 scale (0.0576 × ln 2), or about four points on the original 0–100 scale. This is a statistical association within the model, not a prediction that adding population will raise development. The model explains 32.87% of the variance in development performance.

Mediation Results

Table 6. Indirect effects ($a \times b$)

Path	a	b	$a \times b$	95% bias-corrected CI	Sobel (z; p)	Decision
VF → BRR → DP (H8)	0.0808	−0.0074	−0.00060	(−0.01259; 0.00414)	−0.21; 0.834	Not supported
POP → BRR → DP (H9)	0.0014	−0.0074	−0.00001	(−0.00237; 0.00196)	−0.05; 0.963	Not supported
CE → BRR → DP (H10)	0.0108	−0.0074	−0.00008	(−0.00312; 0.00107)	−0.21; 0.832	Not supported

Source: Data processed by the author, 2026

All three bootstrap intervals include zero, and the Sobel test yields the same conclusion. The data and specification used here therefore provide no adequate statistical evidence of an indirect effect through the budget realization rate. This does not prove that the mechanism does not exist. The result may reflect the narrow measurement of the mediator, limited data variation, and a small number of clusters, which together reduce the power to detect small indirect effects. Removing capital expenditure from the model does not change this conclusion (see Robustness and Sensitivity Tests).

Robustness and Sensitivity Tests

The sensitivity analysis shows that the main conclusions do not change under specifications with year dummies, cluster-robust standard errors, a per-capita specification, and a model without capital expenditure. The main exception is the Village Fund coefficient, which changes when population is removed from the model. As a sensitivity analysis, estimation using only IDM 2023–2024 avoids the comparability problem with ID 2025. The results show that population remains

E-ISSN: 2807-7318, P-ISSN: 2808-3482

positively and significantly associated with development performance, whereas the Village Fund, capital expenditure, and the budget realization rate remain insignificant.

Discussion

Fiscal inputs and budget realization (H1–H3)

Population shows no association with the budget realization rate (H2), so the scale and participation argument is not supported by these data. One plausible explanation is that nagari in Solok Regency face similar institutional constraints regardless of population size such as limited administrative capacity, identical budget reporting cycles, and dependence on the same technical assistance from the district government so that the scale advantage of a larger population does not manifest in higher implementation rates. This interpretation is consistent with the finding that budget realization rates are relatively similar across nagari (mean 86.09%, SD 13.8%), suggesting that common institutional factors dominate over demographic variation. Capital expenditure is likewise not significantly associated with the budget realization rate (H3), and its coefficient is positive rather than negative. Data from the sample show that several nagari with relatively high capital expenditure proportions still achieved full (100%) realization, while nagari with low capital expenditure also showed incomplete realization. This suggests that realization outcomes depend more on overall administrative and institutional capacity than on the composition of expenditure types. These interpretations are candidate explanations, as the relevant variables were not directly measured in this study.

Budget realization and development (H4)

The budget realization rate is not significantly associated with development performance, and its sign is negative. Budget realization alone may not be enough to move a composite index covering social, economic, and environmental dimensions. This finding differs from Hilmawan et al. (2023), who find a mediating role of village original income. One possible reason is the difference in mediators: the budget realization rate captures only spending implementation, not planning quality or targeting accuracy.

Village Fund and capital expenditure on development (H5–H6)

Neither shows a significant association with development performance. This is consistent with Yulitasari & Tyas (2020) but differs from Aji & Qibthiyyah (2023) and Yusuf & Khoirunurrofik (2022). Three considerations apply. First, a three-year span may be too short for spending to

E-ISSN: 2807-7318, P-ISSN: 2808-3482

appear in the index, because infrastructure often yields benefits after a lag. Second, the Village Fund estimate is sensitive to specification: it is insignificant when population is included but becomes significant when population is removed ($\beta = 0.141$; $p < 0{,}001$), and the two are correlated at 0.869. The coefficient in the full model is a partial relationship after controlling for population, so conclusions should not rest on a single *p* value. This indicates that the effect of the Village Fund allocation cannot be separated from nagari population size in this sample. Third, the index change between 2024 and 2025 may add noise to the dependent variable. The finding is therefore not that the Village Fund has no effect, but that no adequate statistical evidence of a partial association was found in this sample and specification.

Population and development (H7)

Population is the only variable significantly associated with development performance, consistent with Firmansyah et al. (2025) and Rambe et al. (2020). The association also holds when Village Index 2025 is excluded, so it does not depend on the change of instrument. Three interpretations are possible, all theoretical and not verified by the model. Nagari with larger populations may have a broader base of economic activity and human resources. Population may also be a proxy for public service scale, urbanization, accessibility, and other regional characteristics absent from the model. Finally, because population is relatively stable over three years, its coefficient mostly reflects differences between nagari rather than change within a nagari. This result should not be read as suggesting that adding population will raise development.

Mediation (H8–H10)

The budget realization rate does not mediate any of the three relationships. This appears to be related to weakness on both sides of the chain: the independent variables are not associated with the level of implementation, and the level of implementation is not associated with development. Given the narrow measurement of the mediator, 31 clusters, and the short period, this is read as an absence of adequate evidence, not as evidence that budget realization is irrelevant. Planning quality, targeting accuracy, apparatus capacity, geography, and accessibility may matter more than the size of the budget or its realization rate, but these factors were not examined directly and remain candidate explanations.

Summary of findings and practical implications

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Of the ten hypotheses tested, only H7 is supported: population is the sole variable with a statistically significant association with village development performance ($\beta = 0.0576$; $p < 0.001$). This finding holds across all model specifications and robustness checks, indicating that cross-nagari differences in population size are systematically associated with differences in development performance scores. The practical implication is not that village governments should seek to increase population, but rather that the characteristics associated with larger nagari broader human resource base, greater economic activity, stronger public service demand—may be the actual drivers of development performance. Village governments and district authorities may therefore benefit from focusing on factors that can be developed regardless of population size: improving planning quality, strengthening apparatus capacity, increasing the accuracy of program targeting, and enhancing accountability and transparency in financial management. These interventions address the mechanisms that this study was unable to test directly, and align with the good governance principles that underpin the theoretical framework. Monitoring physical outputs and program outcomes—rather than budget absorption alone would provide a more meaningful signal of whether fiscal resources are translating into genuine improvements in nagari development.

CONCLUSION

This study examines the effect of the Village Fund, population, and capital expenditure on the development performance of 31 nagari in Solok Regency (2023–2025), with the budget realization rate as a mediator. Only population is significantly associated, whereas the Village Fund, capital expenditure, and the budget realization rate are not, and all three indirect effects are not supported. The Village Fund estimate also depends on model specification. Theoretically, these data do not yet provide adequate statistical evidence that budget realization is a mechanism linking fiscal inputs to nagari development performance. Practically, local governments may consider monitoring physical outputs and program benefits, not only budget absorption, although this recommendation has not been tested in the model. Limitations include a small sample from one regency, potential selection bias, narrow measurement of the mediator, the index change from IDM to ID, the high correlation between the Village Fund and population, and the three-year period. For village governments (nagari), the results suggest that monitoring budget absorption rates alone is insufficient. Village governments should shift their focus in financial management moving beyond the mere achievement of budget realization targets toward the quality of

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program planning, the precision of expenditure targeting, and the delivery of measurable outputs. Technical assistance from the Solok Regency government needs to be strengthened, particularly regarding the planning of the Village Budget (APBDes) and the execution of capital expenditures, given that the complexity of procurement processes can often hinder budget realization. Periodic evaluations of development outputs—rather than just budget absorption will provide a more accurate picture of the effectiveness with which Village Funds are utilized. Future research should use a longer panel, development indicators comparable over time, a larger number of nagari, and variables for planning quality, transparency, accountability, and participation.

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