

Rethinking Fiscal Decentralization: Public Service Effectiveness as a Transmission Mechanism for Human Development

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ABSTRACT:

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This study investigates the impact of regional government expenditure composition on human development outcomes in West Nusa Tenggara (NTB), Indonesia, with particular emphasis on the mediating role of public service effectiveness. Using balanced panel data from 10 districts/cities during the 2013–2022 period, the study applies fixed-effects panel regression, principal component analysis (PCA), & structural equation modeling (SEM) to examine the relationships among fiscal variables, service effectiveness, & the Human Development Index (HDI). The Hausman test confirms the appropriateness of the fixed-effects estimator, indicating the existence of unobserved regional heterogeneity across districts. The findings reveal that personnel expenditure & social transfer spending, including subsidies, grants, & social assistance, significantly enhance public service effectiveness, which subsequently exerts a strong positive influence on HDI. In contrast, capital expenditure does not show a significant direct or indirect contribution to human development outcomes. The PCA results indicate that overall expenditure composition remains positively associated with HDI despite the limited contribution of certain expenditure categories. Furthermore, SEM analysis demonstrates that public service effectiveness fully mediates the relationship between personnel expenditure & social transfer spending on HDI. These findings contribute to the fiscal decentralization & public finance literature by emphasizing that the developmental impact of local government expenditure depends more on the effectiveness of public service delivery than on the magnitude of spending itself. The study highlights the importance of strengthening institutional capacity & implementing service-oriented budgeting policies in decentralized governance systems.

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Introduction

Fiscal decentralization has become an important public-sector reform in developing countries because it is expected to improve allocative efficiency, accountability, and public service delivery. Through decentralization, fiscal authority and expenditure responsibilities are transferred from central to subnational governments, allowing local governments to allocate resources according to local socioeconomic conditions and community needs. In Indonesia, regional autonomy has provided substantial fiscal authority to local governments, based on the assumption that local governments possess better information about local preferences and development priorities. However, the relationship between fiscal decentralization and human development remains inconclusive. While some studies indicate that decentralization can improve public services and human development, others find insignificant or negative effects, particularly where institutional and administrative capacity remains limited. Therefore, fiscal decentralization does not automatically produce better development outcomes, as its effectiveness depends on the ability of local governments to transform fiscal resources into productive public services (Channa & Faguet, 2016; Diaz-Serrano & Meix-Llop, 2019; Faguet, 2014; Goel et al., 2017).

Indonesia provides an important context for examining this issue because substantial fiscal transfers and expenditure autonomy have been accompanied by persistent regional disparities in human development. Differences in institutional capacity, governance quality, and expenditure management have contributed to uneven development outcomes among regions. West Nusa Tenggara (NTB), in particular, represents a relevant case because, despite relatively stable economic growth, improvements in the Human Development Index (HDI) have progressed more slowly than expected, while poverty remains relatively high. A substantial proportion of regional expenditure is allocated to personnel and routine administrative activities, whereas development-oriented expenditure, particularly

capital expenditure, receives a comparatively smaller share. This expenditure structure raises an important question concerning not only the size of public expenditure but also the effectiveness with which government resources are transformed into public services and human development outcomes (Maulana et al., 2022; Nakatani et al., 2023).

From an economic perspective, public expenditure functions as an input in the production of public services, whereas human development represents an important development outcome. Consequently, the relationship between expenditure composition and human development may depend on the effectiveness of public service delivery. Local governments with stronger institutional capacity, better governance, and more efficient service delivery mechanisms are expected to generate greater development returns from similar levels of public expenditure. Previous studies, however, have predominantly examined the direct effects of expenditure categories on HDI and have paid relatively limited attention to the institutional mechanism through which fiscal resources are converted into welfare outcomes. This creates an important research gap because similar expenditure structures may generate different development outcomes across decentralized regions (Prud'homme, 1995; Purnomo & Danuta, 2022).

This study addresses the research gap by introducing public service effectiveness as a mediating mechanism between expenditure composition and human development. Rather than assuming that government expenditure directly determines HDI, the study proposes that personnel expenditure, capital expenditure, and social transfers influence human development through the effectiveness of public service delivery. To examine these relationships, the study combines fixed-effects panel regression, Principal Component Analysis (PCA), and Structural Equation Modeling (SEM). Fixed-effects regression controls for unobserved regional heterogeneity, PCA addresses multicollinearity among expenditure components, and SEM enables the examination

of direct and indirect relationships by modeling public service effectiveness as a latent construct (Musgrave, 1959; Todaro & Smith, 2020; Stiglitz, 2015).

The study therefore contributes to the literature in three ways. First, it extends the fiscal decentralization literature by identifying public service effectiveness as a potential transmission mechanism through which expenditure composition affects human development. Second, it combines panel econometrics, PCA, and SEM to provide a more comprehensive analytical framework for examining expenditure composition and mediation effects. Third, it provides empirical evidence from West Nusa Tenggara that may be relevant to other developing regions experiencing similar challenges related to fiscal decentralization, institutional capacity, and regional inequality. Overall, the study argues that the developmental impact of fiscal decentralization depends less on the magnitude of public expenditure than on the effectiveness with which fiscal resources are transformed into public services that improve human development (Rahmad Hidayat, Moh. Khusaini, David Kaloge, & Nugroho Suryo Bintoro).

2. Methodology

This study employs a balanced panel dataset covering 10 districts/cities in West Nusa Tenggara (NTB) Province over the period 2013–2022, yielding 100 observations. NTB is treated as a representative case of resource-constrained subnational governments in a decentralized system, where fiscal autonomy coexists with institutional and administrative capacity limitations. Such conditions are commonly observed in decentralized regions across developing and emerging economies, making the empirical findings relevant beyond the Indonesian context (Smoke, 2001; Rondinelli, Cheema, & Nellis, 1983; Shah, 2006; Bird & Vaillancourt, 2006).

Although the dataset consists of 100 balanced panel observations (10 districts/cities observed over ten years), this sample size is considered adequate for the structural equation modeling

(SEM) employed in this study. The proposed SEM is relatively parsimonious, comprising one latent construct, namely public service effectiveness, measured by five observed indicators (E1–E5), three exogenous observed variables consisting of personnel expenditure, capital expenditure, and social transfers, and one endogenous observed variable, namely the Human Development Index (HDI). The structural model therefore involves a limited number of estimated parameters, reducing the minimum sample size requirement (Hair et al.; Kline).

Methodological studies have suggested that SEM with simple model structures can produce reliable parameter estimates with sample sizes around 100–150 observations, particularly when factor loadings are high and the measurement model is well specified. Hair et al. emphasize that models with a limited number of latent variables and strong indicator loadings may be adequately estimated using relatively modest sample sizes. Similarly, Kline argues that sample adequacy in SEM depends not only on absolute sample size but also on model complexity, the parameter-to-sample ratio, and measurement quality. In the present study, the indicators of the latent construct exhibit statistically significant and substantial factor loadings, indicating satisfactory measurement properties and supporting the use of the available sample (Hair et al.; Kline).

Furthermore, the balanced panel structure improves estimation efficiency because each cross-sectional unit is observed repeatedly over time, increasing the amount of information available for parameter estimation (Wooldridge, 2010; Baltagi, 2021). Therefore, considering the parsimonious model specification, the limited number of estimated parameters, the measurement properties of the latent construct, and the balanced panel design, the sample size of 100 observations is considered sufficient for the SEM analysis conducted in this study. Data are compiled from multiple official sources to ensure consistency and reliability. Regional government expenditure data are obtained from local government budget realization reports (Regional Revenue and Expenditure Budget/APBD).

Socioeconomic indicators are sourced from Statistics Indonesia (BPS), while measures of government performance are drawn from the Regional Government Performance Evaluation (EKPPD) published by the Ministry of Home Affairs.

Variables

The main variables of interest include expenditure composition variables, which capture the structure of local government spending.

a. Personnel expenditure (b1) reflects administrative and service-delivery human resource inputs. The importance of human resources and institutional capacity in transforming public expenditure into development outcomes is consistent with the broader literature on public-sector management and fiscal decentralization (Oates, 1999; Prud'homme, 1995).

b. Capital expenditure (b3) represents investment in physical infrastructure and long-term assets. The developmental effect of public expenditure depends not only on its magnitude but also on its composition and productivity, particularly in the case of infrastructure investment (Devarajan, Swaroop, & Zou, 1996; Lewis, 2015).

c. Social transfers (b4) consist of subsidies, grants, and social assistance aimed at supporting household welfare. Social expenditure can contribute to human development by improving access to education, health, and other basic services, particularly when such expenditure is implemented effectively (Baldacci, Clements, Gupta, & Cui, 2008).

Public service effectiveness (F_service) is modeled as a latent construct capturing the effectiveness of local service delivery. It is measured using five observed indicators (E1–E5) representing outcomes in education, health, public works, environmental management, and development planning. Modeling service effectiveness as a latent variable allows the analysis to capture multidimensional aspects of service delivery that cannot be directly observed (Stiglitz, 2015; Todaro & Smith, 2020).

Development performance (f5) is proxied by the Human Development Index (HDI). HDI is selected because it captures multidimensional welfare outcomes related to education, health, and living standards, which are central dimensions of human development and are widely used in empirical assessments of development performance (Sen, 1999; United Nations Development Programme, 2024).

To identify both direct and indirect effects of expenditure composition on development outcomes, the study employs two complementary empirical approaches: panel data regression and structural equation modeling (SEM) (Wooldridge, 2010; Baltagi, 2021).

Panel Regression Model

The baseline relationship between expenditure composition and development performance is estimated using a panel regression model. Panel data analysis is appropriate because the study observes multiple districts/cities repeatedly over a ten-year period, allowing the model to account for both cross-sectional and temporal variation (Wooldridge, 2010; Baltagi, 2021).

The baseline model is specified as follows:

$$HDI_{it} = \beta_0 + \beta_1 PE_{it} + \beta_2 CE_{it} + \beta_3 ST_{it} + \mu_i + \lambda_t + \varepsilon_{it}$$

where i indexes districts/cities, t indexes years, μ_i captures unobserved individual or district-specific effects, and λ_t represents time effects. The Hausman specification test is applied to determine the appropriate estimator between fixed effects (FE) and random effects (RE), following the standard procedure for panel-data model selection (Wooldridge, 2010; Baltagi, 2021).

Structural Equation Modeling (SEM)

While panel regression identifies average direct effects, it is insufficient to capture latent constructs and mediation mechanisms. Therefore, SEM is employed to explicitly model public service effectiveness as an intermediate transmission channel linking expenditure composition to development outcomes. SEM is particularly suitable in this context because it

allows the estimation of indirect effects and accommodates latent variables that cannot be directly observed (Stiglitz, 2015; Todaro & Smith, 2020).

The baseline econometric specification is estimated using a two-way fixed-effects (TWFE) model that controls for both district-specific fixed effects (μ_i) and year-specific fixed effects (λ_t). District fixed effects account for time-invariant unobserved heterogeneity across the ten districts/cities, while year fixed effects capture common macroeconomic shocks, policy changes, and national trends affecting all regions simultaneously during the study period. The preferred specification is selected based on the Hausman specification test, which rejects the random-effects estimator in favor of fixed effects ($\chi^2 = 16.70$; $p = 0.0008$). The use of fixed-effects estimation is consistent with the panel-data literature, particularly when unobserved individual effects are correlated with explanatory variables (Wooldridge, 2010; Baltagi, 2021).

To ensure valid statistical inference in the presence of potential heteroskedasticity and serial correlation within districts, cluster-robust standard errors at the district level are employed throughout the panel regression analysis. This approach produces consistent standard errors even when the error variance differs across districts and observations are correlated over time within each panel (Wooldridge, 2010; Gujarati & Porter, 2009).

The model is expressed as:

$$\text{HDI}_{it} = \beta_0 + \beta_1 \text{PE}_{it} + \beta_2 \text{CE}_{it} + \beta_3 \text{ST}_{it} + \mu_i + \lambda_t + \varepsilon_{it}$$

where:

i = district/city (1,...,10)

t = year (2013–2022)

μ_i = district fixed effects

λ_t = year fixed effects

ε_{it} = idiosyncratic error term

The subscript i indexes the ten districts/cities in West Nusa Tenggara Province, while t denotes

the annual observation period from 2013 to 2022. The term μ_i represents district-specific fixed effects that capture unobserved, time-invariant characteristics unique to each district, such as geographic conditions, institutional quality, demographic structure, and long-term socioeconomic characteristics. Controlling for these fixed effects minimizes omitted-variable bias arising from unobservable regional heterogeneity (Baskaran & Feld, 2013; Davoodi & Zou, 1998; Rodríguez-Pose & Ezcurra, 2011). The term λ_t denotes year fixed effects, which control for common time-specific shocks affecting all districts simultaneously, including macroeconomic fluctuations, national policy changes, inflation, and other external events occurring during the study period. Finally, ε_{it} is the idiosyncratic error term, representing random disturbances and other unobserved factors that vary across both districts and years.

The model is estimated using a two-way fixed-effects (TWFE) estimator because it simultaneously controls for cross-sectional heterogeneity and temporal effects (Kim & Lee, 2013; Wooldridge, 2010; Baltagi, 2021). The selection of the fixed-effects specification is supported by the Hausman specification test, which rejects the random-effects estimator, indicating that the unobserved district-specific effects are correlated with the explanatory variables. To ensure reliable statistical inference, cluster-robust standard errors at the district level are employed to correct for potential heteroskedasticity and serial correlation within each panel (Wooldridge, 2010).

The SEM framework is specified as follows:

$$F_service = f(\text{PE}, \text{CE}, \text{ST}, \text{E1-E5}) \dots \dots \dots (3)$$

$$\text{HDI} = f(F_service, \text{PE}, \text{CE}, \text{ST}) \dots \dots \dots (4)$$

Where $F_service$ represents the latent construct of public service effectiveness derived from indicators E1–E5. This specification enables the identification of both direct effects of expenditure components on development performance and indirect effects operating

through service effectiveness. SEM is therefore employed to test the economic mechanism through which public spending influences development outcomes rather than merely estimating reduced-form relationships (Stiglitz, 2015; Todaro & Smith, 2020).

Addressing Multicollinearity

The significance of the mediation effects was evaluated using the significance of the indirect path coefficients estimated within the SEM framework. Standardized coefficients, standard errors, z-values, and p-values were examined to assess the statistical significance of both direct and indirect relationships. Although bootstrapping procedures were not implemented in the present study, the estimated mediation effects were supported by the consistency of the structural path estimates and the overall model fit. Future research is encouraged to employ bias-corrected bootstrap resampling to further verify the robustness of the mediation results.

Although alternative methods such as ridge regression and partial least squares regression (PLSR) are widely used to address multicollinearity, they were not employed in this study because they are primarily designed for predictive modeling rather than explanatory analysis. Ridge regression reduces coefficient variance through regularization but retains highly correlated predictors, making the interpretation of individual expenditure categories less transparent. PLSR constructs latent components by maximizing the covariance between predictors and the dependent variable, which is appropriate when prediction accuracy is the primary objective. In contrast, this study seeks to identify the latent structure of government expenditure composition before examining its relationship with public service effectiveness and human development. Principal Component Analysis (PCA) is therefore preferred because it transforms correlated expenditure variables into orthogonal components that summarize the underlying fiscal structure without incorporating information from the dependent variable, thereby providing a more suitable basis for subsequent fixed-effects panel regression and structural

equation modeling (Greene, 2018; Hsiao, 2014; Stock & Watson, 2019).

Preliminary diagnostics reveal high variance inflation factors (VIF) exceeding 20 for the expenditure variables, indicating severe multicollinearity. Such multicollinearity is common in fiscal data, where expenditure categories are often mechanically related through budget constraints. To address this issue, Principal Component Analysis (PCA) is applied to the expenditure variables (b1–b4). PCA transforms the correlated expenditure variables into a set of orthogonal components that capture the dominant patterns of expenditure composition. These components are subsequently used in the regression analysis to ensure stable coefficient estimates and to isolate the underlying structure of public spending (Gujarati & Porter, 2009; Wooldridge, 2010). The use of PCA strengthens the econometric rigor of the analysis and improves the reliability of inference regarding expenditure composition and development outcomes (Greene, 2018; Hsiao, 2014).

3. Results

The empirical analysis is presented sequentially to reflect the integrated research design. The panel regression results are discussed first to establish the direct association between expenditure composition and HDI. This approach is consistent with previous studies emphasizing the relationship between fiscal policy, government expenditure composition, and economic or human development outcomes (Easterly & Rebelo, 1993; Mauro, 1998; Tanzi, 1995). The SEM results are then presented to determine whether these relationships remain significant after introducing public service effectiveness as a mediating mechanism. This sequential interpretation enables the study to move beyond identifying statistical associations toward explaining the transmission mechanism linking fiscal expenditure to human development (Hill, Vidyattama, & Suryahadi, 2012; Sjafrizal, 2018).

All expenditure variables used in this study are derived from the Regional Government Budget Realization Reports (APBD) published by the

Ministry of Finance and local governments. Regional financial management and local government expenditure are important components of fiscal decentralization and regional autonomy (Kuncoro, 2014; Mardiasmo, 2019). To improve comparability across districts and over time, expenditure variables are expressed as the proportion of total regional government expenditure (percentage of total expenditure) rather than absolute monetary values. This approach is consistent with public-sector accounting and fiscal decentralization practices that emphasize expenditure composition rather than expenditure magnitude alone (Halim, 2020; Basri & Hill, 2011). Therefore, the variables are not transformed into logarithmic form, not expressed in real (inflation-adjusted) values, and not measured on a per capita basis. This proportional measurement captures the relative spending priorities of local governments and reduces scale differences among districts with different fiscal capacities (Lewis, 2015; Simanjuntak, 2003).

The first stage of the analysis estimates the effect of local expenditure components on the Human Development Index (HDI) using panel regression models. The Hausman specification test yielded a test statistic of $\chi^2 = 16.70$ with a p -value of 0.0008, indicating that the fixed-effects (FE) estimator is more appropriate than the random-effects (RE) model. Accordingly, all reported coefficient estimates are obtained from the two-way fixed-effects specification with district-clustered robust standard errors. The use of fixed-effects estimation is appropriate when unobserved regional characteristics may be correlated with explanatory variables, while panel-data estimation allows researchers to control for unobserved heterogeneity across observational units and over time (Wooldridge, 2010; Baltagi, 2021; Greene, 2018).

This suggests that unobserved heterogeneity across districts/cities in NTB is correlated with the regressors and thus must be controlled through fixed effects. Such an approach is consistent with the broader fiscal decentralization literature, which emphasizes the importance of institutional, regional, and socioeconomic

heterogeneity when examining the effects of decentralization and public expenditure (Baskaran & Feld, 2013; Davoodi & Zou, 1998; Rodríguez-Pose & Ezcurra, 2011).

Fixed-Effects Estimates

The FE estimates reveal distinct patterns:

a. Personnel expenditure (b1) has a positive coefficient of $\beta = 0.286$, with a p -value of 0.07. Although the effect is not strongly significant at the 5% level, it is marginally significant, indicating that increases in personnel spending may have some association with improvements in HDI, albeit with limited robustness. This finding is consistent with the broader argument that public expenditure can contribute to human development when it strengthens institutional and service-delivery capacity (Fielding & Torres, 2008; Anand & Sen, 2000).

b. Capital expenditure (b3) yields a small coefficient of $\beta = 0.052$ and is statistically insignificant ($p = 0.78$). This suggests that increases in capital expenditure, including infrastructure investment, do not show a measurable direct relationship with HDI outcomes during the study period. This result is consistent with the argument that the developmental contribution of expenditure depends not only on the amount allocated but also on how effectively resources are transformed into productive outcomes (Devarajan, Swaroop, & Zou, 1996; Bahl & Bird, 2008).

c. Subsidies, grants, and social assistance (b4) show a positive and highly significant effect on HDI, with $\beta = 0.325$ and $p = 0.0003$. This suggests that targeted fiscal transfers to households, communities, or institutions are strongly linked to improvements in human development indicators. The finding is consistent with research emphasizing the role of social expenditure in improving human capital and reducing socioeconomic constraints (Baldacci, Clements, Gupta, & Cui, 2008; Gupta, Verhoeven, & Tiongson, 2003).

Principal Component Analysis (PCA)

To address multicollinearity among expenditure components, Principal Component Analysis (PCA) was performed. PCA is useful for transforming correlated explanatory variables into a smaller number of orthogonal components while preserving the dominant information contained in the original variables (Greene, 2018; Hsiao, 2014; Stock & Watson, 2019). The results show that the first principal component (PC1) explains 78.9% of the total variance in the expenditure data, indicating that PC1 captures the dominant structure of expenditure composition. When PC1 was used as an explanatory variable in the fixed-effects regression, it showed a positive and highly significant effect on HDI ($p < 0.001$).

This confirms that the overall expenditure composition, as summarized by PC1, is strongly associated with human development outcomes, even though not all individual expenditure categories are statistically significant when tested separately. The interpretation is consistent with the literature emphasizing that the **composition and allocation of public expenditure** may be more important than its aggregate magnitude (Devarajan, Swaroop, & Zou, 1996; Afonso & Alegre, 2011; Fan, Hazell, & Thorat, 2000).

Policy Implications: Budget Reform

The results suggest that budget reform should shift from an administrative-oriented approach toward a strategic and results-based budgeting approach. Institutional quality plays an important role in determining whether fiscal decentralization generates effective development outcomes (North, 1990; Rodrik, 2007). Therefore, local governments should reorient public spending by reducing relatively unproductive expenditure and increasing allocations to priority sectors such as education, health, and social protection. This recommendation is consistent with the emphasis placed by UNESCAP on strengthening fiscal decentralization and local governance capacity in the Asia-Pacific region (UNESCAP, 2022).

The implementation of a Medium-Term Expenditure Framework (MTEF) is also

recommended to integrate medium-term planning and budgeting so that fiscal policy does not remain excessively annual and reactive. Evidence-based budgeting should use empirical evidence, including the results of panel-data analysis, to determine expenditure priorities. In addition, the implementation of e-budgeting and public expenditure dashboards can strengthen transparency and accountability, while participatory budgeting can improve the alignment between expenditure priorities and community needs. These reforms are consistent with international recommendations concerning results-oriented public financial management and subnational governance (OECD, 2023; World Bank, 2022).

Budget allocation should also be directly associated with measurable development outputs and outcomes. Each regional government agency (OPD) should establish measurable performance indicators, such as reductions in poverty and improvements in HDI. Incentive and disincentive mechanisms can then be introduced, whereby high-performing regions or OPDs receive additional budgetary support, while low-performing programs undergo evaluation and possible budget reallocation. This output–outcome linkage ensures that expenditure is assessed according to actual development results rather than merely the rate of budget absorption (OECD, 2023; World Bank, 2022).

Annual evaluation of program effectiveness is necessary to ensure efficiency and accountability. Interregional benchmarking can also be employed to compare performance across districts and encourage healthy competition in public service delivery. Such an approach strengthens the connection between decentralization, institutional performance, and development outcomes (North, 1990; Rodrik, 2007).

Pearson Correlation Analysis

All expenditure variables used in this study are derived from the Regional Government Budget Realization Reports (APBD) published by the Ministry of Finance and local governments. To improve comparability across districts and over

time, expenditure variables are expressed as the proportion of total regional government expenditure rather than absolute monetary values. Therefore, the variables are not transformed into logarithmic form, not expressed in real (inflation-adjusted) values, and not measured on a per capita basis. This proportional measurement captures relative spending priorities and reduces scale differences among districts with different fiscal capacities (Halim, 2020; Lewis, 2015; Simanjuntak, 2003).

Pearson correlation analysis was conducted prior to model estimation to examine the relationships among the observed variables and to identify potential multicollinearity. The correlation matrix shows relatively high correlations among the expenditure variables, approximately 0.60–0.80, which is consistent with the high VIF values reported later in the analysis. The service indicators (E1–E5) are also strongly correlated, supporting their specification as indicators of the latent construct of public service effectiveness. The HDI displays stronger correlations with the service indicators than with expenditure variables, providing preliminary evidence that public service effectiveness may mediate the relationship between fiscal expenditure and human development outcomes. The use of correlation analysis as a preliminary diagnostic is consistent with standard econometric procedures for identifying relationships among explanatory variables before model estimation (Gujarati & Porter, 2009; Wooldridge, 2010).

Human Resource Reform

Human resource reform becomes a key component in ensuring that budget policies can be implemented effectively. Recruitment and promotion should be increasingly based on competence and measurable performance, rather than seniority alone. This recommendation is consistent with the broader institutional perspective that bureaucratic quality and institutional arrangements influence economic and development performance (North, 1990; Rodrik, 2007).

Intensive training should be provided in performance-based budgeting, data analysis,

policy analysis, and public-program management. Individual performance assessments should be based on clear and measurable outputs. Strengthening the capacity of the State Civil Apparatus (ASN) to use digital technologies, including big data and e-budgeting systems, is also important for improving the quality of public-sector decision-making and expenditure management. These reforms support the broader objective of strengthening local governance and administrative capacity in decentralized fiscal systems (UNESCAP, 2022; OECD, 2023).

The quantity and functional composition of government employees should also be adjusted to improve efficiency and avoid overstaffing. Personnel expenditure should be assessed not merely according to its budgetary share but according to its contribution to public service effectiveness. This is particularly relevant given the finding that personnel expenditure has only a marginal direct association with HDI in the present study. Strengthening **transformational leadership** within the bureaucracy is therefore important for promoting innovation, accountability, and performance-oriented public administration. Overall, human-resource reform should complement fiscal reform so that additional public expenditure is translated into more effective public services and ultimately improved human development outcomes.

4. Discussion

In this study, capital expenditure did not significantly impact either the effectiveness of public services or the Human Development Index (HDI). Panel estimation results indicate a relatively small coefficient for capital expenditure ($\beta = 0.052$; $p = 0.78$), while Structural Equation Modeling (SEM) results also show that the capital expenditure $\rightarrow$ public service effectiveness pathway is insignificant (coefficient = 0.068; $p = 0.431$), thus there is no indirect effect on HDI through public service effectiveness. This finding suggests that physical investment alone is insufficient to improve the quality of human development if it is not accompanied by improvements in the quality of governance and public services.

This situation can be explained by the fact that infrastructure development does not automatically generate benefits for the community if the infrastructure is not integrated with the public service system. Infrastructure such as school buildings, hospitals, roads, and public facilities requires the support of competent human resources, effective operational systems, ongoing maintenance, and inter-agency coordination to ensure optimal utilization. Without such support, physical investment merely increases government assets without having a real impact on improving access to education, healthcare, or the public's standard of living, which are key components of the HDI.

Furthermore, the research results show that the effectiveness of public services is a mediating mechanism that determines whether government spending translates into improved public welfare. In other words, capital expenditure will only contribute to human development if it improves the quality of public services received by the public. If infrastructure projects are solely oriented toward physical completion and budget absorption without considering service quality, the benefits of development on the HDI will be very limited.

These findings also indicate problems with the quality of capital expenditure implementation in the regions. The infrastructure built is potentially underutilized, does not meet community needs, or is not supported by adequate institutional capacity. As a result, public investment does not result in increased service productivity or improvements in the health, education, and income indicators that form the HDI. Therefore, the amount of capital expenditure allocation is not the primary factor determining the success of human development, but rather how the investment is managed, operated, and integrated into an effective public service system.

Theoretically, these findings reinforce the argument that the relationship between government spending and human development is not direct, but rather dependent on service delivery effectiveness as a transmission mechanism. Therefore, local governments must

not simply increase infrastructure investment; they must also strengthen bureaucratic capacity, service management quality, institutional coordination, and asset maintenance systems so that capital spending can generate tangible benefits for improving the Human Development Index (HDI). These findings also explain the paradox of fiscal decentralization: that increased development budgets are not always followed by increased welfare if the effectiveness of public services remains low.

The SEM approach was employed to test the hypothesized mediating role of public service effectiveness ($F_service$), which was measured as a latent construct from five observed service delivery indicators (E1–E5).

The path estimates are as follows:

1. Personnel expenditure (b_1) $\rightarrow F_service$: coefficient = 0.195, $p = 0.02$, indicating a positive & significant relationship.
2. Subsidies & social assistance (b_4) $\rightarrow F_service$: coefficient = 0.213, $p = 0.01$, also positive & significant.
3. Capital expenditure (b_3) $\rightarrow F_service$: not significant, showing no measurable effect on service effectiveness.
4. $F_service \rightarrow HDI$ (f_5): coefficient = 1.478, $p < 0.001$, indicating a very strong & highly significant effect.

By contrast, the direct paths from expenditure variables (b_1 , b_3 , b_4) to HDI are all statistically insignificant. This means that expenditure does not directly influence HDI; Rather, its effect operates entirely through improvements in the effectiveness of public services.

For increase validity construct, research This should enter *Confirmatory Factor Analysis (CFA)* use test suitability between indicators & latent variables that are measured. CFA allows verification whether indicators used truly represent construct theoretical meaning. Evaluation feasibility of the model in SEM approach is necessary based on several indicator *goodness-of-fit*, among others; 1). Comparative Fit Index (CFI) ≥ 0.90 indicates that the model has

good fit . 2). Root Mean Square Error of Approximation (RMSEA) ≤ 0.08 indicates level error approximation that can be accepted .

The estimated indirect effects indicate that public service effectiveness fully mediates the relationships between personnel expenditure, social transfers, and HDI. The significance of

these mediation paths was evaluated using the SEM structural estimates, supporting the robustness of the proposed service-mediated transmission mechanism. Nevertheless, future studies are encouraged to employ bootstrap resampling procedures to provide additional confirmation of the stability of the indirect effects.

No	Indirect Effect	Estimate	Boot SE	95% Bootstrap CI	p-value
1	Personnel Expenditure (B1) $\rightarrow$ Public Service Effectiveness $\rightarrow$ HDI	0.287	0.082	0.121–0.455	<0.001
2	Social Transfers (B4) $\rightarrow$ Public Service Effectiveness $\rightarrow$ HDI	0.315	0.079	0.169–0.472	<0.001
3	Capital Expenditure (B3) $\rightarrow$ Public Service Effectiveness $\rightarrow$ HDI	0.100	0.086	–0.051–0.261	0.201

Reporting index This important For ensure that the model is built No only significant in a way statistics , but also worthy in a way empirical . Explanation about indicator variables service need clarified . No Enough only mention that the data is measured use Likert scale , but it also has to be explained in source indicators (for example : adaptation from study previous , st&ard institutions , or regulations government). Dimensions measured (for example : quality , accessibility , responsiveness). Validation process instrument (validity & reliability test). This important For increase transparency & credibility measurement.

The insignificant effect of capital expenditure on the Human Development Index (HDI) should not be interpreted as evidence that infrastructure investment is inherently unproductive. Instead, the findings suggest several plausible explanations that merit further consideration. First, infrastructure investment may generate lagged development effects, whereby the benefits of roads, schools, hospitals, irrigation systems, and other public facilities require several years before they are reflected in improvements in human development indicators. Because the present study employs annual observations over the 2013–2022 period, the estimated

contemporaneous relationship may not fully capture these delayed impacts. Consequently, future studies should incorporate dynamic panel models or distributed lag specifications to examine whether capital expenditure produces longer-term effects on human development.

Second, the insignificant coefficient may indicate implementation inefficiency in capital expenditure execution rather than the absence of economic value. Infrastructure projects often experience procurement delays, cost overruns, incomplete construction, weak maintenance, or poor coordination among implementing agencies. Under such circumstances, substantial fiscal allocations fail to translate into effective public services that directly improve education, health, or living standards. This interpretation is supported by the SEM results, which show that capital expenditure does not significantly enhance public service effectiveness, suggesting that the challenge lies not only in the amount of investment but also in its implementation quality and institutional capacity.

Third, the findings may reflect misalignment between infrastructure allocation and social welfare priorities. Capital expenditure directed toward administrative buildings, government offices, or prestige projects may contribute little

to human development when compared with investments in schools, health facilities, clean water systems, sanitation, or rural accessibility. Therefore, the developmental impact of infrastructure depends not only on expenditure volume but also on whether investment priorities are aligned with sectors that directly influence the dimensions of the Human Development Index. This result reinforces the argument that expenditure composition should be evaluated based on its capacity to improve service delivery and welfare outcomes rather than merely increasing physical asset accumulation.

Overall, these findings indicate that the limited contribution of capital expenditure is likely attributable to a combination of delayed development effects, implementation inefficiencies, and infrastructure allocation that is insufficiently aligned with social welfare priorities. Consequently, improving the effectiveness of capital expenditure requires not only larger investment budgets but also better project selection, stronger implementation capacity, effective maintenance systems, and greater alignment between infrastructure planning and human development objectives.

If results SEM model testing does not fulfil criteria *goodness-of-fit* or amount sample No sufficient, then a more approach simple & robust can considered, namely use index composite with method aggregate indicators (eg. through the average or weighting certain). Analysis furthermore can done panel regression or ordinary linear regression without involving latent structural models. The approach This more safe in a way methodological compared to force improper use of SEM fulfil assumptions.

The present findings are broadly consistent with previous empirical studies emphasizing that the developmental impact of public expenditure depends more on institutional quality and service delivery effectiveness than on the volume of fiscal resources alone. For instance, Nakatani, Ryo et al. (2023) demonstrated that fiscal decentralization improves health outcomes only when supported by effective governance and strong institutional capacity. Similarly, Maulana,

Agus et al. (2022) found that the success of Indonesia's regional autonomy largely depends on the capability of local governments to transform fiscal resources into high-quality public services rather than merely increasing expenditure levels. These studies support the present finding that public service effectiveness functions as the critical transmission mechanism linking expenditure composition to human development outcomes.

The insignificant effect of capital expenditure observed in this study is also consistent with previous evidence suggesting that infrastructure spending does not automatically improve welfare indicators. Devarajan, Shantayanan et al. (1996) argued that the productivity of public expenditure depends on its composition and implementation efficiency rather than its magnitude. Likewise, Lewis, Blane D. (2015) reported that local government capital spending in Indonesia frequently encounters implementation constraints, weak maintenance, and institutional inefficiencies that reduce its contribution to service quality and development outcomes. These findings indicate that infrastructure investment alone is insufficient unless accompanied by effective management and service delivery systems.

The positive influence of personnel expenditure and social transfers through public service effectiveness also corroborates recent international evidence. Diaz-Serrano, Luis and Meix-Llop (2019) showed that improvements in public service quality are strongly associated with better educational outcomes under decentralized governance. Similarly, Baldacci, Emanuele et al. (2008) demonstrated that social spending contributes to human development by expanding access to education and health services, provided that expenditure is implemented efficiently. The current study extends these findings by demonstrating that, within the context of Indonesian fiscal decentralization, both personnel expenditure and social assistance influence HDI indirectly through improvements in public service effectiveness rather than through direct fiscal expansion.

From a theoretical perspective, these findings refine the fiscal federalism argument proposed by Wallace E. Oates (1999). While fiscal federalism assumes that decentralization enhances allocative efficiency because local governments possess better information about community needs, the present results suggest that informational advantages alone are insufficient. Effective public service delivery represents the missing institutional mechanism that converts decentralized fiscal authority into measurable improvements in human development. Consequently, this study contributes to the decentralization literature by explaining why previous empirical findings regarding the effects of fiscal decentralization have often been inconsistent across developing countries.

The presentation of tables, SEM path diagrams, and descriptive statistics should be improved. Clearer formatting, consistent labeling, and better visual organization would enhance the readability of the manuscript and facilitate readers' understanding of the empirical findings.

5. Conclusion

The findings of this study provide several important insights into the relationship between the composition of public expenditure & human development outcomes within decentralized fiscal systems. Overall, the empirical evidence consistently demonstrates that local government spending does not automatically translate into improvements in the Human Development Index (HDI). Instead, the impact of public expenditure operates primarily through the effectiveness of public service delivery, which functions as a critical transmission channel linking fiscal inputs to development outcomes. This result offers a mechanism-based explanation for the decentralization paradox frequently documented in developing & emerging economies, where increased fiscal autonomy & higher public spending do not necessarily produce proportional gains in welfare indicators.

The fixed-effects panel regression results initially suggest that social transfers exhibit a strong & statistically significant association with HDI. At the same time, personnel expenditure shows only

marginal significance, & capital expenditure remains insignificant. However, these direct relationships weaken substantially once public service effectiveness is explicitly modeled as a mediating variable through structural equation modeling (SEM). The SEM results reveal that all direct expenditure–HDI relationships become statistically insignificant, while the indirect effects operating through service effectiveness are strong & highly significant. This pattern indicates that expenditure components affect human development outcomes only insofar as they enhance the effectiveness of service delivery, rather than through direct fiscal expansion.

From an economic perspective, this finding highlights the importance of the efficiency outcome nexus of public spending. Public expenditure constitutes an input into the production of public services, while human development outcomes represent the final outputs. The effectiveness with which inputs are transformed into outputs depends on institutional capacity, administrative competence, & service delivery mechanisms. When these intermediate processes are weak, additional spending fails to generate meaningful welfare improvements. Consequently, decentralization should be understood not merely as a transfer of fiscal resources but as a reallocation of responsibility for managing this input-output transformation process.

The positive & significant effect of personnel expenditure on public service effectiveness underscores the role of human resources as a key determinant of service delivery performance. Personnel spending contributes to development outcomes when it enhances the capacity of frontline service providers, improves staff skills, & strengthens institutional performance. However, the marginal nature of its direct association with HDI suggests that personnel expenditure alone is insufficient to improve development outcomes unless it is accompanied by productivity-enhancing reforms. In decentralized settings, personnel spending is often dominated by rigid wage structures & administrative overheads, limiting its potential to improve service quality. This finding reinforces

the argument that personnel expenditure must be evaluated in terms of its contribution to service effectiveness rather than its share in the budget.

Social transfers, by contrast, display a strong & consistent effect on public service effectiveness. This reflects a relatively direct transmission channel through which fiscal resources influence human development. Social assistance programs can immediately reduce household-level constraints on accessing education, health care, & basic services, thereby improving human development indicators. The strength of this effect suggests that expenditure categories with clearer & more direct links to service utilization are more likely to generate measurable development outcomes. From a fiscal federalism perspective, this finding implies that decentralized governments may achieve higher spending productivity when expenditure programs are closely aligned with beneficiary needs & service delivery mechanisms.

In contrast, capital expenditure does not exhibit a statistically significant effect on either public service effectiveness or HDI. This result does not imply that infrastructure investment is inherently unimportant for development. Rather, it suggests that in the absence of effective service management, coordination, & maintenance, capital spending fails to generate immediate or observable welfare gains. Infrastructure projects that are poorly integrated into service delivery systems risk becoming underutilized or economically unproductive, despite absorbing substantial fiscal resources. This finding aligns with the view that capital expenditure contributes to development only when supported by complementary institutional arrangements that ensure its effective use.

By explicitly modeling public service effectiveness as a latent mediating construct, this study extends the fiscal decentralization literature beyond reduced-form expenditure–outcome relationships. Previous empirical studies often focus on whether decentralization or public spending affects development indicators directly, producing mixed & sometimes contradictory results. The present findings suggest that these

inconsistencies arise because many studies overlook the transmission mechanisms through which fiscal resources are converted into outcomes. By identifying service effectiveness as the missing link between expenditure composition & human development, this study provides a more nuanced & theoretically grounded explanation of decentralized outcomes.

The findings also contribute to fiscal federalism theory by refining its core assumptions. Traditional fiscal federalism emphasizes allocative efficiency gains arising from local information advantages. However, the results of this study indicate that information advantages alone are insufficient to improve development outcomes in the absence of effective service delivery mechanisms. Decentralization enhances development performance only when local governments possess the institutional capacity to translate fiscal autonomy into productive public services. This insight refines the decentralization paradox by showing that autonomy without effectiveness can undermine, rather than enhance, welfare outcomes.

Although the empirical analysis focuses on West Nusa Tenggara, the findings should be interpreted within the institutional context of Indonesian fiscal decentralization. While similar challenges may exist in other decentralized regions, differences in governance arrangements, administrative capacity, and policy implementation limit the extent to which these findings can be generalized. Future studies should examine whether the proposed service-mediated fiscal transmission mechanism holds across different institutional and national settings.

From a methodological standpoint, the combined use of fixed-effects panel regression, PCA, & SEM strengthens the robustness of the conclusions. Fixed effects control for unobserved heterogeneity across regions, PCA addresses multicollinearity in expenditure composition, & SEM enables the identification of indirect effects through latent constructs. Together, these approaches allow for a more comprehensive assessment of the economic

mechanisms linking public expenditure to development outcomes.

This study demonstrates that the impact of public expenditure on human development in decentralized fiscal systems depends primarily on the effectiveness of public service delivery rather than on the amount of government spending itself. The empirical results show that personnel expenditure and social transfer spending improve the Human Development Index (HDI) indirectly through enhanced public service effectiveness, whereas capital expenditure does not exhibit a significant contribution. These findings reinforce the argument that service effectiveness serves as the key transmission mechanism linking fiscal resources to development outcomes and provides a mechanism-based explanation for the decentralization paradox.

From a policy perspective, the results suggest that local governments should prioritize improving the quality and effectiveness of public service delivery alongside expenditure allocation. Strengthening institutional capacity, improving public sector management, and implementing outcome-oriented budgeting are likely to generate greater development benefits than merely increasing public expenditure.

This study has several limitations. First, the analysis is limited to one Indonesian province (West Nusa Tenggara), which may restrict the generalizability of the findings to regions with different institutional and fiscal characteristics. Second, the study uses secondary panel data and focuses on expenditure composition and public service effectiveness without incorporating other

potentially influential factors, such as governance quality, political institutions, or citizen participation. Third, the observation period (2013–2022) may not fully capture the long-term effects of capital expenditure on human development.

Future research should extend this framework by examining multiple provinces or conducting cross-country comparisons within developing economies. Further studies may also incorporate additional institutional variables, such as governance quality, bureaucratic capacity, transparency, and accountability, to better explain the mechanisms through which fiscal decentralization influences development outcomes. Employing longer observation periods and alternative analytical approaches, such as dynamic panel models or multilevel analysis, would also provide a more comprehensive understanding of the relationship between public expenditure, service effectiveness, and human development.

Overall, this study advances the literature by shifting the analytical focus from expenditure allocation to expenditure transmission mechanisms. It demonstrates that decentralization should be evaluated not by the magnitude of fiscal resources devolved to local governments, but by the effectiveness with which those resources are converted into public services that enhance human development. Without improvements in service effectiveness, fiscal decentralization risks redistributing resources without improving welfare outcomes, thus perpetuating the decentralization paradox observed in many developing regions.

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8. Author Declaration

Rahmad Hidayat contributed to the conceptualization of the study, data collection, formal analysis, and preparation of the original manuscript draft. Moh. Khusaini was responsible for the research methodology, supervision, validation of the analytical framework, and critical review and editing of the manuscript. David Kaloge contributed to data curation, statistical analysis, and interpretation of the research findings. Nugroho Suryo Bintoro provided supervision, conducted policy analysis, and reviewed the final version of the manuscript. All authors have read and approved the final version of the manuscript and agree to be accountable for all aspects of the work.

Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

Data Availability

The data supporting the findings of this study are available from official publications of regional government financial reports and the Statistics Indonesia (BPS). The datasets are available from the corresponding author upon reasonable request.

Declaration of Artificial Intelligence (AI) Assistance Process

The authors declare that Artificial Intelligence (AI)-based tools were used only to assist in language improvement, grammar checking, and manuscript editing during the preparation of this article. All interpretations, analyses, and conclusions presented in this study remain the sole responsibility of the authors.

Ethics Approval

This study used secondary regional panel data obtained from publicly accessible government publications and official statistical databases. Therefore, ethical approval and informed consent were not required.

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