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RESEARCH ARTICLE

Assessing the footprint of Special Autonomy Funds: The effectiveness of fiscal interventions in improving socio-economic welfare in Aceh

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ABSTRACT

This study aims to evaluate the effectiveness of the Special Autonomy Fund (SAF)—locally known as *Dana Otonomi Khusus Aceh* (DOKA)—in improving socio-economic welfare in Aceh Province. The analysis employs a panel data regression approach using data from 23 regencies and municipalities over the 2019–2023 period. The development indicators examined include the Human Development Index (HDI), life expectancy, average years of schooling, and household consumption expenditure. The estimation results reveal that while life expectancy significantly contributes to HDI, SAF exhibits a negative and statistically significant effect on all socio-economic indicators. These findings suggest that substantial fiscal transfers have not been accompanied by effective implementation or well-targeted policy directions. SAF allocation appears to be administratively driven and lacks a long-term development strategy grounded in local needs. The policy implications highlight the necessity of reformulating SAF's design toward an outcome-based framework, enhancing institutional capacity, and strengthening performance-based monitoring and evaluation systems. Therefore, affirmative fiscal policies such as SAF can only succeed when supported by sound governance, clear development priorities, and a genuine pro-poor orientation.

1. Introduction

Since the enactment of Law No. 11 of 2006 concerning the Governance of Aceh, the central government of Indonesia has allocated Special Autonomy Funds (SAFs) to

the province as a form of fiscal affirmation aimed at supporting post-conflict reconstruction and accelerating development. These funds also serve as one of the key commitments of the 2005 Helsinki Peace Agreement, representing economic compensation for resource exploitation during the conflict period. Between 2008 and 2023, Aceh has received over IDR 100 trillion in special autonomy fund making it the largest recipient of affirmative fiscal transfers in Indonesia (BPKA, 2023).

However, the magnitude of these allocations has not been adequately reflected in improvements to Aceh's socio-economic welfare indicators. According to BPS data (2024), Aceh's Human Development Index (HDI) in 2023 stood at 72.23, still below the national average of 74.39. Disparities are also evident in household monthly consumption expenditures, which remain below IDR 1,050,000 in most regencies/municipalities. In education, the average years of schooling hovers between 8 and 9 years, while life expectancy remains stagnant at approximately 65–66 years. Furthermore, the ratio of capital expenditure to total regional budgets continues to decline, and the effectiveness of special autonomy fund utilization in health and economic programs has yet to demonstrate any transformative impact.

This phenomenon illustrates a significant output–outcome gap, highlighting the disconnect between substantial fiscal inputs (special autonomy fund) and the intended development outcomes. Various studies have pointed to weak governance, overlapping authority, and local elite dominance as key factors hindering the optimal implementation of special autonomy fund-funded programs (Ikhsan et al., 2023; Fadhila et al., 2023; Dahlawi et al., 2023). Most programs tend to focus on basic infrastructure without being accompanied by long-term investments in human capital development.

Socio-economic disparities across regions in Aceh also warrant serious concern. According to BPS (2024), regencies such as Simeulue, Gayo Lues, and Aceh Singkil recorded HDI scores below 70, reflecting continued underdevelopment in access to basic education and healthcare services. These regencies/municipalities receive annual SAF allocations—albeit in relatively smaller amounts compared to more populous areas. Additionally, the Gini ratio, ranging from 0.29 to 0.34 across several regencies/municipalities, indicates troubling levels of inequality. The decline in capital spending in many areas further suggests a shift from productive to consumptive budgeting, signalling shortcomings in long-term development planning (BPS, 2024; Abrar et al., 2020).

This study offers significant contributions on two fronts. Academically, it strengthens the literature on the effectiveness of affirmative-based fiscal decentralization (asymmetric decentralization) in post-conflict settings, particularly in relation to human development. By empirically analyzing the relationship between special autonomy fund and socio-economic welfare variables, this article aims to address gaps in previous research that have focused primarily on normative and institutional dimensions. Practically, the findings offer policy input for both central and regional governments to redesign special autonomy fund allocation in a more evidence-based, pro-poor, and socially and fiscally sustainable manner. This is particularly critical as Aceh's special autonomy funding is set to run out in 2027, making the transitional phase a vital moment for redefining policy direction (Suwaryo et al., 2020; Aulianur et al., 2023).

This research aims to assess the effectiveness of fiscal interventions through the Special Autonomy Fund in promoting socio-economic welfare in Aceh, with a specific focus on the education, health, and household economic sectors. The article also seeks to evaluate the extent to which this affirmative fiscal policy has succeeded in achieving its original goals: equitable, sustainable development that benefits grassroots communities. Using an empirical approach, this article aspires to offer a foundation for rethinking and reformulating special autonomy fund policy to be more responsive to human development needs.

2. Literature review

2.1. Special autonomy fund as an affirmative fiscal intervention

The SAF represents an affirmative fiscal intervention by the central government for provinces granted asymmetric decentralization status, such as Aceh and Papua. According to Law No. 11 of 2006 on the Governance of Aceh, the fund is intended to accelerate development and equitable welfare distribution in post-conflict regions, as well as to strengthen the capacity of local governments to deliver effective governance. Theoretically, such fiscal interventions are rooted in the concepts of fiscal decentralization and fiscal equity, which emphasize the provision of public funds based on regional needs and levels of underdevelopment.

Sustikarini (2019) refers to Aceh's special autonomy fund as a "peace dividend," an economic compensation derived from the peace process that is expected to enhance welfare and reduce the risk of horizontal conflict. However, in practice, the

fund does not consistently lead to enhancements in social outcomes. Ikhsan et al. (2023) argue that the absence of a grand design and frequent regulatory shifts have resulted in unclear development trajectories. Similarly, Dahlawi et al. (2023) highlight weak accountability and limited oversight as key obstacles to the optimal implementation of the fund.

Fiscal policy gives central role in shaping the distribution of resources and promoting human development. Public finance functions not only as a tool for resource allocation and stabilization but also for distribution—particularly in addressing social inequities. In the context of decentralization, fiscal transfers from the central government to regional administrations are expected to strengthen local capacity to provide basic public services, such as education, healthcare, and infrastructure, thereby improving the quality of life and enhancing the HDI.

Human development, as conceptualized by Sen (1999), emphasizes the expansion of individual capabilities, including the ability to live a long and healthy life, acquire knowledge, and enjoy a decent standard of living (Alvarado, 2022; Biggeri et al., 2018; Doussard & Yenigun, 2024). In this framework, fiscal decentralization requirement moves beyond revenue distribution—it should also be geared toward reducing inequality and structural poverty. Todaro and Smith (2015) further emphasize that investments in health and education are critical levers for enhancing human capital, particularly in regions affected by conflict or marginalization.

In the case of Aceh, the allocation of special autonomy funds should preferably support these core dimensions of development. However, empirical studies suggest that the connection between fiscal input and development output remains weak, often due to fragmented policy implementation and the prioritization of physical infrastructure over social investment. As such, the theoretical promise of fiscal policy as an instrument for equitable development has not yet been fully realized in practice.

In the framework of this study, the HDI is a composite indicator that encompasses the dimensions of education (mean years of schooling and expected years of schooling), health (life expectancy at birth), and a decent standard of living (per capita expenditure). HDI is widely used as a quantify of social welfare and the effectiveness of regional development. In the case of Aceh, despite the allocation of SAFs to the education and health sectors, HDI performance has remained stagnant

and lags behind other regions that do not receive similar affirmative funding (BPS, 2024).

Fadhila et al. (2023) find that the management of special autonomy funds in the education and health sectors during the 2017–2022 period has not been effective in improving related indicators. Meanwhile, Abrar et al. (2020), using a panel data approach, conclude that special autonomy funds have not had a significant impact on reducing poverty or increasing HDI—whether through capital expenditures or spending on goods and services. These findings indicate that large fiscal inputs do not automatically guarantee development outcomes if not accompanied by sound governance and evidence-based policymaking.

2.2. Special autonomy fund and the health dimension: Between allocation and life expectancy

In public finance literature, the effectiveness of local government spending is closely related to institutional quality, participatory mechanisms, and fiscal accountability (Reta et al., 2025; Setiawan, 2022). In Aceh, low capital expenditure, bloated routine spending, and the dominance of politically driven projects have become common features in the management of the Special Autonomy Fund (Reta et al., 2025). Aulianur et al. (2023) find that only productive sectors such as agriculture, trade, and transportation have demonstrated a tangible impact on poverty reduction, whereas SAF are often not allocated to these sectors.

Furthermore, interregional disparities in the utilization and outcomes of the special autonomy fund indicate weak effectiveness in fiscal distribution. The stagnant Gini ratio and high inequality in household consumption expenditures suggest that Aceh's fiscal policy has failed to reach the most vulnerable groups (BPS, 2024). This supports the argument that fiscal decentralization without institutional strengthening may exacerbate inequality—a phenomenon referred to as the "fiscal decentralization paradox" (Nugroho et al., 2021; Setiawan, 2022; Setiawan & Choirunnisa, 2023).

In the context of human development, the health sector is a fundamental determinant of quality of life and societal productivity. Budget allocations to health under the special autonomy fund are expected to serve as strategic fiscal instruments to improve access to essential services, such as health facilities, medical personnel, and public health programs. According to the theory of public

expenditure for health, public health spending can increase life expectancy if it is implemented efficiently and in a targeted manner (Alhassan et al., 2021; Yefriza, 2015; Zueras & Rentería, 2022).

However, in the case of Aceh, life expectancy has remained stagnant at approximately 65–66 years over the past five years (BPS, 2024), suggesting that fiscal interventions have not yet had a lasting impact on public health outcomes. Fadhila et al. (2023) argue that special autonomy fund-funded health programs in Aceh are often fragmented, lack sustainability, and are rarely evaluated for effectiveness. This is concerning, given that life expectancy is one of the core components of the HDI, which reflects collective well-being. Weak intersectoral coordination and the persistent bias toward physical infrastructure further hinder progress toward holistic and equitable health development.

2.3. Special autonomy fund and the education dimension: Measuring long-term investment

The education sector is frequently regarded as a leading pillar in human development policy. According to human capital theory (Becker, 1994), investment in education yields long-term economic and social returns, particularly by enhancing individual competitiveness and quality of life. In Aceh, the Special Autonomy Fund has allocated a significant portion of the budget to the education sector, including school infrastructure development, scholarships, and teacher training. However, the average years of schooling remain in the range of 8–9 years in many regencies/municipalities (BPS, 2024), indicating that improvements in educational quality have yet to materialize.

Fadhila et al. (2023) observe that special autonomy fund spending on education in Aceh is still concentrated on non-personnel expenditures and does not significantly address teaching quality. Disparities in education quality across regions also remain a major obstacle to achieving educational equity. Yet, increased years of schooling have a substantial impact on HDI and upward mobility for impoverished populations. Therefore, evaluating the effectiveness of special autonomy fund allocations should not be limited to budget absorption but should also focus on educational outcomes that reflect deeper social transformation.

2.4. Special autonomy fund and household economic welfare: Evaluating consumption expenditure

Improving household economic welfare, especially among the poor, is one of the primary objectives of the special autonomy fund. In public economics, government spending serves to correct market failures and enhance the income capacity of vulnerable groups (Setiawan, 2022). Despite more than a decade of special autonomy fund disbursement in Aceh, monthly household consumption expenditure—used as a proxy for real income—remains low and uneven across regencies/municipalities. For example, Gayo Lues and Simeulue record average monthly expenditures of less than IDR 900,000 (BPS, 2024).

Suwaryo et al. (2020) report that special autonomy fund-based poverty alleviation programs in Aceh have shown limited impact on income improvement, mainly due to ineffective economic empowerment initiatives and minimal community participation. Instead, funds are often absorbed by short-term projects that fail to generate multiplier effects. Therefore, special autonomy fund-based strategies for household economic development must focus on job creation, MSME development, and the reform of community-based social protection programs to sustainably increase household consumption.

A synthesis of various studies on the effectiveness of fiscal decentralization, particularly the the special allocation fund, reveals that the impact of fiscal policy on social welfare is not linear and is highly influenced by sectoral and spatial contexts. Studies by Nugroho et al. (2021) and Yusri (2022) emphasize the importance of allocating funds to social sectors—such as education and health—that have proven to directly reduce poverty and improve access to basic services. However, these successes are not consistent across all sectors. Yusri notes that while is effective in education and sanitation, it shows limited impact on access to clean water. Likewise, Sebayang (2023) finds that even though education, health, and infrastructure receive a large share of special autonomy fund in Aceh, none of these sectors show statistically significant effects in reducing poverty.

More nuanced insights are offered by Permai et al. (2021), who use a Geographically Weighted Regression (GWR) approach to show that the effectiveness of fiscal decentralization varies depending on local characteristics. This implies that a one-size-fits-all policy approach is ineffective in the highly diverse context of Indonesia. Thus, this synthesis highlights that the success of fiscal interventions is

not solely determined by the magnitude of funds allocated but also by the quality of governance, institutional capacity, and policy responsiveness to local development needs. Fiscal policies that fail to account for sectoral and geographic specificities are at risk of falling short of achieving sustainable human development goals.

This study is grounded in theories of fiscal intervention within the context of asymmetric decentralization and human development. The special autonomy fund is positioned as an affirmative fiscal instrument aimed at addressing structural inequalities, particularly in post-conflict regions such as Aceh. Within this framework, the allocation of special autonomy fund is treated as an input expected to generate outcomes in the form of improved socio-economic indicators, as reflected in the components of the HDI, namely:

- Health: measured through life expectancy, serving as a reflection of the effectiveness of fiscal interventions in expanding access to basic healthcare services.
- Education: measured through mean years of schooling, representing the outcome of public spending in the formal education sector.
- Economic: represented by monthly household consumption expenditure, serving as a proxy for household welfare and purchasing power.

The effectiveness of this fiscal intervention is highly influenced by budgetary governance, the capacity of local institutions, and need-based planning (Hakiman & Sheely, 2025). If the mechanisms for allocating and executing the Special Autonomy Fund are not functioning optimally, the intended outcomes will not be achieved—even with substantial fiscal inputs.

Research on Aceh's Special Autonomy Fund has garnered significant attention from scholars across fields such as development economics, public financial governance, and post-conflict studies. However, much of the existing literature tends to focus on individual sectors or offers primarily normative descriptions without a comprehensive evaluative approach toward socio-economic development outcomes. Within this context, there remains a critical research gap—specifically, in linking the fiscal effectiveness of the special autonomy fund to the three core dimensions of welfare represented by the HDI: health, education, and household economic well-being.

Sustikarini (2019) frames the SAF fund as a peace dividend intended to bring economic stability and inclusive development in post-conflict settings. Nonetheless,

she also highlights how the fund often becomes entangled in patterns of political patronage by local elites, thereby limiting its equitable impact on society. Ikhsan et al. (2023) reinforce this observation, emphasizing that the absence of a coherent development blueprint and weak accountability have rendered the special autonomy fund fund largely ineffective in reducing poverty or significantly improving Aceh's HDI.

Empirical research by Abrar et al. (2020), employing a panel data approach, finds that the SAF fund does not have a statistically significant impact on poverty reduction or HDI improvement at the regency level—regardless of whether the funds were spent on capital investment or goods and services. Similar findings are presented by Fadhila et al. (2023), who argue that the allocation of SAF to education and health has not been effective due to weak planning, monitoring, and evaluation systems. From a spatial perspective, Aulianur et al. (2023) underscore regional disparities in the utilization of special autonomy fund and note that productive sectors such as agriculture and trade remain underprioritized in local government budgets. Setiawan (2022) concludes that after two decades, special autonomy in Aceh has yet to function effectively as an instrument for enhancing social welfare. He calls for a reform of special autonomy fund policy design, strengthened accountability, and transparent systems to prevent recurring structural failures. The relevance of this literature is especially pronounced as Aceh approaches the end of its special autonomy period in 2027.

A recent study by Sustikarini (2019) echoes similar concerns. Despite the fact that Aceh has received over IDR 100 trillion in special autonomy fund funding since 2008, poverty levels remain high and local government spending remains largely consumptive. Their findings suggest that the inefficacy of the SAF fund is not due to its size, but rather to flawed institutional design and unmeasured fiscal policy direction. Ikhsan et al. (2023) similarly point out that the absence of a coherent development blueprint and weak accountability mechanisms have hindered the transformative potential of special autonomy fund. In line with these findings, Fadhila et al. (2023) emphasize that ineffective planning and evaluation systems have limited the impact of special autonomy fund allocations on essential sectors such as education and health. Indeed, the latest report from BPS (2024) records Aceh's HDI stagnating at 72.23, with low life expectancy and household consumption below the national average—highlighting that substantial fiscal inputs have yet to translate into meaningful development outcomes.

Drawing on these findings, the present study seeks to fill this research gap by offering a more integrative and evaluative approach. Rather than merely examining sectoral allocations, this research assesses the simultaneous impact of special autonomy fund funding on three key dimensions of human development: health (life expectancy), education (mean years of schooling), and economy (household consumption expenditure). This approach enables a more holistic and contextual analysis of the effectiveness of fiscal interventions under the special autonomy scheme in promoting human development in a post-conflict region.

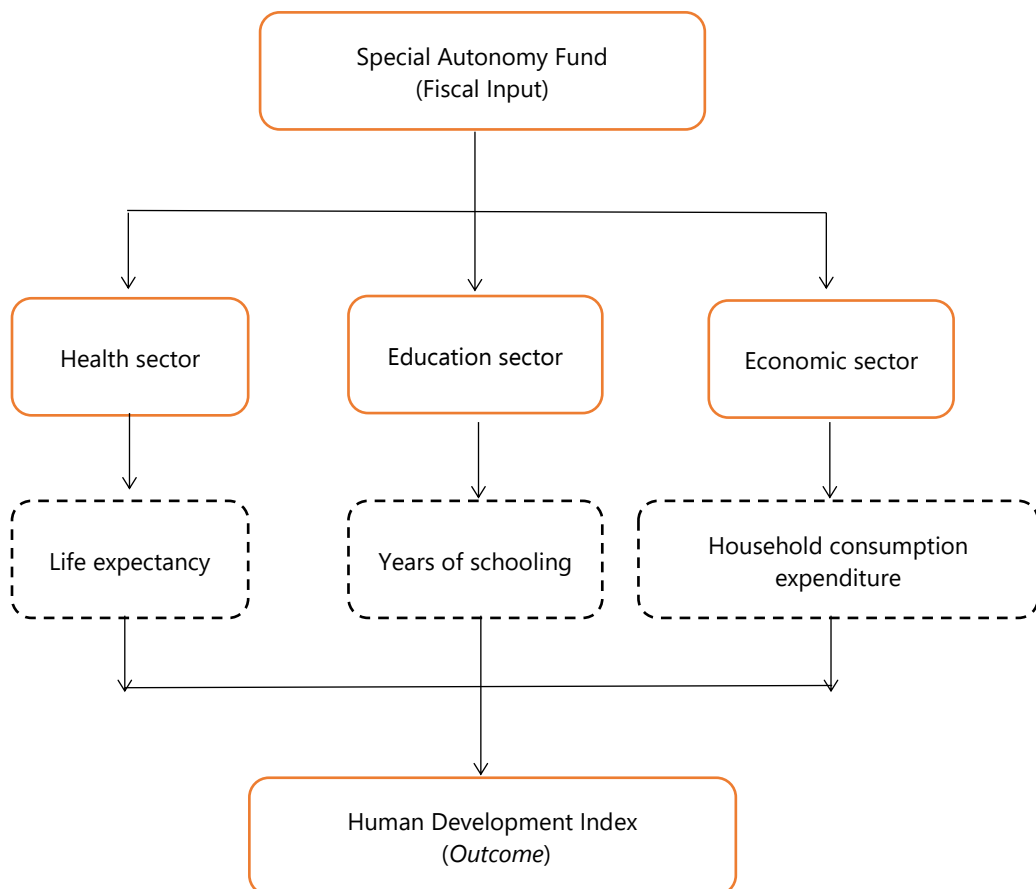The conceptual model is illustrated in Figure 1 as follows:

Figure 1. Framework for fiscal and human development linkages

3. Methods

3.1. Research design and methodological framework

This study adopts a quantitative-descriptive and explanatory approach to analyze the relationship between the special autonomy fund and regional fiscal variables in relation to socio-economic welfare indicators in Aceh Province. The primary focus is to assess the effectiveness of fiscal intervention through the special autonomy fund in three core dimensions of human development: health, education, and household economy. The study covers 23 regencies/municipalities and municipalities in Aceh Province, utilizing time-series data from 2019 to 2023. All regions included in the study are recipients of special autonomy fund and possess complete datasets for the variables under analysis.

The research is based on secondary data obtained from the following sources:

- Statistics Indonesia (BPS) Aceh: Data on Human Development Index (HDI), life expectancy (LE), mean years of schooling (EDU), and household consumption expenditure (CONS_EXP).
- Aceh Financial Management Agency (BPKA): Data on Special Autonomy Fund allocation (SAF).
- Regional Government Financial Reports (LKPD).

The data are compiled in a panel format, combining both cross-sectional and time-series dimensions.

3.2. Empirical models

The methods section should provide sufficient information for similarly qualified researchers to replicate the study. This section should include the study's design and materials, a detailed description of all interventions and comparisons, and the analysis employed.

This study develops four panel regression models to measure the effect of the special autonomy fund and regional fiscal variables on human development indicators.

Model 1 – Human Development Index (HDI) as a Composite Variable: evaluates the overall impact of fiscal interventions on the HDI, which integrates health, education, and standard of living components.

$$\text{HDI}_{it} = \alpha + \beta_1 \text{LE}_{it} + \beta_2 \text{CONS\_EXP}_{it} + \beta_3 \text{EDU}_{it} + \mu_i + \varepsilon_{it} \tag{1}$$

Model 2 – Health (Life Expectancy): assesses the influence of SAF and fiscal variables on life expectancy as a proxy for public health outcomes.

$$\text{LE}_{it} = \alpha + \beta_4 \text{SAF}_{it} + \mu_i + \varepsilon_{it} \tag{2}$$

Model 3 – Education (Mean Years of Schooling): measures the impact of fiscal inputs on the average years of formal education completed by the population.

$$\text{EDU}_{it} = \alpha + \beta_5 \text{SAF}_{it} + \mu_i + \varepsilon_{it} \tag{3}$$

Model 4 – Household Economy (Consumption Expenditure): analyzes the relationship between fiscal allocations and household consumption as a proxy for economic welfare.

$$\text{CONS\_EXP}_{it} = \alpha + \beta_6 \text{SAF}_{it} + \mu_i + \varepsilon_{it} \tag{4}$$

where:
i = regency/municipality
t = years
μ_i = individual (fixed effect or random effect)
ε_{it} = error term

The selection of the regression model will be tested using the Chow Test, Hausman Test and Lagrange Multiplier test to determine whether the Common Effect Model (CEM), Fixed Effect (FE) or Random Effect (RE) model is the most appropriate.

To ensure clarity in measurement and analysis, the following operational definitions are used for each variable in this study:

- SAF (Special Autonomy Fund Allocation): The annual allocation of the Special Autonomy Fund to each district/municipality in Aceh Province from 2019 to 2023, measured in billion Rupiah.
- HDI (Human Development Index): Composite index representing human development levels in regencies/municipalities/municipalities, expressed in

percentage terms (%), covering the dimensions of health, education, and standard of living.

- LE (Life Expectancy at Birth): The average number of years a newborn is expected to live, representing health outcomes, expressed in years.

- EDU (Mean Years of Schooling): The average length of formal education completed by individuals aged 25 years and above, expressed in years.

- CONS_EXP (Household Consumption Expenditure): Monthly household expenditure on food and non-food items, serving as a proxy for welfare and income level, measured in Rupiah.

4. Results

4.1. Descriptive overview of the data

The key variables in this study reveal substantial variation across regions and over time. The indicator for life expectancy (LE) has an average value of 68.4 years, with a minimum of 63.94 and a maximum of 72.06 years. The distribution of LE is approximately normal, as indicated by a Jarque-Bera statistic of 6.22 (p=0.04), although the wide disparity suggests that several regencies/municipalities remain lagging in terms of basic health achievements. This variation indicates that access to and quality of healthcare services remain uneven across Aceh, despite regular special autonomy fund allocations to all regencies/municipalities.

Meanwhile, monthly per capita household consumption expenditure (CONS_EXP) averages IDR 1,168,365, with a relatively high standard deviation of IDR 312,609. This points to a purchasing power gap between regions—regencies/municipalities with economic activity or proximity to trade centers tend to have higher consumption levels compared to more remote areas. Such inequality offers an early indication that economic distribution remains uneven and that consumption is a sensitive indicator of local economic welfare conditions.

The primary variable in this study, the special autonomy fund, has an average annual allocation of IDR 91.6 billion, ranging from IDR 25 billion to IDR 201 billion. This disparity reflects differences in population size, development needs, and possibly the political influence of recipient regencies/municipalities. In the context of fiscal equity, this variation warrants further analysis in relation to human development outcomes. Additionally, the mean years of schooling (EDU) is recorded at 9.5 years, indicating that the majority of Aceh's population completes education

up to junior or senior high school level. While encouraging, this also suggests the need for further efforts to increase educational attainment to higher levels.

Other key variables, such as Local Own-Source Revenue (PAD) and Gross Regional Domestic Product (GRDP), also exhibit significant variation across regencies/municipalities. This disparity reflects the sharp differences in local fiscal capacity and economic potential, which influence each district's ability to finance development programs independently. Regencies/municipalities with low PAD tend to rely heavily on SAF and other central transfers, while those with higher PAD enjoy greater flexibility in development planning. Thus, interregional variation across all these variables forms a crucial basis for evaluating the effectiveness of SAF in improving socio-economic welfare indicators evenly across Aceh Province.

Table 1. Statistical description of key variables

Variables	Mean	Minimum	Maximum	Standard deviation
LE	68,40	63,94	72,06	2,22
CONS_EXP	1.168.365	738.221	2.397.301	312.609
SAF	91,64	25,18	201,83	35,53
EDU	9,50	7,58	13,04	1,16
GDRP	8.224,68	1.531,41	28.472,15	5.963,78

Source: Authors' own calculation

Based on a series of tests including the Chow Test, Hausman Test, and Lagrange Multiplier (LM) Test, the most appropriate models for each data structure are presented in Table 2.

Table 2. Panel model selection test

Model	The best & fit model	Hausman probability test
Model 1 – HDI	Fixed effect	0.0000
Model 2 – LE	Fixed effect	0.0000
Model 3 – EDU	Random effect	0.1414
Model 4 – CONS_EXP	Random effect	0.6251

Source: Authors' own calculation

Following a series of diagnostic tests, the effects of the special autonomy fund and other factors on socio-economic welfare indicators were estimated. The very significant Hausman probability values (p=0.0000) in the Hausman test findings demonstrated that the Fixed Effect model was more suitable for Models 1 (HDI) and 2 (LE). The Chow test was used to compare the Common Effect and Fixed Effect models. This test showed that differences in the characteristics of regencies or cities

affected the dependent variables, and the model must account for regional fixed effects to produce unbiased estimates.

However, the Hausman test probability value for Model 3 (LP) was 0.1414 and for Model 4 (CONS_EXP) was 0.6251, both of which are not statistically significant. For these two models, the Random Effect model is more appropriate, assuming that regional differences are not correlated with the independent variables. Choosing the right model is crucial for accurate regression interpretation, especially as this study uses panel data across regencies/municipalities over an extended time period. Therefore, this study applies a combination of Fixed Effect and Random Effect approaches to reflect spatial heterogeneity in Aceh. Moreover, model specifications are adjusted to suit the characteristics of each dependent variable (Table 3).

Table 3. Summary of panel regression results – Impact of special autonomy fund on socio-economic indicators in Aceh Province

Model	Dependent Variable	Estimation Method	Independent Variable	β	Std. Error	t	p	R^2
Model 1	Human Development Index (HDI)	Fixed Effect (FE)	Life Expectancy (LE)	5.9400	0.812	7.31	0.0000	0.684
			Avg. Years of Schooling (AYS)	0.2150	0.427	0.50	0.6173	
			Household Consumption (Rp)	0.000004	0.000003	1.23	0.2210	
Model 2	Life Expectancy (LE)	Fixed Effect (FE)	Special Autonomy Fund (SAF)	-0.0047	0.0012	-3.92	0.0000	0.412
Model 3	Avg. Years of Schooling (EDU)	Random Effect (RE)	Special Autonomy Fund (SAF)	-0.0033	0.0010	-3.30	0.0011	0.385
Model 4	Household Consumption (Rp/month)	Random Effect (RE)	Special Autonomy Fund (SAF)	-2,090.71	620.45	-3.37	0.0009	0.428

Notes: SAF shows a negative and significant impact in Models 2, 3, and 4; In Model 1, only LE significantly affects HDI; education and consumption variables are not statistically significant; The use of Fixed Effect or Random Effect is based on the Hausman test results for each model.
Source: Authors' own calculation

4.2. Insights from regression estimations

This section presents the results of panel regression analysis from the four models developed to assess the impact of the special autonomy fund on socio-economic welfare indicators in Aceh Province, namely the HDI, life expectancy (LE), average years of schooling (EDU), and household consumption expenditure (CONS_EXP). The discussion goes beyond statistical significance by interpreting the substantive

meaning of the inter-variable relationships and comparing them with findings from previous literature. Considering the context of fiscal decentralization in Aceh as a post-conflict region with special autonomy status, the estimation results provide a critical view of the effectiveness of affirmative fiscal policies and their impact on human development. The analysis is carried out systematically based on the estimated models and is linked to theoretical reflection and empirical conditions in the field.

Model 1 – HDI as a composite variable

The Fixed Effect panel regression estimation results indicate that among the three explanatory variables—life expectancy, average years of schooling, and household consumption expenditure—only life expectancy has a statistically significant influence on the HDI in Aceh Province. The coefficient of LE at 5.94 suggests that an increase in life expectancy by one year has the potential to raise the HDI by nearly six points. Meanwhile, EDU and household consumption do not show statistically significant effects, although their directional relationship is positive. This finding underscores the importance of the health dimension in human development, particularly in post-conflict regions that continue to face challenges in access to and quality of basic services. This aligns with Timmer's (2015) assertion that improvements in health indicators tend to yield quicker observable impacts compared to investments in education or the economy in the short term.

The limited influence of education and consumption variables on HDI may also reflect structural issues in the implementation of regional policies, especially the inefficiency in the allocation of education budgets and the uneven distribution of economic benefits. Fadhila et al. (2023) found that the allocation of SAFs for education in Aceh often does not reflect local needs and tends to focus on infrastructure spending without corresponding improvements in educational quality. Likewise, household consumption expenditures may not reflect real increases in purchasing power, given the persistent levels of poverty and open unemployment in several regencies/municipalities. Thus, although HDI is nationally used as a macro development indicator, these results indicate the need to re-evaluate the relative contribution of each dimension in the context of special autonomy regions like Aceh, so that fiscal policies can be more effectively and evidence-based in their targeting.

Model 2: Health – Life expectancy

The panel regression estimation using a Fixed Effect model shows that the Special Autonomy Fund (*Dana Otonomi Khusus Aceh* or special autonomy fund) has a negative and statistically significant effect on life expectancy (AHP) in Aceh Province, with a coefficient of -0.0047 and a probability value below 1 percent. Substantively, this finding indicates that increased fiscal allocations through special autonomy fund have not corresponded with improvements in public health quality. This paradox raises a fundamental question: why has this affirmative fund—intended to strengthen human development—not yielded positive outcomes in basic health indicators?

This is consistent with Sustikarini (2019), who argues that in the Aceh context, SAF are often not used for programs directly benefiting public welfare, but instead serve as tools for political consolidation by local elites. Further, the weak impact of special autonomy fund on life expectancy is likely rooted in policy implementation and priority-setting issues. Budget absorption in the health sector is often suboptimal, whether due to limited planning capacity at the local level or the absence of performance-based incentives in budget allocation.

Additionally, health spending tends to focus on physical projects—such as building clinics or procuring equipment—without being accompanied by essential services like medical staffing, health outreach, or nutrition interventions. This finding is reinforced by Fadhila et al. (2023), who show that many special autonomy fund-funded programs lack sustainability and are fragmented, failing to produce long-term effects on human development outcomes.

The absence of a structured and evidence-based approach in health policy planning has led to special autonomy fund's failure in fulfilling its transformative function. Stagnant life expectancy in several regencies/municipalities, despite receiving substantial funds each year, highlights weak cross-sectoral coordination and the lack of outcome-based monitoring and evaluation systems. As Qibthiyyah and Siregar (2016) assert, the success of fiscal decentralization is not only determined by the amount of funding, but also by the quality of local institutions and the prioritization of strategic sectors.

In this regard, reformulating the strategy for utilizing Aceh's Special Autonomy Fund in the health sector is an urgent necessity if the target of improving life

expectancy is to be achieved meaningfully and equitably. This argument is also supported by Siburian (2022), who found that without improvements in fiscal governance, decentralized funding may fail to reduce poverty or enhance human capital. Similarly, the sociological analysis by Wijatmoko et al., (2023) underscores that the lack of transparency and local accountability mechanisms in Special Autonomy Fund management is a critical barrier to better health outcomes.

Model 3: Education – Average Years of Schooling

The panel regression estimation using the Random Effect approach reveals that the special autonomy fund has a negative and statistically significant effect on average years of schooling (EDU), with a coefficient of -0.0033 and a high level of significance ($p < 0.01$). This indicates that instead of promoting increased access to and duration of education, rising allocations of Aceh's Special Autonomy Fund are associated with declining educational attainment. This finding appears to contradict the primary goal of the Special Autonomy Fund as a fiscal affirmative instrument to accelerate human development, including education. The result underscores that the size of the allocation alone does not guarantee effectiveness, especially if not accompanied by well-directed policies based on local needs.

One likely explanation for the weak influence of the special autonomy fund on education lies in the budget's disproportionate focus on physical infrastructure rather than on the quality and sustainability of learning processes. Fadhila et al. (2023) observed that in Aceh, the use of the special autonomy fund in the education sector tends to be symbolic and project-oriented, such as constructing school buildings or procuring equipment, with little attention paid to teacher training, contextual curricula, or enhancing student motivation. Moreover, regional disparities and the weakness of the education outcome monitoring system have hindered structural improvements in education quality. Suwaryo et al. (2020) also emphasize that the use of special autonomy funds in education is often not based on evidence-based planning, but rather follows a routine annual budget pattern.

This condition illustrates that reforming education governance is a fundamental prerequisite for making the special autonomy fund an effective instrument for long-term educational acceleration. Average years of schooling is a key indicator of human capital investment and contributes directly to social mobility and the reduction of structural poverty. Therefore, if the use of the special autonomy fund is

not directed toward transformational aspects of education, improvements in the HDI will likely stagnate in the long run. In line with the findings of Aulianur et al. (2023), the challenge in Aceh lies not in budget availability, but in the region's ability to design and implement sectoral policies that focus on outcomes rather than mere outputs.

Average years of schooling is a key indicator of human capital investment and contributes directly to social mobility and the reduction of structural poverty. According to Reta et al. (2025), governance quality—particularly in planning, targeting, and monitoring education programs—determines the extent to which public funding can close inequality gaps and raise learning outcomes in peripheral regions. Furthermore, Doussard & Yenigun (2024) emphasize that in the absence of strong institutional frameworks, decentralized educational investments risk being absorbed into administrative inefficiencies, limiting their transformational impact. Therefore, aligning fiscal decentralization with governance reforms is essential to ensure that education financing translates into measurable and equitable social advancement.

Model 4: Economic – Household Consumption Expenditure

The panel regression estimation using the Random Effect approach shows that the Special Autonomy Fund has a negative and statistically significant effect on monthly per capita household consumption expenditure. The regression coefficient of -2,090.71 ($p < 0.01$) indicates that increases in the Special Autonomy Fund are associated with declines in household consumption levels. In the context of development economics, household consumption is often used as a proxy for welfare because it reflects purchasing power, fulfillment of basic needs, and improvements in quality of life (Sebayang, 2023). These results suggest that fiscal intervention through Aceh's Special Autonomy Fund has not succeeded in raising household economic capacity in an equitable manner.

This finding reinforces the indication that the Special Autonomy Fund is not yet designed to directly strengthen the economic base of communities. Many programs funded through Aceh's Special Autonomy Fund still focus on large-scale infrastructure or short-term projects that do not address the daily consumption needs of the poor. As Ikhsan et al. (2023) argue, the allocation of the Special Autonomy Fund in Aceh tends to be elite-driven, where projects favor certain groups

and fail to generate a multiplier effect on the local economy. Consequently, a large budget allocation does not automatically improve purchasing power unless it is accompanied by microeconomic empowerment programs such as business training, access to capital, or strategic commodity price interventions.

In addition, low fiscal absorption capacity and a lack of policy innovation at the local level further hinder the fund's impact on household consumption. According to Sustikarini (2019), the failure of special autonomy to improve economic welfare is due to the weak technocratic capacity of regional governments in designing data-based policies. This results in the absence of targeted programs for vulnerable or poor rural groups such as fishermen, farmers, and informal workers. As a result, the Special Autonomy Fund often gets trapped in routine budgeting mechanisms and loses its leverage in driving structural change in household economies.

Considering these findings, it is necessary to reposition the Special Autonomy Fund from merely a funding instrument to a tool for community economic empowerment. The Special Autonomy Fund policy in Aceh should be directed toward programs that raise household income, including incentives for entrepreneurship, protection for small businesses, and reforms in local commodity trade systems. Aulianur et al. (2023) recommend that the Special Autonomy Fund be directly linked to productive sectors such as agriculture and trade, which have the potential to create jobs and boost domestic consumption. Therefore, fiscal policy reform in Aceh must clarify the direction and targets of household economic development so that increases in consumption are not only realized but also sustainable and inclusive.

5. Discussion
5.1. General findings and reflection

Based on the estimation results from all four models, this study finds that the Special Autonomy Fund in Aceh has not yet been fully effective in promoting comprehensive improvements in the socio-economic welfare of the population. In Model 1, only life expectancy was found to have a significant effect on the Human Development Index, whereas average years of schooling and household consumption expenditure did not show meaningful influence. This indicates that, at present, the health dimension is the dominant factor driving improvements in HDI, while the education and economic aspects have yet to provide sufficient support.

The results from Models 2, 3, and 4 suggest an even more concerning trend: the Special Autonomy Fund shows a negative and significant impact on life expectancy, years of schooling, and household consumption. This pattern reinforces the mismatch between the intended objectives of the Special Autonomy Fund and the actual outcomes observed on the ground. The large volume of funding has not been matched by responsive governance, evidence-based program planning, or a policy focus on strategic sectors that truly address basic community needs. In line with the findings of Setiawan (2022) and Yusri (2022), these results support the argument that Aceh's main development challenge lies not in limited fiscal resources, but in the weak effectiveness of policy implementation and its orientation toward social outcomes.

The key reflection from these findings is that the Special Autonomy Fund, as an affirmative policy instrument, has yet to fulfill its transformative role. When core welfare indicators decline or stagnate despite continuous financial inflows, the issue lies in how the funds are designed, allocated, and governed. Therefore, reforming the Special Autonomy policy in Aceh cannot be limited to extending its duration; it must be accompanied by a paradigm shift—from mere fiscal transfers to outcome-based financing grounded in social justice.

5.2. Implications of the research findings

The findings of this study carry significant theoretical and practical implications in the context of managing the Special Autonomy Fund in Aceh. Theoretically, the results contribute to the literature on asymmetric fiscal decentralization, particularly in assessing the effectiveness of fiscal interventions in improving welfare in post-conflict regions. The lack of significance—or even the negative impact—of the Special Autonomy Fund on health, education, and household economic indicators suggests that the scale of funding alone does not guarantee socio-economic development success without need-based planning and strengthened local institutions. These findings reinforce the argument that the current input-based budgeting approach must be transformed into outcome-oriented planning, ensuring that public spending genuinely addresses fundamental community needs.

Practically, this study's implications target policymakers at both the provincial and national levels, especially in revising strategies for the allocation and use of the Special Autonomy Fund moving forward. The evidence that the fund has yet to

positively affect life expectancy, educational attainment, and household consumption should serve as a catalyst for fiscal policy reform in Aceh. Regional governments must design planning and oversight mechanisms based on spatial and sectoral data, strengthen program evaluation systems, and promote public participation in budget formulation. Furthermore, a clearer prioritization of productive sectors and essential public services is necessary so that the special autonomy fund functions not merely as administrative expenditure, but as a concrete instrument for promoting equitable social transformation.

6. Conclusion

The special autonomy fund's ability to enhance socioeconomic wellbeing in Aceh Province is still far from ideal, as this study shows. Panel regression estimates from the four models reveal that the fund's allocation has a negative and statistically significant effect on key indicators of health (life expectancy), education (years of schooling), and household economy (consumption expenditure), each representing a major dimension of human development. Although life expectancy was statistically significant in increasing the HDI, the special autonomy fund itself did not show a positive contribution to these social outcomes. In other words, a large budget alone does not automatically lead to improved welfare without high-quality planning, implementation, and public policy evaluation.

These findings reinforce the view that the core problem in the development of special autonomy regions like Aceh is not fiscal limitations, but the low effectiveness of local financial governance, weak prioritization of key sectors, and the absence of outcome-based oversight mechanisms. The prevailing administrative and fragmented budgeting patterns hinder the socio-economic transformation that special autonomy is meant to achieve. Therefore, improving Aceh's fiscal strategy must involve structural reform and institutional capacity-building to ensure that the special autonomy fund functions as a truly impactful development instrument.

The study's empirical results and analysis highlight the pressing need for strategic enhancements in the special autonomy fund's administration in order to have a noticeable effect on the socioeconomic well-being of Acehnese communities. Consequently, the following suggestions are developed as evidence-based policy options, including panel model estimations, institutional constraints found throughout the analysis period, and local dynamics. Several recommendations are

generated from the study's analysis and findings, including the following: (a) Reformulate outcome-based allocation of the special autonomy fund, local governments should shift the budgeting paradigm from input-based and infrastructure-heavy spending to outcome-based financing, especially in education, health, and household economy sectors; (b) Strengthen regional mechanisms for monitoring and evaluating performance; a more organized and up-to-date system is required to evaluate the impact of the Special Autonomy Fund on human development outcomes, including the participation of civil society and academia in oversight procedures; (c) Prioritize strategic sectors that directly affect the population – local governments and legislatures must formulate policies that favor the lower-income population, such as nutrition interventions, vocational education, food subsidies, and household economic empowerment; and (d) Enhance institutional and technical capabilities locally investing in bureaucratic human resources is essential to enhancing more responsible and locally responsive planning, implementation, and reporting capabilities.

Conflict of interest

The authors declare that there are no conflicts of interest regarding this publication.

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