
Does Government Expenditure Affect Poverty, Health, and Education? Evidence from Aceh, Indonesia

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Abstract

Economists have talked about government expenditure and its relation to poverty, health, and education for decades. Indeed, many theories and empirical evidence have been conducted since then. This study evaluates the relationship between Special Autonomy Fund (SAF) and poverty, health, and education indicators in Aceh province, Indonesia, using a panel dataset of 30 regions in the 2002-2018 period. Synthetic Control Method (SCM) is used as the model to accommodate the allocation of SAF to Aceh given by the central government since it is commonly applied to the cases of policy intervention in comparative case studies. This paper discovers that the SAF plays a vital role in lowering the poverty rate, escalating access to safe sanitation, and improving the net enrolment ratio of senior secondary schools. However, there is no prominent association between SAF allocation and access to safe water. This outcome variable shows positive and negative signs; therefore, a conclusion could not be provided.

Keywords: Poverty; health; education; government expenditure; Special Autonomy Fund; Synthetic Control Method; Aceh.

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I. Introduction

1.1. Background Analysis

The relationship between government expenditure and poverty, health, and education has attracted many policymakers and academia's attention since a long time ago. Many researchers identify that the rise in government expenditure can contribute to poverty alleviation; at the same time, it would increase the quality of health and education as well. The Keynesian theory explains how government spending plays a vital role in alleviating poverty. It suggests that public expenditure boosts aggregate demand, stimulating economic growth and reducing the unemployment rate. This argument supports many scholars' opinion that increasing government expenditure may trigger economic growth, raise people's proficiency, and lessen transaction costs. Furthermore, according to Asghar, Hussain, and Rehman (2012), throughout the stipulation of social assistance and infrastructural facilities required to pursue rapid economic growth, public spending might favourably impact economic development and poverty alleviation.

Similarly, health and education could be a channel to achieve economic growth. Romer (1990) emphasised the importance of government expenditure in research and development to boost economic growth. In his famous endogenous growth theory, Romer (1990) underlined that spending on the health and education sector is considered developing human capital, generating endogenous technical progress, and creating economic growth. Policymakers frequently propose more expenditure on health and education, especially at the early stages of development, following this theoretical assumption. Likewise, based on the United Nations (2013), health care, education, safe drinking water, and proper sanitation are essential for securing and maintaining human development, alleviating poverty, and attaining other development objectives.

In much academic research, education's importance in achieving long-term economic growth has been thoroughly acknowledged. Many countries' development is built on the foundation of education; that is why it is widely considered a long-term human capital investment, leading to long-term growth. Human resources are equipped with the necessary information, skills, and competencies through education, positively contributing to their countries' economic and social progress. According to Todaro and Smith (2011), education contributes to developing critical human capital, which is crucial to reducing poverty and ensuring equity and social justice.

However, it is not in all cases that government spending positively impacts the outcome variables. Millsap (2021) argues that too much spending by the government might lead to several drawbacks to societies. First, it raises the living cost by inflating prices through subsidies. Second, it hampers innovation by crowding out the private sector's investment. Third, it harms the environment since resources are used inefficiently. Lastly, it creates a reliance on the government, which discourages risk-taking and industrialism.

This study investigates the impact of government expenditure on poverty, health, and education outcomes in Aceh Province, Indonesia, using province-level data from 2002 through 2018.

1.2. Context of Aceh

1.2.1. History of Aceh: Humanity Conflict and Tsunami Disaster

Aceh is a province located in the northern part of Sumatra Island. It has 18 districts and five cities, while the total population was about 5.3 million people in 2019 (Statistics of Indonesia, 2021). This province has a long history of civil war with the central government. In their paper, Nurpratiwi and Hanny (2019) say that the conflict started only a few years after Indonesia declared its independence (Indonesia's Independence Day is on 17th August 1945). The Acehnese people were disappointed in the central government because there was massive exploitation in Aceh by building many strategic and huge industries to dig for

natural resources such as oil and gas. Unfortunately, the development gap between Java and non-Java at that time was still too high; as a result, the Acehese people were still living in poverty (Nurpratiwi and Hanny, 2019).

The situation gradually became uncontrolled at that moment. In 1975, a group of Acehese founded an organisation named Free Aceh Movement (Gerakan Aceh Merdeka/GAM) as a symbol of resistance to the central government (Nurpratiwi and Hanny, 2019). This organisation has successfully got sympathy from the local people. GAM had one agenda: to ask for independence and separate Aceh from Indonesia. Therefore, the conflict became worse time after time and peaked when President Soeharto used his military approach to end the war by putting a status of Military Operation Area (Daerah Operasi Militer/DOM) in Aceh in the period of 1990-1998. At that time, poverty grew uncontrollable, as the people experienced a long humanitarian conflict in the past few decades. Difficulties in fulfilling primary necessities, getting access to worthy education and health care, or having a whole family (because some of their family members were killed during the conflict) are reasons why Aceh has a severe problem in reducing poverty.

Thus, it could be more difficult for the local authority because Aceh was also hit by a destructive earthquake and a tsunami at the end of 2004. The disaster, which killed more than 200 thousand people worldwide, has worsened the situation since many people lost their homes, family members, and occupations; consequently, the poverty rate increased. This horrible moment made the central government distribute the recovery fund (the majority of the fund came from aid) from 2005 to 2009 to help the local government develop the main infrastructure like housing for refugees, schools, health facilities, bridges, and roads. Since then, Aceh has grown more compared to 15 years ago.

1.2.2. The Scheme of Fiscal Decentralisation

Decades ago, Indonesia adopted a centralised government system, as represented by Law 5/1974. Since then, the central government has had full access to wealthy resources and has a single political power. This system practically stopped in 1998, and a new era of decentralisation began. Muhammad (2016) argues that the old system was replaced for two reasons. First, the central government was putting too much pressure on the regions. Furthermore, the central government could not address many difficulties in the areas; yet, it caused some parts, such as Aceh and Papua, to ask for independence. Second, the government was untransparent and undemocratic, particularly in economics, politics, and governance.

In Indonesia, decentralisation was introduced in January 2001 as the implementation of Law 22/1999 and Law 25/1999, which regulates the division of authority between central and local government, and introduces the concept of a balanced fund, respectively (Dartanto and Brodjonegoro, 2003). Law 25/1999 was designed as the principle of money follows function. It means that if the authority is given to a lower-level government, the fund must follow (Mahi, 2001). One of the impacts of fiscal decentralisation policy is intergovernmental transfer. Furthermore, the Law mandates the fiscal decentralisation process; consequently, a new scheme of intergovernmental transfer between the central government and the subnational authorities was set (Dartanto and Brodjonegoro 2003). New components of the fund were then created; for instance, general allocation fund (Dana Alokasi Umum/DAU), specific allocation fund (Dana Alokasi Khusus/DAK), and revenue sharing (Dana Bagi Hasil/DBH).

Intergovernmental transfer is a type of funds sourced from national expenditure (Anggaran Pendapatan dan Belanja Negara/APBN) allocated to the regions implementing fiscal decentralisation, consisting of DAU, DAK, DBH arrangements. The local authorities will have much more resources to run the government. Furthermore, it might effectively reduce the imbalance of funding sources between the central and the local government,

reduce the funding gap of interregional government affairs, decrease the interregional public service gap, and fund the implementation of special autonomy and regional privileges.

1.2.3. Special Autonomy Fund

Aceh is one of three provinces in Indonesia that get the special autonomy area label (the other two are Papua and West Papua). Papua got this status based on Law 21/2001; on the other hand, Aceh was legitimated by Law 11/2006. The special autonomy status given by the central government to Aceh aims to eliminate the existence of GAM, which wanted to separate Aceh from the Republic of Indonesia. In other words, it is used to keep the unity of this country.

Furthermore, according to Law 11/2006, the provinces that have this status will receive the SAF from the central government, and for Aceh itself, the SAF would be allocated for 20 years, from 2008 to 2027. The same law also states that in the case of Aceh, the central government allocates this amount of money to fund seven development sectors, which are infrastructures, economy, poverty, education, health, social, and implementation of Aceh privilege. Specifically, the proportion of SAF in the first 15 years is 2 percent of national DAU, while it would be reduced to 1 percent in the last five years.

The graph shown in Figure 1 illustrates the comparison between the SAF and the total expenditure of Aceh. From the picture, it can be observed that the SAF has a big proportion compared to the government spending. In every year except 2009, the percentage was more than a half. In other words, the government of Aceh has a massive dependency on the SAF to execute its programs. It could be harmful because the locally-generated revenue (Pendapatan Asli Daerah/PAD) of Aceh Province in 2018 was 2.3 trillion rupiahs (Statistics of Indonesia 2021), or only 19% of the total expenditure. The local government should be worried about this fact and take strategic programs to increase their PAD; thus, when the central government stops the SAF in 2027, Aceh will have enough PAD to implement their plans.

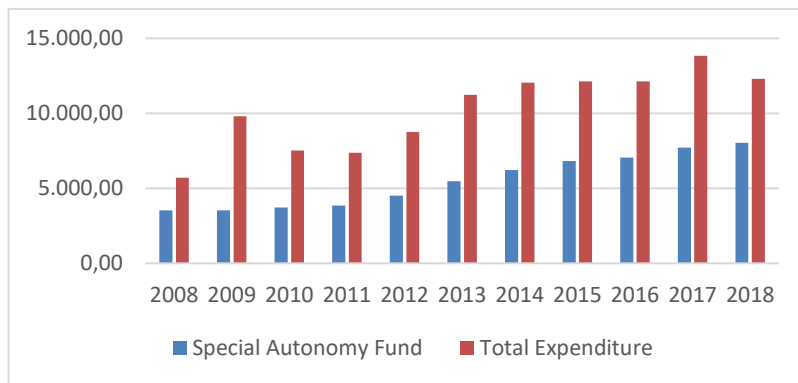


Figure 1. Special Autonomy Fund Versus Total Expenditure of Aceh (in Billion Rupiah)

Source: Author's calculation based on data from Development Planning Agency of Aceh and Ministry of Finance of Indonesia, 2021

1.3. Research Problems, Research Objectives, and Research Questions

Even though the number of funds spent by the local government was considerably massive, Aceh, hitherto, still has many problems to solve. One of the most severe problems is poverty. From 2008 until 2019, Aceh has received the SAF as much as 73.1 trillion Rupiahs. Additionally, the central government also develops projects funded by the national budget located in many provinces in Indonesia. Recently, there are some national strategic projects which are being developed or will be developed in Aceh; for instance, Keureuto Dam,

Jambo Aye Kanan Irrigation, Special Economic Zone (*Kawasan Ekonomi Khusus/KEK*) of Lhokseumawe, or highways (Sigli-Banda Aceh, Lhokseumawe-Sigli, Langsa-Lhokseumawe, and Binjai-Langsa). Some ministries also have programs to be executed in Aceh, like the Ministry of Marine and Fisheries, Public Works, and Agriculture. Unfortunately, data in 2019 shows that Aceh was the poorest province in Sumatra and the sixth poorest province in Indonesia.

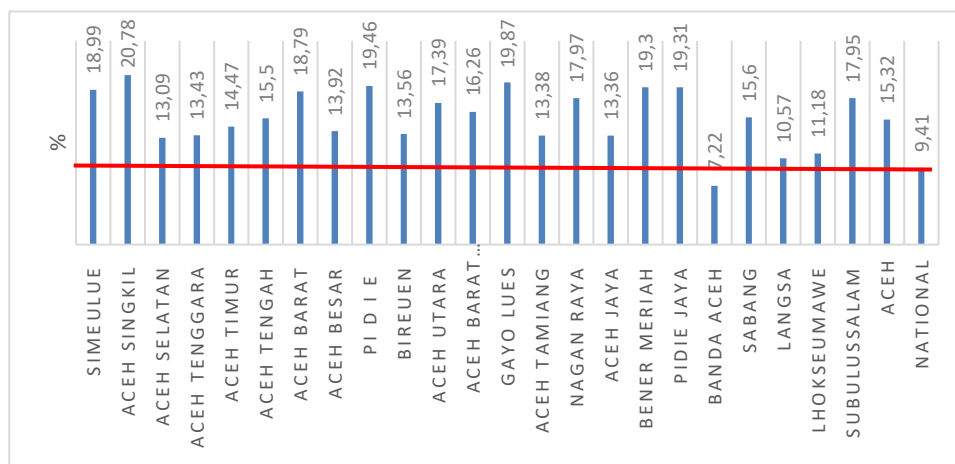


Figure 2. Percentage of Poor Population in Aceh in 2019 Compared to National Level
 Source: Author's construction based on data from Statistics of Indonesia, 2021

As shown in Figure 2, data at the municipality level from Statistics of Indonesia in March 2019 depicts that 15.32% of Acehese people are poor, which is considerably high compared to the percentage of poor populations at the national level (9.41%). Only Banda Aceh, the capital city, depicted a lower number among all municipalities. Other than that, there was still one municipality, Aceh Singkil, in which 1 of every five inhabitants was poor.

Another main issue is about health care. At the moment, Aceh still faces health difficulties such as a high maternal death rate, stunting, and poor life expectancy, which are still lower than the national average. According to the Minister of Health, Indonesia's life expectancy in 2019, for example, has reached 71.5 percent, but only 67.8 percent in Aceh (Infopublik, 2021). Similarly, data from National Population and Family Planning Agency (Badan Kependudukan dan Keluarga Berencana Nasional/BKKBN) in 2018 says that, with a proportion of 37.3 percent, stunting in Acehese toddlers was ranked 31st out of 34 provinces in Indonesia. At a younger age, the rank was just the worst. Stunting among children under the age of two was placed 34th out of 34 provinces, with the rate of 37.9%.

Furthermore, the Aceh Government addresses five health issues: (1) stunting prevention, (2) non-communicable disease (NCD) management, (3) tuberculosis (TBC) management, (4) vaccine coverage and quality, and (5) maternal and neonatal mortality rates. Regardless, in improving the quality of health, Aceh still often faces various challenges, such as a limited number of doctors and the absence of adequate medical personnel, especially in regional hospitals. Health issues, such as good nutrition, have not been prioritised in the regions, and access to primary health care is considered limited. The treatment of health problems in the areas has not been based on community rights, even though the regions genuinely need adequate access to primary health care.

The last point is the quality of education. It also sounds like an alarm to the local government and needs special attention. Reubee (2020) claims that Aceh has the lowest grade of youth education in Indonesia. The Higher Education Entrance Test Institute

(Lembaga Tes Masuk Perguruan Tinggi/LTMPT), which issued the results of the Computer-Based Written Examination for the State University Entrance Examination, confirmed this. LTMPT also declares that the exam assesses cognitive abilities, such as general reasoning and comprehension, which are essential for success in formal education, notably higher education (Reubee, 2020). Overall, the test put Aceh in the lowest position, the same with Maluku, North Maluku, East Nusa Tenggara, Papua, and some provinces in Sulawesi.

This research investigates the impact of government expenditure, in this case, the Special Autonomy Fund, on several outcomes: poverty, health, and education in Aceh. For that objective, this paper will focus on three research questions:

1. What is the impact of the Special Autonomy Fund on poverty in Aceh Province?
2. What is the impact of the Special Autonomy Fund on health care sectors in Aceh Province?
3. What is the impact of the Special Autonomy Fund on education attainment in Aceh Province?

1.4. Theories of Public Spending

The first school of thought is Wagner's Law. Wagner, a reputable Figure German economist, hypothesised that different levels of government's actions have a natural tendency to intensify and expand (Obi et al., 2016). It is presumptively based on the existence of an economy and the expansion of government operations, with the government sector growing at a greater rate than the economy. Based on Wagner's investigation of Germany and other developed countries, Wagner's Law has been one of the earliest and the most prominent principles of public spending. It argues that when the economy develops, the government's activities and functions tend to increase. Necessarily, government spending grows at a greater rate than national revenue, which causes government spending to rise over time as a percentage of national income.

Moreover, according to the Law, a rise in government spending would be essential for the people. Explicitly, as per capita income increases, the government's allocation of national revenue increases to compensate for the authority's expanded protective, administrative, and educational functions. Specifically, rising national income causes more government spending, not vice versa. It appears that government spending has no impact on economic development, and it cannot be considered a policy tool (Arestis et al., 2020).

The second theory, the Keynesian view, gives an opposite argument about public spending. The principle postulates that government spending can be effectively used as an exogenous macroeconomic instrument to boost national income by multiplying aggregate demand and output. According to Keynes's theory of aggregate demand, independent government spending has a beneficial impact on economic growth (Arestis et al., 2020). A proactive and appropriate fiscal policy, particularly at the beginning of development steps, could be a powerful macroeconomic policy apparatus on the government's side for boosting economic activity and creating jobs.

Based on the Keynesian view, increases in government spending, which are assumed autonomous and exogenous, are treated due to raises in national revenue. Arestis et al. (2020) claim that, more crucially, government spending is an important macroeconomic policy variable that might be employed to increase economic development and ease short-run swings in economic activity, according to the conventional Keynesian perspective. In addition, Keynesian economic theory underlines that higher government spending is considered an engine for stimulating growth through the effect of fiscal multiplier and the role of investment-accelerator (Arestis et al. 2020). Moreover, Keynes (1936) synthesises that the connection between government spending and national revenue is inverse.

The third school of thought was developed by Richard Musgrave, an English economist, and Walt Whitman Rostow, an American economic intellectual. They proposed

a development model in response to the causes of increased government spending and contend that government spending is a must for economic growth (Obi et al., 2016). As Musgrave and Rostow claimed, the public sector contributes to the financial framework, for instance, roads, water supply, schools, and sanitation. Because most of these projects need significant capital, the government's spending will automatically continue to rise. Edame and Eturoma's (2014) study assumes that with more significant expenditure on education, health, and social assistance, the balance of public investment would follow human capital development. In a nutshell, they believe that the state makes decisions on behalf of its citizens. At the same time, people's necessities for infrastructural and essential services such as health, education, transportation, and electricity develop greater than per capita income.

The idea continues to say that there are market failures in the earlier phases of development; yet, these market failures require considerable government intervention to address. This theory was later criticised for neglecting the private sector's role in economic growth, especially in the thinking that government spending is the only source of economic development (Muthui et al., 2013). Although this theory was formulated based on the experiences of many countries' economic growth, there is only a little explanation about the continuing economic growth in levels that happen simultaneously.

The last assumption about public spending comes from Peacock and Wiseman. In explaining their school of thought of government expenditure, Peacock and Wiseman (1967) propose that growth in public spending occurs due to the economy's boom and recession instead of in the manner described by Wagner's Law. They said that the increase in government spending is determined by the income generated under normal times. Economic development leads to a rise in national income and, as a result, government revenue, which leads to an increase in government spending over time. However, there would be a pressing need for increased government spending during a conflict. Moreover, it underlines the recurrence of abnormal structures resulting in a significant decrease in government spending and income. Public expenditure should not be predicted to rise steadily and continuously, to accommodate specific demands, e.g., natural disasters or war epidemics (Edame and Eturoma, 2014).

They further said that governments boost tax rates and expand the tax system to fund higher government spending during such times. Individuals are increasingly willing to tolerate higher tax rates (Ahmed, 2019). In Peacock and Wiseman's theory, there are three effects or disruptions that result in taxes not falling back to their original level. The first is the displacement effect, a term used to describe how increasing taxes causes private spending to be replaced by governmental expenditure. The second, inspection effect, is a government effort that becomes apparent only after the economic hardship. Lastly, the so-called "concentration effect" is interpreted as a social disruption that results in the concentration of previously private-sector activity under the government's control.

1.5. Theoretical Framework

There are various studies conducted about what government spending is and how it affects poverty alleviation as well as health and education outcomes. However, the connection between them is varied. Let us see an example of poverty. Fine (1997) states that public spending can potentially be a powerful tool in the fight against poverty. Regardless, conflicts in program evaluations are frequently caused by differing policy purposes. It is more straightforward to agree on the importance of the welfare goal instead of deciding what it has to be. Fine (1997) also suggests target optimization to obtain the most effective impact of government spending.

In another paper, Anderson et al. (2018) argue that affiliation between expenditure and income poverty is complicated because of several factors. First, and most importantly, it relates to the type of government expenditure. Spending on transfers and subsidies with the aid of the authorities can immediately alleviate poverty through growing impoverished

families' actual disposable income. It can also accomplish that circuitously by enhancing impoverished households' nutrition, health, and education, improving market earnings. Similarly, government expenditure on essential health, education, and infrastructures such as roads in rural areas, water, sanitation, and accommodations, is widely known to help poor households become more productive and earn more money (see, for example, McKay, 2004).

Therefore, and the next factor, these certain sorts of expenditure, theoretically, are considered to alleviate poverty effectively and sometimes referred to as "pro-poor" (Anderson et al., 2018). However, because of inadequate targeting, another portion of government spending in the form of transfers from central government to local authorities and direct subsidies might not reach poor people in developing countries. As a result, the real impact of expenditure on transfers and "pro-poor" programs would depend on how much the fund goes to the right target group of poor people, which varies by country.

Another theoretical issue, which is also essential to address, is government spending on health. Anand and Ravallion (1993) have tried to analyse the link between life expectancy and gross national product. The conclusion of the research is derived into some points. First, providing vital commodities and services by the government, such as health care, improves social results. Second, economic growth affects life expectancy indirectly. When average wages increase, individuals can acquire necessary social goods and services, improving people's health and nourishment; consequently, it would reduce mortality rates and extend life expectancy. It was also discovered that economic improvement is only essential when used to fund appropriate public services, implying that economic expansion leads to a more excellent social service supply. Lastly, if income poverty plummets, social output improves.

Identically, health care investment is widely seen as productive spending that has a broad economic impact. Access to essential health services would extend life expectancy, decrease child mortality, and increase a variety of other health measurements (Maitra and Mukhopadhyay, 2012). Healthiness minimises both illness-related deaths and improves labour competency, indirectly contributing to economic development. Similarly, Howitt (2005) investigated these positive health benefits and later reported that six possible channels are found to support his claim about how a country's health care escalation might affect its long-run development. A finding by Gupta et al. (2004) shows that government expenditure on health sectors affects health outcomes positively. The authors suggest policymakers allocate healthcare resources generously and efficiently to promote economic growth and improve prosperity.

The last conceptual framework of government spending developed in this study is its relationship with education and economic growth. In the traditional human capital theory, production factors (i.e., capital and labour) are essential for economic growth. However, workers must be well-trained and skilled to increase their productivity, and education is the primary source to train and develop their skills. Education is always considered an economic good since it is difficult to attain; hence, it must be distributed or traded (Obi and Obi, 2014). Experts believe education is both consumer and capital goods since it provides utility to consumers while also producing other goods and services. Furthermore, education might generate the human ability required for economic growth as a capital good. This argument emphasises that capability enhancement is as prominent as other factors in the manufacturing process like physical equipment, finance, or natural resources.

Additionally, Obi et al. (2016) opine that by increasing human capital, society can get benefits as well. For instance, the enlargement of goods and services enhanced labour productivity, a better productivity growth rate, and additional societal benefits for inhabitants (e.g., an improved health service). Furthermore, Obi et al. (2016) also explained a more specific issue. The main point is that a poor-quality secondary school will negatively impact productivity when government investments in tertiary education are turned into valuable capabilities. However, a high school investment tends to give better productivity if young students obtain earlier abilities, such as in primary schools and kindergarten and at

home. Early intervention by the public is critical to make investments in tertiary education more productive.

II. Data and Research Methodology

2.1. Data Sources

Panel data sets of 30 provinces in Indonesia are used in this study, and the period is 2002-2018. Indonesia has 34 provinces nowadays; however, to be consistent, this study excludes Riau Islands, West Papua, West Sulawesi, and North Kalimantan since these provinces were formed after 2002, so some data of them are still unavailable. Overall, data in this research come from several sources. First, the independent variable, total expenditure of all provinces, is obtained from the Directorate General of Financial Balance of the Ministry of Finance. Second, variables of access to safe water, access to safe sanitation, and net enrollment ratio of senior secondary school are acquired from Indonesia Database for Policy and Economic Research (INDO-DAPOER), which is affiliated with the World Bank. Finally, data of poverty rate, unemployment rate, and regional GDP are gathered from Statistics of Indonesia.

2.2. Variables

There are four dependent variables used in this research; (1) poverty rate, as the representation of poverty outcome, (2) access to safe water and (3) access to safe sanitation, on behalf of health care variables, and (4) net enrollment ratio of senior secondary school, to reflect education attainment. Next, only one independent variable is exerted, total expenditure (in natural log form). On the other hand, the control variables are regional GDP (in natural log form) and the unemployment rate.

2.3. Model Specification: Synthetic Control Method

The fundamental conceptualization behind synthetic control is that a group of entities, rather than a single entity, can frequently give a preferable comparison for the unit that has been exposed to an intervention. It enables researchers to run case studies by establishing a synthetic control area that predicts an area's outcome if the intervention was not implemented. The SCM constructs the counterfactual area by averaging pre intervention outcomes across regions with similar characteristics to the treatment area. A pool of prospective candidates is used to determine the donor areas combined to generate the synthetic control. The selection of donor areas and weights is based on predictor variables that impact the outcome. Before the policy intervention, the outcome variable itself is enforced. The result nearly resembles the outcome of affected areas before policy implementation and becomes a control for affected areas after the execution. Thus, the outcomes between affected areas and the synthetic control equivalent after policy intervention demonstrate the policy's efficacy.

Specifically, the SCM will create a counterfactual group whose outcomes are similar to Aceh in the research. The synthetic group is defined as a weighted combination of the unexposed provinces with similar characteristics before the SAF was given. Following the special fund, this research uses the synthetic group's results to estimate the counterfactual condition of Aceh in the absence of the fund.

Thirty provinces in Indonesia will be observed between 2002 and 2018. Let us assume $i = 1$ be the Aceh Province, and $i = 2, \dots, 30$ be otherwise. Then, we let $T_0 = 2008$ be the first year when Aceh started to receive the special fund, and Y_{it} be the outcome variable that evaluates the intervention's impact (allocation of the SAF) on province i at the time t . In addition, according to Abadie, Diamond, and Hainmueller (2010), Y_{it}^N is the outcome variables when the intervention occurs, and Y_{it}^I is the outcome variable when the intervention is absent. The SAF effect for Aceh during 2008-2018 can be defined as the

difference between outcome variables that refer to the policy intervention and the time without intervention. It can be explained as follows:

$$\alpha_{it} = Y_{1t}^I - Y_{1t}^N, t = 2008, \dots, 2018 \quad (1)$$

As Y_{it}^N is unobserved, then we can estimate the effect using SCM.

Following Abadie et al. (2010), then we create (30x1) vector of weights $W = \omega_2, \dots, \omega_{30}$ so that $\omega_i \geq 0$ for $i = 2, \dots, 30$ and $i = 230 \omega_i = 1$. Following Halim, Ingrid, and Ottemoesoe (2013), since $W = i = 230 \omega_i$, then the model would be:

$$\alpha_{it} = Y_{it} - i = 230 \omega_i Y_{it}, t = 2008, \dots, 2018 \quad (2)$$

III. Results and Discussion

3.1. Sensitivity Test: The Outcome Lags

It is essential to examine whether different outcome lags can provide different synthetic groups of the province and lead to different results. McClelland and Gault (2017) verify many possibilities of outcome lag choice, and the results vary. Their empirical result confirms that when they use at least two different years as the outcome lags, the Root Mean Square Prediction Error (RMPSE) was low. Almost similarly, the choice of utilizing all outcome lags for all pre-intervention generates a low number of RMPSE as well. Theoretically, the less RMSPE, the more valid the model. Nevertheless, McClelland and Gault (2017) also clarify that in terms of visual fit and RMPSE, the synthetic group applying the average-lag or last-year-lag outcomes fits worse than most other possibilities. Below, we will see three comparisons of synthetic Aceh in RMSPE value for each outcome variable.

It can be found in Table 1 that for all outcome variables of synthetic Aceh, using all outcome lags in the pretreatment period of the regression yields the lowest RMSPE. It means that it might be the fittest model that can be used. This finding bolsters McClelland and Gault's (2017) invention. On the other hand, using only the final-year-lag outcome contributes the worst RMSPE, except access to safe sanitation variables. However, its value has only 0.58 difference compared to the second-worst. Principally, as Kaul et al. (2016) recommended, another model to replace the all-lag model genuinely does not produce a synthetic group that closely resembles the treated group during the pre-intervention phase. However, to be clear, all results below use the all-lag model for each outcome variable in the regression.

Table 1. Summary of Synthetic Aceh Root Mean Squared Prediction Error for All Outcome Variables

| Outcome Variables | Outcome Lags | RMSPE |
|---|---------------|-----------|
| Poverty rate | 2002-2007 all | 0.5274787 |
| | 2002 and 2007 | 1.137317 |
| | 2007 | 2.223005 |
| Access to safe water | 2002-2007 all | 2.99501 |
| | 2002 and 2007 | 5.095802 |
| | 2007 | 5.147222 |
| Access to safe sanitation | 2002-2007 all | 5.411977 |
| | 2002 and 2007 | 7.323366 |
| | 2007 | 7.265312 |
| Net enrollment ratio of senior secondary school | 2002-2007 all | 3.441378 |
| | 2002 and 2007 | 3.530068 |
| | 2007 | 7.853436 |

Source: Author's computation using STATA software, 2021

3.2. The Impact of Government Expenditure on Poverty

The primary output of the SCM is a preintervention and postintervention path for the outcome variable of the synthetic province. It is comparable to the course of the treated province's outcome variable (Aceh is the treated province, in this case). As explained before, the synthetic Aceh is created by convexly combining regions in the donor pool which have mostly similar characteristics with Aceh in terms of the SAF distribution predominance predictor variables. According to Abadie, Diamond, and Hainmueller (2010), the synthetic control approach requires policymakers to show a similarity within the state subject to a particular policy and its synthetic counterpart, which comes from the calculating weight of the donor pool. Consequently, the SCM "would be protected" from extreme counterfactual estimates (King and Zheng, 2006).

Table 2. Poverty Rate Predictor Means

| Variables | Aceh | |
|------------------------|----------|-----------|
| | Real | Synthetic |
| Ln (Total Expenditure) | 28.36711 | 27.14782 |
| Ln (Regional GDP) | 31.65203 | 30.09292 |
| Unemployment Rate | 10.41833 | 11.40597 |
| Poverty Rate (2002) | 29.83 | 30.40654 |
| Poverty Rate (2003) | 29.76 | 28.88019 |
| Poverty Rate (2004) | 28.47 | 28.19529 |
| Poverty Rate (2005) | 28.69 | 28.32423 |
| Poverty Rate (2006) | 28.28 | 28.80396 |
| Poverty Rate (2007) | 26.65 | 26.93151 |

Source: Author's computation using STATA software, 2021

Table 2 highlights comparisons of pretreatment features of real Aceh with those of synthetic Aceh and includes a fundamental property of the synthetic control predictors. Suppose we see total expenditure and regional GDP variables (both are in natural logarithm form). They have a pretty similar pattern as the synthetics of Aceh are more than one lower than Aceh. Before the SAF allocation for Aceh, government expenditure and GDP had little potential in predicting the poverty rate in Aceh. It explains the difference in government spending and GDP between Aceh and the synthetic version. In contrast, the unemployment rate of synthetic Aceh is higher than its synthetic.

Table 3. Synthetic Aceh Donor Province Weight on Poverty Rate

| Province | Weight |
|----------------|--------|
| Maluku | 0.649 |
| South Sumatera | 0.351 |
| Sum | 1.000 |

Source: Author's computation using STATA software, 2021

Table 3 displays the weights of the control provinces in the synthetic Aceh. Based on the regression, the Province of Maluku and South Sumatra were the best combinations of synthetic Aceh before the policy intervention. Maluku is the most heavily weighted, very close to 65 percent. Another province, South Sumatera, contributes the rest.

Figure 3 displays the poverty rate for Aceh and its synthetic counterpart in the 2002-2018 period. The lines went together from 2002 until 2007, even though the magnitude was different. Literally, before the treatment, the two pathways should be closely aligned, so discrepancies after the intervention can be interpreted as the treatment's effect (McClelland

and Gault, 2017). There was a slight increase in the poverty rate of Aceh in 2005. It might be understandable because a destructive tsunami hit Aceh at the end of 2004; consequently, the poverty rate would be higher. Then, the lines diverged from 2007 to 2010, before coming closer in 2011. In the last eight years, the lines showed no large gap. However, there were three times that Aceh had more significant poverty rates than the synthetic Aceh, in 2012, 2014, and 2017.

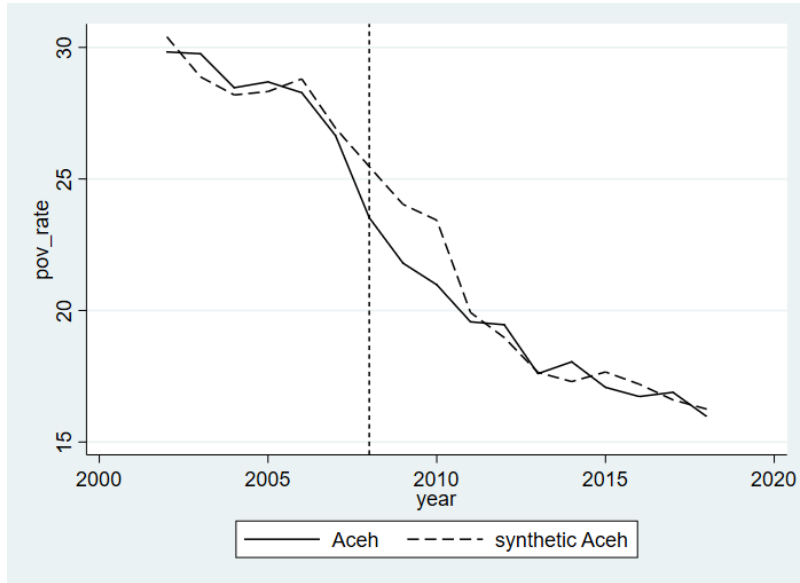


Figure 3. Trends in Poverty Rate: Aceh versus Synthetic Aceh

Source: Author's computation using STATA software, 2021

3.3. The Impact of Government Expenditure on Health

Table 4 expresses the pretreatment characteristics of access to safe water variables between Aceh and synthetic Aceh. As the independent variable, total expenditure shows no significant power in forecasting access to safe water in Aceh before the distribution of SAF. However, regional GDP was the best predictor based on the regression since the discrepancy between actual and synthetic Aceh was statistically minimal.

Table 4. Access to Safe Water Predictor Means

| Variables | Aceh | |
|-----------------------------|----------|-----------|
| | Real | Synthetic |
| Ln (Total Expenditure) | 28.36711 | 27.80655 |
| Ln (Regional GDP) | 31.65203 | 31.61123 |
| Unemployment Rate | 10.41833 | 10.72784 |
| Access to Safe Water (2002) | 33.35 | 35.24092 |
| Access to Safe Water (2003) | 37.97 | 35.63152 |
| Access to Safe Water (2004) | 42.95 | 37.83618 |
| Access to Safe Water (2005) | 28.42 | 32.41395 |
| Access to Safe Water (2006) | 34.15 | 34.72768 |
| Access to Safe Water (2007) | 38.44 | 39.9698 |

Source: Author's computation using STATA software, 2021

There was a gap between real Aceh and its synthetic unemployment rate, even though it was small. The trend of water access in Aceh below 2008 fluctuated. For instance,

after reaching 42.95 percent in 2004, only 28.42 percent of total inhabitants consumed water safely in 2005. At that moment, finding safe water might be difficult for Acehese people after being hit by a tsunami disaster, until the government (and NGOs) rebuilt infrastructures massively starting from the beginning of 2005.

Table 5 demonstrates the weights of the synthetic group, which consists of three provinces. Riau had the biggest proportion, which shared more than 50 percent, followed by North Sulawesi and Central Kalimantan with 25.7 and 20.9 percent, respectively. On behalf of the remaining provinces, these provinces were assumed to have similar attributes to Aceh in access to safe water conditions.

Table 5. Synthetic Aceh Donor Province Weight on Access to Safe Water

| Province | Weight |
|--------------------|--------------|
| Central Kalimantan | 0.209 |
| North Sulawesi | 0.257 |
| Riau | 0.534 |
| Sum | 1.000 |

Source: Author's computation using STATA software, 2021

We can see more apparent details regarding the trend of access to safe water of Aceh and synthetic Aceh in Figure 4. Both Aceh and synthetic Aceh had the lowest percentage of people with safe water consumption in 2005. Specifically, for Aceh itself, the difference between data in 2004 and 2005 was significant enough, about 15 percent. Starting from 2006, the percentage of access to safe water in Aceh increased, although there were small slips in 2012 and 2014. Contrastingly, the averaged access to safe water value of Central Kalimantan, North Sulawesi, and Riau depicts a consistently positive movement, especially from 2005. After the government intervention, especially in 2008-2011, Aceh's access to safe water relatively grew faster and surpassed the synthetic's achievement in 2009-2013; however, from 2014 until the end of the period, it experienced lower marks. It is essential to say that the unpredictably low access to safe water of Acehese people in 2005 (it might happen because of a natural disaster) affected the choice of synthetic Aceh. Moreover, it influenced the graph consistency of Aceh, particularly in the pretreatment period.

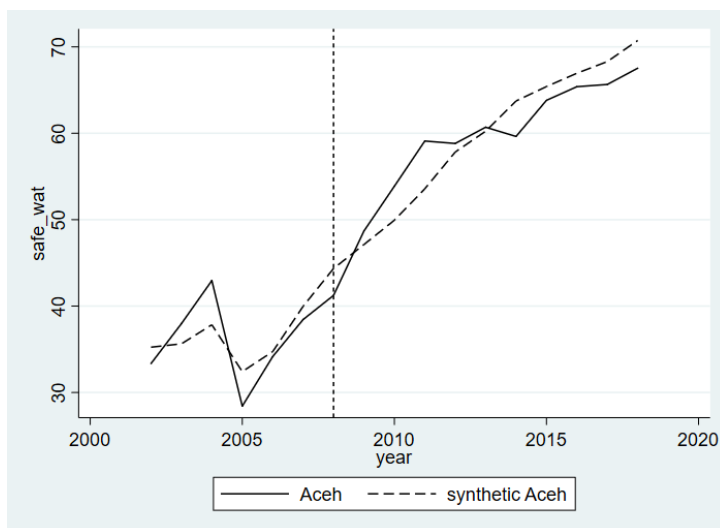


Figure 4. Trends in Access to Safe Water: Aceh versus Synthetic Aceh

Source: Author's computation using STATA software, 2021

Illustration of estimator means for Aceh and the synthetic Aceh in terms of access to safe sanitation can be seen in Table 6. In this scenario, theoretically, all total expenditure, regional GDP, and the unemployment rate might not be the best predictors since there are quite significant gaps between Aceh and synthetic Aceh. For example, when the total expenditure of Aceh (in natural logarithm form) shows the value of 28.36, the synthetic (we will see what the provinces were later) has less than 27. The same comparison with regional GDP (in natural logarithm) and unemployment rate (in percentage) has 1.7 and 2.3 dissimilarities, respectively. The propensity of access to safe sanitation in Aceh before the SAF allocation denotes one downward trend in the middle of the period. It lost about 22 percent in 2005 compared to a year before. The argument behind this is that the earthquake and tsunami in December 2004 caused large problems for people to fulfil their primary necessities, including safe sanitation. Large groups of people became refugees, and many refugee camps generally had inappropriate sanitation to be used together by many households. On the flip side, synthetic Aceh marked 51 percent at the lowest and 56 percent at the highest number of populations who could access their sanitation safely in the period.

Table 6. Access to Safe Sanitation Predictor Means

| Variables | Aceh | |
|----------------------------------|----------|-----------|
| | Real | Synthetic |
| Ln (Total Expenditure) | 28.36711 | 26.90308 |
| Ln (Regional GDP) | 31.65203 | 29.97935 |
| Unemployment Rate | 10.41833 | 8.112953 |
| Access to Safe Sanitation (2002) | 54.64 | 53.59437 |
| Access to Safe Sanitation (2003) | 59.25 | 53.97424 |
| Access to Safe Sanitation (2004) | 62.57 | 56.09368 |
| Access to Safe Sanitation (2005) | 40.37 | 50.32102 |
| Access to Safe Sanitation (2006) | 48.41 | 50.49961 |
| Access to Safe Sanitation (2007) | 50.35 | 51.56584 |

Source: Author's computation using STATA software, 2021

Three provinces became the synthetic Aceh for the outcome variable of access to safe water (Table 7). The first province and the most prominent weight contributor was Jambi (it shared almost two-thirds of the weight). The second one was Gorontalo, a province formed in 2000 and located on the north side of Sulawesi Island, with 31.8 percent of the population. Lastly, Riau contributed close to 4 percent and completed the list.

Table 7. Synthetic Aceh Donor Province Weight on Access to Safe Sanitation

| Province | Weight |
|------------|--------|
| Gorontalo | 0.318 |
| Jambi | 0.643 |
| Riau | 0.039 |
| Sum | 1.000 |

Source: Author's computation using STATA software, 2021

Figure 5 outlines the pattern of access to safe sanitation between Aceh and its donor pool. According to the graph, it is important to note that Aceh experienced a significant change in 2004 (more than 60 percent) compared to 2005 (about 40 percent) during the treatment period. On the other hand, even though there was a downward trend for the synthetic Aceh, it was not as extreme as Aceh. If we look further, from 2005 to 2008, the portion of access to safe water in Aceh increased rapidly, about 16 percent. In fact, at that time, government and donor countries were building a massive amount of housing for the residents, mainly located in Banda Aceh and Meulaboh as the most affected locations. It

might instantly affect that number since so many housings were developed in only three years. As a result, the number of refugees decreased, and at the same time, it affected the number of people who get the appropriate access to their sanitation. Another critical finding is that since the government intervention until 2018, the percentage of inhabitants with safe-accessed sanitation in Aceh was always more significant than the synthetic Aceh. Thus, we could construct a pre-assumption that the SAF allocation affects access to safe sanitation in Aceh.

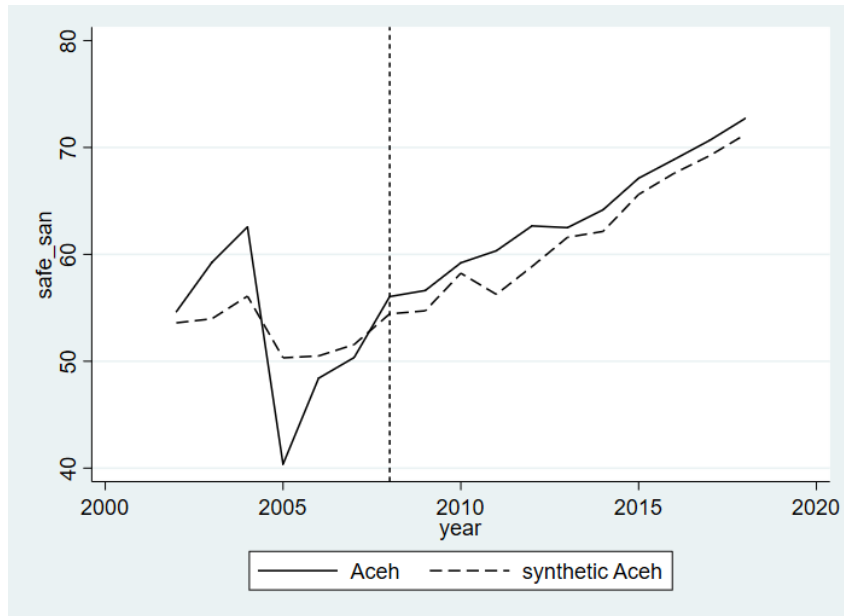


Figure 5. Trends in Access to Safe Sanitation: Aceh versus Synthetic Aceh

Source: Author's computation using STATA software, 2021

3.4. The Impact of Government Expenditure on Education

The last sub-section in this chapter explains how government expenditure, explicitly distribution of the SAF, impacts education. The variable of education used in the study is the net enrollment rate of senior high school students. Using all-year outcome lag, the predictor means of Aceh and synthetic Aceh for all variables were not close, as shown in Table 8.

Total expenditure, for instance, had a difference of 0.8 points between Aceh and its synthetic during the preintervention period. It had the same condition as regional GDP, a 0.5-point gap. On the other hand, the discrepancy of the unemployment rate of Aceh with the donor pool was even higher, about 3.8 percent as predicted. Like other previous outcome variables, estimator means of students enrolled in senior high school dropped sharply in 2005. The synthetic Aceh experienced the same trend but was not too large.

Table 8. Net Enrollment Ratio of Senior Secondary School Predictor Means

| Variables | Aceh | |
|--|----------|-----------|
| | Real | Synthetic |
| Ln (Total Expenditure) | 28.36711 | 27.56342 |
| Ln (Regional GDP) | 31.65203 | 31.12879 |
| Unemployment Rate | 10.41833 | 6.617475 |
| Net Enrollment Ratio of Senior Secondary School (2002) | 60.23 | 57.94962 |
| Net Enrollment Ratio of Senior Secondary School (2003) | 61.63 | 59.74309 |
| Net Enrollment Ratio of Senior Secondary School (2004) | 62.04 | 61.01572 |
| Net Enrollment Ratio of Senior Secondary School (2005) | 52.25 | 58.09819 |
| Net Enrollment Ratio of Senior Secondary School (2006) | 57.07 | 55.37723 |
| Net Enrollment Ratio of Senior Secondary School (2007) | 61.76 | 56.84248 |

Source: Author's computation using STATA software, 2021

Table 9 indicates a list of provinces and their weights regarding the nexus of net enrollment ratio of senior secondary school and government spending. Yogyakarta rose with more than 80 percent of weight, followed by Jakarta with 10.8 percent. Bali, the last province, came up with 6.3 percent of the weight.

Table 9. Synthetic Aceh Donor Province Weight on Net Enrollment Ratio of Senior Secondary School

| Province | Weight |
|------------|--------|
| Bali | 0.063 |
| Jakarta | 0.108 |
| Yogyakarta | 0.829 |
| Sum | 1.000 |

Source: Author's computation using STATA software, 2021

Figure 6 exhibits comparison trends of the senior high school enrollment rate for Aceh and the synthetic Aceh before and after SAF allocation. From the picture, it can be highlighted that, in 2006-2011, senior secondary school enrollment rates in Aceh were higher than the synthetic Aceh. Note that the trend started two years before the policy implementation. Since 2008, the gap between them has become smaller, and even in 2012, the donor pool could overlap Aceh and remain for two years. However, from 2014 until 2018, the education value of Aceh came back higher than its synthetic.

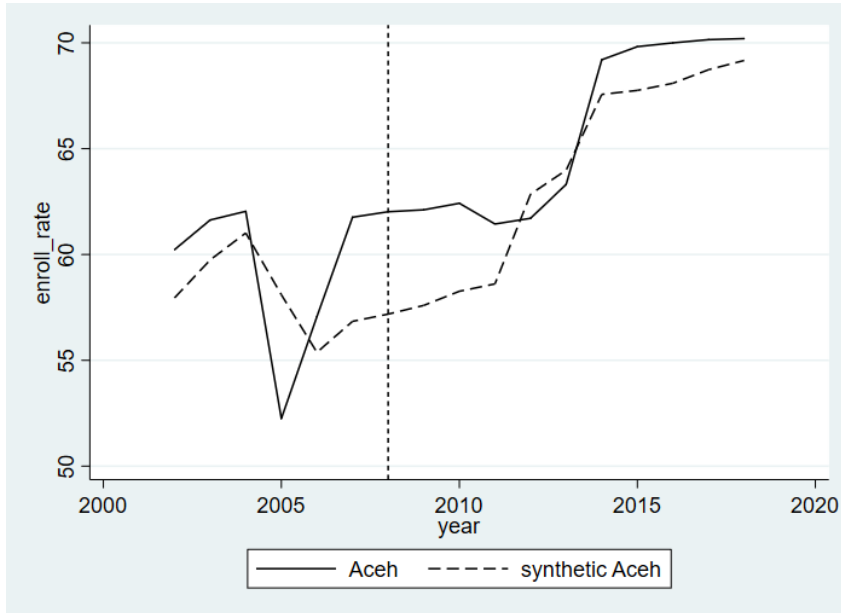


Figure 6. Trends in Net Enrollment Ratio of Senior Secondary School: Aceh versus Synthetic Aceh

Source: Author's computation using STATA software, 2021

IV. Conclusions and Recommendations

The purpose of this research is to investigate the impact of government expenditure, especially the Special Autonomy Fund, on poverty, health care, and education. Using panel data of all provinces in Indonesia, it aims to answer three questions. For the first question, 'What is the impact of the Special Autonomy Fund on poverty in Aceh Province?', this study finds that the allocation of SAF plays a role in lowering the poverty rate in Aceh. This conclusion is supported by empirical evidence that, after the government policy, almost all estimates of the poverty rate have negative signs. This study finds different results for the second question, 'What is the impact of the Special Autonomy Fund on health care sectors in Aceh Province?'. For the variable of access to safe water, the estimations reveal no clear association between SAF allocation and safe water access. The estimates show both positive and negative signs without any dominant mark. In contrast, all the estimates of access to safe sanitation variables show positive results, which means that the distribution of SAF statistically increases safe sanitation access. For the last question, 'What is the impact of the Special Autonomy Fund on education attainment in Aceh Province?', this study concludes that the SAF distribution positively influences the net enrollment ratio of senior secondary school. According to the results, only two of the eleven predictors are negative.

This study suggests that SAF allocation decreases the poverty rate, increases the percentage of people who access sanitation safely, and raises the net enrollment ratio of senior secondary school. Contradictorily, access to safe water demonstrates no clear nexus with the SAF distribution. Therefore, as recommendations, the government has to make a supreme effort in allocating the money right on target to increase the effectiveness of government expenditure. Also, the local government of Aceh needs to maximise its income sources to anticipate the termination of SAF allocation in 2028. Last, the central government might consider continuing the SAF because it positively impacts Aceh.

This research has several limitations to raise. Firstly, it relates to the pre-intervention period. It is only six years, which is relatively short to accommodate the synthetic control method. However, getting a longer pretreatment period is not possible using outcome variables in this study because some data are unavailable. For instance, data on the poverty rate in 1997 and 1998 is impossible to get since the Statistics of Indonesia did not do the surveys at that moment. Conversely, the period for post intervention is eleven years, which is long enough. Lastly, this research ignores the existence of other types of spending, especially after the tsunami. Much more funds spent in Aceh might affect the outcome variables, directly or indirectly. For example, the recovery fund that the central government and donor countries gave between 2005 and 2009 to develop infrastructures in Aceh after the tsunami disaster.

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