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

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List of Acronyms

APBN	*Anggaran Pendapatan dan Belanja Negara/*National Expenditure
BKKBN	*Badan Kependudukan dan Keluarga Berencana Nasional/* National Population and Family Planning Agency
DAK	*Dana Alokasi Khusus/*Specific Allocation Fund
DAU	*Dana Alokasi Umum/*General Allocation Fund
DBH	*Dana Bagi Hasil/*Revenue Sharing
DOM	*Daerah Operasi Militer/*Military Operation Area
FPL	Food Poverty Line
GAM	*Gerakan Aceh Merdeka/*Free Aceh Movement
GDP	Gross Domestic Product
GNP	Gross National Product
HDI	Human Development Index
INDO-DAPOER	Indonesia Database for Policy and Economic Research
KEK	*Kawasan Ekonomi Khusus/*Special Economic Zone
LTMPT	*Lembaga Tes Masuk Perguruan Tinggi/*Higher Education Entrance Test Institute
NDC	Non-Communicable Disease
NGO	Non-Government Organization
PAD	*Pendapatan Asli Daerah/*Locally-Generated Revenue
PL	Poverty Line
RMSPE	Root Mean Square Prediction Error
TBC	Tuberculosis
SCM	Synthetic Control Method
SAF	Special Autonomy Fund

Dedication Page

For my mother Faridah and my father Yusri Syamsuddin,

for my wife Andria Afrida,

and for my kids, Khalifa Muhammad Al-Fatih and Khalifa Shalahuddin Al-Ayyubi,

Thank you for all your support.

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Abstract

Economists have talked about government expenditure and its relation with poverty, health, and education from decades ago. Indeed, many theories and empirical evidence have been conducted since then. This study aims to evaluate relationship between one type of government spending, Special Autonomy Fund (SAF), and poverty, health, and education indicators in Aceh province, Indonesia, using panel dataset of 30 provinces in 2002-2018 period. Synthetic Control Method (SCM) is used as the model, since it is commonly applied to the cases of policy intervention in comparative case studies. This paper discovers that the SAF lowers poverty rate, escalate access to safe sanitation, and improve net enrollment ratio of senior secondary school. Nevertheless, there is no prominent association between SAF allocation and access to safe water.

Relevance to Development Studies

Research on the impact of Special Autonomy Fund in Aceh on poverty, health, and education has been done by many researchers. Usually, it utilizes panel dataset of fixed effect model using data in municipality level. This study, however, tries to apply synthetic control method using provincial-level panel dataset, which might benefit the policymakers in order to develop future policies.

Keywords

Poverty, health, education, government expenditure, Special Autonomy Fund, Synthetic Control Method, Aceh

Chapter 1
Introduction

1.1 Background Analysis

The relationship between government expenditure and poverty, health, and education has attracted a great number of policymakers and academia's attention since long time ago. Many researchers identify that the raise of government expenditure can contribute to poverty alleviation; at the same time, it would increase the quality of health and education as well. Keynesian theory explains how government spending plays an important role to alleviate poverty. It suggests that public expenditure boosts the aggregate demand, which will stimulate economic growth and reduce unemployment rate. This argument is in line with many scholars' opinion which says that an increase of government expenditure may trigger economic growth, raise people proficiency, and lessen transaction cost. Furthermore, according to Asghar, Hussain, and Rehman (2012), throughout the stipulation of social assistance and infrastructural facilities required to pursue a rapid economic growth, public spending might have a favorable impact on economic development and poverty alleviation.

Similarly, health and education could be a channel to achieve economic growth. Romer (1990) emphasized the importance of government expenditure in terms of research and development to boost economic growth. In his famous endogenous growth theory, Romer (1990) specifically underlined that spending on health and education sector is considered as developing human capital, which generates an endogenous technical progress and consequently creates an 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 United Nations (2013), health care, education, safe-drinking water, and proper sanitation are all essential for securing and maintaining human development, alleviating poverty, and attaining other development objectives.

In a plethora of 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 as a long-term human capital investment which leads to a long-term growth. Human resources are equipped with the necessary information, skills, and competences through education, allowing them to give a positive contribution to the economic and social progress of their countries. According to Todaro and Smith (2011), education contributes to the development of critical human capital, which is crucial to reduce poverty and to ensure the existence of equity and social justice.

However, it is not all cases that government spending gives positive impact on 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 investment of private sector. Third, it has a negative impact on the environment since resources are used inefficiently. Lastly, it creates a reliance on the government, which discourages risk-taking and industrialism.

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

1.2 Justification and Relevance of the Research

There are actually a lot of research that examine the effect of government spending on poverty, health, and education outcomes. Empirically, the results are diverse. For instance, after analyzing annual time series data of Pakistan in the period of 1972-2008, Asghar, Hussain, and Rehman (2012), reveal that government expenditure on health, education, and law and order gives a significant impact on poverty alleviation. On the other hand, the same study also concludes that government expenditure on budget deficit and economic positively influence the poverty reduction, which means it increased the poverty level in Pakistan. Regarding to health spending, this study implies no significant impact on poverty alleviation.

In the case of connection between public spending on health and education, Gupta, Verhoeven, and Tiongson (2002) examined cross-sectional data of 50 developing and transition economies around the world, and then made a conclusion that an increase of government expenditure would matter for health and education indicators. According to World Bank (1993), The number of diseases in underdeveloped countries may be decreased if governments made a basic set of cost-effective therapeutic treatments available.

In another analysis, the research on the impact of public spending on education gives double-edged sword results. While some says that their relationship is weak (see Noss 1991 and Flug et al. 1998), another literature explains the strong connection between them (Gallagher 1993).

According to several literatures, it is too early to make a conclusion about the effect of government expenditure on poverty, health, and education, since there are different results conducted by the research. This might be because of some following reasons. First, it has a high dependency on the data involved in the studies; for example, the research uses national data (it might be in province or municipality level) could have different conclusion with research that uses cross-country data. Second, it might also depend on the types and purposes of the expenditure. For instance, health care expenditure would probably give different outcomes compare to education spending. Lastly, the use of other variables as the control (some of them could be dummy variables) might affect the results.

In the case studies of Aceh, there are several literatures about how government expenditure in the form of Special Autonomy Funds (SAF) influences economic growth indicators such as poverty rate, inequality, Human Development Index (HDI), or unemployment rate, using panel data regression with fixed effect model in district level. However, the method used in this research could provide an opportunity to new research.

1.3 Research Objectives and Questions

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

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

1.4 Contribution to the Literature

There are many previous literatures have addressed the impact of government expenditure, especially the SAF, on economic growth in Aceh. Nevertheless, majority of the studies applies panel data regression with fixed effect method and use the data in municipality level. These previous studies also work with the period of data starting from 2008, which is the time when the SAF was started to distribute to Aceh. Differently, this research will also apply the time frame before the SAF was given. As a novelty, this research uses data in provincial level and predicts the effects by adopting Synthetic Control Method (SCM) developed by Abadie et al (2010) as it is used to evaluate the policy intervention (the allocation of SAF for Aceh since 2008) in comparative case studies. Therefore, this research paper will try to enrich the methodology and reduce the gap regarding this matter.

1.5 Research Overview

This paper is structured as follow:

Chapter 1 : The Introduction. This chapter consists of several sub-sections, which are the background analysis, the justification and relevance of the research, the research purposes and questions, as well as the research contribution to the literature.

Chapter 2 : Context of Aceh Province. This chapter provides more specific information about history of Aceh, decentralization scheme as the introduction of how Aceh receives the SAF, an explanation about the SAF itself, and problems that are addressed.

Chapter 3 : Theoretical Framework and Empirical Literature Reviews. This chapter discusses the framework of this research, followed by literature reviews as well.

Chapter 4 : Data and Research Methodology. This chapter demonstrate the methodology of the research paper. It includes data sources, variables used, and econometrics model.

Chapter 5 : Results and Discussions. This chapter explains the important results of this research.

Chapter 6 : Conclusion and Policy Recommendations. This chapter represents the conclusions of the research and policy recommendations for future studies.

Chapter 2
Context of Aceh Province

More details information regarding Aceh will be explained in this chapter. This aims to build a channel to understand how the earlier and recent situation is, and identify what the problems are.

2.1 History of Aceh: Humanity Conflict and Tsunami Disaster

Aceh is a province that is located at the northern part of Sumatera Island. It has 18 districts and 5 cities, while the total population was about 5.3 million people in 2019 (Statistics of Indonesia 2021). This province has a long history regarding a civil war with the central government. In their paper, Nurpratiwi and Hanny (2019) says that the conflict has started only a few years after Indonesia declared its independence (Indonesia's Independence Day is on 17th August 1945). The Acehnese people was disappointed in the central government because there was a massive exploitation in Aceh by building many strategic and huge industries to dig the 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 Acehnese people were still living under poverty (Nurpratiwi and Hanny 2019).

The situation gradually became uncontrolled at that moment. In 1975, a group of Acehnese founded an organization named Free Aceh Movement (Gerakan Aceh Merdeka/GAM) as a symbol of resistance to the central government (Nurpratiwi and Hanny 2019). This organization 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 worst time after time and reach the peak when President Soeharto used his military approach to end the conflict by putting a status of Military Operation Area (Daerah Operasi Militer/DOM) to Aceh at 1990-1998. Experiencing a long humanity conflict in the past few decades, resulting the poverty grew uncontrollable. Difficulties of meeting basic 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 some reasons why Aceh has a serious problem in reducing poverty.

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

2.2 The Scheme of Fiscal Decentralization

Decades ago, Indonesia adopted a centralized government system, as represented by Law 5/1974. It means that the central government has a full access on the wealth resources and has a single political power as well. This system practically stopped in 1998, and a new era of decentralization system began. Muhammad (2016) argues that the old system was replaced because of two reasons. First, the central government was giving too much pressure to the regions. Furthermore, the central government was unable to address many difficulties in the regions; yet, it caused some regions, such as Aceh and Papua, to ask for independence. Second, the government was untransparent and undemocratic, particularly in terms of economics, politics, and governance aspects.

On the other hand, decentralization system can be interpreted as the transfer of particular affairs from central government to local government in term of a better public service. In other words, it also can be drawn as the transition of resources and functions from a higher to a lower government. According to Litvack (1999), there are three types of decentralization, which are political, administrative, and fiscal. Political decentralization allows local population and their representatives to have more power in setting regulations to be implemented locally. Thus, administrative decentralization provides the redistribution of authority, responsibility, and resources among central, provincial, and district/municipality levels of government. On the other hand, fiscal decentralization is defined as a delegation of the authority over increasing revenues or access to transfers and making decisions on current and investment expenditures.

Theories about fiscal decentralization are initially developed by Tiebout (1956), Musgrave (1959), and Oates (1972). They claim that it promotes higher efficiency, better public service, greater transparency, and, eventually, economic growth. Fiscal decentralization is considered as part of a reformation package to increase the efficiency of the public sector, to create competition among local or subnational governments in providing public goods and services, and to facilitate economic growth (Bahl and Linn 1992; Davoodi and Zou 1998; Bird and Wallich 1993). According to Oates (1999), the basic principle of fiscal decentralization is that public services should be provided by the lowest level of government.

Nevertheless, not all literatures show advantages of decentralization. Some scientists prove that decentralization's drawbacks are more dominant. For example, according to Prud'homme (1995), richer regions may be able to provide some amount and quality of public goods as poorer regions, but with fewer taxes. It could happen because richer regions would have a greater tax base, collect more taxes, and provide more public goods. Additionally, after investigating a decentralization system in Brazil, Machado (2013) found evidence that suggest decentralization may not inevitably improve accountability simply by bringing choices closer to the populations. Municipalities with higher levels of poverty, lower quality of education, and fewer participant in election may find it more difficult to monitor officials' accountability than cities with more educated and more political-participation inhabitants.

In Indonesia, decentralization 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 balance fund, respectively (Dartanto and Brodjonegoro, 2003). Law 25/1999 was designed as the principal 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 decentralization policy is the existence of intergovernmental transfer. Furthermore, the law mandates the fiscal decentralization process; consequently, it will set a new scheme of intergovernmental transfer between the central government and the subnational authorities (Dartanto and Brodjonegoro 2003). New components of 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 an amount of fund sourced from national expenditure (Anggaran Pendapatan dan Belanja Negara/APBN) allocated to the regions in the context of implementing fiscal decentralization which consists of DAU, DAK, DBH arrangement. Using this fund, 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 gap of interregional public service, and also fund the implementation of special autonomy and regional privileges. The scheme of intergovernmental fiscal transfer in Indonesia can be seen as Figure 1 below.

Figure 1.

Intergovernmental Fiscal Transfer in Indonesia
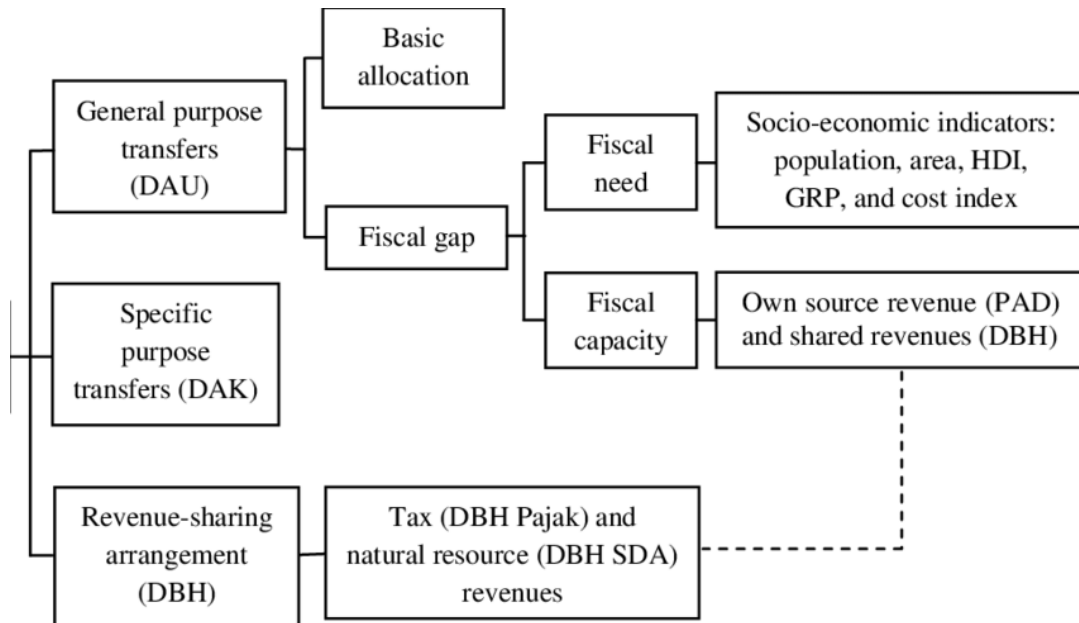
Source: Mumbunan, Ring, and Lenk (2012)

In another picture, we can find that since 2001, the central government has consistently increased fiscal transfers to the regions (Figure 2). It is clearly shown that in 2006, intergovernmental transfers rose sharply as the impact of the oil price windfall in 2005. The DAU was almost doubled; as a consequence, total transfer in 2006 was about 1.5 times than a year before. Moreover, since 2014, as the central government focused on infrastructure development, the share of specific grant to the total intergovernmental transfer has increased. For instance, the composition of transfer to subnational governments in 2017 consisted of 61 percent of general-purpose grant, 26 percent of specific grant, and 13 percent of shared revenue. Moreover, intergovernmental transfers in the 2018 budget (excluding the village grants) are projected to be 34.5 percent of total central government expenditure.

Figure 2.

Intergovernmental Fiscal Transfer in Indonesia since Fiscal Decentralization Policy
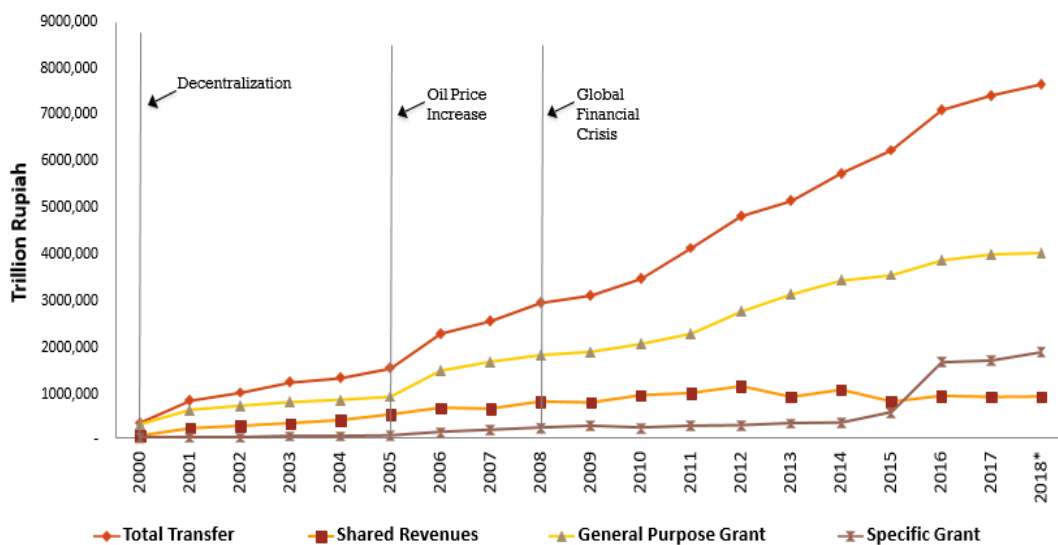
Source: Mahi (2020)

2.3 Special Autonomy Fund

Another essential discussion in this section should be about the SAF. Aceh is one of three provinces in Indonesia which get the label of special autonomy area (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. A literature from Abrar (2018) says that 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 product of law also states that in the case of Aceh, the central government allocate this amount of money to fund 7 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, whilst in the last 5 years, it would be reduced into 1 percent. In the first two years, Aceh was given 3.53 billion Rupiahs of SAF to be spent. Figure 3 below illustrates that the number of SAF allocation increased gradually almost every year, and it became more than double in 2018 (7.629 billion Rupiahs). It rose significantly from 2011 until 2015; nevertheless, the amount of SAF allocated for Aceh decreased slightly at the end of the period given.

Figure 3.

The Allocation of Special Autonomy Fund for Aceh
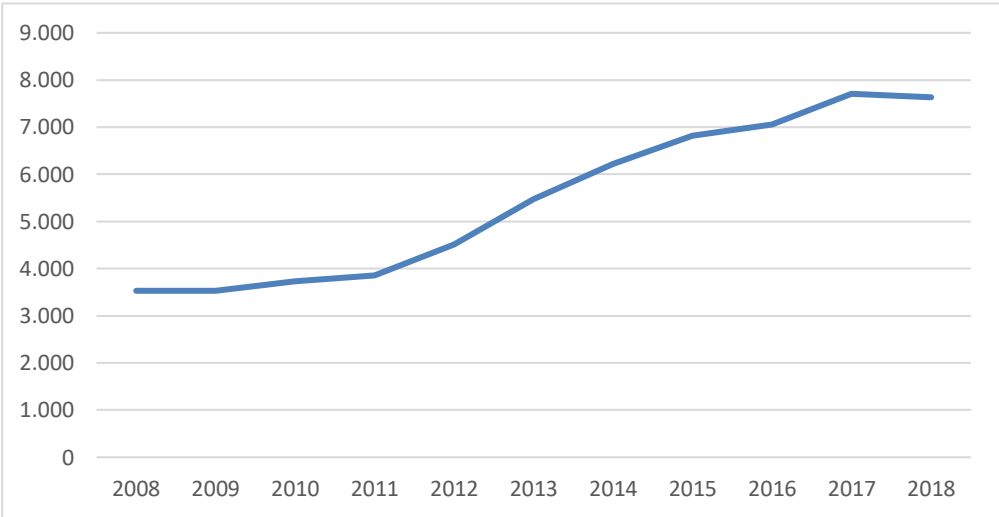
Source: Author's computation based on data from Development Planning Agency of Aceh

On the contrary, Figure 4 illustrates the total expenditure of Aceh in the period of 2003-2018. Overall, the amount of fund increased almost every year, except in 2010, 2011, and 2018. From the picture below, we also can see obviously that the amount of the fund increased dramatically every year from 2006 until 2009. To be the starting point, the SAF was firstly distributed to Aceh in 2008. Interestingly, in 2009, there was an additional spending of about 4 billion Rupiah compared to a year before. In two consecutive years since 2010, the graph showed declining trends. This might happen because the price of palm oil fell down exceptionally; yet, it affected the national income of Indonesia massively. However, starting from 2013 until the end of period given, total spending of this province has never been below 11 trillion Rupiah. Indeed, the SAF affects the total expenditure of the Aceh government.

Figure 4.
Annual Total Expenditure of Aceh (in Billion Rupiah)
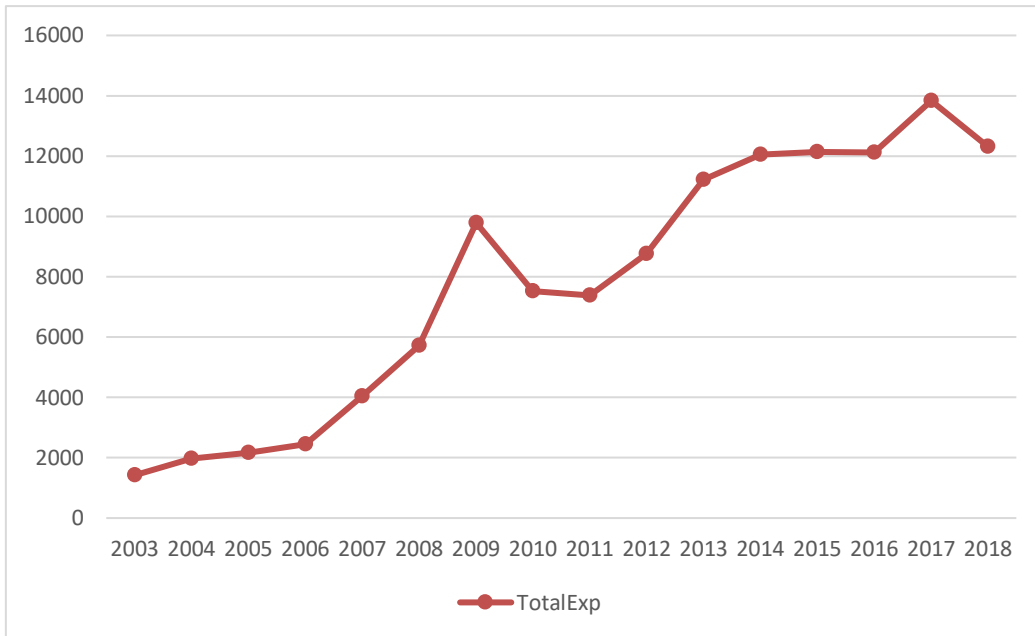
Source: Author's construction based on data from Ministry of Finance of Indonesia

Additionally, the graph shown by Figure 5 illustrates the comparison between the SAF and 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 big dependency on the SAF to execute their programs. This could be negative because the locally-generated revenue (Pendapatan Asli Daerah/PAD) of Aceh Province in 2018 was 2.3 trillion rupiah (Statistics of Indonesia 2021), or only 19% of the total expenditure. The local government should be worries with this fact and should take strategic programs to increase their PAD; thus, when the central government decide to stop the SAF in 2027, Aceh will have enough PAD to implement their plans.

Figure 5.
Special Autonomy Fund Versus Total Expenditure of Aceh (in Billion Rupiah)
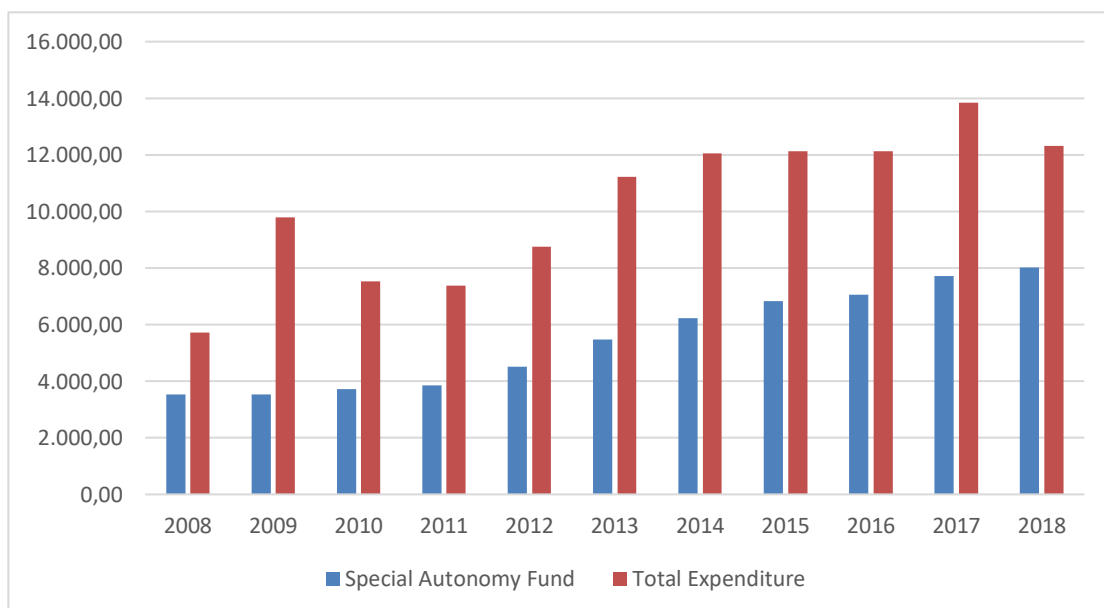
Source: Author's calculation based on data from Development Planning Agency of Aceh and Ministry of Finance of Indonesia

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2.4 Addressing the Problems

Even though the amount of fund spent by the local government was considerably massive, Aceh, hitherto, still have many problems to solve. One of the most chronical is poverty. Since 2008 until 2019, Aceh has received the SAF as much as 73.1 trillion Rupiahs. Additionally, the central government also develop projects funded by 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 Ministry of Marine and Fisheries, Ministry of Public Works, and Ministry of Agriculture.

Unfortunately, data in 2019 shows that Aceh was the poorest province in Sumatera and the sixth poorest province in Indonesia, although theoretically, rise of both general and specific fund allocation will decrease the poverty level (Rao et al., 1998). Let us see Figure 6 below. The graph demonstrates the annual poverty rate of Aceh since the beginning of new millennium until 2019. Moreover, data in the period of 2002-2007 indicates that more than one-fourth of total Acehnese are categorized as the poor. This claim is understandable since Aceh was recently destroyed by a mega-tsunami on the 26th of December, 2004. Besides, the conflict between GAM and the central government was still on going until a peace agreement was signed by both parties in 2006.

Figure 6.

Percentage of Poor Population in Aceh
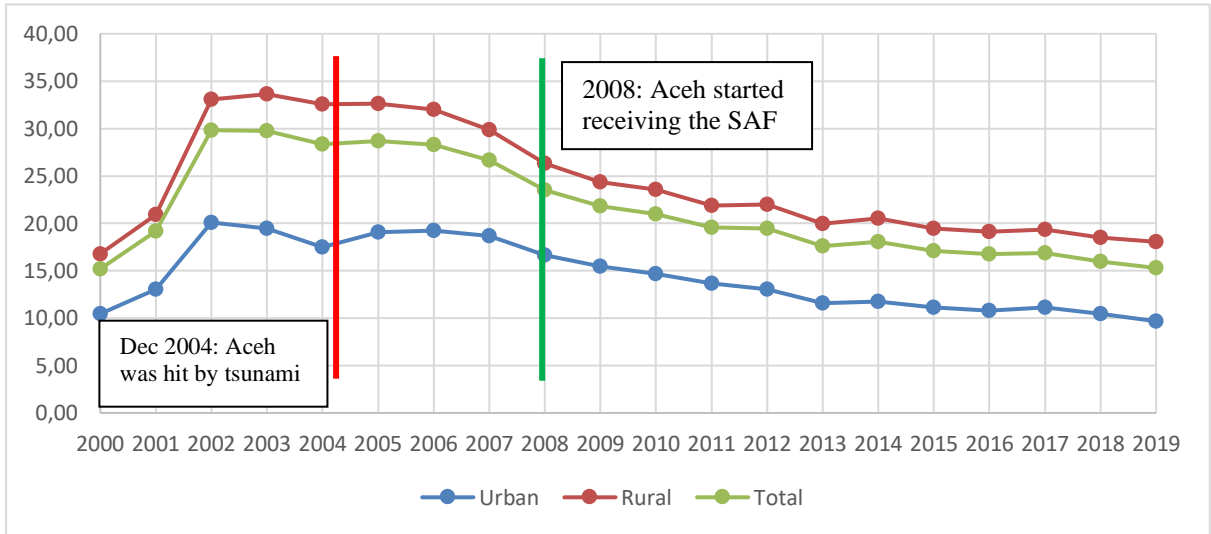
Source: Author's computation based on data from Statistics of Indonesia

In 2008, for the first time since 2001, the poverty rate was below 25 per cent. This positive progress continued, and it gained 15.32 per cent in 2019. However, in 2014 and 2017, there were minor blips in overall slowly diminishing trends. If we split the number based on living area of the people, another striking point could come. It can be found that the share of poor people in urban area increased in 2005, right after tsunami disaster. It was because two big cities, Banda Aceh and Meulaboh, were very badly affected by tsunami. These cities experienced huge damages, which automatically raised the number of citizens who had difficult economic situations as the impact of losing their jobs or head of families. On the other hand, number of poor people in urban area diminished almost 50 per cent by the end of the period given, compared to the highest number in 2002.

As can be seen in Figure 7 below, data in municipality level from Statistics of Indonesia in March 2019 shows that 15.32% of Acehnese people are poor, which is considerably high compared to the percentage of poor populations in 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, which 1 of every 5 inhabitants was poor.

Figure 7.

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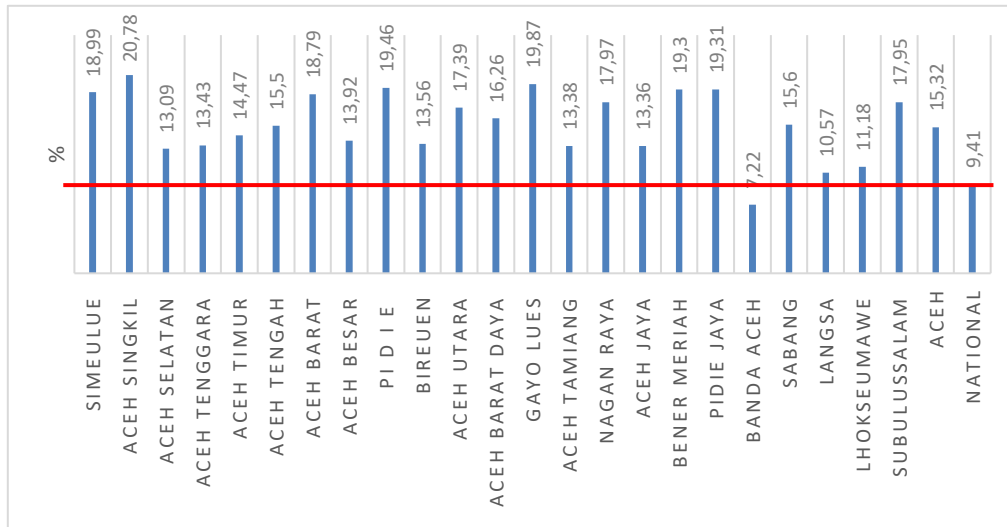
Source: Author's construction based on data from Statistics of Indonesia

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, all of 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 per cent, but only 67.8 per cent 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 per cent, stunting in Acehnese 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 is now addressing five health issues: stunting prevention, non-communicable disease (NCD) management, tuberculosis (TBC) management, vaccine coverage and quality, and 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 adequate nutrition, have not been prioritized in the regions, and access to basic health care is considered limited. The treatment of health problems in the areas has not been based on community rights, despite the fact that what the people in the regions genuinely need is access to basic health care.

The last point is the quality of education. This also sounds an alarm to the local government and needs a special attention. For instance, Reubee (2020) claims that Aceh has the lowest quality 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 critical for success in formal education, particularly higher education (Reubee 2020). Overall, the test put Aceh in the lowest position together with Maluku, North Maluku, East Nusa Tenggara, Papua, and some provinces in Sulawesi.

Based on three points explained above, it is quite obvious that Aceh is still struggling with poverty, health care, and education problems. Hence, this paper tries to provide scientific research and find the answers whether there is a connection between government expenditure on poverty, health, and education in Aceh. The next chapter will explain about theoretical framework of this research as well as important findings that were conducted by previous researchers.

Chapter 3
Theoretical Framework and Empirical Literature Review

3.1 Theories of Public Spending

There are four school of thoughts that widely used by economist in terms of explaining about government expenditure, which are Wagner's Law, Keynesian View, Musgrave and Rostow Theory, and Peacock and Wiseman Theory. Below, we will see all the theories mentioned.

3.1.1 Wagner's Law: A Law of Increasing State Expenditure

The first school of thought is Wagner's Law. Wagner, a repuFigure German economist, hypothesized 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. Furthermore, Eldemerdash and Ahmed (2019) conclude that Wagner's Law is based on three primary factors. First, during the process of expanding the economy, government tends to strengthen administrative process and lower risk in order to guarantee that markets run under control. Industrialization and modernization would occur as a result of economic expansion, displacing the public sector in favor of the private sector. Because the public sector's proportion of economic activity is shrinking, the government must spend more money to regulate the private sector. To put it another way, these state's function result in the enlargement of public sector by substituting public for private activities.

Second, there are many public sectors whose demand is elastic, such as education, cultural activities, health facilities, and spending for poverty. Therefore, public pressure to allocate more public services will increase government spending. Economic growth, in this case, would increase government expenditure, but not the other way around. Increased demand for fundamental infrastructure, such as education and health care, would result from higher real income. Wagner claims that the government can deliver these services more effectively and efficiently than the private sector (Arestis et al. 2020). In addition, there would be an increase in cultural and welfare spending, as well as economic redistribution.

Finally, economic development involving large-scale projects is sometimes impossible to finance by the private sector; thus, it must be taken over by the government, particularly in terms of providing public goods. This situation is resulted by massive private monopolies created by technical advanced combined with the increase of number of investments in numerous sectors. The government, in this case, needs to control and take over the economy by investing in those sectors, which would enhance the government spending, and at the same time, minimize the monopolies and promote economic efficiency (Arestis et al. 2020).

Wagner's Law, which is based on Wagner's investigation on Germany and other developed countries, has been one of the earliest and the most prominent principles of public spending. It argues that when economy develops, government's activities and functions have a tendency to increase. Necessarily, government spending grows at a greater rate than national revenue, which causes government spending, as a percentage of national revenue, raises over time. Moreover, according to the law, a rise of government spending would be essential for the people. Explicitly, as per capita income increases, the government's allocation of national revenue increases as well in order to compensate the authority's expanded protective, administrative, and educational functions. To be specific, 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 considerably used as a policy tool (Arestis et al. 2020).

3.1.2 Keynesian View of Public Spending

Different with Wagner's Law, Keynesian view gives an opposite argument related to 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 as well. Based on 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 in the government's side for boosting economic activity and creating jobs. Likewise, a group of studies on endogenous growth models have highlighted the positive impact of government spending in stimulating economic development. For example, literatures from Wu et al. (2010) and Facchini and Melki (2013) provide arguments of beneficial effect of government spending on growth of a country.

Based on Keynesian view, increases in government spending, which are assumed autonomous and exogenous, are treated as a result of raises in national revenue. Arestis et al. (2020) claims that, more crucially, government spending is an important macroeconomic policy variable that might be employed not just to increase economic development but also to ameliorate short-run swings in economic activity, according to the conventional Keynesian perspective. In addition, Keynesian economic theory underlines that higher government spending is considered as an engine for stimulating growth throughout the effect of fiscal multiplier and the role of investment-accelerator (Arestis et al. 2020). Moreover, Keynes (1936) synthesizes that the connection between government spending and national revenue is inverse.

According to his theory, Keynes pushed for higher government spending and reduced taxes to make a great demand and pull the world economy out of the downturn. Keynesian economics is coined to describe the idea that the authority may influence aggregate demand and intervene the economy in order to attain ideal economic performance. Economies tend to stabilize slowly, which require interventions by the government to generate short-term demand. Specifically, salaries and jobs give a slower respond to the market demand, that is why, intervention is needed to keep them on the track.

There are three main aspects that government needs to pay attention: interest rates, tax rates, and social programs. As a reply of slow price changes, money supply can be used to incentivize borrowing and lending by changing its interest rates. Government's decision to reduce interest rate is considerably significant in improving economic systems, triggering people's consumption, and promoting investment. The economic activities then get better and ensure that growth and jobs continue. On the other hand, income tax, as government's primary source of revenue, are used to fund public sector like infrastructure, education, health care, and social programs. Intervention in terms of increasing or decreasing taxes should be done by the government to take part and control economic activities. Similar with the previous two, spending on social programs to make sure markets work smoothly. If there is a recession, government needs to intervene by increasing supply of skilled labor. It would drop wages on the labor market; thus, companies will benefit in getting productive labor with a considerably lower cost.

3.1.3 Musgrave and Rostow Theory

The third school of thought is 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). Public sector, as Musgrave and Rostow claimed, contributes to economic framework; for instance, roads, water supply, schools, and sanitation. Because the majority of these projects need significant capital, the government's spending will automatically continue to rise. A study from Edame and

Eturoma (2014) assumes that with greater 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, and at the same time, people's necessities for infrastructural and basic services such as health, education, transportation, and electricity develop greater than per capita income.

The idea goes on 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 criticized for neglecting the private sector's role to economic growth, especially in the thinking that government spending is the only source of economic growth (Muthui et al. 2013). Despite the fact that this theory was formed based on the experiences of many countries' economic growth, there is only a little explanation about the continuing of economic growth in levels that happen at the same time.

In order to increase people's wellbeing, the authority needs to implement the entire programs. Musgrave (1987) contends that determining the type and quality of social goods as well as how much specific consumers are expected to pay could be a challenge faced by policymakers. Indeed, a political mechanism must be used to make the decision. Voters can make a decision based on their vote choices. Actually, the concept of modern living and financial processes are consistently driven by demands on public requirements throughout the political process.

3.1.4 Peacock and Wiseman Theory of Public Expenditure

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 as a consequence of economy's boom and recession instead of in the manner described by Wagner's Law. They said that under normal times, the increase in government spending is determined by the amount of income generated. Economic development leads to an increase in national income and, as a result, government revenue, which leads to an increase in government spending over time. However, during a conflict, there would be a pressing need for increased government spending. Moreover, it underlines the recurrence of anomalous structures that result in significant decrease of government spending and government income, too. To accommodate specific demands, such as natural disasters or war epidemics, public spending should not be predicted to raise in a steady and continuous manner (Edame and Eturoma 2014).

They further said that during such times, governments boost tax rates and expand the tax system to fund higher government spending. 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 being able to fall back to their original level. The first one is displacement effect, which is a term used to describe how an increase in taxes causes private spending to be replaced by governmental spending. 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 which is under the government's control.

In another explanation, the Peacock and Wiseman's analysis is based on three main premises (Henrekson 1990). To begin with, the government is always able to find beneficial methods to spend available funds. Second, the majority of citizens are unwilling to pay greater taxes. Finally, government's respond to citizen's wishes is a must. The primary concept of a 'tolerable burden of taxation' is derived from these fundamental assumptions.

3.2 Theoretical Framework of Government Expenditure on Poverty, Health, and Education

There are various studies that conduct about what government spending is and how it affects poverty alleviation as well as health and education outcomes. However, the connection between them is vary. Let us see an example, on poverty. Fine (1997) states that public spending has a potential to be a major tool in the fight against poverty. Regardless, conflicts in program evaluations are frequently caused by differing the policy purposes. It is simpler to agree on the importance of the welfare goal instead of to agree on what it has to be. This does not have to block evaluations of government expenditure programs or reform initiatives. In spite of that, it should serve as a reminder of the importance of being clear about the assumptions that underpin policy decisions and being aware of how these assumptions may influence policy outcomes. Fine (1997) also suggests target optimalization 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 the 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 additionally accomplish that circuitously by means of enhancing impoverished households' nutrition, health, and education, leading to the improvement of market earnings. Similarly, government expenditure on basic health, education, and some kinds of infrastructure 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 effectively alleviate poverty and sometimes referred 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 be highly dependent on how much the fund goes to the right target group of poor people, which varies by country. Nonetheless, transfers and subsidies might have other consequences, such as reducing household labor supply and increasing amount of private transfer, which can compensate the impact on poverty. Overall, the impact of transfers and subsidies spending is still debaFigure, even though it is well targeted. Another consideration is because it also relates to how the money is spent (McKay 2004). Furthermore, Anderson et al. (2018) point out that direct income taxes does not play an important role in reducing poverty because low-income households are excluded and not taxed at all. Nevertheless, indirect taxes contribute to a big proportion of tax revenue (for example, value-added tax) in many countries.

As mentioned before, the effect of government expenditure on poverty might vary depending on which sectors it is spent, how successful it goes to the right cohorts, and how it is financed. In addition, the time span of analysis and the measurement of poverty itself might be influential in making conclusions.

Another theoretical issue, which is also important to address, is about government spending on health. Anand and Ravallion (1993) have tried to analyze 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 are able to acquire important social goods and services, which then improve people's health and nourishment; as a consequence, it would reduce mortality rates

and extend life expectancy. It was also discovered that economic improvement is only essential when it is used to fund appropriate public services, implying that economic expansion leads to a greater social service supply. Lastly, if income poverty plummets, social output improves. Another important finding of their study is that after an adjustment of health and poverty expenditure, positive association between life prospect and wealth vanished across country.

Identically, health care investment is widely seen as a productive spending that has a broad economic impact. Access to basic health services would extend life expectancy, decrease child mortality, and increase a variety of other health measurement (Maitra and Mukhopadhyay 2012). Healthiness minimizes illness-related deaths and improves labor competency, both of which have contribution indirectly to economic development of a country. Comparably, Howitt (2005) investigates these positive benefits of health 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 to allocate health-care resources generously and efficiently in order to promote economic growth and improve people's prosperity. Variables like per capita income, adult literacy rate, access to safe water, access to safe sanitation, urbanization, and private expenditure all have beneficial effect on health, according to researchers. Meanwhile, Carrin and Politi (1995) show that, although GNP per capita is a significant indicator of health status, it is not suggested as a controlling factor.

The last conceptual framework of government spending developed in this study is on its relationship with education, and further, economic growth. In traditional theory of human capital, production factor (i.e., capital and labor) are essential to support economic growth. However, to increase their productivity, workers must be well-trained and skilled, and education is the main source to train and develop their skills. Education is always considered as economic good since it is difficult to attain; hence, it must be distributed or traded (Obi and Obi 2014). Experts consider education as both consumer and capital goods since it provides utility to consumers whilst also being used to produce other goods and services. Furthermore, education, as a capital good, might be used to generate human ability required for economic growth. This argument emphasizes that capability enhancement is as prominent as other factors in 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 resulted by the enhancement of labor productivity, a better productivity growth rate, and additional societal benefits for inhabitants (e.g., an improved health service). Cunha and Heckman (2009) establish a framework for evaluating education program over life cycle of people, based on classical human capital. In terms of acquiring skills, spending more money in education is necessary. In other words, talents acquired during one's life cycle are complimentary.

Furthermore, Obi et al. (2016) also put their explanation to a more specific issue. The main point is that, a poor-quality secondary school will have a negative impact on productivity when government investments at tertiary education are turned into useful capabilities. However, a raise on high school investment has a tendency to give better productivity if young students obtained earlier capabilities, such as in primary schools and kindergarten, as well as at home. In this point, early intervention by public is critical to make investments in tertiary education more productive. An effective education at university needs learning process using sound approach for students at an earlier level, unless for students with exceptional talent. Majority of research on rates of return to schooling make no distinction between elementary, secondary, or tertiary education. Moreover, educational returns vary by demographic, and marginal return to schooling is a diminishing function of time spent in school.

Summary of theoretical framework of government expenditure on poverty, health, and education can be found as follow:

Figure 8.

Summary of Theoretical Framework of Government Expenditure on Poverty, Health, and Education

```
                          ┌─────────────────┐
                          │  Government     │
                          │  Expenditure    │
                          └─────────────────┘
        ↙                         ↓                         ↘
┌──────────────────┐    ┌──────────────────┐    ┌──────────────────┐
│ In Terms of      │    │ In Terms of      │    │ In Terms of      │
│ Alleviating      │    │ Improving        │    │ Developing       │
│ Poverty          │    │ Health Care      │    │ Quality of       │
│ • Fine (1997)    │    │ • Anand &        │    │ Education        │
│ • McKay (2004)   │    │   Ravalion (1993)│    │ • Cunha &        │
│                  │    │ • Gupta et al.   │    │   Heckman (2009) │
│                  │    │   (2004)         │    │ • Obi et al.     │
│                  │    │                  │    │   (2016)         │
└──────────────────┘    └──────────────────┘    └──────────────────┘
        ↓                         ↓                         ↓
┌──────────────────┐    ┌──────────────────┐    ┌──────────────────┐
│ • Increase       │    │ • Develop health │    │                  │
│   individual's   │    │   care system    │    │ • Develop human  │
│   productivity   │    │ • Extend life    │    │   capital        │
│ • Earn more      │    │   expectancy     │    │                  │
│   money          │    │                  │    │                  │
└──────────────────┘    └──────────────────┘    └──────────────────┘
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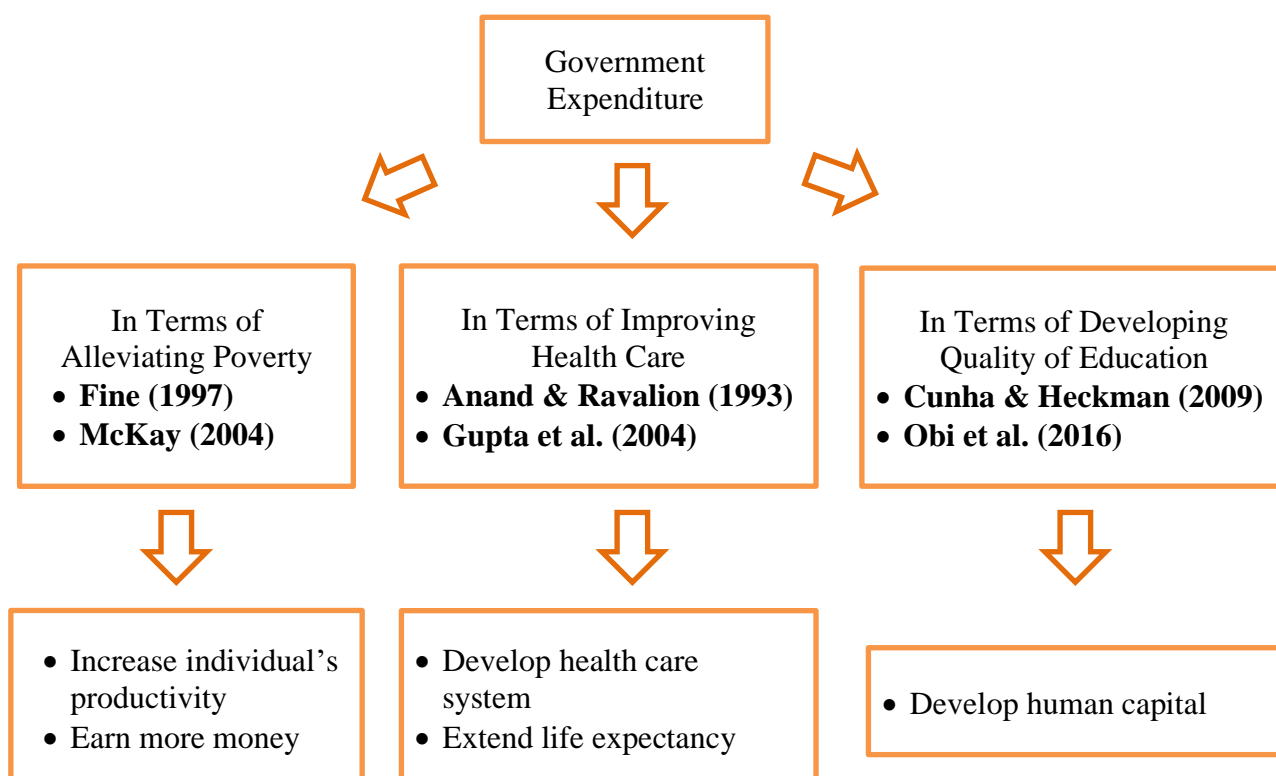
Source: Author

3.3 Literature Review of Government Expenditure on Poverty, Health, and Education

Numerous sets of previous study have provided empirical evidence in explaining correlation between public expenditure and poverty reduction, health care development, and educational achievement. Indeed, poverty eradication is one of the most interesting problem to be solved by economist. One group of them, Lipton and Revallion (1995), investigate the impact of public expenditure on poverty alleviation in developing countries, and argue that poor communities with limited access to public infrastructure previously, tend to gain more benefit from new investment. For many impoverished people in rural areas, the only way out of that bad condition is moving to the city, where they can expect a greater and unpredictable wage. In another study, from 1960-1991, Kenworthy (1998) look at the effect of social prosperity policies on poverty eradication in 15 developed and developing countries, and pointed out that government expenditure on social welfare in the countries surveyed was effective in alleviating poverty. Specifically, notwithstanding the same levels of redistribution, the accomplishment of the United States and Canada in eradicating poverty rate implies that the success of enhanced social-welfare policy may be feasible without a significant increase in spending. This means raises in benefit levels of the programs that help unemployed and low-income people could be enough to bring these two countries to have a lower poverty rate compared to the rest.

In another literature, after examining panel dataset in regional level in Thailand in the period of 1977-1999, Fan, Yu, and Jitsuchon (2008) find that increased government expenditure on agricultural research yields the highest return on investment of agricultural output and at the same time, gives the second-biggest impact on reducing poverty in rural areas. This study also suggests that the most important factor of poverty reduction in Thailand is rural electrification expenditure, since it triggers the raise of employment in nonfarm sectors, while education in farming areas has the third-largest influence on poverty alleviation. Besides, irrigation is expected to improve agricultural productivity; yet, there is a lot of regional variety. On the other hand, public expenditure on rural roads does not considerably impact agricultural output and further poverty reduction.

Mehmood and Sadiq (2010) estimate the long-term and short-term nexus between government fiscal deficit and poverty in Pakistan, which are the result of excessive government spending relative to tax collection. According to time-series data in time span of 1976 and 2010, the findings show negative correlation between government spending and poverty in both the short run and the long run. Quite similarly, Pradhan (2010) attempts to investigate the relationship between government spending expansion and poverty alleviation using cointegration and causality method in India. The author came into the conclusion that both expenditure development and growth could help to solve poverty problem. Thus, the author emphasizes the importance of the government's role in strengthening financial institutions to support long-term economic growth and poverty alleviation. In Indonesia, research conducted by Alamanda (2020) analyzes the impact of various type of government spending on poverty and income equality using panel dataset in provincial level. According to this paper, social assistance, subsidy, and grant spending have only a little impact on lowering poverty and income inequality. Furthermore, infrastructure spending positively and significantly affects poverty alleviation in Indonesia, which has a greater impact in rural areas rather than in urban areas.

A set of empirical evidence has established how government expenditure influences health care sectors. However, the results vary and depends on the dependent variables involved. Several studies have found that public health expenditures had a minor or statistically insignificant impact on infant or child mortality. For example, evidence from Kim and Moody (1992), which based on research of 117 countries in 1986, discovers that public health spending does not significantly contribute to mortality rates. Compared to the significance of socioeconomic resources, government expenditure on health provides only a little contribution to overall people health. Similarly, Filmer and Pritchett (1997) have shown that, at traditional levels, health expenditure has a limited impact, which is proved by small and insignificant coefficient. Regression of 45 countries from 1987 to 1995 generated a conclusion that independent variables of government spending demonstrate less than 0.1 per cent of observed mortality rates are different between countries.

Nevertheless, by investigating the impact of poverty eradication and public health investment in 40 less-developed countries from 1985 to 1990, Carrin and Politi (1995) argue that, health status is positively affected by Gross National Product (GNP) per capita, but is not considerably the controller. They unsuccessfully found a significant effect of public health expenditure on these indicators. The study employs a regression analysis using life expectancy, newborn mortality, and under-five child mortality as outcome variables.

On the contrary, some literatures show benefit of public health expenditure on health status. With only a small investment, infant and child mortality can be significantly decreased throughout Central America and the Caribbean (Hojman 1996). It is suggested that ensuring the right recipient could be more essential than finding a new resource of fund. Likewise, after investigating 35 developing countries, Bidani and Ravallion (1997) conclude that poor people had a significantly lower health status compared to other groups, and disparities in health expenditure could be important for the poor.

Education, as the last variable connected with government spending, has a variety of empirical evidence as well. To examine the effectiveness of public investment on education, Baldacci et al. (2003) promotes a model for 94 less-developed countries from 1996 to 1998. According to the study's main findings, public spending on education does not have impact on social outcomes, and specifically, it is deteriorated by adult incompetence and gender disparity. They propose that, in addition to government expenditure, these negative social factors need to be removed to hasten human development. Similar to that, when estimate the efficiency of health and education in 76 countries from 1990 to 1998 using Stochastic Frontier Analysis (SFA), Jayasuriya and Wodon (2003) find that neither education spending nor geographical disparities had a statistically fundamental effect on net enrollment of primary school. The authors used real per capita GDP, adult literacy, as well as private and public per capita government spending on education as the independent variables.

According to Gallagher (1993), government expenditure on education has a beneficial impact on educational accomplishment after having a better quality and efficacy. This study was conducted using data of 47 less-developed countries and the period of 1975-1987. This documentation is later supported by Mingat and Tan (1998), who argue that education is critical to a country's social and economic well-being. On most measurements of educational achievement, they have discovered that developing countries are behind developed countries. The authors examine 125 low-income and high-income countries in 1993 to estimate the relationship between per capita GNP and several educational performances and try to determine the reasons why developed countries benefit more in education. Based on the main findings, obtaining the same level of elementary school coverage in the worst-economic-attainment countries requires twice the number of resources that the richest countries have spent. By surveying production function of municipalities in Brazil, de Mello and Pisu (2009) posit that while government investment has a favorable impact on education, income is the most important factor of educational outcomes. The data also suggests to include expenditure on non-education initiatives, as they are related to the outcomes. In addition, Craigwell, Bynoe, and Lowe (2012) evaluate the effectiveness of government expenditure on health and education acquisition. It involves panel data of life expectancy and school enrollment rates as the dependent variables from 19 Carribean countries in time span of 1995-2007 for health care and 1980-2009 for education using OLS model. The results show a large positive impact of health expenditure on health; on the other hand, education expenditure shows no consequential impact on elementary and secondary school enrollment.

The impact of government expenditure on poverty, health, and education can be summarized into the table below:

Table 1

Summary of Relationship between Government Spending and Poverty, Health, and Education

Researchers	Year	Data and Time Period	Impact	Main Findings
Kenworthy	1998	15 developing and developed countries (1960-1991)	Negative impact on poverty	Government spending in social welfare effectively reduces poverty.
Fan, Yu, and Jitsuchon	2008	Regions in Thailand (1977-1999)	Negative impact on poverty	An increase of government spending in education stimulates a better agricultural output and reduces poverty in rural areas.

Mehmood and Sadiq	2010	Pakistan (1976-2010)	Negative impact on poverty	Government spending (in terms of fiscal deficit) negatively influence poverty in short and long run.
Pradhan	2010	India (1951-2008)	Negative impact on poverty	Both fiscal expansion and economic growth are significant in alleviating poverty.
Alamanda	2020	Provinces in Indonesia (2005-2017)	Impact on poverty depends on types of government expenditure	Social assistance, subsidy, and grant expenditure is insignificantly linked to poverty and income inequality. On the other hand, Infrastructure spending is statistically significant to decline poverty rate.
Kim and Moody	1992	117 countries (1986)	Insignificantly negative impact on mortality rates	Health expenditure gives a small impact on mortality rate.
Carrin and Politi	1995	40 developing countries (1985-1990)	Insignificant impact on health	GNP per capita is significant factor of health outcomes. It increases life expectancy and decreases infant mortality and child mortality under five years old.
Hojman	1996	22 Central America and Carribean countries (1990s)	Negative impact on health factors	Decreases of infant and child mortality are affected by an increase of health care spending. Redirecting existing resources is more important than acquiring a new one.
Filmer and Pritchett	1997	45 countries (1987-1995)	Negative but limited impact on health	There is only a weak relationship between health expenditure and mortality rate.
Bidani and Ravallion	1997	35 developing countries (1980s-1990s)	Significant impact on health status	Spending by the government has a positive impact on the poor's health.
Gallagher	1993	47 less-developed countries	Positive impact on education outcome	Educational government expenditure positively influences variables of education.
Mingat and Tan	1998	125 less-developed and developed countries (1993)	Matters to education	Developing countries need to spend twice than developed countries to gain the same education level.

Baldacci et al.	2003	94 developing countries (1996-1998)	Has no impact on education out-comes	To speed up human development, detrimental social factors such as adult illiteracy and gender inequality must be eliminated.
Jayasuriya and Wodon	2003	76 countries (1990-1998)	Has no effect on education	Education spending and regional differences show no impact on net primary education enrollment.
De Mello and Pisu	2009	5.591 municipalities in Brazil (2000)	Positive impact on education	Income is very essential to education sectors; additionally, spending on other program beside education also plays an important role.
Craigwell et al.	2012	19 countries in Carribea (1980-2009)	Positive impact on health and no substantial impact on education	Spending on health has statistically significant impact on life expectancy, while spending on education gives no discernible effect on elementary and secondary school enrollment.

The next chapter provides data and methodology of this research. It consists of three sub-sections, which are data sources, variables, and model specification.

Chapter 4
Data and Research Methodology

4.1 Data Sources

Panel data sets of 30 provinces in Indonesia are used in this study, and the time 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 form after 2002, so that 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, are obtained from Directorate General of Financial Balance of Ministry of Finance. Second, data 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 are affiliated with World Bank. Finally, data of poverty rate, unemployment rate, and regional GDP are all gathered from Statistics of Indonesia.

4.2 Variables

4.2.1 Dependent 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.

Table 2

Description of Dependent Variables

Variables	Description
Poverty rate (pov_rate)	Poverty rate represents the number of people who are living under poverty line divided by total population. In order to measure poverty, Statistics of Indonesia uses the concept of people's ability to meet their basic necessities. Furthermore, poor population are people who have per capita average spending below poverty line. According to Statistics of Indonesia (2021), Poverty Line (PL) shows value of monthly minimum spending required (in Rupiah) to cover an individual's fundamental necessities, combining food and non-food necessities. PL is sum of Food Poverty Line (FPL) and non-Food Poverty Line (non-FPL). FPL portrays minimum expenditure of individuals to fulfill their foods such as rice, meat, milk, egg, or vegeFigures, while non-FPL represents individuals' minimum spending of non-food necessities like health, education, clothes, and housing.
Access to safe water (safe_wat)	According to World Bank (2021) definition, access to safe water refers to the number of people who benefit managed drinking water system (as a percentage of the population). This is to say, it determines the percentage of individuals who get their

	drinking water from a better source (i.e., a pipe, a public water tap, or an artesian well) which is available and safe from major chemical pollution.
Access to safe sanitation (safe_san)	Access to safe sanitation represents people who use at least basic sanitation facilities (as a share of total population), such as improved sanitation services which are separable from other households (World Bank). This indicator includes both individuals who utilize basic sanitation functions and those who use safely-maintained sanitation features. Some examples of enhanced sanitation facilities include septic tanks, flush to piped sewage systems, and pit lavatories.
Net enrollment ratio of senior secondary school (enroll_rate)	Based on World Bank (2021) description, net enrollment rate is the proportion of children in official school age who are registered in school compared to the population of that age group. Besides, senior secondary school is the higher level of secondary education, which aims to set the foundations for lifetime learning and human improvement by providing much more subject-oriented and skill-oriented lessons from more specialized teachers. Thus, net enrollment ratio of senior secondary school is derived by dividing number of pupils registered in the upper level of secondary school by the habitant in the group aged 15-18, then multiplying by 100.

4.2.2 Independent Variable

There is only one independent variable in this research, which will be described on the table below:

Table 3

Description of Independent Variables

Variables	Description
Total expenditure, in natural logarithm form (ln_total_exp)	This variable reflects annual total spending of local government in provincial level in Indonesia. To simplify the process of regression and interpretation, it will be used in natural logarithm form.

4.2.3 Control Variables

This research uses two control variables, which are regional GDP and unemployment rate.

Table 4

Description of Control Variables

Variables	Description
Regional Gross Domestic Product (GDP), in natural logarithm form (ln_reg_GDP)	According to definition from Statistics of Indonesia (2021), regional GDP is total transactions in an area by both residents and non-residents in one particular year. There are two types of regional GDP that are usually used, on the basis of current price

	and constant price. GDP based on current prices denotes value-added of goods and services estimated using current-year prices, whereas GDP based on constant prices depicts value-added of these products and services calculated using prices in a single year. Variable of regional GDP used in this study is GDP at current market prices by expenditure.
Unemployment rate (unemp_rate)	Unemployment rate is interpreted as the proportion of unemployed people in the labor force (Statistics of Indonesia). Thus, the labor force is people in the working age (15 years old and older) who are employed or have a job earlier but are temporarily unemployed.

4.3 Model Specification: Synthetic Control Method

The key 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 preintervention outcomes across areas that have similar characteristic with the treatment area. A pool of prospective candidates is used to determine the donor areas that will be combines to generate the synthetic control. Selection of donor areas and weights is based on predictor variables that has an impact on the outcome as well as the outcome variable itself prior to the policy intervention is enforced. The result nearly resembles the outcome of affected areas before policy implementation and become a control for affected areas after implementation. Thus, the between outcomes of affected areas and the synthetic control equivalent after policy intervention demonstrates the policy's efficacy.

Specifically, in the research, the SCM will create a counterfactual group whose outcomes are alike then compared to Aceh. The synthetic group is defined as a weighted combination of the unexposed provinces which have similar characteristics before the SAF 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.

There are 30 provinces in Indonesia that will be observed in the period of 2002-2018. Let assume $i = 1$ be the Aceh Province, and $i = 2, \ldots, 30$ 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 which evaluate the impact of the intervention (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 effect of the SAF for Aceh during 2008-2018 can be defined as the difference between the outcome variable that refers to the policy intervention and when the time without the intervention. It can be explained as follow:

$$\alpha_{1t} = Y_{1t}^I - Y_{1t}^N, \text{t} = 2008, \ldots\ldots, 2018$$

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 $W = w_2, \ldots, w_{30}$ so that $w_i \geq 0$ for i = 2, ..., 30 and $\sum_{i=2}^{30} wi = 1$. According to Halim, Inggrid, and Ottemoesoe (2013), since $W = \sum_{i=2}^{30} wi$, then the model would be:

$$\alpha_{1t} = Y_{1t} - \sum_{i=2}^{30} wiYit, t = 2008, \ldots\ldots, 2018$$

The following chapter will explain the regression results and the main findings of this research.

Chapter 5
Results and Discussions

This chapter provides the results of the regression using SCM. This model is used since during the period of 2002-2018, there was a policy intervention conducted to Aceh, which is the allocation of the SAF. Since SAF was firstly distributed in 2008, then the period will be separated into two, preintervention (2002-2007) and postintervention (2008-2018) period. Furthermore, we would like to see if distribution of the SAF will give impacts on poverty alleviation, health indicators development, and quality of education in Aceh. The sub-sections below will firstly elucidate the sensitivity test in order to choose the best approach, then continue with results of the regression as well as explanation of the main findings.

5.1 Sensitivity Test: Outcome Lags

It is important to examine whether different outcome lags can provide different synthetic groups of province and lead to different results. McClelland and Gault (2017) verify many possibilities of outcome lags choice, and the results vary. Their empirical result confirms that when they use at least 2 different years as the outcome lags, the value of Root Mean Square Prediction Error (RMPSE) was low. Almost similarly, the choice of using all outcome lags for all preintervention generates 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.

Table 5

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

It can be found in Table 5 that for all outcome variables of synthetic Aceh, using all outcome lags in 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 (2017) invention. On the other hand, using only the final-year-lag outcome contribute the worst RMSPE, except access to safe sanitation variable. However, its value has only 0.58 difference compared to the second worst. Principally, as being recommended by Kaul et al. (2016), another model to replace all-lag model actually does not produce a synthetic group that closely resembles the actual treated group during the preintervention phase. However, to be clear, all results below use all-lag model for each outcome variable in the regression.

5.2 The Impact of Government Expenditure on Poverty

The major output of the SCM is a preintervention and postintervention path for the outcome variable of synthetic province, which is comparable to the path 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 provinces 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), synthetic control approach requires policymakers to show a similarity within the state that is subject to a certain policy and its synthetic counterfactual, which come from the calculation of weight from the donor pool. As a consequence, the SCM "would be protected" from extreme counterfactual estimates (King and Zheng 2006).

Table 6 highlights comparisons of pretreatment features of real Aceh with those of synthetic Aceh and includes a key property of synthetic control predictors. If we see variables of total expenditure and regional GDP (both are in natural logarithm form), they have quite similar pattern as the synthetics Aceh are more than 1 lower than Aceh. Before the SAF allocation for Aceh, government expenditure and GDP had little potential in predicting poverty rate in Aceh. This explains the difference in both spending and GDP between Aceh and the synthetic version. In contrast, unemployment rate of synthetic Aceh is higher than its synthetic.

Table 6

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

Table 7 displays the weights of control province in the synthetic Aceh. Based on the regression, Province of Maluku and South Sumatera are the best combination of synthetic Aceh before the policy intervention. Among them, Maluku is the most heavily weighted, very close to 65 per cent. Another province, South Sumatera, contributes the rest.

Table 7

Synthetic Aceh Donor Province Weight on Poverty Rate

Province	Weight
Maluku	0.649
South Sumatera	0.351
Sum	1.000

Figure 9 displays poverty rate for Aceh and its synthetic counterpart in the 2002-2018 period. From 2002 until 2007, the lines went together, even though the magnitude were different. Literally, prior to the treatment, the two path ways should be closely aligned, so that discrepancies after the intervention can be interpreted as the treatment's effect (McClelland and Gault 2017). There was a slight increase of poverty rate of Aceh in 2005. It might be understandable because a destructive tsunami was hit Aceh in the end of 2004; consequently, poverty rate would be higher. Then, the lines diverged from 2007 to 2010, before coming closer in 2011. In the last eight year, the lines showed no large gap. However, there were three times that Aceh has larger poverty rates than the synthetic Aceh, which were in 2012, 2014, and 2017.

Figure 9.

Trends in Poverty Rate: Aceh vs Synthetic Aceh
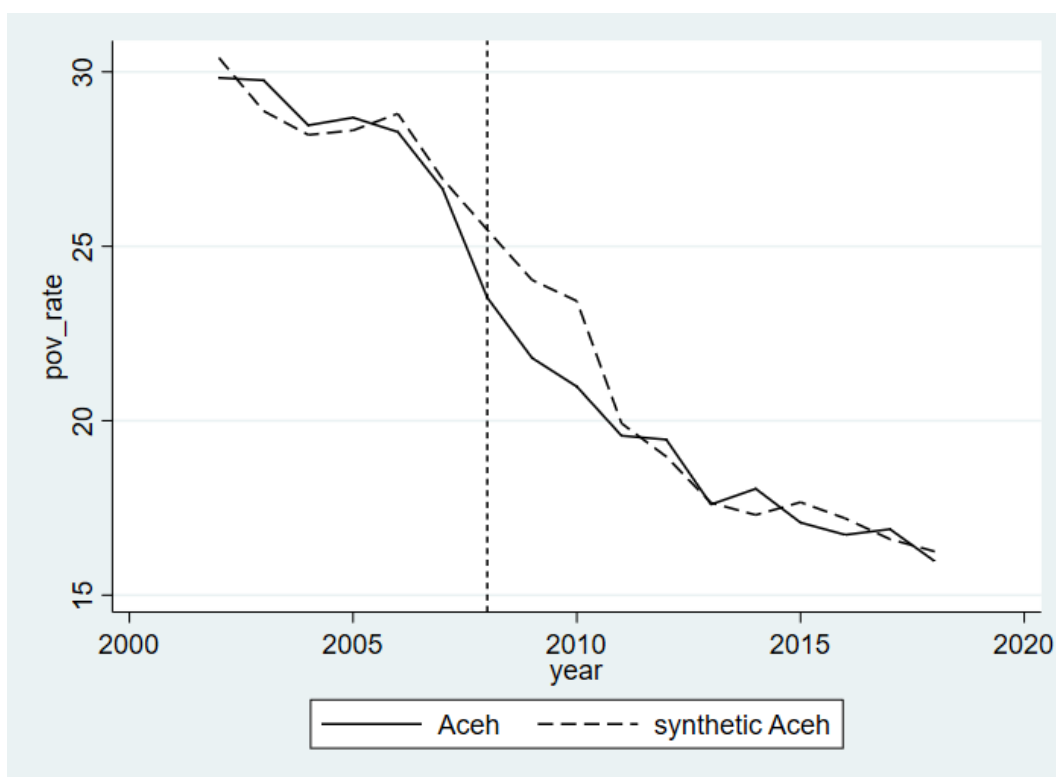
Source: Author's computation using STATA software

Table 8

Results of Poverty Rate for Posttreatment Periods

Year	Estimates
2008	-1.94257
2009	-2.23555
2010	-2.45323
2011	-0.35524
2012	0.488
2013	-0.04725
2014	0.75222
2015	-0.58374
2016	-0.47036
2017	0.28626
2018	-0.28268

Results for postintervention periods are provided by Table 8. By paying attention to the estimation Figure, we can see that almost the values are negative. Thus, it might be concluded that the SAF supports poverty alleviation.

5.3 The Impact of Government Expenditure on Health

This sub-section presents the relationship between government spending and health care indicators. There would be two outcome variables to estimate: access to safe water and access to safe sanitation. There is a logical thinking which explains that when government increase the expenditure, people's economy develops, and poverty rate decreases. Since number of poor people declines, it means that there will be more people who enable to build a good water and sanitation system; therefore, number of people who have access to safe water and safe sanitation will automatically increase. Furthermore, when government spending raises, health services and facilities improve, so that people's health quality develops.

5.3.1 The Impact of Government Expenditure on Access to Safe Water

Table 9 express the pretreatment characteristics of access to safe water variable between Aceh and synthetic Aceh. Total expenditure, as the independent variable, shows no important power in terms of forecasting access to safe water in Aceh prior to the distribution of SAF. However, regional GDP was the best predictor based on the regression since the discrepancy between real and synthetic Aceh was statistically very small. For unemployment rate, there was a gap between real Aceh and its synthetic, even though it was not big. The trend of water access in Aceh below 2008 fluctuated. For instance, after reaching 42.95 per cent in 2004, there was only 28.42 per cent of total inhabitants who consume water safely in 2005. At that moment, finding safe water might be difficult for Acehnese people after being hit by tsunami disaster, until the government (and also NGOs) rebuilt infrastructures massively starting from the beginning of 2005.

Table 9

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

Table 10 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. These provinces, on behalf of the remaining provinces, were assumed to have similar attributes with Aceh in terms of access to safe water condition.

Table 10

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

We can see more obvious details regarding the trend of access to safe water of Aceh and synthetic Aceh in Figure 10. Both Aceh and the synthetic Aceh has the lowest percentage of people with safe water consumption in 2005. For Aceh itself, the difference between data in 2004 and 2005 was large enough, about 15 per cent. Started from 2006, its performance increased, although there were small slips in 2012 and 2014. Contrastingly, 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 period, it experienced lower marks. It is essential to say that the unpredictably low access on safe water of Acehnese people in 2005 (it might happen because of natural disaster) affected the choice of synthetic Aceh. Moreover, it influenced the graph consistency of Aceh, particularly in pretreatment period.

Figure 10.

Trends in Access to Safe Water: Aceh vs Synthetic Aceh
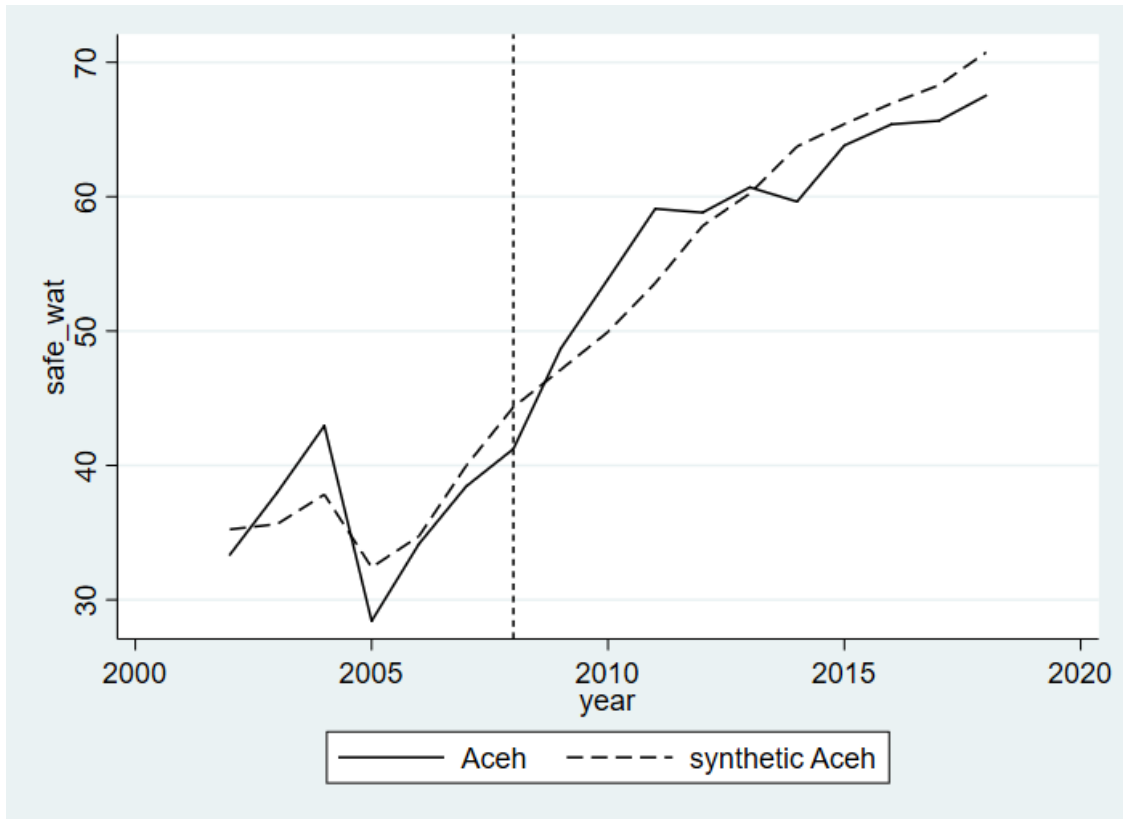
Source: Author's computation using STATA software

Table 11

Results of Access to Safe Water for Posttreatment Periods

Year	Estimates
2008	-3.11261
2009	1.56781
2010	3.93524
2011	5.52776
2012	0.99688
2013	0.46651
2014	-4.10841
2015	-1.59318
2016	-1.55608
2017	-2.64537
2018	-3.21222

Table 11 illustrates estimations of safe water access in post policy periods. Some estimations are positive, while the rest are negative. At this point, these contrasting estimates do not show clear relationships between allocation of the SAF and access to safe water.

5.3.2 The Impact of Government Expenditure on Access to Safe Sanitation

Illustration of estimator means for Aceh and the synthetic Aceh in terms of access to safe sanitation can be seen in Table 12. In this scenario, theoretically, all total expenditure, regional GDP, and unemployment rate might not be the best predictors since there are quite big gaps between Aceh and the synthetic Aceh. For example, when 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 GPD (in natural logarithm) and unemployment rate (in percentage), which have 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 per cent in 2005 compared to a year before. The argument behind this is because earthquake and tsunami in December 2004 caused large problems for the people in fulfilling their basic necessities, including safe sanitation. There were large groups of people became refugees and many refugee camps generally had inappropriate sanitation to be used together by lots of households. On the flip side, the synthetic Aceh marked 51 per cent at the lowest and 56 per cent at the highest of number of populations who could access their sanitation safely in the period.

Table 12

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

There were three provinces that became the synthetic Aceh for outcome variable of access to safe water (Table 13). The first province and the biggest weight contributor was Jambi (it shared almost two third of the weight). The second one was Gorontalo, a province which was formed in 2000 and located in the north side of Sulawesi Island, with 31.8 per cent of weight. Lastly, Riau contributed closely to 4 per cent and completed the list.

Table 13

Synthetic Aceh Donor Province Weight on Access to Safe Sanitation

Province	Weight
Gorontalo	0.318
Jambi	0.643
Riau	0.039
Sum	1.000

Figure 11.

Trends in Access to Safe Sanitation: Aceh vs Synthetic Aceh
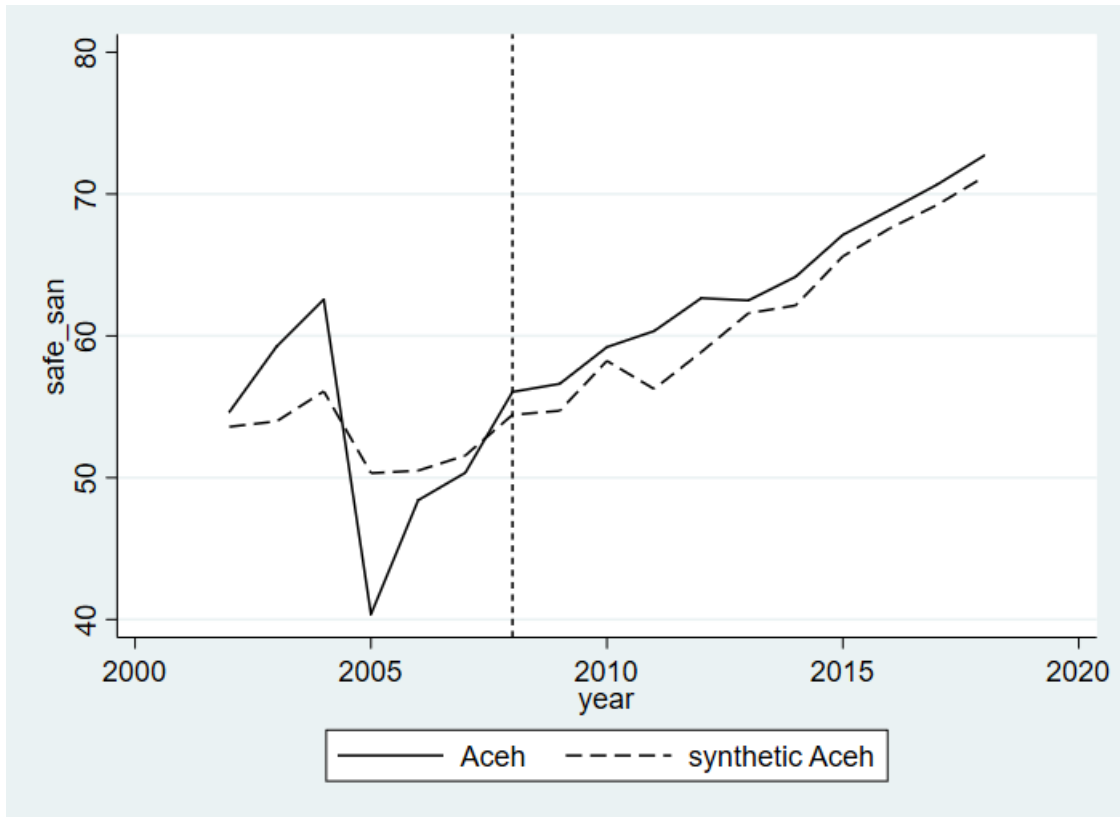
Source: Author's computation using STATA software

Figure 11 outlines the pattern of access to safe sanitation between Aceh and its donor pool. According to the graph, it is important to notice that, Aceh experienced a large change in 2004 (more than 60 per cent) and in 2005 (about 40 per cent) during the treatment period. On the other hand, in the same time frame, even though there was a downward trend for the synthetic Aceh, it was not as extreme as Aceh. If we see further, from 2005 to 2008, portion of access to safe water of Aceh increased rapidly, about 16 per cent. In fact, at that time, government and donor countries were building a massive number of housings for the residents, mainly located in Banda Aceh and Meulaboh as the most affected locations. This might instantly affect that number, since in only three years, so many housings were developed. As a result, number of refugees decreased, and at the same time, it results an increase in people who get the appropriate access to their sanitation. Another important finding to point out is that, since the government intervention until 2018, percentage of inhabitants with safe-accessed sanitation in Aceh was always greater than the synthetic Aceh. Thus, we could construct a pre assumption that the SAF allocation affects access to safe sanitation in Aceh.

Table 14

Results of Access to Safe Sanitation for Posttreatment Periods

Year	Estimates
2008	1.61473
2009	1.89985
2010	0.97401

32

2011	4.08083
2012	3.79763
2013	0.90272
2014	2.0221
2015	1.51402
2016	1.28935
2017	1.43372
2018	1.49917

Table 14 declares prediction of safe sanitation access in relation to allocation of the SAF. It confirms the positive relationship between the two variables, clarified by all positive estimation results in posttreatment period. Evidence shows that the SAF affects access of safe sanitation in Aceh. However, the range of estimates were relatively not large. It was 0.9 in 2013 as the smallest and 4 in 2011 as the largest.

5.4   The Impact of Government Expenditure on Education

The last sub-section in this chapter explains in what way government expenditure, explicitly distribution of the SAF, has an impact on education. Variable of education used in the study is net enrollment rate of senior high school. Using all-year outcome lag, predictor means of Aceh and synthetic Aceh for all variables were not close each other, which is showed by Table 15. Total expenditure, for instance, had a difference of 0.8 point between Aceh and its synthetic during preintervention period. It had the same condition with regional GDP, which had a 0.5-point gap. On the other hand, discrepancy of unemployment rate of Aceh with the donor pool was even higher, about 3.8 per cent of predictor means. Almost like other previous outcome variables estimator means of students enrolled in senior high school percentage dropped sharply in 2005. The synthetic Aceh experience the same trend, but was not too large.

Table 15

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

Table 16 indicates list of provinces and their weights regarding nexus of net enrollment ratio of senior secondary school and government spending. Yogyakarta arose with more than 80 per cent of weight, then followed by Jakarta with 10.8 percent. Bali, the last province, came up with 6.3 per cent of weight.

Table 16

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

Figure 12 exhibits comparison trends of enrollment rate of senior high school for Aceh and the synthetic Aceh before and after the allocation of SAF. From the picture, it can be highlighted that, in 2006-2011, enrollment rates of senior secondary school in Aceh were higher compared to the synthetic Aceh. Note that the trend started two years before the policy implementation. Since 2008, the gap between them became smaller, and even in 2012, the donor pool could overlap Aceh and remain for two years. However, in 2014 until 2018, the education variable of Aceh came back higher than its synthetic.

Figure 12.

Trends in Net Enrollment Ratio of Senior Secondary School: Aceh vs Synthetic Aceh
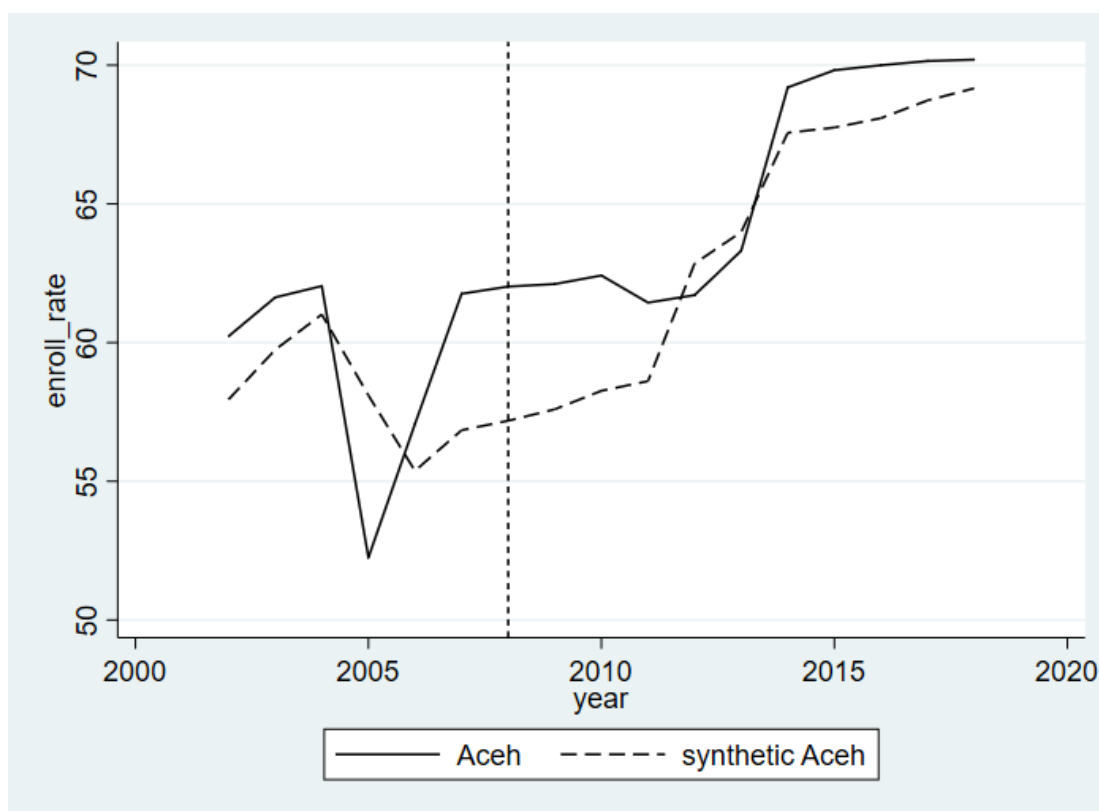
Source: Author's computation using STATA software

Table 17

Results of Net Enrollment Ratio of Senior Secondary School for Posttreatment Periods

Year	Estimates
2008	4.83595
2009	4.51575
2010	4.15684
2011	2.8301
2012	-1.1391
2013	-0.67427
2014	1.63505
2015	2.06789
2016	1.91003
2017	1.41863
2018	1.03252

Table 17 establishes the estimations of net enrollment ratio of senior secondary school after the policy. Generally, the estimates showed positive signs even though there were two negative marks as well. Therefore, we will have a conclusion that the allocation of SAF increased net enrollment rate of senior high school in Aceh.

Chapter 6
Conclusion and Policy Recommendation

6.1 Conclusion

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

Furthermore, the complete regression results using STATA software will be provided in appendices. It includes *synth* command to find predictors before the treatment as well as to obtain the results of Aceh and synthetic Aceh comparison graphically for all period, and *synth runner* command to get the results of posttreatment estimates.

6.2 Policy Recommendation

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

6.3 Limitation

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

Appendices

Appendix I

Estimation Results of Total Expenditure on Poverty Rate

```
. synth pov_rate ln_total_exp ln_reg_GDP unemp_rate pov_rate(2002) pov_rate(2003)
pov_rate(2004) pov_rate(2005) pov_rate(2006) pov_rate(2007), trunit(1) trperiod(2008) fig
---------------------------------------------------------------------------------
-------------------------------
Synthetic Control Method for Comparative Case Studies
---------------------------------------------------------------------------------
-------------------------------

First Step: Data Setup
---------------------------------------------------------------------------------
-------------------------------
control units: for 1 of out 29 units missing obs for predictor ln_total_exp in period 2004
-ignored for averaging
---------------------------------------------------------------------------------
-------------------------------
Data Setup successful
---------------------------------------------------------------------------------
-------------------------------
                 Treated Unit: Aceh
               Control Units: Bali, Bangka Belitung, Banten, Bengkulu, Central Java,
Central Kalimantan, Central Sulawesi,
                              East Java, East Kalimantan, East Nusa Tenggara, Gorontalo,
Jakarta, Jambi, Lampung, Maluku,
                              North Maluku, North Sulawesi, North Sumatera, Papua, Riau,
South East Sulawesi, South
                              Kalimantan, South Sulawesi, South Sumatera, West Java, West
Kalimantan, West Nusa Tenggara,
                              West Sumatera, Yogyakarta
---------------------------------------------------------------------------------
-------------------------------
          Dependent Variable: pov_rate
  MSPE minimized for periods: 2002 2003 2004 2005 2006 2007
Results obtained for periods: 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013
2014 2015 2016 2017 2018
---------------------------------------------------------------------------------
-------------------------------
                   Predictors: ln_total_exp ln_reg_GDP unemp_rate pov_rate(2002)
pov_rate(2003) pov_rate(2004)
                              pov_rate(2005) pov_rate(2006) pov_rate(2007)
---------------------------------------------------------------------------------
-------------------------------
Unless period is specified
predictors are averaged over: 2002 2003 2004 2005 2006 2007
---------------------------------------------------------------------------------
-------------------------------

Second Step: Run Optimization
---------------------------------------------------------------------------------
-------------------------------
---------------------------------------------------------------------------------
-------------------------------
Optimization done
---------------------------------------------------------------------------------
```

```
-----------------------------

Third Step: Obtain Results
-------------------------------------------------------------------------------------
-------------------------------
Loss: Root Mean Squared Prediction Error

--------------------
   RMSPE  |  .5274784
------------------
-------------------------------------------------------------------------------------
-------------------------------
Unit Weights:

---------------------------------
              Co_No | Unit_Weight
-------------------+-----------
               Bali |           0
    Bangka Belitung |           0
             Banten |           0
           Bengkulu |           0
       Central Java |           0
  Central Kalimantan |          0
   Central Sulawesi |           0
          East Java |           0
    East Kalimantan |           0
 East Nusa Tenggara |           0
          Gorontalo |           0
            Jakarta |           0
              Jambi |           0
            Lampung |           0
             Maluku |        .649
       North Maluku |           0
     North Sulawesi |           0
     North Sumatera |           0
              Papua |           0
               Riau |           0
 South East Sulawesi |          0
   South Kalimantan |           0
     South Sulawesi |           0
     South Sumatera |        .351
           West Java |          0
   West Kalimantan |           0
 West Nusa Tenggara |           0
      West Sumatera |           0
         Yogyakarta |           0
-------------------------------
-------------------------------------------------------------------------------------
-------------------------------
Predictor Balance:

-------------------------------------------------------
                            |  Treated   Synthetic
-----------------------------+---------------------
                ln_total_exp | 28.36711    27.14782
                  ln_reg_GDP | 31.65203    30.09292
                  unemp_rate | 10.41833    11.40597
              pov_rate(2002) |    29.83    30.40654
              pov_rate(2003) |    29.76    28.88019
              pov_rate(2004) |    28.47    28.19529
              pov_rate(2005) |    28.69    28.32423
```

38

```
        pov_rate(2006) |      28.28   28.80396
        pov_rate(2007) |      26.65   26.93151
--------------------------------------------------
------------------------------------------------------------------------------------
----------------------------
```

Appendix II

Estimation Results of Total Expenditure on Poverty Rate
in Posttreatment Periods

```
. synth_runner pov_rate ln_total_exp ln_reg_GDP unemp_rate pov_rate(2002) pov_rate(2003)
pov_rate(2004) pov_rate(2005) pov_rate(2006) pov_rate(2007), trunit(1) trperiod(2008)
Estimating the treatment effects
Estimating the possible placebo effects (one set for each of the 1 treatment periods)
|                              | Total: 29
..........................| 17.00s elapsed.

Conducting inference: 5 steps, and 29 placebo averages
Step 1... Finished
Step 2... Finished
Step 3... Finished
Step 4... Finished
Step 5... Finished

Post-treatment results: Effects, p-values, standardized p-values

            | estimates      pvals   pvals_std
------------+-------------------------------
         c1 |  -1.94257    .0344828    .3103448
         c2 |  -2.23555    .0344828    .3793103
         c3 |  -2.45323    .0344828    .2413793
         c4 |   -.35524    .8275862    .8965517
         c5 |      .488    .6896552    .7931034
         c6 |   -.04725    .9655172           1
         c7 |    .75222    .4827586    .7931034
         c8 |   -.58374    .8275862    .8965517
         c9 |   -.47036    .7931034    .8965517
        c10 |    .28626    .8275862    .9310345
        c11 |   -.28268    .7931034     .862069
```

Appendix III

Estimation Results of Total Expenditure on
Access to Safe Water

```
. synth safe_wat ln_total_exp ln_reg_GDP unemp_rate safe_wat(2002) safe_wat(2003)
safe_wat(2004) safe_wat(2005) safe_wat(2006) safe_wat(2007), trunit(1) trperiod(2008) fig
-------------------------------------------------------------------------------------------
-------------------------------
Synthetic Control Method for Comparative Case Studies
-------------------------------------------------------------------------------------------
-------------------------------

First Step: Data Setup
-------------------------------------------------------------------------------------------
-------------------------------
control units: for 1 of out 29 units missing obs for predictor ln_total_exp in period 2004
-ignored for averaging
-------------------------------------------------------------------------------------------
-------------------------------
Data Setup successful
-------------------------------------------------------------------------------------------
-------------------------------
                   Treated Unit: Aceh
                  Control Units: Bali, Bangka Belitung, Banten, Bengkulu, Central Java,
Central Kalimantan, Central Sulawesi,
                                 East Java, East Kalimantan, East Nusa Tenggara, Gorontalo,
Jakarta, Jambi, Lampung, Maluku,
                                 North Maluku, North Sulawesi, North Sumatera, Papua, Riau,
South East Sulawesi, South
                                 Kalimantan, South Sulawesi, South Sumatera, West Java, West
Kalimantan, West Nusa Tenggara,
                                 West Sumatera, Yogyakarta
-------------------------------------------------------------------------------------------
-------------------------------
        Dependent Variable: safe_wat
  MSPE minimized for periods: 2002 2003 2004 2005 2006 2007
Results obtained for periods: 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013
2014 2015 2016 2017 2018
-------------------------------------------------------------------------------------------
-------------------------------
                    Predictors: ln_total_exp ln_reg_GDP unemp_rate safe_wat(2002)
safe_wat(2003) safe_wat(2004)
                                safe_wat(2005) safe_wat(2006) safe_wat(2007)
-------------------------------------------------------------------------------------------
-------------------------------
Unless period is specified
predictors are averaged over: 2002 2003 2004 2005 2006 2007
-------------------------------------------------------------------------------------------
-------------------------------

Second Step: Run Optimization
-------------------------------------------------------------------------------------------
-------------------------------
-------------------------------------------------------------------------------------------
-------------------------------
Optimization done
-------------------------------------------------------------------------------------------
-------------------------------

Third Step: Obtain Results
-------------------------------------------------------------------------------------------
-------------------------------
Loss: Root Mean Squared Prediction Error
```

```
--------------------
   RMSPE |   2.99501
--------------------
-------------------------------------------------------------------------------------
-------------------------------
Unit Weights:

--------------------------------
             Co_No | Unit_Weight
-------------------+------------
               Bali |           0
    Bangka Belitung |           0
             Banten |           0
           Bengkulu |           0
        Central Java |          0
   Central Kalimantan |       .209
    Central Sulawesi |          0
          East Java |           0
     East Kalimantan |          0
 East Nusa Tenggara |           0
           Gorontalo |          0
            Jakarta |           0
              Jambi |           0
            Lampung |           0
             Maluku |           0
       North Maluku |           0
     North Sulawesi |        .257
     North Sumatera |           0
              Papua |           0
               Riau |        .534
 South East Sulawesi |         0
   South Kalimantan |           0
     South Sulawesi |           0
     South Sumatera |           0
           West Java |          0
    West Kalimantan |           0
 West Nusa Tenggara |           0
      West Sumatera |           0
          Yogyakarta |          0
--------------------------------
-------------------------------------------------------------------------------------
-------------------------------
Predictor Balance:

-------------------------------------------------------
                          |  Treated   Synthetic
--------------------------+----------------------------
             ln_total_exp |  28.36711   27.80655
               ln_reg_GDP |  31.65203   31.61123
               unemp_rate |  10.41833   10.72784
            safe_wat(2002) |    33.35   35.24092
            safe_wat(2003) |    37.97   35.63152
            safe_wat(2004) |    42.95   37.83618
            safe_wat(2005) |    28.42   32.41395
            safe_wat(2006) |    34.15   34.72768
            safe_wat(2007) |    38.44    39.9698
-------------------------------------------------------
-------------------------------------------------------------------------------------
-------------------------------
```

Appendix IV

Estimation Results of Total Expenditure on
Access to Safe Water in Posttreatment Period

```
. synth_runner safe_wat ln_total_exp ln_reg_GDP unemp_rate safe_wat(2002) safe_wat(2003)
safe_wat(2004) safe_wat(2005) safe_wat(2006) safe_wat(2007), trunit(1) trperiod(2008)
Estimating the treatment effects
Estimating the possible placebo effects (one set for each of the 1 treatment periods)
|                                | Total: 29
...........................| 18.00s elapsed.

Conducting inference: 5 steps, and 29 placebo averages
Step 1... Finished
Step 2... Finished
Step 3... Finished
Step 4... Finished
Step 5... Finished

Post-treatment results: Effects, p-values, standardized p-values

            | estimates      pvals  pvals_std
------------+------------------------------------
         c1 |  -3.11261   .3448276   .6551724
         c2 |   1.56781   .8275862   .9310345
         c3 |   3.93524   .4137931   .7241379
         c4 |   5.52776   .3448276   .7586207
         c5 |    .99688   .9310345   .9655172
         c6 |    .46651   .9655172   .9655172
         c7 |  -4.10841   .6206897    .862069
         c8 |  -1.59318   .8965517   .8965517
         c9 |  -1.55608   .8275862   .9310345
        c10 |  -2.64537   .7586207    .862069
        c11 |  -3.21222   .6551724   .8275862
```

Appendix V

Estimation Results of Total Expenditure on
Access to Safe Sanitation

```
. synth safe_san ln_total_exp ln_reg_GDP unemp_rate safe_san(2002) safe_san(2003)
safe_san(2004) safe_san(2005) safe_san(2006) safe_san(2007), trunit(1) trperiod(2008) fig
--------------------------------------------------------------------------------
--------------------------------
Synthetic Control Method for Comparative Case Studies
--------------------------------------------------------------------------------
--------------------------------

First Step: Data Setup
--------------------------------------------------------------------------------
--------------------------------
control units: for 1 of out 29 units missing obs for predictor ln_total_exp in period 2004
-ignored for averaging
--------------------------------------------------------------------------------
--------------------------------
Data Setup successful
--------------------------------------------------------------------------------
--------------------------------
                 Treated Unit: Aceh
                Control Units: Bali, Bangka Belitung, Banten, Bengkulu, Central Java,
Central Kalimantan, Central Sulawesi,
                               East Java, East Kalimantan, East Nusa Tenggara, Gorontalo,
Jakarta, Jambi, Lampung, Maluku,
                               North Maluku, North Sulawesi, North Sumatera, Papua, Riau,
South East Sulawesi, South
                               Kalimantan, South Sulawesi, South Sumatera, West Java, West
Kalimantan, West Nusa Tenggara,
                               West Sumatera, Yogyakarta
--------------------------------------------------------------------------------
--------------------------------
           Dependent Variable: safe_san
  MSPE minimized for periods: 2002 2003 2004 2005 2006 2007
Results obtained for periods: 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013
2014 2015 2016 2017 2018
--------------------------------------------------------------------------------
--------------------------------
                   Predictors: ln_total_exp ln_reg_GDP unemp_rate safe_san(2002)
safe_san(2003) safe_san(2004)
                               safe_san(2005) safe_san(2006) safe_san(2007)
--------------------------------------------------------------------------------
--------------------------------
Unless period is specified
predictors are averaged over: 2002 2003 2004 2005 2006 2007
--------------------------------------------------------------------------------
--------------------------------

Second Step: Run Optimization
--------------------------------------------------------------------------------
--------------------------------
--------------------------------------------------------------------------------
--------------------------------
Optimization done
--------------------------------------------------------------------------------
--------------------------------

Third Step: Obtain Results
--------------------------------------------------------------------------------
--------------------------------
Loss: Root Mean Squared Prediction Error
```

```
--------------------
  RMSPE |  5.411977
--------------------
--------------------------------------------------------------------------------------------
--------------------------------
Unit Weights:

---------------------------------
            Co_No | Unit_Weight
------------------+--------------
             Bali |           0
  Bangka Belitung |           0
           Banten |           0
         Bengkulu |           0
     Central Java |           0
Central Kalimantan |          0
  Central Sulawesi |          0
        East Java |           0
  East Kalimantan |           0
East Nusa Tenggara |          0
        Gorontalo |        .318
          Jakarta |           0
            Jambi |        .643
          Lampung |           0
           Maluku |           0
     North Maluku |        .039
   North Sulawesi |           0
   North Sumatera |           0
            Papua |           0
             Riau |           0
South East Sulawesi |         0
 South Kalimantan |           0
   South Sulawesi |           0
   South Sumatera |           0
        West Java |           0
  West Kalimantan |           0
West Nusa Tenggara |          0
    West Sumatera |           0
       Yogyakarta |           0
---------------------------------
--------------------------------------------------------------------------------------------
--------------------------------
Predictor Balance:

-------------------------------------------------------
                      |  Treated   Synthetic
----------------------+--------------------------------
          ln_total_exp |  28.36711   26.90308
           ln_reg_GDP |  31.65203   29.97935
           unemp_rate |  10.41833   8.112953
         safe_san(2002) |    54.64   53.59437
         safe_san(2003) |    59.25   53.97424
         safe_san(2004) |    62.57   56.09368
         safe_san(2005) |    40.37   50.32102
         safe_san(2006) |    48.41   50.49961
         safe_san(2007) |    50.35   51.56584
-------------------------------------------------------
--------------------------------------------------------------------------------------------
--------------------------------
```

Appendix VI

Estimation Results of Total Expenditure on
Access to Safe Sanitation in Posttreatment Period

```
. synth_runner safe_san ln_total_exp ln_reg_GDP unemp_rate safe_san(2002) safe_san(2003)
safe_san(2004) safe_san(2005) safe_san(2006) safe_san(2007), trunit(1) trperiod(2008)
Estimating the treatment effects
Estimating the possible placebo effects (one set for each of the 1 treatment periods)
|                            | Total: 29
...........................| 18.00s elapsed.

Conducting inference: 5 steps, and 29 placebo averages
Step 1... Finished
Step 2... Finished
Step 3... Finished
Step 4... Finished
Step 5... Finished

Post-treatment results: Effects, p-values, standardized p-values

            | estimates      pvals  pvals_std
------------+------------------------------
        c1 |   1.61473    .5517241   .9310345
        c2 |   1.89985    .4482759   .8965517
        c3 |    .97401    .7586207   .9655172
        c4 |   4.08083    .2068966    .862069
        c5 |   3.79763    .2758621   .8965517
        c6 |    .90272    .8275862   .9655172
        c7 |    2.0221    .7931034   .9310345
        c8 |   1.51402    .7586207   .9655172
        c9 |   1.28935     .862069          1
       c10 |   1.43372    .7586207   .9655172
       c11 |   1.49917    .7931034   .9655172
```

Appendix VII

Estimation Results of Total Expenditure on
Net Enrollment Ration of Senior Secondary School

```
. synth enroll_rate ln_total_exp ln_reg_GDP unemp_rate enroll_rate(2002) enroll_rate(2003)
enroll_rate(2004) enroll_rate(2005) enroll_rate(2006) enroll_rate(2007), trunit(1)
trperiod(2008) fig
----------------------------------------------------------------------------------------
-------------------------------
Synthetic Control Method for Comparative Case Studies
----------------------------------------------------------------------------------------
-------------------------------

First Step: Data Setup
----------------------------------------------------------------------------------------
-------------------------------
control units: for 1 of out 29 units missing obs for predictor ln_total_exp in period 2004
-ignored for averaging
----------------------------------------------------------------------------------------
-------------------------------
Data Setup successful
----------------------------------------------------------------------------------------
-------------------------------
                 Treated Unit: Aceh
                Control Units: Bali, Bangka Belitung, Banten, Bengkulu, Central Java,
Central Kalimantan, Central Sulawesi,
                              East Java, East Kalimantan, East Nusa Tenggara, Gorontalo,
Jakarta, Jambi, Lampung, Maluku,
                              North Maluku, North Sulawesi, North Sumatera, Papua, Riau,
South East Sulawesi, South
                              Kalimantan, South Sulawesi, South Sumatera, West Java, West
Kalimantan, West Nusa Tenggara,
                              West Sumatera, Yogyakarta
----------------------------------------------------------------------------------------
-------------------------------
        Dependent Variable: enroll_rate
  MSPE minimized for periods: 2002 2003 2004 2005 2006 2007
Results obtained for periods: 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013
2014 2015 2016 2017 2018
----------------------------------------------------------------------------------------
-------------------------------
                  Predictors: ln_total_exp ln_reg_GDP unemp_rate enroll_rate(2002)
enroll_rate(2003) enroll_rate(2004)
                              enroll_rate(2005) enroll_rate(2006) enroll_rate(2007)
----------------------------------------------------------------------------------------
-------------------------------
Unless period is specified
predictors are averaged over: 2002 2003 2004 2005 2006 2007
----------------------------------------------------------------------------------------
-------------------------------

Second Step: Run Optimization
----------------------------------------------------------------------------------------
-------------------------------
----------------------------------------------------------------------------------------
-------------------------------
Optimization done
----------------------------------------------------------------------------------------
-------------------------------

Third Step: Obtain Results
----------------------------------------------------------------------------------------
-------------------------------
```

```
Loss: Root Mean Squared Prediction Error

--------------------
   RMSPE | 3.441378
--------------------
---------------------------------------------------------------------------------------------
--------------------------------
Unit Weights:

----------------------------------
            Co_No | Unit_Weight
-------------------+--------------
             Bali |        .063
  Bangka Belitung |           0
           Banten |           0
         Bengkulu |           0
     Central Java |           0
Central Kalimantan |          0
  Central Sulawesi |          0
        East Java |           0
   East Kalimantan |          0
East Nusa Tenggara |          0
        Gorontalo |           0
          Jakarta |        .108
            Jambi |           0
          Lampung |           0
           Maluku |           0
     North Maluku |           0
    North Sulawesi |          0
    North Sumatera |          0
            Papua |           0
             Riau |           0
South East Sulawesi |         0
  South Kalimantan |          0
    South Sulawesi |          0
    South Sumatera |          0
        West Java |           0
   West Kalimantan |          0
West Nusa Tenggara |           0
    West Sumatera |           0
       Yogyakarta |        .829
----------------------------------
---------------------------------------------------------------------------------------------
--------------------------------
Predictor Balance:

-----------------------------------------------------
                      |  Treated   Synthetic
----------------------+------------------------------
         ln_total_exp |  28.36711   27.56342
           ln_reg_GDP |  31.65203   31.12879
           unemp_rate |  10.41833   6.617475
    enroll_rate(2002) |     60.23   57.94962
    enroll_rate(2003) |     61.63   59.74309
    enroll_rate(2004) |     62.04   61.01572
    enroll_rate(2005) |     52.25   58.09819
    enroll_rate(2006) |     57.07   55.37723
    enroll_rate(2007) |     61.76   56.84248
-----------------------------------------------------
---------------------------------------------------------------------------------------------
--------------------------------
```

Appendix VIII

Estimation Results of Total Expenditure on
Net Enrollment Ration of Senior Secondary School
in Posttreatment Period

```
. synth_runner enroll_rate ln_total_exp ln_reg_GDP unemp_rate enroll_rate(2002)
enroll_rate(2003) enroll_rate(2004) enroll_rate(2005) enroll_rate(2006) enroll_rate(2007),
trunit(1) trperiod(2008)
Estimating the treatment effects
Estimating the possible placebo effects (one set for each of the 1 treatment periods)
|                               | Total: 29
..........................| 12.00s elapsed.

Conducting inference: 5 steps, and 29 placebo averages
Step 1... Finished
Step 2... Finished
Step 3... Finished
Step 4... Finished
Step 5... Finished

Post-treatment results: Effects, p-values, standardized p-values

            | estimates       pvals  pvals_std
------------+-------------------------------
        c1 |   4.83595    .1034483   .3448276
        c2 |   4.51575    .1034483   .4137931
        c3 |   4.15684    .1034483   .5517241
        c4 |    2.8301    .4482759   .8965517
        c5 |   -1.1391    .8965517          1
        c6 |   -.67427     .862069   .9310345
        c7 |   1.63505    .6551724          1
        c8 |   2.06789    .6206897   .9655172
        c9 |   1.91003    .6206897   .9655172
       c10 |   1.41863    .7241379   .9655172
       c11 |   1.03252    .8275862          1
```

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