Earmarking policy: how it affects the Indonesian health and education sector

Faishal Fadli, Vietha Devia Sagita Sumantri

Departement of Economics, Faculty of Economics and Business, Brawijaya University, Malang, Indonesia

Article Info	ABSTRACT
	This research analyses the implementation of earmarking policies in Indonesia that allocate 20% of expenditure for the education sector and 5% for the health sector by using the difference in difference method in the before and after the pandemic period. This research uses life expectancy at birth, number of maternal deaths, and the budget allocation for health as a representation of the health sector. To represent the education sector, this research uses primary education pupils, the primary school pupils-teacher ratio, and the budget allocation for education. This research also using propensity score matching and chow breakpoint test for robustness checks. The results of this research show the health and education sectors improved during the implementation of earmarking policy. *This is an open access article under the [CC BY-SA](#) license.*

Corresponding Author:

Vietha Devia Sagita Sumantri
Departement of Economics, Faculty of Economics and Business, Brawijaya University
Veteran Stree, East Java, Malang, 65143 Indonesia
Email: vietha.devia@ub.ac.id

1. INTRODUCTION

Earmarking policy ensures the availability of a budget. Applicable laws apply the amount of the budget. The certainty of budget allocations can lead to the creation of efficiency in government spending [1]. With the creation of efficiency in government spending, the implementation of earmarking policy is expected to have a positive effect.

Earmarking is devoting specific revenue to the financing of particular public service and therefore provides certainty in budget allocations efficiently [2]. Earmarking policies can also improve the quality of public goods and services and create good governance [3]. Because earmarking policy can provide a certain amount of fund to create public goods and minimize corruption. Therefore, the private sector cannot provide public goods. People require public goods as they increase an individual's welfare. Inequality in the creation of public goods often occurs, especially in the remote area. It is due to lack of budget allocation and corruption. With the earmarking policy the lack of budget allocations can be eliminated. The implementation of the earmarking policy can therefore increase the welfare of the community [4].

Health and education provided by the government can also improve the welfare of the community [5]. This is because middle-income income groups cannot afford the health and education provided by the private sector. The role of the state is to provide health and education for the public in a way that can be reached by all levels of society [5]. The implementation of earmarking policy is expected to improve the quality of public goods and services for the health and education sector.

There are two categories of earmarking; substantive and symbolic [3]. Substantive earmarking policy is the practice of strongly linking the source of funds to their expenses. If the funds received an increase, then the expenditure will also proportionally increase. Symbolic earmarking of tax is the practice of

linking funding sources, expenditure, and loose rules so that policymakers impose taxes in line with the proportion of funds spent on expenditure items. The early stages of earmarking policies in Indonesia used symbolic types, but over time, the application of earmarking policy in Indonesia switched to the more efficient and effective subjective type.

Another source argues that there are two types of earmarking policy; full earmarks and partial earmarks [6]. Under a full earmark, the earmarked revenue source is the only source of revenue for the program, while a partial earmark permits the legislature to supplement the earmarked revenues with another source of funds. Therefore, partial earmarks are more efficient than full earmarks [7]. The earmarking policy applied in Indonesia is partial earmarks, and it is therefore expected to have a positive impact on the health and education sector.

In 2001, the earmarking policy was proposed for the education sector in Indonesia. Implementation started in 2003 for the education sector and in 2009 for the health sector. The legal basis for implementation is the issuance of Article 49 of Law Number 20 (2003) and Law Number 9 (2009) [2], [8].

The law requires a funding allocation of 20% for the education sector and 5% for the health sector from the overall government budget. The government budget referred to this research is the central government budget, not the regional government budget. The Indonesian government was able to implement the policy in its entirety in 2008 for the education sector and in 2015 for the health sector. Years, where requirements were missed, was due to a lack of funds in the Indonesian government budget to fulfil the policy. However, the years where the Indonesian government were able to fully fund the health and education sectors shows the persistence of the government to implement the earmarking policy. Therefore, this research aims to analyse whether the persistence of the Indonesian government is commensurate with the results obtained or not.

Some researchers state that the implementation of earmarked tax policies in other countries has been successful [2], [3], [8]–[11]. There are various reasons why some countries have successfully implemented this tax policy. The primary reason is that earmarking applies the benefit principle of taxation [11], [12]. Earmarking policy ensures that people will get a better education and health [13]. Also, earmarking policy provides more assurance of minimum levels of financing for public services that governments consider worthy. With the fulfilment of the minimum level of financing for public services, at least the government can provide public services, albeit at a minimum. For example, establishing schools and hospitals in remote areas. Thirdly, it will reduce corruption. Because earmarking policy sets the amount of budget allocation so that avoids periodic haggling within the bureaucracy and eradicates the need to create legislature for an appropriate level of funding. The fourth reason is that earmarking provides stability and continuity of funding, and the fifth reason is that earmarking policy may lead to lower costs due to the rapid speed at which projects are completed. The sixth reason is earmarking linking taxation with spending (for example vehicle tax is used to finance the highway construction). Furthermore, earmarking may overcome resistance to taxes and help to generate new sources of revenue. Also, earmarking policy garners political support which in turn leads to funding increase, and finally, earmarking constrains overall public spending and taxing [14].

However, several researchers have argued that the implementation of the earmarking policy in some countries was unsuccessful because of several problems [15]–[19]. Some of these problems include rigidity of budget allocations, uneven budget distribution, income distribution function failure, manipulation and compliance issues, the substitution of revenues, tax policy implications, increased tax administration, and compliance cost.

According to the previous research [2], [3], [8], [9], [15]–[20], no researchers have examined the impact of implementing earmarking policies in Indonesia on the health and education sectors directly. Therefore, this study aims to see how the impact of implementing earmarking policies in Indonesia, especially the impact on the education sector and the health sector. Whether the implementation of the earmarking policy has a positive or negative impact on the two sectors. The results of the research can be used as material for evaluating the implementation of earmarking policies in Indonesia by Indonesian government. If the implementation of the earmarking policy has a positive impact on these two sectors, this research can become a reference for the Indonesian government to implement earmarking policy in other sectors.

2. METHOD
2.1. Data
This research analyses the effects of the implementation of earmarking policies in Indonesia, specifically for the health and education sectors. This research obtained secondary data from the World Bank [21] (https://data.worldbank.org) and the data is transformed into quarterly and log versions from 1970 to 2017. The reason for transforming the data as such was because the implementation of the policy took approximately three months to see changes in percentages of the state budget. The transformation was also to standardise the data.

The President submitted the state budget draft at the House of Representatives Plenary Meeting in mid-August and this draft was approved by the House of Representatives at the end of September. The President then approved the State Budget Draft mid-October through the Law on State Revenue and Expenditure Budget. If there were any changes to the state budget draft, in mid-January the government represented by the Minister of Finance submitted the State Budget Revenue Amendment to the House of Representatives. The State Budget Revenue Amendment was then approved unanimously in the plenary session of the House of Representative in mid-February. If there were no changes, in January the government implemented the State Budget.

This research was conducted using life expectancy at birth (LEB) and number of maternal deaths (NMD) as a representation of the health sector. LEB indicates the number of years a new-born infant would live if common patterns of mortality at the time of birth were constant throughout the baby's life. NMD refers to the death of a woman either during pregnancy or within 42 days of termination of the pregnancy, irrespective of the duration and site of the pregnancy, of any cause related to or aggravated by the pregnancy, or of the management of the pregnancy, but not from accidental or incidental causes. Primary education pupils (PEP) and the primary school pupil-teacher ratio (PST) represent the education sector. PEP refers to the total number of pupils enrolled at primary level in public and private schools. PST is the average number of pupils per teacher in primary schools.

2.2. Chow breakpoint test

Chow test as an analytical tool to test whether there are two or more different regressions [22]. In the Chow test there is a model stability test which functions as a valid prediction in the use of a model when it is in a certain period of the entire range of estimated time periods [23]. If there are policy variables, the Chow test can assess whether the equation model can predict well from the period the policy was implemented to the end of the observation period. Here is the model equation:

$$F = \frac{(\mu'\mu - (\mu_1'\mu_1 + \mu_2'\mu_2))/k}{(\mu_1'\mu_1 + \mu_2'\mu_2)/(T-2k)} \tag{1}$$

where $\mu'\mu$ is the restricted sum of squared residuals, $\mu_i'\mu_i$ is the sum of squared residuals from subsample i, T is the total number of observations, and k is the number of parameters in the equation.

2.3. Difference in differences (DID) method

Difference in differences is one of the analytical tools that tries to imitate experimental research designs. The application of this analysis tool is to use data from observational studies, so that an evaluation of the differential effects of the treatment in the "'treatment group' versus 'control group' in a natural experiment is obtained [24]. DID can be used to conduct research on the effects of policy implementation and government intervention in an economy [25]. Models built using DID can assess the impact of treatment (implementation of policies in a government) on the results in the form of the dependent variable. The method of assessment is by identifying the average change over a certain period in the outcome variable for the treatment group against the average change over a certain period of time for the control group. The application of DID can reject exogenous effects and isolate the true effects of treatment. The Model as follows:

$$\text{Health Sector: } LEB_{cd} = \beta_c + \beta_d + \propto Treated_c \ X \ Post_d + \delta NMD_{cd} + u_{cd} \tag{2}$$

$$\text{Education Sector: } PEP_{cd} = \beta_c + \beta_d + \propto Treated_c \ X \ Post_d + \delta PST_{cd} + u_{cd} \tag{3}$$

Where the dependent variables are the LEB and PEP, the country c is at date d. βc reflect country-specific, time-invariant fixed effects and βd reflect time-specific, country-invariant fixed effects. $Treated c$ denotes a vector of dummy variables of $Treated c = 1$ for the treatment group and $Treated c = 0$ for the control group. The treatment group is Indonesia, and the control group is Malaysia. $Post t$ denotes a vector of dummy variables where $Post d = 1$ in the post-treatment period after the implementation of the earmarking policy was implemented at date $t \geq 0$, and $Treated c = 0$ otherwise. $u cd$ are the error terms. NMD and primary school PST country c at date d are the control variables. To overcome a potentially confounding size effect, this research is using control variables [26].

Meanwhile, to differentiate the value of θ, this study uses two sources of variation. First, this research is recognized using θ to utilise the variety between the treatment group and the control group. Second, to take advantage of the diversity within each group, θ is differentiated both before and after the earmarking policy is implemented.

Common trend assumption or parallel assumption must be met for the use of the DID methodology to work properly. No treatment results from the treatment group and the control group will give the same trend is the definition of the common trend assumption [26]. Usually in applying the common trend assumption, pre-treatment data is used to show the same trend.

Malaysia was used as the control group in this study due to similar characteristics with Indonesia. Moreover, Malaysia is a neighbouring country that borders directly with Indonesia. In addition, Malaysia has the same religion as Indonesia, so that Malaysia's customs and culture are similar to Indonesia's. The race of the Malaysian nation is also the same as Indonesia, namely the Malay race. This causes the structure of Malaysian society to be similar to that of Indonesian society. Therefore, the people of Malaysia and Indonesia share the same views on the health and education sector. Therefore, the use of Malaysia as a control group in the DID method is very appropriate to use to analyse the implementation of earmarking policies in Indonesia that are not implemented in Malaysia.

2.4. Propensity score matching (PSM) method

To eliminate selection bias, the control group must be selected carefully. Therefore, the PSM method was used to minimize the possibility of selection bias. In the various multidimensional matching variables, PSM can reduce one-dimensional scores in the matching process [25].

The logistic regression model is used in the application of the PSM method because this distribution is often close to normal [27]. Given the observed covariate vectors (x_i), as conditional probabilities for specifying certain treatments ($w_i=1$) versus non-treatment ($w_i=0$), PSM will define the trend scores for individuals. The covariates in vector X are called matching variables.

$$P(x_i) = pr(w_i = 1 | X = x_i) \tag{4}$$

The next process is to match treated subjects with non-treated subjects that support a computable propensity score. The methods usually used are nearest neighbour matching, radius matching, kernel matching, and stratification matching. Then, performing a balance assessment, which examines whether the propensity scores are balanced among the treatment and matched groups and whether the matched variables are balanced between the treatments and the matched teams among the propensity score strata.

3. RESULTS AND DISCUSSION
3.1. Chow breakpoint test

The results of the Chow breakpoint test in Table 1 show significant results for all variables. Indicated by the statistical F value > from the F Table and the probability value <5%. The conclusions obtained accept the hypothesis that the parameters are unstable for both periods before January 2003 and 2009 and after January 2003 and 2009 at 5% significance level. These results indicate that for both periods the parameters change significantly, or the implementation of earmarking policy affects the LEB, NMD, PEP, and the primary school PST.

Table 1. Stability test results parameter

Variable	Break date	F-statistic	p-value
PEP	January 2003	39.51610	0.0000
PST	January 2003	184.1203	0.0000
LEB	January 2009	147.2605	0.0000
NMD	January 2009	110.7200	0.0000

3.2. Difference in difference (DID) method

This research applies a variable trend graph before the implementation of treatment (earmarking policy) to meet the common trend assumption. This research can fulfil these assumptions if the graph displays the same trend in both the treatment and control group over time. Figure 1 shows a graph of these variables.

The inspection results for the common trend assumption show that all variables of the treatment and control group follow the same trend pattern before the implementation of the treatment-the difference in graph level is due to differences in population. The population in Indonesia is far greater than the population in Malaysia. As a result, the graph level for the variable of the number of maternal deaths and the number of Indonesian primary education pupils is higher than in Malaysia. It is inversely proportional to the life

expectancy at birth variable. Life expectancy at birth in Malaysia is higher as Malaysia's population is smaller than Indonesia's population.
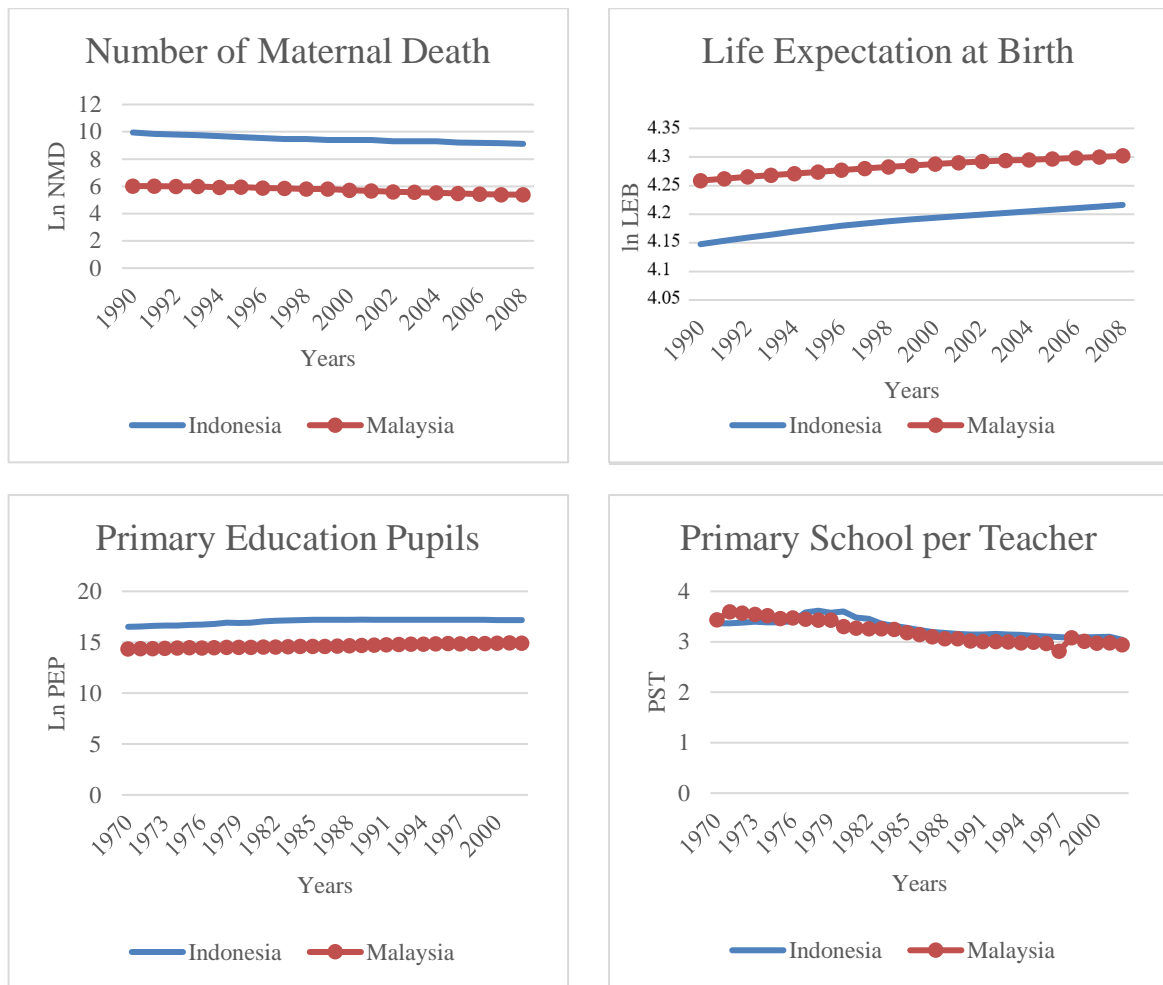

Figure 1. Common trend assumption test

Based on the summary data in Table 2, positive changes due to the implementation of the earmarking policy are shown. About 16 percent of the data has received the treatment. The LEB variable has increased by 0.1 percent and the NMD variable has decreased by 2 percent which means that there is an improvement in the health sector. However, the increase in the LEB variable is not as significant as the decrease in the NMD variable because the measure of one's life expectancy can only be evaluated in the long run.

Table 2. Summary of the data

Variables	Obs.	Mean	Std. Dev.	Min	Max
Before					
LEB	188	4.23	0.05	4.14	4.30
NMD	188	7.85	1.76	5.39	10.02
PEP	324	15.67	1.14	14.31	17.22
PST	324	3.12	0.31	2.25	3.61
After					
LEB	36	4.31	0.01	4.30	4.34
NMD	36	5.32	0.12	5.04	5.43
PEP	60	17.21	0.03	17.18	17.32
PST	60	2.91	0.11	2.63	3.03

In line with the health sector, the education sector has also experienced improvements. The PEP variable increased around 2% after the implementation of the earmarking policy while the PST variable decreased by around 1%. The decrease in the PST variable shows that the increase in the number of teachers exceeds the increase in the number of students.

Based on the results of the DID methods in Table 3, positive changes occurred after the implementation of the earmarking policy. IDN is Indonesia which determines whether there is an influence on the treatment variable. The result of the DID methods in the health sector shows that the LEB variable is estimated to grow by 0.17% per quarter, while the NMD variable will decrease by 0.07% every quarter. The allocation of funds for the health sector still grew positively by 0.002%. Comparing to Malaysia, Indonesia experienced a 0.17% higher LEB growth during the earmarking policy implementation.

Table 3. Difference in difference results

Variable	Coefficients	Std. Err.	T	P>|t|	95% Conf. Interval	
Health sector					R^2: 0.99	
ET	0.002	0.001	2.35	0.02	0.0003	0.004
IND	0.17	0.004	34.79	0.00	0.161	0.181
LEB	0.17	0.01	41.36	0.00	0.16	0.18
NMD	-0.07	0.00	-54.87	0.00	-0.07	-0.07
Education sector					R^2: 0.98	
ET	-0.066	0.029	-2.21	0.02	-0.124	-0.007
IND	2.44	0.016	149.63	0.00	2.41	2.47
PEP	2.37	0.02	103.00	0.00	2.32	2.42
PST	-0.68	0.03	-18.62	0.00	-0.75	-0.61

There is no difference in the results of the DID in the education sector, which shows that the PEP variable is estimated to grow by 2.37% per quarter, while the PST variable will decrease by 0.68% every quarter. The allocation of funds for the education sector was reduced by 0.066%. This is due to the achievement of an education fund allocation of 20% of the total state budget. Compared to Malaysia, Indonesia experienced a 2.44% higher PEP growth during the earmarking policy implementation.

The primary objective of the 20% funding allocation for the education sector and 5% for the health sector has been to improve the quality of the two sectors. With the increase and certainty of budget allocations, the programmes to be carried out by the ministries in both sectors are more numerous and diverse. One example in the education sector is the increase in quantity and quality of teachers through the recruitment of new teachers and training provisions for all teachers. Consequently, PST experienced a decline in the implementation of the earmarking policy. The allocation of funds can also be used to eliminate primary education fees so that people in the middle to lower classes can access primary education. The impact of this is an increase in the PEP.

In the draft for the 2019 government budget, the education budget is planned at 487.9 trillion rupiahs. This amount is up by 9.86% from 2018 budget of 444.1 trillion rupiahs and is up by 38.1% from the 2014 budget. The government can match this amount due to the application of the earmarking policy. The budget has been used to run programmes from the Ministry of Education.

An example of the improvement in the health sector is the increase in the quantity and quality of medical personnel and hospitals. The increase and certainty of the allocation of funds for the health sector reduce the cost of health insurance provided by the government. It has an impact of increasing the LEB variable and decreasing the NMD variable. The Indonesian Government cannot implement these programs without the implementation of the earmarking policy.

As a result of implementing the earmarking policy, the government can allocate funds of 122 trillion rupiahs (or 5%) of the total budget for the health sector in 2018. The funds are used by the Ministry of Health to carry out three focuses of the Healthy Indonesia Programme: Healthy Living Movement, Family Approach, and Minimum Service Standards. The Movement of Healthy Living Communities is a cross-sector engagement, and all development factors include the community to implement health development. The family approach includes health services as it reaches out to all families in the working area of the Community Health Centre (regional).

3.3. Propensity score matching (PSM) method

This research used the number of maternal deaths and life expectations at birth for the health sector and the primary education per teacher and primary school per teacher for the education sector as matching variables. The matching ratio was 1:1. Table 4 presents the PSM results which show that the difference between the treatment country and matched country is negligible. The results of the estimation of the average

treatment of treated effect (ATT) with 3 matching methods (nearest neighbour, radius, and stratification) in Table 4 also show conformity with the DID coefficients results. The t-test in Table 4 shows significant results (>t table). These results indicate that it is appropriate to use the Malaysia as a control group and Indonesia as the treatment group.

Table 4. Propensity matching results

| Matching methods | Variable | | | | | | | |
| | PEP | | PST | | LEB | | NMD | |
	ATT	t	ATT	t	ATT	t	ATT	t
Nearest neighbor	2.577	156.723	-0.296	-12.403	2.921	26.311	-0.041	-3.129
Radius	2.577	156.722	-0.296	-12.403	2.921	26.311	-0.041	-3.129
Stratification	2.577	156.723	-0.296	-12.403	2.921	26.311	-0.041	-3.129

Robustness checks is a method used in quantitative research to test the validity of previous test results. The reason for carrying out robustness checks is to identify changes in conclusions when assumptions change. Bayesian perspective does not require a robustness check, although if the research has significant uncertainty in its assumptions, it should incorporate this into the model. However, there are always alternate data-analysis choices, so it is possible to consider other multiverse branches.

This research uses the PSM method for robustness checks. This research also applied a placebo test to explore whether the earmarking policy affected only Indonesia. Moreover, the decrease and increase of each variable is not the effect of the seasonal trend of each variable. Carrying out a placebo test is an alternate way to test the assumption used in the difference in difference method that using different treatment and control group will result differently [24]. Because if the placebo test is not different, then the impact is not the result of policy implementation.

Table 5 is the result of the placebo test. The application of the placebo test uses the PSM method. The research variables and the research duration used were identical to the actual test. The only changes are that Singapore was used as the treatment group and Brunei Darussalam as the control group. The same reason was also applied when using both countries.

The results of the placebo test showed that the implementation of the earmarking policy in Indonesia had no impact on other country education and health sectors (such as Singapore and Brunei Darussalam). The results of the estimation of the propensity score for the placebo test in the Table 5 show that there is no relationship between the applications of the earmarking policy and the education sector. This varies from the results of its application in Indonesia, which showed positive results. Although the results of the placebo test in the health sector showed a manner of influence, this was in a decline of the results in the health sector due to an increase in NMD.

Table 5. Placebo estimation of the propensity score

Variable	Coefficients	Std. Err.	Z	P>|z|	95% Conf. Interval	
Health sector						
NMD	0.80	0.21	3.81	0.00	0.39	1.21
Education sector						
PST	5.949242	0.8549997	6.96	0.000	4.273473	7.62501

The same as Table 5, this placebo test also used the number of maternal deaths for the health sector and the primary education per teacher for the education sector as matching variables. Table 6 presents the PSM results which show that the difference between the treatment country and matched country is also negligible. These results indicate that it is appropriate to use the Brunei Darussalam state as a control group.

Table 6. Placebo propensity matching results

| Matching methods | Education sector | | Health sector | |
	ATT	t	ATT	t
Nearest neighbor matching	2.004	104.978	0.811	28.634
Radius matching	1.989	107.194	0.811	28.634
Stratification matching	2.001	113.459	0.811	28.634

So far, the government has provided educational assistance and scholarships from a pre-school level up to the highest level of education, especially for the poor. In 2019, the government provide scholarships to 20.1 million students through the Smart Indonesia Program. Through the *Bidik Misi* scholarship, the Ministry of Education assisted 471,800 students. Furthermore, between 2014 and 2019, the Indonesian government also invested in the Education Fund Management Institution and provided scholarships to around 27,000 students to continue their education at home and abroad. The government also finances 123 selected research contracts.

In 2017, the School Operational Assistance Program had increased the net enrolment rate for primary, junior high, high, and Islamic schools by 10% at 18.62% from the initial period of implementation of the earmarking policy of 8.55%. Therefore, the education ministry allocated state expenditures to strengthen the School Operational Assistance program for 57 million students, improving the quality of government employees and non-government employee's teachers through professional allowances and accelerating school construction and rehabilitation. Furthermore, educational assistance is intended to build 1,407 vocational practice rooms and help with the certification of 3,000 students as well as strengthening vocational programs greater in size and integrated across ministries and assists with the construction of classroom and laboratory facilities in a thousand Islamic boarding schools.

The Indonesian Government applied the earmarking policy for the health sector and used 5% of the total budget in 2016. By December 2016, 1,422 health workers (251 medical teams) had been placed in 28 provinces and 91 regencies/cities. In 2017 these figures were increased with 347 health workers working in 60 Community Health Centres. This was a breakthrough in the distribution of health workers in Indonesia.

Also, the maternal mortality rate decreased from 5,019 people in 2013 to 4,704 people in 2016. The infant mortality rate decreased from 23,703 babies in 2013 to 21,549 babies in 2016. The number of children under five who experienced stunted growth also decreased from 37.2% in 2013 to 27.5% in 2016. By the end of 2016, the Ministry of Health had distributed 4,952.2 tonnes of extra food for 550,248 pregnant women who experienced chronic energy deficiency.

In 2015, data from the Ministry of Health showed that 225 districts/cities were declared free of malaria. This figure increased in 2016 to 240 districts/cities. Furthermore, 240 districts/cities managed to reduce the incidence rate of dengue fever by 62% in 2016. Moreover, in May 2016, the World Health Organisation declared that Indonesia had succeeded in eliminating neonatal maternal tetanus in Papua and West Papua.

Infrastructure owned by the Ministry of Health has also developed. In addition to developing the existing Public Health Centre, the government has also invested in the completion of 124 Community Health Centres in the border area. Further building and development of 379 Community Health Centres for remote and border areas have also continued. The Ministry of Health also plans to build 55 primary hospitals, which have reached 23 primary hospitals until 2016. The entire work programme of the health ministry cannot be executed without sufficient and constant budget allocation because most infrastructure projects are multi-year projects. Therefore, the application of the earmarking policy in the health sector does have a positive impact.

Although this research uses a different method from previous studies, the results of this study are in line with previous studies which state that implementing earmarking policies can have a positive impact [4], [11], [13], [28], [29]. Because when the Indonesian Government implements an earmarking policy, the government can better guarantee the minimum level of financing for public services that are considered appropriate. In addition, the implementation of earmarking policies can reduce the level of corruption because earmarking policies determine the amount of budget allocations thereby avoiding periodic bargaining within the bureaucracy and eliminating the need to establish a legislature for the appropriate level of funding [6], [14], [30], [31]. What's more, implementing an earmarking policy can lead to lower costs due to the fast speed of project completion due to the stability and certainty of funding. Implementing earmarking policies can also overcome tax resistance, help generate new sources of revenue, and can limit overall public spending and taxes [3], [7], [10].

4. CONCLUSION

This research analyses the effect of the earmarking policy on health and education sectors by using the chow breakpoint test, DID, and PSM methods. The result indicates that the earmarking policy could effectively improve the health and education sector. Those sectors are the primary component for increasing human resources. The increase in the LEB variable and a decrease in the NMD variable for the health sector reflects an improvement. The increase in the PEP variable and a decrease in the PST variable reflect an improvement in the education sector.

This result can act as an evaluation material so that the implementation of the earmarking policy can continue. Policymakers can use this research as one of the primary considerations to increase the allocation

of funds for the health sector. Policymakers should also be able to implement the earmarking policy in other vital sectors. However, to investigate the long-term effects of earmarking policy on health and education sectors, further analysis is required.

REFERENCES

[1]   J. Burkhead and J. Miner, *Public Expenditure*. New York: Routledge, 2017. doi: 10.4324/9781315127712.
[2]   F. Fadli, O. Hongbing, and Y. Liu, "Earmarking tax for Indonesia's economic growth through the education and health sector in the long and short term period," *Business and Economic Research*, vol. 10, no. 1, p. 1, Nov. 2019, doi: 10.5296/ber.v10i1.15889.
[3]   R. M. Bird, "Tobacco and alcohol excise taxes for improving public health and revenue outcomes : marrying sin and virtue ?," *Policy Research Working Paper Series, 2015.*, no. November, pp. 1–35, Nov. 2015, doi: 10.1596/1813-9450-7500.
[4]   J. Winters and D. Sridhar, "Earmarking for global health: benefits and perils of the World Bank's trust fund model," *BMJ*, p. j3394, Aug. 2017, doi: 10.1136/bmj.j3394.
[5]   P. Flavin, "State government public goods spending and citizens' quality of life," *Social Science Research*, vol. 78, pp. 28–40, Feb. 2019, doi: 10.1016/j.ssresearch.2018.11.004.
[6]   J. Michael, "Earmarking State Tax Revenues," New York, 2015. [accessed: Aug 30 2021]. Available: https://www.leg.mn.gov/docs/2008/other/080060.pdf.
[7]   J. Jackson, "Tax earmarking, party politics and gubernatorial veto: theory and evidence from US states," *Public Choice*, vol. 155, no. 1–2, pp. 1–18, Apr. 2013, doi: 10.1007/s11127-011-9822-y.
[8]   F. Fadli, G. Maski, and V. D. S. Sumantri, "Earmarking tax: Can it increase public trust in the indonesian government?," *Institutions and Economies*, vol. 12, no. 2, pp. 1–40, 2020.
[9]   T. Stratmann, "The effects of earmarks on the likelihood of reelection," *European Journal of Political Economy*, vol. 32, no. December 2009, pp. 341–355, 2013, doi: 10.1016/j.ejpoleco.2013.08.001.
[10]   J. Jou, J. Niederdeppe, C. L. Barry, and S. E. Gollust, "Strategic messaging to promote taxation of sugar-sweetened beverages: lessons from recent political campaigns," *American Journal of Public Health*, vol. 104, no. 5, pp. 847–853, May 2014, doi: 10.2105/AJPH.2013.301679.
[11]   S. Carattini, M. Carvalho, and S. Fankhauser, "Overcoming public resistance to carbon taxes," *WIREs Climate Change*, vol. 9, no. 5, Sep. 2018, doi: 10.1002/wcc.531.
[12]   J. A. Stark and E. Kirchler, "Inheritance tax compliance – earmarking with normative value principles," *International Journal of Sociology and Social Policy*, vol. 37, no. 7/8, pp. 452–467, Jul. 2017, doi: 10.1108/IJSSP-07-2016-0086.
[13]   C. Cashin, S. Sparkes, and D. Bloom, *Earmarking for Health: From Theory to Practice*, 5th ed., no. 5. 2017.
[14]   V. Z. Eichenauer and B. Reinsberg, "What determines earmarked funding to international development organizations? Evidence from the new multi-bi aid data," *Review of International Organizations*, vol. 12, no. 2, pp. 171–197, Jun. 2017, doi: 10.1007/S11558-017-9267-2.
[15]   S. Bauhoff, I. Rodríguez-Bernate, D. Göpffarth, R. Guerrero, I. Galindo-Henriquez, and F. Nates, "Health plan payment in Colombia," *Risk Adjustment, Risk Sharing and Premium Regulation in Health Insurance Markets*, pp. 279–294, Jan. 2018, doi: 10.1016/B978-0-12-811325-7.00010-5.
[16]   M. Besiou, A. J. Pedraza-Martinez, and L. N. Van Wassenhove, "Vehicle supply chains in humanitarian operations: Decentralization, operational mix, and earmarked funding," *Production and Operations Management*, vol. 23, no. 11, pp. 1950–1965, Nov. 2014, doi: 10.1111/poms.12215.
[17]   P. Hieronymi, "The use of reasons in thought (and the use of earmarks in arguments)," *Ethics*, vol. 124, no. 1, pp. 114–127, 2013, doi: 10.1086/671402.
[18]   G. Barabucci, A. Di Iorio, S. Peroni, F. Poggi, and F. Vitali, "Annotations with EARMARK in practice," in *Proceedings of the 1st International Workshop on Collaborative Annotations in Shared Environment metadata, vocabularies and techniques in the Digital Humanities - DH-CASE '13*, 2013, pp. 1–8. doi: 10.1145/2517978.2517990.
[19]   F. Toyasaki and T. Wakolbinger, "Impacts of earmarked private donations for disaster fundraising," *Annals of Operations Research*, vol. 221, no. 1, pp. 427–447, Oct. 2014, doi: 10.1007/s10479-011-1038-5.
[20]   A. Baranzini and S. Carattini, "Effectiveness, earmarking and labeling: testing the acceptability of carbon taxes with survey data," *Environmental Economics and Policy Studies*, vol. 19, no. 1, pp. 197–227, Jan. 2017, doi: 10.1007/s10018-016-0144-7.
[21]   T. W. Bank, "World Bank Open Data | Data," 2021. https://data.worldbank.org/ (accessed Aug. 30, 2021).
[22]   D. Ciuiu, M. Bădileanu, and L. I. Georgescu, "Granger causality test and chow breakpoint test on the romanian day ahead electricity market," *Procedia Economics and Finance*, vol. 22, pp. 601–609, 2015, doi: 10.1016/s2212-5671(15)00269-5.
[23]   D. N. Gujarati, *Basic Econometric*. New Delhi: Tata McGraw Hill Publishing Company Limited, New Delhi, 2012. doi: 10.1126/science.1186874.
[24]   A. Goodman-Bacon, "Difference-in-differences with variation in treatment timing," Cambridge, MA, Sep. 2018. doi: 10.3386/w25018.
[25]   Y. Yan and O. Hongbing, "Effects of house-sale restrictions in China: a difference-in-difference approach," *Applied Economics Letters*, vol. 25, no. 15, pp. 1051–1057, Sep. 2018, doi: 10.1080/13504851.2017.1394968.
[26]   Y. Shu and J. Cai, "'Alcohol Bans': Can they reveal the effect of Xi Jinping's anti-corruption campaign?," *European Journal of Political Economy*, vol. 50, pp. 37–51, 2017, doi: 10.1016/j.ejpoleco.2017.09.004.
[27]   C. J. Morgan, "Reducing bias using propensity score matching," *Journal of Nuclear Cardiology*, vol. 25, no. 2. Springer New York LLC, pp. 404–406, Apr. 2018. doi: 10.1007/s12350-017-1012-y.
[28]   A. Wright, K. E. Smith, and M. Hellowell, "Policy lessons from health taxes: a systematic review of empirical studies," *BMC Public Health*, vol. 17, no. 1, p. 583, Dec. 2017, doi: 10.1186/s12889-017-4497-z.
[29]   Inayati, Gunadi, and H. Rosdiana, "Earmarking tax policy on local taxation in indonesia: towards pro fiscal legitimacy and budget flexibility policy," *KnE Social Sciences*, vol. 3, no. 10, p. 372, Aug. 2018, doi: 10.18502/kss.v3i10.2922.
[30]   M.-F. F. Cuéllar, "Earmarking earmarking," *SSRN Electronic Journal*, vol. 49, no. 2, pp. 249–301, 2012, doi: 10.2139/ssrn.1981836.
[31]   A. Aflaki and A. J. Pedraza-Martinez, "Humanitarian funding in a multi-donor market with donation uncertainty," *Production and Operations Management*, vol. 25, no. 7, pp. 1274–1291, Jul. 2016, doi: 10.1111/poms.12563.

BIOGRAPHIES OF AUTHORS

Faishal Fadli 🆔 🔗 sc ⟳ is a lecturer at the Department of Economics, University of Brawijaya Malang. Doctorate in Economics obtained from Huazhong University of Science and Technology, Wuhan, China. Received a full scholarship from the Chinese government during his doctoral study process. Apart from teaching undergraduate and postgraduate classes, he also participates in research and community service. Has a variety of journals published at the international level indexed by Scopus, EBSCO, and ABI. Besides, he is also a Reviewer and Editor in the KARINOV Journal, SAGE OPEN, and the South Asian Journal of Social Studies and Economics. In addition, he is also active in attending and being a speaker at conferences both at the national and international levels. He can be contacted at email: faishalfadli@ub.ac.id.

Vietha Devia Sagita Sumantri 🆔 🔗 sc ⟳ is a lecturer at the Department of Economics, University of Brawijaya Malang. Her doctoral degree was obtained from the Department of Economics at Huazhong University of Science and Technology, Wuhan, China. Received a full scholarship from the Chinese Government to pursue her doctoral degree. Actively teaching undergraduate and postgraduate students, conducting research with outputs in the form of scientific journals and conferences that have been published at the international level in the Scopus and EBSCO indexes, and actively participates in conducting community service on a national scale. She is also an Editor in the KARINOV Journal and actively attend and being a speaker at conferences both at the national and international levels. She can be contacted at email: vietha.devia@ub.ac.id.