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# Public Health Spending, Governance Quality and Poverty Alleviation

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## Abstract

Poverty alleviation has become the main priority program in most developing countries. This research empirically studies the correlation between public health spending, governance quality, and poverty alleviation in developing countries. The panel data were estimated via a random-effects (RE) model and robustness check using instrumental variables (IV) (two-stage least-squares [2SLS]) and first-difference generalized method of moments (GMM) because of the endogeneity problem. The results suggest that public health spending has a significant effect on reducing the poverty rate, and that countries with better governance tend to reduce poverty than countries with poor governance. Increasing public health spending by one percentage point may reduce poverty by 0.48 percentage points in countries with good governance supposing the governance quality influences public health spending. Conversely, in countries with poor governance, the poverty headcount ratio may decline by 1.375 percentage points when public health spending increases by one percentage point.

**Keywords:** public health spending; governance; poverty

**JEL classifications:** H5; I1

## 1. Introduction

Poverty alleviation has become a top priority in most developing countries. The goal to ‘eradicate extreme poverty and hunger’ was featured prominently in the Millennium Development Goals, superseded in 2015 when the United Nations (UN) launched a new program, the Sustainable Development Goals. This program has 17 agendas, the first of which is ‘no poverty’, and the aim is for countries to attain this target by the end of 2030. In 2015, approximately 10% of the population in the world was living below the poverty line (World Bank 2018). Most live in developing countries. The UN thus encourages the governments all over the world, especially those of developing countries, to minimize poverty.

The governments in developing countries attempt to

achieve this by boosting economic growth, which is arguably the most important instrument for poverty reduction. Growing the economy by boosting labor demand creates employment opportunities for the poor, thereby pulling them out of poverty. However, income distribution may be unequal between the rich and the poor because of their uneven participation in this growth process—wealthier groups tend to benefit more from economic growth than poorer groups. This means economic growth has a limited ability to reduce poverty. The target to end poverty in 2030 is unlikely to be achieved by relying only on economic growth (World Bank 2014). Additional efforts should thus be made to enable economic growth to effectively reduce poverty. For example, the governments can intervene by implementing pro-poor policies. These policies can be enacted by allocating resources for public spending to reduce poverty.

Several researchers have investigated the correlation between various targeted public expenditure

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programs and poverty alleviation. However, their results vary greatly and rely on the type of government spending. For instance, Mosley, Hudson & Verschoor (2004) have found that pro-poor public expenditure has a negative and substantial impact on the poverty headcount at \$1 per day. Pro-poor spending in their study is defined as primary education and social spending. Health spending is not categorized as pro-poor, but is used to measure infant mortality. Wilhelm & Fiestas (2005) have concluded, based on nine previous studies, that government spending on education, health, agriculture and infrastructure has a positive effect on poverty alleviation.

Anderson et al. (2018) have investigated whether government spending affects income poverty, concluding that there is no clear indication that public expenditure significantly contributes to alleviating poverty in developing countries. Anderson et al. (2018) have observed that the correlation between public expenditure and poverty alleviation is influenced by factors including the type of public spending, the control variables used in the regression model, and the regions of the country sampled for the estimation. The difference in results between Mosley, Hudson & Verschoor (2004) and Anderson et al. (2018) can be attributed to the types of government expenditure explored in these two studies. Therefore, the effectiveness of different types of government expenditure in alleviating poverty must continue to be explored.

This paper investigates how public health spending, a form of government expenditure, can alleviate poverty for several reasons. First, good health enables people to undertake essential activities, such as work and school. Good health is a crucial asset for poor people because it is unlikely for them to have other assets compared with wealthier people. Supposing the poor get sick, they cannot work, meaning they cannot earn income, whereas wealthier people may rely on assets such as savings or other forms of financial support when they are unwell and unable to work. However, supposing the poor are healthy, they can be more pro-

ductive in an economic sense and earn more income, which can lift them out of extreme poverty. Second, certain diseases, such as tuberculosis (TB), can increase the poverty rate because of the high cost of treatment. The cost of treatment for TB is around 15% of the annual income of poor households in Thailand (World Health Organization, 2002). Several prior studies have examined the effect of public health spending on poverty. Several have researched poverty reduction caused by economic growth, globalization, trade openness, foreign aid, and public spending allocation in general. Researchers have focused on the effect of public health spending on health outcomes, such as infant mortality and life expectancy. Lanjouw et al. (2001) have investigated the significance of public spending in Indonesia on primary health care for the poor. They have discovered that the patterns are consistent with the experience of other countries: that primary health care spending tends to be pro-poor. Increasing spending on primary health care will provide the greatest benefit to the poor. This research can prove that public health spending is promising to alleviate poverty in developing countries. Therefore, this study investigates whether public health spending can reduce poverty.

Poverty reduction through government expenditure can also be affected by other factors such as governance. Khan (2005) has stated that, generally, 'governance' is a concept that comprises procedures, rules, practices, and norms that regulate who examines power to achieve something and how to control the decision-makers. Studies by Anderson, de Renzio & Levy (2006) and Fozzard (2001) have found that government budget allocation is influenced by political processes and technical analysis is significant. Another concern is the quality of budgeting rather than the quantity of budget allocation (Simson 2012). This study suggests that poverty alleviation is best facilitated by ensuring that government spending is accountable and transparent, and thus strengthening the demand side of the governance (Simson 2012).

Several studies have also examined the contribution

of governance to health and education outcomes. Rajkumar & Swaroop (2008) have observed that the value of the governance of a country can be evaluated by the levels of bureaucracy and corruption. They have discovered that public health spending and government expenditure on primary education have a greater effect in countries with good governance. However, in poorly governed countries, public spending has virtually no effect on education and health outcomes. Makuta & O'Hare (2015) have examined the quality of governance in Sub-Saharan Africa and the effect of government expenditure on health outcomes. According to their results, countries with good governance minimize under-five mortality and increase life expectancy more effectively than countries with poor governance when both types of countries undergo the same increase in public health spending.

Therefore, this paper also examines governance quality as an independent variable and as an interaction variable with public health spending for several reasons. First, the cycle of government expenditure of planning, budgeting, implementation, and evaluation can lead to inefficiency, corruption, and poor planning. Second, previous studies have not determined whether public expenditure on poverty alleviation has better outcomes in countries with good governance. Similar researches have studied the correlation between public expenditure and education and health outcomes (Makuta & O'Hare 2015; Rajkumar & Swaroop 2008). This study seeks to determine whether the results will align with those of previous studies on health and education outcomes. This paper is structured as follows. Chapter 2 presents the literature review and theories that explain the correlation between public health spending, governance quality, and poverty. Chapter 3 describes the empirical models that contain the variables and the data used in the research. Chapter 4 presents the results of the study. Chapter 5 discusses the results and Chapter 6 concludes the main findings and proposes recommendations for future studies.

## 2. Literature Review

It is believed that government expenditure affects poverty alleviation. However, the effect of public spending on poverty is complex and varied widely depending on the type of expenditure—for example, education, nutrition or health. This type of government expenditure tends to alleviate poverty and is often called pro-poor expenditure (Carter 2015).

Pro-poor expenditure is also known as spending on anti-poverty in Indonesia. Anti-poverty spending in Indonesia increased to 1.4% of GDP in 1998/1999 when the 'social safety net' was launched (Daly & Fane 2002). The main focus changed from job creation schemes, financed mainly by loans and grants to small firms and community groups, to in-kind subsidies for rice, public health care, scholarships for children in poor families, and grants for schools in poor areas. The most accurately targeted program was health care, covering twice as many people in the two poorest deciles as in the remaining eight. They have argued that health care programs were the most successful.

Sasana & Kusuma (2018) have investigated government expenditure and poverty in Indonesia. They discovered that government expenditure had negative effect on poverty in 33 provinces in Indonesia during the period of 2008–2013. The poverty rate was lower in provinces with higher government expenditure. They suggested that government expenditure should be allocated on a pro poor principle, to allow the poor to easily access public facilities such as schools, health, and sanitation.

Conversely, Anderson et al. (2018) have found that government expenditure does not have a significant effect on reducing poverty. They have analysed 19 studies on how government expenditure affects income poverty, including any type of expenditure that can play an insignificant role in poverty alleviation. Following on these previous studies, this study focuses on government health expenditure because health plays an important role in alleviating poverty.

Health is an important asset for the poor since the

poor depend on their health to obtain income. They are more likely to have no other assets. On the other hand, rich people can use their assets when they feel unhealthy. They have assets and other financial capital.

Poor health can cause poverty. A sick person must pay for healthcare, including transportation to visit health providers and additional costs supposing they need to stay in health facilities for several days. Health status also has a relationship with income. Supposing the head of the family becomes sick, they cannot work. This situation can affect other family members, as one of them may need to take care of the sick. As a result, both family members cannot work. Supposing they are paid for the days they work, they will lose their income. In addition, low-income families affected by the illness tend to sell their assets to pay for medical costs or borrow from money lenders with high interest rates, which can make them poorer. Since health status can affect poverty, the government should intervene by providing the poor with a budget to access healthcare.

Governance also affects poverty outcomes. Since the outcomes of government expenditure are determined by how it is allocated, the poor cannot fully accept the budget. Reducing allocation renders the health budget smaller and thus limits the opportunity to alleviate poverty. As a consequence, the outcome may not be as expected by the government. To prevent this type of corruption, the government should protect the budget from corruption, inefficiency, and the process of creating rules or policies. This study uses government effectiveness as an indicator to measure government inefficiency in implementing the budget. This indicator also measures the quality of policy to ensure that public spending can be effectively targeted to reduce poverty. This indicator is used here to investigate whether the outcomes of government spending are similar or different to those found in previous studies (Makuta & O'Hare 2015; Rajkumar & Swaroop 2008). Based on the theoretical view, this empirical study predicts that public health spending and governance quality

will reduce poverty.

In reality, the great achievement over the last generation is that the world has succeeded in reducing the number of people who live under poverty rate from around 1.9 billion in 1990 to about 650 million in 2018 (World Bank 2018). However, Sub-Saharan Africa will have a greater share of the poor in 2030 based on the estimation of the World Bank by 87% of the poorest population of the world supposing economic growth continues its recent previous trajectory. The countries in Sub-Saharan Africa are developing countries. Therefore, this study focuses on developing countries since the population of the poor in the world lives in developing countries.

### 3. Method

#### 3.1. Estimation Strategy

In this study, the poverty alleviation function (POV) depends on government expenditure (GE), governance quality (GOV), and other explanatory variables (X). Generally, the poverty function can be expressed as follows:

$$POV = f(GE, GOV, X)$$

We estimated poverty alleviation as the following model:

$$POV_{it} = \beta_0 + \beta_1 HEALTH_{it} + \beta_2 GOV_{it} + \beta_3 GDP_{pcit} + \beta_4 TRADE_{it} + \varepsilon_{it} \quad (1)$$

The variables can be explained as follows: POV represents the measure of the poverty rate. Even though there are numerous measurements of poverty, this study focuses on poverty headcount ratio. This measurement is relatively reliable for the specific data in this study compared with other measurements of poverty. It measures the number of poor people (headcount) whose income is below the poverty line relative to the whole population of the region or country measured. To determine the poverty line, this study uses a daily purchasing

power parity. Since the research concentrates on developing countries, we used an income of \$1.90 a day and defined the poverty line as the minimum standard for people to be involved in economic life. Supposing the income of an individual falls below \$1.90, they are categorized as poor. This measurement follows a previous research by Kwon & Kim (2014).

HEALTH is public health spending. It defines government expenditure as a function of poverty reduction. Thus, we examined HEALTH as the main interest variable. Based on the World Bank data, developing countries usually divide their expenditure budget according to different sectors: general government, education, health, agriculture, infrastructure, consumption, and military. Each sector has specific purposes. All does not affect poverty reduction. According to previous literature, pro-poor expenditure tends to play a significant role in alleviating poverty. The main types of pro-poor expenditure are education, health, agriculture, and infrastructure. Anderson et al. (2018) have found that health and education spending are statistically significant, reducing poverty at the 1% level. Kwon & Kim (2014) have used public health spending as a control variable when estimating the effect of governance on poverty. This paper uses public health expenditure as the interest variable. Since the focus is on developing countries, the data should have a similar measurement to public health spending. Thus, public health spending is measured as a share of gross domestic profit (GDP) instead of measured as a share of total spending.

GOV measures the quality of governance. We assumed that governance quality can reduce poverty rate. Prior studies by Makuta & O'Hare (2015) and Rajkumar & Swaroop (2008) have found that countries with better governance quality can improve educational outcomes, reduce infant mortality, and increase life expectancy than countries with poor governance quality. Regarding GOV variable, we used dummy variables to differentiate between countries with good governance and those with poor governance. We defined GOV = 1 where the govern-

ment effectiveness index of the country is above the mean and GOV = 0 supposing that index is below the mean. Following Kwon & Kim (2014) and Makuta & O'Hare (2015), we used the government effectiveness index from the Worldwide Governance Indicators (WGI).

Generally, WGI is calculated by Kaufmann, Kraay & Mastruzzi (2010). The indicators are based on 31 different types of data from numerous variables that capture governance opinion from survey respondents, different types of public organizations among countries, providers of the profitable business of information, and non-government institutions. They capture the governance from inception until implementation. This starts when people in each country vote to elect their representatives in parliament or vote for their president. The WGI includes Voice and Accountability, Political Stability, and Lack of Violence to determine the process of selecting, monitoring, and replacing the government. The Government Effectiveness indicator captures how the government formulates policies on whether this process is effective and efficient. This indicator is captured using the perceptions of survey respondents. We focused on the Government Effectiveness index rather than the other five WGI indexes because we examined the quality of policies in developing countries, including the quality of public services and the commitment of governments to formulate and implement policies effectively.

Regarding the explanatory variable (X), we used the following determinant factors that affect poverty: GDP per capita (GDPpc) and trade. All control variables are measured as a share of GDP, since the research covers developing countries. Anderson et al. (2018) have found that the differences in regression results are due to the choice of control variables. We thus chose control variables that significantly affect the dependent variable. Following Makuta & O'Hare (2015) and Rajkumar & Swaroop (2008), GDP per capita is essential for this model. When GDP per capita increases, the income of the people in that country also rises. In this study, it is assumed that poor people will benefit from an

increase in their income. In addition, trade grows the economy of a country, and economic growth leads to optimal revenue. Higher expenditure proportionate to the need to alleviate poverty is possible supposing the income of the country is higher. Bayar & Sezgin (2017) have found that trade openness and improvement in the financial sector play a significant role in reducing poverty.

We also estimated the impact of governance quality on public health spending to reduce poverty by using the interaction between governance quality and public health spending as follows:

$$\begin{aligned} \text{POV}_{it} = & \beta_0 + \beta_1 \text{HEALTH}_{it} + \beta_2 \text{GOV}_{it} \\ & + \beta_3 (\text{HEALTH}_{it} * \text{GOV}_{it}) + \beta_4 \text{GDPpc}_{it} \\ & + \beta_5 \text{TRADE}_{it} + \varepsilon_{it} \end{aligned} \quad (2)$$

Finally, we assessed the total impact of public health spending on poverty alleviation, both directly and indirectly, through governance quality using this equation by Rajkumar & Swaroop (2008):

$$\frac{\% \Delta \text{POV}}{\% \Delta \text{HEALTH}} = \beta_1 + \beta_3 \text{GOV}_{it} \quad (3)$$

### 3.2. Data

This paper analyzes cross-country data from 24 lower–upper and middle–upper income countries from 2003 to 2016. We used secondary data from several sources. Our empirical analysis uses the World Bank data from 24 developing countries in 2003–2016. In addition, for the term of governance, this study follows Asra et al. (2005), and Makuta & O'Hare (2015) by using WGI (Kaufmann, Kraay & Mastruzzi 2010). The sample of 24 developing countries was chosen since they have completed the data for poverty rate and other variables. Mostly, the data of developing countries are incomplete. Therefore, finding ideal sample of developing countries is challenging.

### 3.3. Robustness Check

Statistical issues might occur when we estimated poverty alleviation using this model. First, we had to clarify the appropriate approach for estimating the panel dataset. We used the Chow test and the Hausman test to choose the appropriate model from a pooled least-squares (OLS) model, a fixed-effects (FE) model, and a random-effects (RE) model. Since the poverty variable has missing values, we employed multiple imputations to check the consistency of our results using listwise deletion. We then checked whether the heteroscedasticity and autocorrelation problems exist.

Finally, we applied the instrument variable (IV) to address the endogeneity problem. According to the previous researches by Filmer & Pritchett (1999), Makuta & O'Hare (2015), and Rajkumar & Swaroop (2008), public health spending and its outcomes can move in two directions. Public health spending and poverty potentially affect each other. Poverty reduction may rely on the amount of public health spending, and the allocation of public health spending can align with a poverty reduction target. This means there is a reverse causality between public health spending and poverty in this paper. Without addressing this endogeneity problem, the results of our estimation can be biased.

## 4. Result

The data for this research came from 24 countries for 14 years between 2003 and 2016. The summary statistics of the data are shown in Table 1.

According to Table 1, there are missing values for the POV dependent variable. The method used to address missing values in this paper is listwise deletion. Using this method, the data are removed from an observation supposing it has missing values. The data are then eliminated from the analysis. A large number of missing values may lead to inaccurate results (StataCorp 2013). The missing values for POV amount to 14, or 3.8% of total observations. The Stata system automatically excludes the

**Table 1. Summary Statistics of Variables**

Variables	Obs	Mean	Std. Dev.	Min.	Max.
POV	322	5.31118	5.891427	0	28.1
HEALTH	336	6.284214	2.024259	2.172131	13.67662
GOV	336	0.4880952	0.5006038	0	1
GDPPC	336	10,860.30	5,628.21	1910.772	26,240.27
TRADE	336	76.9052	32.24175	22.10598	157.9743

missing values. We applied the multiple imputation method as an alternative way to address the missing values. This method is used as a tool to check the robustness of the listwise deletion method.

The data in this paper are a panel dataset. We regressed Eq. 1 and Eq. 2 using three models: OLS, FE and RE. We applied the Chow test to choose between OLS and FE models and the Hausman test to choose between the FE and RE models. The outcome for the Eq. 1 estimation of these three models is shown in Table 2.

Based on the Chow and Hausman tests, the RE model is the most appropriate model. Therefore, we used the RE model to explain the result of the estimation. As shown by the RE model in Table 2, all the explanatory variables except for trade have a significant effect on poverty reduction.

Public health spending is significant at 0.001 to reduce poverty with a coefficient of  $-0.910$ . It can thus be interpreted that increasing public health spending by one percentage point can reduce the poverty headcount ratio by 0.9 percentage points. The governance quality variable is also significant at  $< 0.01$ . Governance quality is a dummy variable of 1 for countries with good governance (the governance index above the mean) and 0 for countries with poor governance. The coefficient of governance quality represents the disparity between countries with good governance and countries with poor governance. Countries with good governance tend to reduce poverty by 1.62 percentage points than countries with poor governance.

Income per capita or GDP per capita has a significant impact on poverty reduction at  $< 0.001$ . However, the coefficient of GDP per capita is too small compared to other independent variables. Suppos-

ing the GDP per capita increases by one percentage point, the poverty headcount ratio will decrease by 0.00006 percentage points. It seems that the impact of GDP per capita on poverty reduction is not significant. The last control variable is trade. Even though trade has a positive outcome for reducing poverty, the trade variable is not significant.

This paper also investigates the role of governance quality in how public health spending affects poverty alleviation. We applied the interaction term between public health spending and governance quality. The estimation follows Eq. 2, and the outcome is presented in Table 3.

The estimation using the interaction between public health spending and governance quality (see Table. 3) has similar results to the regression without interaction (see Table 2). According to Table 3, all the regressors except for the trade variable are still significant. Additionally, the coefficients for public health spending and governance quality increase to  $-1.375$  and  $-6.861$ , respectively, compared to the regression without interactions. This means that adding the interaction between public health spending and governance quality as a control variable causes public spending to further reduce the poverty headcount ratio. Increasing public health spending by one percentage point can decrease the poverty headcount ratio by 1.375 percentage points.

The interaction between public health spending and governance quality has a significant coefficient. However, the sign of the coefficient is surprisingly positive: it differs slightly from that of Rajkumar & Swaroop (2008) and Makuta & O'Hare (2015). The effect of public health spending on poverty alleviation becomes  $\beta_1 + \beta_3 \times \text{GOV}_{it}$  when the interaction



**Table 2. Regression Results of Eq. 1 Poverty Headcount Ratio without an Interaction**

Dependent Variable: Poverty Headcount Ratio			
Independent variables	OLS	FE	RE
Public health spending	-0.575*** (0.136)	-1.033*** (0.198)	-0.910*** (0.180)
Governance quality	-0.104 (0.578)	-1.928** (0.657)	-1.622** (0.629)
GDP per capita	-0.00067*** (0.00005)	-0.00041*** (0.00006)	-0.00046*** (0.00006)
Trade	-0.039*** (0.009)	-0.005 0.016	-0.0139 (0.0141)
Constant	19.294*** (1.413)	17.561*** 1.938	17.937*** (1.940)
R2	0.36	0.29	0.29
Number of observations	322	322	322

Note: \* p < 0.05; \*\* p < 0.01; \*\*\* p < 0.001

**Table 3. Regression Result of Eq. 2 Poverty Headcount Ratio with Interactions**

Dependent Variable: Poverty Headcount Ratio	
Independent variables	RE
Public health spending	-1.375*** (0.211)
Governance quality	-6.861*** (1.455)
Public health spending x Governance quality	0.935*** (0.236)
GDP per capita	-0.00045*** (0.00006)
Trade	-0.020 (0.014)
Constant	20.94771*** (2.070)
R2	0.29
Number of observations	322

Note: \* p < 0.05; \*\* p < 0.01; \*\*\* p < 0.001

term is added. Observed from countries with poor governance, the marginal effect of public health spending on the poverty headcount ratio is  $\beta_1$  because  $GOV = 0$ ; meanwhile, observed from countries with good governance ( $GOV = 1$ ), the marginal effect is  $\beta_1 + \beta_3$ . Thus, the effect of public health spending on poverty reduction in countries with good governance is  $-1.375 + (0.935 \times 1) = -0.438$ . It can thus be interpreted that in countries with good governance, one percentage point of growth in public health spending leads to a 0.438 percentage points reduction in the poverty headcount ratio. Conversely, in countries with poor governance, increasing public health spending by one percentage point reduces the poverty headcount ratio by 1.375 percentage points.

#### 4.1. Empirical Robustness

Reverse causality might occur between public health spending and poverty, thus we employed an instrument for public health spending to address this endogeneity problem. Previous researchers have argued that government spending and social outcomes may influence each other (Rajkumar & Swaroop 2008). For instance, governments raise their public health spending to reduce poverty. Similarly, the poverty rate increases because public health spending is not adequate enough to prevent it.

Choosing an instrument for public health spending must meet the requirements. An instrument has to correlate with public health spending, but not with

the error. Since the study by Rajkumar & Swaroop (2008) has used the state legal system as an instrument for public spending, this paper also adopts this approach. The data for the state are based on the article by Rajkumar & Swaroop (2008), referring to the Wikimedia Foundation and the Central Intelligence Agency.

The orientation of countries' state legal systems may differ based on their histories. Countries that won independence from the French tend to use French civil law; countries fragmented from the Soviet Union are likely to use socialist law; German civil law is used in several other countries. The types of state law to use as an IV can affect government decision to allocate public spending. According to Rajkumar & Swaroop (2008), several people believe that countries with civil law systems are more state-oriented than countries with common legal systems. Countries with civil law systems are less state-oriented than communist and ex-communist countries. Following Rajkumar & Swaroop (2008), the 24 countries in this study are categorized according to three types of law: French civil law, German civil law, and socialist law. We created a categorical dummy variable for these types of law. To check the validity of the instrument, we used the first-stage graph, namely Sargan p-value and monotonicity graph. The types of state law should have a significant effect on health. The Sargan p-value is more than 0.05 and the monotonicity graph is monotonous. This result shows that types of state law are valid as an instrument for health.

Another issue for the panel dataset is missing values for the dependent variable. We used a multiple imputation method as well as the listwise deletion method to handle the missing data on poverty as the output variable. The result of the empirical robustness check is shown in Table 4.

The regression using multiple imputations to handle missing values for the poverty dependent variable has a similar result to that obtained via the listwise deletion method. It means that the data on the missing values for the poverty variable do not affect the result because the amount of missing data is rel-

atively small (3%). We compared the results from Table 2, column 3 and Table 4, column 1 for estimation without interaction between public health spending and governance quality. Observed from the interaction term, we compared the results from Table 3, column 2 and Table 4, column 2.

The result of the estimation using the IV two-stage least-squares (2SLS) method to overcome the endogeneity problem is only significant for the governance quality variable at a 95% level, although the sign is as expected. We compared the results in Table 2, column 3 and Table 4, column 1 with Table 4, column 3.

Finally, column 4 explains the result of estimation using the interaction term. We applied the first-difference generalized method of moments (GMM) instead of IV (2SLS) because the result of IV (2SLS) has a multicollinearity problem (see Appendix 2). Following Ivaschenko (2004), we used GMM to address the endogeneity problem. Based on Table 4, column 4, all variables are significant for reducing poverty at different levels of significance, except for trade. These results are similar to those obtained using the RE model.

## 4.2. Analysis

Which one is more important for poverty reduction: public health spending or governance quality?

Generally, public health spending has a positive outcome in reducing the poverty level. The effect that public health spending has on reducing poverty is small. Increasing public health spending by one percentage point may reduce the poverty headcount ratio by 0.9 percentage points. However, when conducting the empirical robustness check using IV (2SLS), public health spending becomes insignificant for alleviating poverty. This result indicates that public health spending may not directly reduce the poverty headcount ratio. Public health spending may be effective for certain dimensions of health that can affect poverty, such as nutrition and infant mortality. Similarly, when Mosley, Hudson & Verschoor (2004) have constructed a pro-poor ex-

**Table 4. Empirical Robustness**

Dependent Variable: Poverty Headcount Ratio				
Independent variables	1	2	3	4
Public health spending	-0.881*** (0.193)	-1.348*** (0.228)	-3.486 (4.815)	-0.495* (0.209)
Governance quality	-1.709* (0.715)	-6.966*** (1.618)	-1.931* (0.808)	-4.878*** (1.424)
Public health spending x Governance quality		0.936*** (0.258)		0.637** (0.231)
GDP per capita	-0.00044*** (0.00007)	-0.00043*** (0.00008)	-0.00026 (0.00032) (0.167)	-0.00023* (0.00009)
Trade	-0.012 (0.016)	-0.017 (-0.015)	-0.026 32.336	-0.0115 (0.013)
Constant	17.367*** 2.136534	20.325*** (2.267)	-28.421 322	8.453*** (2.212)
Number of observations	336	336		266

Note: \* p < 0.05; \*\* p < 0.01; \*\*\* p < 0.001

column 1: multiple imputation method without interaction (see Eq. 1); column 2: multiple imputation method without interaction (see Eq. 2); column 3: using IV in the estimation without interaction (see Eq. 1); column 3: using first-difference GMM in the estimation without interaction (see Eq. 2).

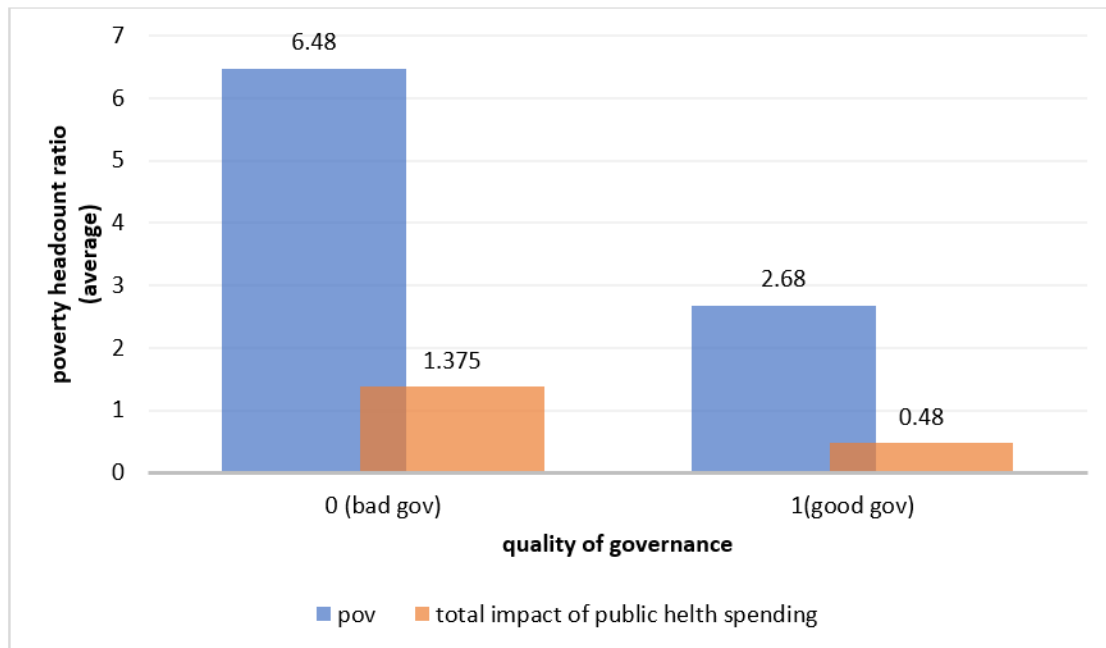
penditure index, they exclude public health expenditure. Based on their OLS regression, public health spending has a negative outcome for poverty. Additionally, they have examined the effect of public health expenditure on infant mortality.

In regard to the interaction term, public health spending has a significant effect on poverty. The impact of increasing public health spending in countries with good governance is reduced, since the coefficient of the interaction between public health spending and governance quality has a different sign from the public health spending variable. Increasing one percentage point in public health spending can reduce poverty by 0.48 percentage points in countries with good governance when the governance quality influences public health spending. Conversely, in countries with poor governance, the poverty headcount ratio may decline by 1.375 percentage points when public health spending increases by one percentage point. This result differs slightly from that of previous researches by Makuta & O'Hare (2015) and Rajkumar & Swaroop (2008).

Therefore, we could say that public health spending has a greater effect on reducing poverty in countries with poor governance than in countries with good governance. As shown in Figure 1, countries with poor governance have an average poverty

headcount ratio of 6.8%, whereas countries with good governance have an average headcount of 2.68%. Increasing public health spending does not substantially reduce the poverty headcount ratio in good governance countries. This result may be influenced by several factors. Countries with good governance may have well-equipped healthcare facilities that poor people can easily access. For example, Turkey (good governance) has 2.41 hospital beds per 1,000 people, whereas Honduras (poor governance) has 0.73 hospital beds per 1,000 people. Turkey also has an effective health insurance program. We also compared domestic private health expenditure per capita that represents household or corporate spending either paid directly to healthcare providers or prepaid to voluntary health insurance. Based on the World Bank data, domestic private health spending in Turkey is USD203,311, while in Honduras it is only USD166,369. Moreover, in countries with poor governance, public health spending plays an essential role in alleviating poverty. These countries can allocate public health spending to health/medical services targeted at the poor. The result of the estimation confirms that public health spending tends to reduce poverty in countries with good governance when the governance quality affects public health spending.

In addition, when there is no intervention from the



**Figure 1. The Total Impact of Public Health Spending for Different Governance Qualities**

government, public health spending has a less significant effect on poverty compared with good governance. This is because public health spending may not directly reduce poverty, but instead decreasing the infant mortality rate or providing better nutrition for poor households to be more productive and earn more income. Further, governance quality can be a proxy for allocating other public spending. Public spending in other areas, such as education spending, transfer, and subsidized spending may be a more effective way to alleviate poverty.

Governance quality has a significant effect on reducing poverty in all the estimations, and provides a greater effect than public health spending. It is reasonable to state that countries with good governance may alleviate poverty more effectively than countries with poor governance. Countries with good governance tend to reduce poverty by 1.62 to 1.9 percentage points than countries with poor governance when there is no interaction with public health spending. When the interaction occurs, that number rises to around 6.9 percentage points.

The other control variables of GDP per capita and

trade have a different effect on poverty. GDP per capita does reduce poverty, but not to a substantial degree: a one percentage point increase in GDP per capita may only reduce poverty by 0.0004 percentage points. This result can be explained by the consumption patterns of poor households. According to Moav & Neeman (2008), poor people across the world do not invest in their children's education to escape from the poverty trap. A large portion of their income is spent on weddings, festivals and funerals. For example, 15% of the income earned by poor households in rural India is spent on festivals. Trade has a negative sign, as expected, but no significant effect on poverty reduction. This result is similar to that of previous research by Khan & Bashir (2013) in Bayar & Sezgin (2017), concluding that the relationship between trade and poverty is not significant.

In Indonesia, public spending on primary health care and anti-poverty spending has been successful in benefiting the poor (Lanjouw et al. 2001; Daly & Fane 2002). However, those studies did not consider the governance quality. Based on the aforementioned analysis, improving the quality of gover-

nance is more effective to reduce poverty rate rather than increasing public health expenditure. Therefore, the improvement of governance quality must be implemented in delivering public health spending. The government should enhance the quality of policies in pro-poor spending, especially public health spending, including the quality of public services and the commitment of the governments to effectively formulate and implement the policies.

## 5. Conclusion

Poverty is a persistent problem faced by all countries in the world, mostly developing countries. Most governments have enacted policies to reduce poverty. Boosting the economy is a common way of doing this. However, economic growth cannot reduce poverty effectively without government intervention. Supposing the results of economic growth are not distributed equally among all citizens, the poverty rate can become worse and income inequality can rise.

Government intervention involves creating policies targeted at poverty reduction. The government decides how much budget to allocate to different types of spending. Public health spending is one type of public spending that can reduce the poverty rate. In addition to creating policies, budget allocation decisions also affect poverty. In this study, we introduced government effectiveness as an indicator of governance quality.

Based on the estimation results, public health spending plays a significant role in reducing poverty, even though the magnitude is small. In addition, when public health spending is affected by governance quality, it can reduce the poverty headcount ratio in countries with good governance compared with countries with poor governance. Moreover, governance quality has a greater effect on reducing poverty than public health spending. Governance quality may reduce poverty more effectively than public health spending.

The limitations of this paper can be a reference for

future studies. They can be used to guide or develop future studies. First, the effect of public health spending on poverty reduction is small. Therefore, future studies can explore the effect of public health spending on nutrition or infant mortality, as they are multidimensional indicators of poverty in relation to health. Second, this study only used the Government Effectiveness index from WGI (Kaufmann, Kraay & Mastruzzi 2010) to measure governance quality. Five other indices are used in WGI to measure governance quality. Therefore, future researches may also examine other indices in terms of how they effectively reduce poverty. Third, the RE model is the most appropriate model based on the Chow and Hausman tests. However, RE will not control unobserved time-invariant characteristics of a country. Thus, future studies should consider other methods of estimation. Finally, the estimation regression model only generates a small R-squared, meaning that the independent variables in this study do not explain in detail how to reduce poverty. Other studies should consider variables that can reduce poverty significantly based on the poverty reduction theories and previous researches.

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## Appendices

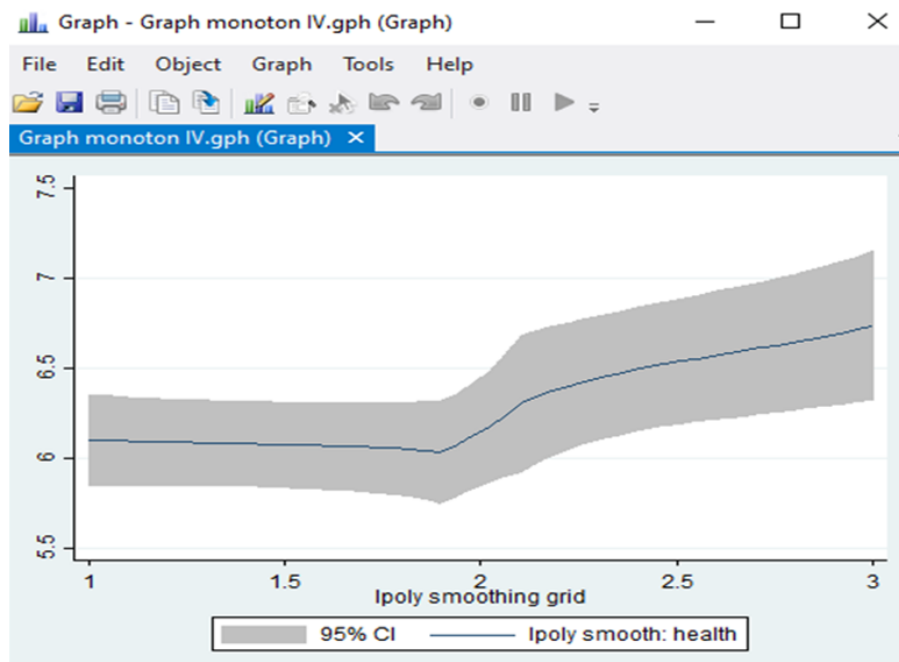
### Appendix 1: Validity Check for Instrument Variables

In the first stage, a country's state legal system significantly affects health by prob. > F: 0.0107. Thus, a state legal system is a valid instrument, based on a Sargan value of  $p = 0.6767$  that is greater than 0.05. Thus, this instrument is valid.

First-stage regression summary statistics					
Variable	R2	Adj. R2	Par. R2	F(1, 317)	Prob > F
Health	0.1041	0.0928	0.0204	6.5891	0.0107

Minimum eigenvalue statistic = 6.5891					
Critical Values					
Ho: Instruments are weak					# of endogeneous regressors: 1
					# of excluded instruments: 1
2SLS relative bias	5%	10%	20%	30%	
2SLS Size of nominal 5% Wald test	16.38	8.96	6.66	5.53	
LIML Size of nominal 5% Wald test	16.38	8.96	6.66	5.53	



Test of overidentifying restrictions	
Sargan (score) $\chi^2(1)$	0.173809 (p= 0.6767)
Basman $\chi^2(1)$	0.170662 (p=0.6795)

## Appendix 2: Multicollinearity Problem When Estimating Eq. 3 Using Instrumental Variable Two-Stage Least-Squares Method Because Variance Inflation Factor > 10

Dependent Variable: Poverty Headcount Ratio		
Independent variables	RE	
Public health spending	-4.123	
	-10.044	
Governance quality	-15.705	
	-32.448	
Public health spending x Governance quality	2.492	
	-5.836	
GDP per capita	-0.00027	
	-0.00054	
Trade	-0.046	
	-0.109	
Constant	37.726	
	-63.629	
Wald chi2(5)	73.05	
Number of observations	322	
VIF Uncentered		
Variable	VIF	1/VIF
Public health spending x Governance quality	16.78	0.0596
Governance quality	15.57	0.0642
Public health spending	10.28	0.0973
Trade	7.1	0.1408
GDP per capita	3.89	0.2568