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Causality on the Growth-Governance-Fiscal Decentralization Nexus: An Analysis of Time Series in Indonesia

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Abstract:

This study tries to disentangle whether governance and fiscal decentralization in Indonesia improves economic growth in the period 1984 – 2014. Also, it investigates whether there is a causality in the growth-governance-fiscal decentralization nexus in Indonesia. The results run by OLS (Ordinary Least Square) and VECM (Vector Error Correction Model) provide different intrepretation. However, one could argue that VECM can best describe the relationship between growth and governance as well fiscal decentralization both in short and long run since simple OLS are useful when all variables are stationary at level.

Keywords: governance; fiscal decentralization; growth; Indonesia

JEL Classification: H770; H830; O430

Introduction

Governance has become a central issue in the literature of development theory, public policy and economics. In this context, economist and other social scientists have investigated whether some countries have better governance than the others, whether sub-national governments within countries' jurisdictions perform better than the others, and how does governance link with levels of socio-political development, size of a region or country, social trust within countries, and levels of decentralization.

A pioneer work by Kaufman and Kraay (2002) reinstates the framework of relationship between governance and growth that may be bi-directional. They argued that poor governance causes weak economic performance which in turn reinforces poor governance. Such phenomenon is called as low income governance traps. However, one of the weaknesses of their study is that they have focused on cross-country data. While this provides a large sample of countries and a relatively long time span, such studies are open to the criticism in a sense that there are important unobserved factors such as fiscal decentralization which may have an important influence on economic performance.

Concerning this situation, the purpose of the present study is to freshly explore as follows: (1) Whether governance and fiscal decentralization underpins the growth in Indonesia; (2) Whether there is causality in the governance-fiscal decentralization-growth nexus in Indonesia. To obtain the result, we introduce a governance and fiscal decentralization variable into the Solow augmented Mankiw-Romer-Weil (MRW) structural model for Vector Error Correction Model (VECM) and Vector Autoregressive (VAR) estimation for the period 1984-2014.

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1. Literature Review

There are several scholars who attempt to directly link fiscal decentralization and economic growth. Davoodi and Zou (1998) found that the negative effect of fiscal decentralization on economic growth exists in developing countries, but there is an insignificant contribution in developed countries. In addition, Martinez-Vazquez and McNab (2003) pointed out that there are potentially indirect effects of decentralization on growth. However, in the next study, Martinez-Vazquez and McNab (2006) failed to observe evidence of a direct relationship between decentralization and growth. However, fiscal decentralization tended to have a positive indirect effect on economic growth through its beneficial impact on price stability.

In the case of Indonesia, Ismail and Hamzah (2006 cited in Yulindra 2012) found that the expenditure indicator is positively and significantly correlated with growth, while the revenue indicator shows the opposite one. Moreover, Fadli (2014) found that fiscal decentralization has a positive impact on regional economic growth since it has the ability to reduce regional disparities in the eastern and western Indonesia.

Moving to the governance-growth nexus, there are several arguments that governance do matter for economic performance. First, the quality of economic governance, measured by the security of property rights and the level of contract enforcement, is crucial to growth and investment (Knack and Keefer 1995). Second, the subjective indexes of corruption are negatively linked with investment and economic growth (Mauro 1995). Third, efficiency in bureaucracy couples with the absence of corruption, the rule of law, and protection of property rights are important for growth (Alesina and Spolaore 1997). Last, quality of economic policy, reflected by the rationale decision of central government to tackle inflation as well as to manage budget surplus and openness in trade, do matter for erecting growth (Sugiyanto and Digdowiseiso 2017).

In the case of Indonesia, recent study conducted by McCulloch and Malesky (2011) found that there is little or no statistically significant association between many typical measures of local economic governance and the growth performance of the district. But, overall governance indicator is positively and significantly correlated with district growth when instrumenting growth with mudslides. In another perspective, Hamid (2013) found that there is a positive relationship between the mayor/regent's quality and the change of local road infrastructure.

2. Methodology

Measuring governance for longer time period in a country can be problematic. The World Bank Governance Indicator is established on 1996, while corruption perception index of the Transparency International is firstly launched on 1995. To bridge this gap, I used Dahlberg *et al.* (2016) on the basic quality of government data set for the period 1984-2014 (see Table 1). They basically compiled the ICRG variables of corruption, law and order, and bureaucracy quality and take the mean value of them in 0-1 scale. Higher value indicates higher quality of government.

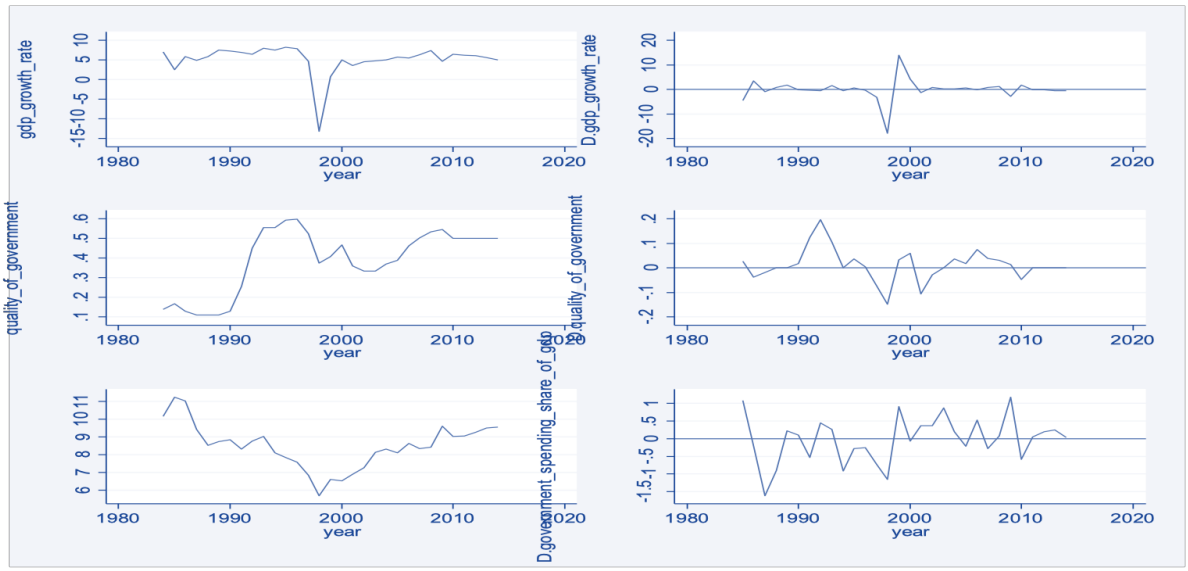
In addition, they also compiled population growth rate from the World Bank Indicators. Meanwhile, we use trade and investment share of GDP, GDP growth rate and GDP per capita from the IMF database based on the 2015 World Economic Outlook. Also, I use the same source to obtain government expenditure share of GDP as a proxy of fiscal decentralization. Here, Murshed *et al.* (2009) stated that fiscal decentralization related to devolution which is given to local government. The size of devolution is defined as a capacity of state. In terms of national level, this indicator can best measure the size of government relative to the national economy. Meanwhile in measuring human capital, I use human capital index based on your schooling and return to education. This data is constructed by Feenstra *et al.* (2015) on Penn World Table Version 9.0.

Table 1. Summary of statistic

Variable	Obs	Mean	Std. Dev.	Min	Max
year	31	1999	9.092121	1984	2014
quality_of~t	31	.3873955	.1630552	.1111111	.5972222
population~e	31	1.536282	.2757284	1.260193	2.197361
trade_shar~p	31	54.17376	10.74448	39.97386	96.1862
government~p	31	8.491936	1.244718	5.69	11.23
investment~p	31	32.15906	6.817063	13.64	44.62
gdp_growth~e	31	5.156871	3.75712	-13.127	8.22
gdp_per_ca~a	31	2.11e+07	6198423	1.23e+07	3.41e+07
human_capi~x	31	2.118407	.2308587	1.68166	2.41677

Overall, Figure 1 shows that growth rate and government size provide a wider range of variation than quality of government and they have more variance from one time period to the next. However, we do not know whether the variable is non-stationary or not.

Figure 1. Growth Rate, Quality of Government, and Government Size, 1984-2014



Mankiw, Romer and Weil (MRW) (1992) showed that with the inclusion of human capital in the production function, the explanatory power of the traditional Solow growth model is significantly improved. I use the MRW work and extend the Solow model to include governance and fiscal decentralization as a determinant of the multifactor productivity.

For simplicity, I will consider an economy that produces only one good. Output is produced with a well-behaved neoclassical production function with positive and strictly diminishing marginal product of physical capital. This condition ensures that the marginal products of both capital and labor approach infinity as their values approach zero, and approach zero as their values go to infinity.

The Solow augmented Mankiw-Romer-Weil (MRW) model is used as a basis for this study. The production function incorporating the size and quality of the government is of the Cobb-Douglas form:

$$Y(t) = K(t)^{\alpha} H(t)^{\beta} [G(t)\ QoG(t)\ L(t)]^{1-\alpha-\beta} \quad (1)$$

where: Y(t) is the aggregate level of real income, K(t) is the level of physical capital, and H(t) is the level of human capital.

The size dimension of the government G(t) is measured by the level of government expenditure, L(t) is the amount of labour employed, and QoG(t) measures the quality dimension of the government.

Let $0 < \alpha < 1$, $0 < \beta < 1$, and $\alpha + \beta < 1$. These conditions ensure that the production function exhibits constant returns to scale and diminishing return to each point. Time is indexed by a continuous variable (t). With the omission of the governance term, the model yields standard neoclassical results. That is, the growth rate of output per capita is accelerated with increases in investments in physical capital and decreases in population growth, depreciation rate of capital, and the initial level of output per capita.

This paper adopts Solow Augmented Mankiw-Romer-Weil (MRW) model because it permits the inclusion of more policy variables in economic growth equation. Specifically, the model was modified to include governance and fiscal decentralization as one of its explanatory variables. There are various channels through which governance and fiscal decentralization affects economic growth. But this study adopts five (5) transmission channels which are investment, human capital, trade, population growth and initial level of GDP per capita. Thus, my specification is formulated as follows:

$$GROWTH_t = \alpha_0 + \alpha_1 LGDPPC_t + \alpha_2 QOG_t + \alpha_3 GOV_t + \alpha_4 (QOG*GOV)_t + \alpha_5 INV_t + \alpha_6 TRADE_t + \alpha_7 HC_t + \alpha_8 POP_t + \mu_t \quad (2)$$

where: $GROWTH_t$ is GDP growth rate at time t, $LGDPPC_t$ is natural logarithm of GDP per capita at time t, QOG_t is quality of government as a proxy of governance at time t, GOV_t is government size as a proxy of fiscal

decentralization at time t, INVt is total investment share of GDP at time t, TRADEt is total trade share of GDP at time t, HCt is human capital index at time t, and POPt is population growth rate at time t.

To capture indirect effect of governance on economic growth through fiscal decentralization, I put interaction term between quality of government and government size.

Since this study will employ quantitative tools of data analysis, there are several estimation techniques, as follows: First, The Augmented Dickey-Fuller (ADF) unit root test will be used to test for stationarity; Second, a cointegration test will be conducted to determine if the time series variables have a long-term or equilibrium relationship between them; Third, the Vector Error Correction Model (VECM) will then be used toto reveal the short-run dynamics in the economic growth function; Fourth, the Vector Autoregressive (VAR) Granger Causality test will be conducted to ascertain the causal relationship between governance, fiscal decentralization, and economic growth; and Lastly, impulse-response analysis is performed based on VAR estimation.

3. Results

The univariate characteristics of the data was analysed using the Augmented Dickey Fuller (ADF) tests to establish the order of integration, since the actual datagenerating process is not known. The result of the ADF test for all the variables used in our estimations is reported in Table 2. The first column shows the list of all the variables that are tested. The second column (model) shows whether the equation that is estimated for the testing purpose involves a trend and a constant, a constant only, or neither a constant nor a trend. The third column shows the number of lags that are used for each model and they are significant at the 5 percent level. The fourth and fifth column is the ADF level and ADF first difference. To sum up, our variable is mostly unit root and non stationary. The first differencing of variable will make stationary of the data.

Table 2. ADF Test

Series	Model	Lags	ADF level	ADF first difference
Growth	Intercept	0	-0.7060854*	-1.279816*
	Trend + Intercept	0	-0.7059555*	-1.27895*
	None	0	-0.252788*	-1.279992*
Gdppc	Intercept	0	-0.0028099	-0.7494067*
	Trend + Intercept	0	-0.1670036	-0.7488835*
	None	0	0.0020116*	-0.4072733*
Qog	Intercept	0	-0.1096143	-0.5595906*
	Trend + Intercept	1	-0.2146766	-0.7164658*
	None	0	0.0101048	-0.5423137*
Gov	Intercept	0	-0.1525986	-0.92589*
	Trend + Intercept	0	-0.1298563	-1.025022*
	None	0	-0.0055128	-0.9228597*
Qog*Gov	Intercept	0	-0.1148616	-0.6868317*
	Trend + Intercept	0	-0.2051053	-0.6866055*
	None	1	-0.0054604	-0.7684044*
Inv	Intercept	0	-0.1987467	-1.012078*
	Trend + Intercept	0	-0.2245747	-1.015787*
	None	0	-0.0083892	-1.012122*
Trade	Intercept	0	-0.493702*	-1.451073*
	Trend + Intercept	0	-0.5063325	-1.460634*
	None	0	-0.0180472	-1.451006*
HC	Intercept	0	-0.0469085*	-0.044225
	Trend + Intercept	0	0.193482*	-.2438141
	None	0	0.0100384*	-0.06949
Pop	Intercept	0	-0.0892034*	-0.0894816
	Trend + Intercept	0	-0.0729511*	0.2222373
	None	0	-0.0222699*	-0.067312*

Most of the estimated coefficient in equation 1 are statistically significant, particularly related to variable of interest such as governance. However, the variable of government size as measure of fiscal decentralization is negative and insignificant. In addition, the inclusion of interactive term (QoG*Gov) changes the size and magnitude of primary variable such as quality of government, while coefficient of government size remains negative and

insignificant. Overall, there is clear evidence of no autocorrelation in the residuals of all model, the data are homoskedastic in all model, but growth has non-normal characteristic.

Table 3. Simple Growth Regression result

Variable	Growth (1)	Growth (2)
Lgdppc	-14.39826** (6.64201)	-14.60747** (6.719124)
Qog	11.74208** (4.842736)	32.93195 (29.86545)
Gov	-0.966447 (0.9256742)	-0.0705299 (1.557848)
Qog*Gov	-	-2.524565 (3.51007)
Inv	0.1950334** (0.0964562)	0.2236059** (0.1052684)
Trade	-0.3534769* (0.075016)	-0.3539368* (0.0758184)
HC	15.69284 (13.20575)	16.09193 (13.35808)
Pop	-0.7965957 (11.65478)	-2.324549 (11.96908)
Resid	-0.8821708* (0.1729885)	-0.8647713* (0.1703678)
Adjusted R2	0.6601	0.6529
LM tests (Prob>Chi2)	0.4898	0.4250
White test	0.4154	0.4154
Normality Test		
Skewness	0.0000*	0.0000*
Kurtosis	0.0000*	0.0000*
J-B	0.0000*	0.0000*
No. of Observation	31	31

Notes: Number of parentheses are robust standard error where *** = significant at 1 percent level, ** = significant at 5% level, and * = significant at 10% level.

Meanwhile, in Figure 2, the essence of co-integration test is to find out if there is a long term relationship between variables that are stationary at different levels of integration. The cointegrating relation is found to be appropriate since the graph reverts to the equilibrium. Also, the evident from Table 3 on the estimated coefficient of Resid confirms that the relationship between Growth and other explanatory variables are valid (no spurious regression) in the long run.

Figure 2. Cointegrating relation in growth equation

Arming with the message from Table 3, the lag order selection criteria was conducted and can be seen in table 4. The maximum lag structure that is used follows Said and Dickey (1984), who suggested a lag order equal to $T^{1/3}$. T is the number of observations, which in this case is 31 years (1984 to 2014). Therefore, the maximum lag

structure of 3 is used in the testing procedure. From the selection criteria, it is seen that the lag of three (3) had more number of selection as it was selected by five (5) criterions in all models. Therefore, the number of lagged terms included was three (3).

Table 4. Lag Order Selection criteria

	Lag	LL	LR	FPE	AIC	HQIC	SBIC
Growth (1)	0	-52.8614		4.59848	4.34725	4.46361	4.72788
	1	-52.7194	0.28413	4.92474	4.40853	4.53943	4.83673
	2	-48.8835	7.6716*	4.05934	4.20597	4.35142	4.68176
	3	-47.0741	3.619	3.87639*	4.14815*	4.30815*	4.67151*
Growth (2)	Lag	LL	LR	FPE	AIC	HQIC	SBIC
	0	-50.6697		4.25402	4.26212	4.39303	4.69033
	1	-50.3887	0.56196	4.52008	4.31348	4.45893	4.78927
	2	-47.95	4.8774	4.12668	4.21072	4.37071	4.73408
	3	-43.905	8.0901*	3.36855*	3.99321*	4.16776*	4.56416*

By using the lag order selection criteria, I will test whether I use VECM as my estimation model. To do this, I have to employ Johansen cointegration technique in standard growth model 1. If the variables are non cointegrated, we cannot run VECM model, instead we deploy unrestricted VAR model. From Table 5, it is clear that there are approximately five and six cointegration among variables by looking at trace statistic and maximum statistic.

Table 5. Johansen Tests for Cointegration

Trend: constant — Number of obs = 28
Sample: 1987 - 2014 — Lags = 3

maximum rank	parms	LL	eigenvalue	trace statistic	5% critical value	1% critical value
0	105	130.10526		1035.8242	124.24	133.57
1	118	502.90878	1.00000	290.2172	94.15	103.18
2	129	576.50137	0.99479	143.0320	68.52	76.07
3	138	602.49377	0.84380	91.0472	47.21	54.46
4	145	623.9834	0.78454	48.0679	29.68	35.65
5	150	639.04274	0.65893	17.9493*1	15.41	20.04
6	153	647.55329	0.45550	0.9282*5	3.76	6.65
7	154	648.01737	0.03261			

maximum rank	parms	LL	eigenvalue	max statistic	5% critical value	1% critical value
0	105	130.10526		745.6070	45.28	51.57
1	118	502.90878	1.00000	147.1852	39.37	45.10
2	129	576.50137	0.99479	51.9848	33.46	38.77
3	138	602.49377	0.84380	42.9793	27.07	32.24
4	145	623.9834	0.78454	30.1187	20.97	25.52
5	150	639.04274	0.65893	17.0211	14.07	18.63
6	153	647.55329	0.45550	0.9282	3.76	6.65
7	154	648.01737	0.03261			

From Table 6, the results from the core specification confirm that natural logaritm of GPD per capita, governance, fiscal decentralization, investment, and trade are highly significant determinants of economic growth in Indonesia. Adding the interactive effect between governance and fiscal decentralization will make all variables become statistically significant. Related to our variable of interest, both governance and fiscal decentralization are negatively correlated with economic growth in model I. However, after adding interactive term, both the estimated coefficient of governance and fiscal decentralization are positively correlated. Thus, the need to incorporate better governance in fiscal decentralization is very essential for stimulating economic growth in Indonesia.

Table 6. VECM results

Variable	Growth (1)	Growth (2)
Lgdppc	19.12395* (5.468267)	2.504142* (0.0262903)
Qog	-9.569524* (1.73925)	21.03887* (0.0477763)
Gov	-1.68108** (0.8861396)	1.090431* (0.0029079)

Variable	Growth (1)	Growth (2)
Qog*Gov	-	-2.462301* (0.0051345)
Inv	-0.3178941* (0.0651215)	0.0138242* (0.0002147)
Trade	-0.1351246*** (0.0815683)	-0.0158006* (0.0004876)
HC	-3.157209 (15.90527)	-10.55991* (0.0731121)
Pop	20.71827 (6.44787)	-6.791041* (0.0196513)
No. of observation	28	28

Notes: Number of parentheses are robust standard error where *** = significant at 1 percent level, ** = significant at 5% level, and * = significant at 10% level.

There is empirical evidence that growth is contemporeneously correlated with governance and fiscal decentralization (see Kauffman and Kraay, 2002; Kyriacou and Roca-Sagales, 2011). However, many also believe that there is potential endogeneity on fiscal decentralization and government quality (see de Mello and Barenstein, 2001, Altunbas and Thornton 2012, Sugiyanto *et al.* 2018). This section to investigate whether there is a causal relationship between these variables and if there exists such relationship, is it a unidirectional or bilateral causality?

We consider the following VAR equation such that

$$GROWTHt = \alpha_0 + \alpha_1 GROWTHt\text{-}i + \alpha_2 QOGt\text{-}j + \alpha_3 GOVt\text{-}j + v_{1t} \quad (3)$$

$$QOGt = \alpha_0 + \alpha_1 QOGt\text{-}i + \alpha_2 GROWTHt\text{-}j + \alpha_3 GOVt\text{-}j + v_{2t} \quad (4)$$

$$GOVt = \alpha_0 + \alpha_1 GOVt\text{-}i + \alpha_2 GROWTHt\text{-}j + \alpha_3 GOVt\text{-}j + v_{3t} \quad (5)$$

And we start to use the same criterion in selecting the maximum lag order, which is three (3). From the selection criteria in Table 7, it is seen that the lag of three (3) had more number of selection as it was selected by three (3) criteria in all models. Therefore, the number of lagged terms included was three (3).

Table 7. Lag Order Selection criteria

(1) Growth QoG Gov	Lag	LL	LR	FPE	AIC	HQIC	SBIC
	0	-97.0298		.254474	-1.58293	-1.58293	-1.58293
	1	-49.6398	94.78	.016492	-4.32507	-4.1942*	-3.8969*
	2	-41.4099	16.46	.017894	-4.27007	-4.00825	-3.41365
	3	-28.5727	25.674*	.014537*	-4.5441*	-4.15143	-3.25953

The result from Table 8 indicates that the three lagged values of governance and fiscal decentralization does not cause economic growth. Similarly, the three lagged valus of growth and governance does not cause fiscal decentralization. However, the three lagged values of economic growth cause governance.

Table 8. Granger Causality Wald tests (Three Lagged)

Equation	Excluded	F	df	df_r	Prob > F
gdp_growth_rate	quality_of_gove~t	.8443	3	18	0.4874
gdp_growth_rate	government_spen~g	.77996	3	18	0.5204
gdp_growth_rate	ALL	1.09	6	18	0.4053
quality_of_gove~t	gdp_growth_rate	3.6338*	3	18	0.0329
quality_of_gove~t	government_spen~g	.6106	3	18	0.6168
quality_of_gove~t	ALL	1.8424	6	18	0.1471
government_spen~g	gdp_growth_rate	.79047	3	18	0.5149
government_spen~g	quality_of_gove~t	.58099	3	18	0.6351
government_spen~g	ALL	.51171	6	18	0.7917

When we change the number of lags into 7, clearly the results changes dramatically in terms of p-value. For example, in Table 9, the seven lagged of governance and fiscal decentralization cause economic growth. Similarly, the seven lagged of growth and fiscal decentralization cause governance. So, there is a bi-directional relationship

between growth and governance. Also, fiscal decentralization has unilateral relationship with growth and governance.

Table 9. Granger Causality Wald tests (Seven Lagged)

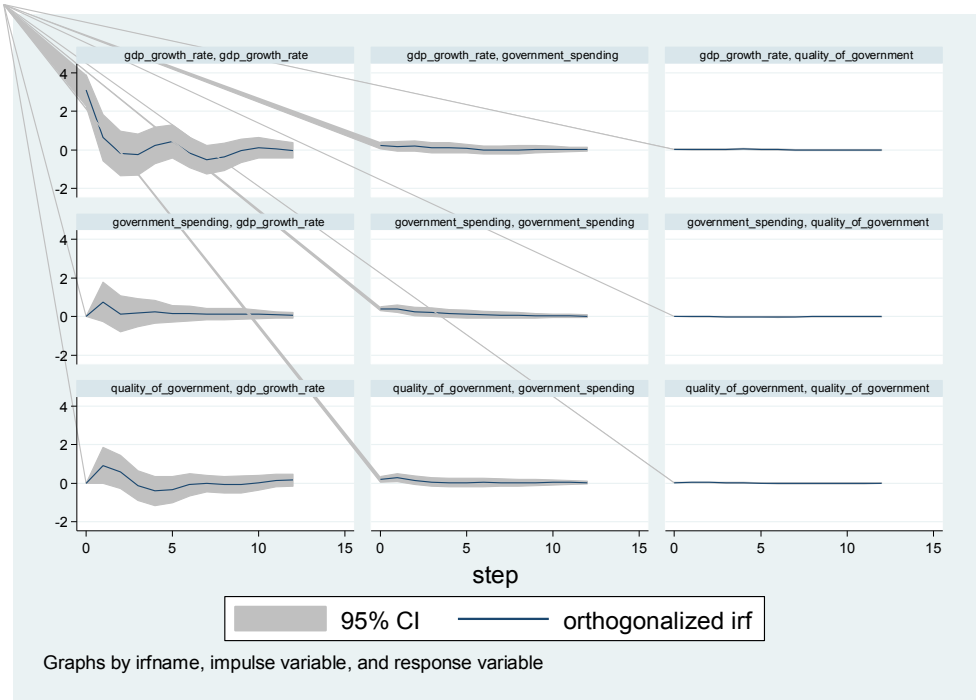
Equation	Excluded	F	df	df_r	Prob > F
gdp_growth_rate	quality_of_gove~t	156.98*	7	2	0.0063
gdp_growth_rate	government_spen~g	107.47*	7	2	0.0092
gdp_growth_rate	ALL	140.83*	14	2	0.0071
quality_of_gove~t	gdp_growth_rate	12.448*	7	2	0.0764
quality_of_gove~t	government_spen~g	8.5714*	7	2	0.1004
quality_of_gove~t	ALL	14.786*	14	2	0.0651
government_spen~g	gdp_growth_rate	.54609	7	2	0.7707
government_spen~g	quality_of_gove~t	.46857	7	2	0.8111
government_spen~g	ALL	.75158	14	2	0.7042

Impulse response function (IRF) in time series analysis is important in determining the effects of shocks on the variables of the system. Put it simply, IRF shows how changes in one variable at the beginning affect another variable through time. It also investigates the response of a variable to shocks from itself and other variables in the VAR model.

Of paramount importance in the analysis of IRF, is how variables respond to innovations or shocks in other variables and shocks from itself within the same VAR model. Thus, we set to investigate the relationship between growth and governance as well as fiscal decentralization by investigating the responses of these various time series variables to shocks from each other and also themselves.

Moving to Figure 3, fiscal decentralization responds positive to its innovations and shocks in the first period but as it enters the second period, it declines and is fairly constant till the end. Similar situation takes place in growth where it responds highly positive in the beginningto its innovations and shocks, before starts to decline in third and seven period. From eleven periods onward, growth is relatively stable. Meanwhile, governance response to its innovations and shocks is relatively constant from the beginning to the end. Similarly, economic growth and fiscal decentralization in Indonesiaremain stable to innovations and shocks in governance at a fairly constant rate over periods of time. Also, governance and fiscal decentralization in Indonesia responds highly positive in the second period to innovations and shocks in economic growth, before starts to stable in the third period and seventh period, respectively.

Figure 3. IRF based on VAR estimation



Conclusion

This study departed from two simple questions. Does governance and fiscal decentralization in Indonesia improves economic growth? And is there any evidence of reverse causality between governance and growth, fiscal decentralization and growth, as well as fiscal decentralization and governance?

The simple OLS and VECM on growth regression provide different result. In the former, governance is positively correlated with growth. However, the estimated coefficient of fiscal decentralization is negative and insignificant. The inclusion of interactive term (QoG*Gov) changes the size and magnitude of primary variable where governance becomes insignificant, while coefficient of government size remains negative and insignificant.

In the latter, both governance and fiscal decentralization initially are negatively correlated with economic growth. However, after adding interactive term, both the estimated coefficient of governance and fiscal decentralization are positively correlated. From this explanation, simple OLS are usefull when all variables are stationary at level. However, since some exogenous variables are stationary at the first difference, thus VECM can best describe the relationship between growth and governance as well fiscal decentralization both in short and long run.

The distinctive feature of this study is the significant role played by governance and fiscal decentralization in explaining the long-term pattern of economic growth in Indonesia. The results from the long-run estimation and the impulse responses revealed the fact that a good governance couple with better implementation of fiscal decentralization will boost economic growth over the long-run period. Future research should attempt to correct some of the shortcomings of this study. The lack of available long-term series on governance rating must be addressed, and this may give a better parameter estimate of the effect of governance on economic growth.

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