How does fiscal policy stimulate economic growth in Japan?

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Abstract

The economic conditions change over time along with business cycles, as an economy goes through expansion and contraction. Government expenditure is one of the significant variables that can change economic conditions in any country. The relationship between government expenditure and economic growth has been debated over several decades and has not been clearly specified yet, in both developed and developing countries. Most of the findings revealed mixed results. Based on this background, the objective of this paper is to shed light on the relationship between the composition of government expenditure and economic growth using the latest data from 1972–2016. To achieve this main objective, we examined the short and long-run relationship between fiscal policy, other macroeconomic variables and economic growth in Japan. Autoregressive Distributed Lag (ARDL)-ECM approach and a number of diagnostic and specification tests were used to examine the impact of government expenditure on economic growth on time series data in Japan. This study used two models to examine the relationship between expenditure and economic growth.

The results reveal that government expenditure and revenue have a statistically positive and a significant impact on economic growth while inflation rate has a statistically negative and a significant impact on economic growth in the long-run. Rate of interest is insignificant in the long-run. These findings are in line with the Keynesian approach, which indicates a powerful effect of government spending, on economic growth. Particularly, we find that in disaggregate level, education expenditures are among the most important factors in the improvement of economic growth. Specifically, the findings imply that Japan's economic growth could be improved significantly if expenditure on education is increased. This eventually would have a significant impact on human capital which leads to enhanced output. Education is more prominence in knowledge based economy since knowledge and human capital generated by education are vital for the economy than ever. The formation of human capital through education and training will contribute to the economic growth of a nation.

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Grounded on the premises that there are little studies on the impact of expenditure in Japanese economy to an aggregate and disaggregate level under ARDL approach, this paper provides new evidence on the potential effect of revenue, expenditure and interest rate on Japan's economic growth over the last four decades. Also, this study explores the short-run effect on economic growth from expenditure at aggregate as well as disaggregates levels.

Key words: Government expenditure, education expenditure, economic growth, ARDL, Japan

1. Introduction

Over decades the relationship between public expenditure and economic growth has been an enduring issue among researchers and policy makers. The general observation among the researchers is that public sector expenditure is an important tool that the government uses to stimulate the economy (Omoke, 2009, Oni et al., 2014). Government expenditure is the expenses spend by the government for the maintenance of itself, the economy and the general public at large. Based on the above context, we can easily identify two approaches which support the government expenditure and economic growth. The first theoretical background is based on Wagner's law. Wagner (1883) observed that there was a cause and effect relationship between the growth of economy and relative growth of public sector. In the meantime he revealed in the theory that an increase in per capita income and output in industrialized countries led to increase in the size of public sector. The main causes for this behavior were social problems, expansion of traditional functions of the government, growth of population, urbanization, increase in prices and national income. Wagner underlined that the economic growth as the main determinant of public sector growth. Therefore, it was suggested that the causal relationship between economic growth and government expenditure runs from income to expenditure.

However, Keynes (1936) indicated that government expenditure as an important variable of economic growth. Keynesian theory states that the government expenditure, as a fiscal policy tool, is useful for attaining short-term, steady and higher long run economic growth rate. Therefore, this theory suggests that the government involvement in the economy through the fiscal policies play an important role in the development process. Further this theory points out that government could change economic depressions by borrowing money from the private sector and then redistribute this money to the private sector through several spending programs. Keynesian approach exhibits that government expenditure was an exogenous factor for increasing national income. Therefore, it suggests that the causal relationship between government expenditure and national income runs from expenditure to income.

As a result of different theoretical perspectives, there exists a wide-range of empirical literature, with the aim of testing the soundness of Wagner's approach or Keynesian approach of government

expenditure. The results of examining the relationship between the size of government expenditure and economic growth seem ambiguous in both developing and developed countries. Research findings for some developed countries show that higher government expenditure leads to higher economic growth (Liu et al., 2008); while other developed countries do not exhibit such a relationship.

This study chooses one country from developed nations; namely Japan. Out of many Western countries, Japan was the first country to become an industrialized economy (Bawumia, 1998). Not only that it transformed from a less developed country to a developed one in a comparatively short period of time, over the course of several decades, Gould (1983) shows that the overall size of the public sector in Japan is substantially smaller than the average of western industrialized countries.

The real GDP growth rate for the third quarter of 2017 in Japan was 0.6 per cent and its annual real GDP growth rate was 2.5 per cent. It represented a positive growth in Japan for seven consecutive quarters. The total population in 2016 was 126.93 million. This ranked eleventh in the world and made up 1.7 per cent of the world's total. Japan's GDP was $4,949,272 million in 2016. In Japan, private consumption accounts for 56.9 per cent of the GDP, government consumption about 19.8 per cent and investment 23.4 per cent. Exports and imports account for 16.1 per cent and 15.1 per cent respectively in 2016. The GDP per capita in Japan was recorded as $48556.93 in 2017. One of the most serious issues in Japan is enormous national debt. Japan's government debt to GDP ratio was recorded at 236 per cent in 2017, the highest among developed countries. The amount was more than double that of the U.S., which stands at 108 per cent, according to the International Monetary Fund. Japan's fiscal situation is getting more and more worsening than previous. Japan's central government has been running government deficits since the early 1990s (Outlook for Economic Activity and Prices, January 2018).

Governments usually target to encourage steady and sustainable economic growth, and long-lasting poverty reduction. Many research showed that a strong fiscal condition was a key factor in accomplishing macroeconomic stability. Meantime, it was identified as a critical element for sustained economic growth and poverty reduction. Poorer fiscal position leads to a weakening of almost all economic condition such as GDP growth rate, interest rate, current account deficit, public debt, inflation, etc. If the government revenue of the economy is not adequate to attain macroeconomic objectives with poor fiscal conditions, government wants to obtain funds from domestic or foreign sources. Thus, the government has to concern about debts or impose more taxes on the general public. Not only that poor fiscal position can lead to higher inflation, crowding out investment and uncertainty, all of which finally impact on economic growth (Gupta et al., 2004). The Keynesian approach suggests that higher government spending leads to higher economic growth. Figures 1 and 2 exhibit the behavior of budget deficit as well as GDP

growth rates in Japan. The huge and persistent fiscal deficits stimulated considerable concerns about sustainability of the economic growth. Many studies revealed that the large and persistent deficit reduces economic growth (Romer, 2001).

General government final consumption expenditure as a percentage of GDP in the world was around 17 per cent in 2016 while it was about 20 per cent in Japan. The size and growth of this amount has stimulated a fair amount of research on the relationship between the size of government and economic growth (Lindauer and Velenchik, 1992). Much less is shown about how the composition of public expenditure affects an economies' growth rate. Still, this may be the crucial issue. While the size of government is a

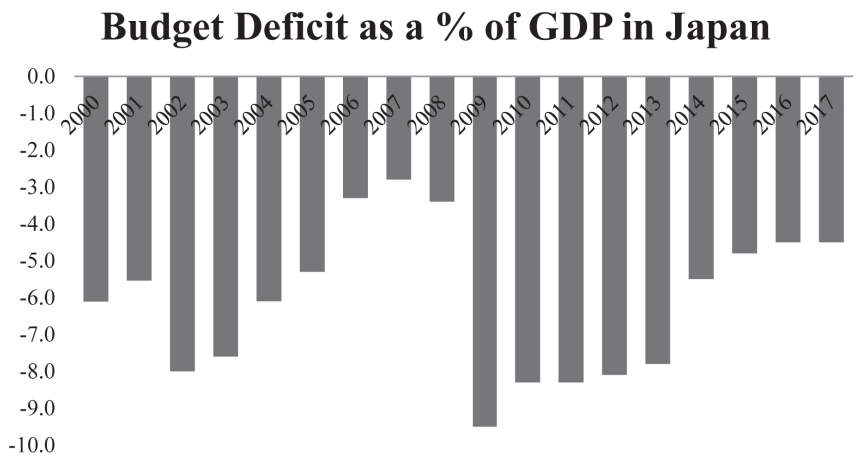

Figure 1　Budget Deficit as a Percentage of GDP in Japan from 2000–2017
Source: www.adb.org/statistics

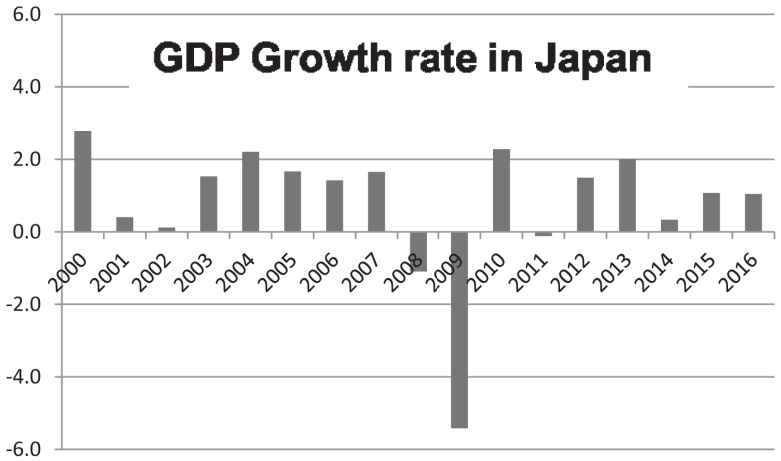

Figure 2　GDP growth rate from 2000–2016 in Japan
Source: www.adb.org/statistics

public-choice issue, its composition is a policy matter. Which component of government expenditure should be reduced or increased? Is it health expenditure, expenditure on education or expenditure on defense? The answer depends on the contribution of these components to economic growth.

Based on this background, the objective of this paper is to identify the relationship between the composition of government expenditure and economic growth using the latest data from 1972–2016. Therefore, this study will open an avenue to find whether the relationship between government expenditure and economic growth also changes or not in line with the changes in economy. Before proceeding, research questions for the study have been summarized as follows.

- ❖What is the relationship between economic growth rate and inflation rate, government expenditure, government revenue and interest rate?
- ❖What is the relationship between economic growth and health and education expenditure ?
- ❖What is the short run and long run relationship among the economic growth rate and macroeconomic variables?

The remainder of this study is structured as follows: Section 2 presents the literature review. Section 3 covers details of the data and methodology employed in the study. Section 4 explains the results of the analysis. Section 5 provides the main conclusion of the study.

2. Literature Review

Several studies have examined the causal link between government expenditure and national income. Singh and Sahni (1984) investigated it for India. The results suggested that there was a causality relationship between them. The empirical result of the study did not support neither Wagnerian nor Keynesian approaches.

Srinivasan (2013) examined the causal link between public expenditure and economic growth in India using data over the period 1973–2012. The author used co-integration approach and error correction model to analyze data. The co-integration test results showed the existence of long-run equilibrium relationship. The error-correction model estimate showed the one-way causality runs from economic growth to public expenditure in the short-run and long-run, supporting the Wagner's law of public expenditure. Ahsan et al. (1992) examined the causality between public expenditure and national income for the United States. Results failed to detect any causality.

On the other hand, there are a number of empirical studies on relationship between education expenditure and economic growth across countries. Permani (2009) reviewed the literature on the links between education and economic growth in East Asia. The author found that education was important for economic growth but it was not an enough condition to achieve considerable economic growth. The complementarity between education and other factors in improving productivity and efficiency was seen as the

major driving force of economic growth. Further, the statistical analysis showed that there is bidirectional causality between education and economic growth in East Asia. Musila and Belassi (2004) examined the relationship between government education expenditure (per worker) and economic growth over the period 1965–1999. They revealed that education expenditure per worker exhibits a positive and a significant impact on economic growth in both the long run and short run. Al-Yousif (2008) explored the causal relationship between education expenditure (as a proxy for human capital) and economic growth in the six economies of the Gulf Cooperation Council over the period 1977–2004. Granger causality test results with a vector error-correction model were mixed and varied across the countries.

The empirical studies tried to find out the impact of health expenditure on economic growth. Devlin and Hansen (2001) investigated the causal relationship between aggregate health-care expenditure and GDP in 20 OECD countries using annual data from 1960–1987. The results suggested that for some countries, Granger causality runs from health-care expenditure to GDP, while for others, it runs from GDP to health-care expenditure. Bhatt and Jain (2004) examined the long-run relationship between private health-care expenditure and GDP in India by employing cointegration tests. The results did not reveal long run equilibrium relationship between variables.

Mehrara and Musai (2011) studied Granger causality between health expenditure and income for 11 oil-exporting developing countries over the period 1971–2007. Findings of the study suggested that there was strong causality running from GDP and oil revenues to health expenditure with no feedback effecting health on GDP in oil exporting countries. Moreover, oil revenues have shown significant effects on GDP in short run. Kiymaz et al (2006) investigated the long-run relationship among the per capita private, public, and total health care expenditure and per capita gross domestic product and population growth of Turkey. They found some evidence of multivariate co-integrating relationships among the health care expenditure and gross domestic product, and population growth. Further, the results showed a bivariate co-integrating relationship between private health care expenditure and per capita gross domestic product.

Wang (2011) examined the causality between health-care expenditure and economic growth of 31 countries over the period 1986–2007. The study employed the panel regression and quantile regression equations. The results of the panel regression showed that increase in expenditure on health stimulates the economic growth. The results of quantile regression showed that in the countries with medium and high levels of economic growth, the impact of expenditure growth on economic growth was positive, that is, while health care expenditure growth was quantile, the impact of economic growth on expenditure growth was different.

Terasawa and Gates (1998) investigated the relationship between government size and economic growth of 21 industrialized countries. The Government size was indicated by

government final consumption expenditures and transfer payments. The expected results of this study were that the relationship between government consumption expenditure and GDP growth was positive for developing countries, and negative for industrialized countries. Further, they believed that transfer payments, and social welfare programs were likely to reduce economic growth. They showed that these programs reduce motivation for work and inspire tax prevention activities. The ultimate impact of these activities was reducing economic growth of the country. These expected relationships of the study were consistent with economic performance and government size for the OECD countries.

Sriyalatha (2009) examined the relationship between government expenditure and economic growth in Sri Lanka over the period of 1975–2005 using aggregate and disaggregate data. The results of the co-integration tests revealed that there was a positive long-run equilibrium relationship between government expenditure and economic growth while the defense expenditure affected negatively to long-run economic growth of the country. The causality tests results suggested that defense expenditure and economic growth rate were seen as granger causing government expenditure. Finally, the result determined that growth rate of the economy and increase in defense expenditure both led to growth of public expenditure in Sri Lanka.

Sriyalatha (2012) examined the validity of Wagner's Law for Sri Lanka for the period of 1959–2010. The results of the co-integration tests indicated that there was long run equilibrium between public expenditure and economic growth. Although the results of the study did not reveal consistency among the six versions of Wagner's Law, the results indicated that the direction of causality runs from growth of GDP to public expenditure.

Attari and Javed (2013) investigated the relationship between the rate of inflation, economic growth and government expenditure in Pakistan by using the time series data over the period of 1980–2010. The study used aggregate as well as disaggregated data on current expenditure and development expenditure for the analysis. The results revealed that there was a long term relationship between rate of inflation, economic growth and government expenditure. Meantime, the causality test results revealed that the rate of inflation did not affect the economic growth but government expenditures did affect economic growth in Pakistan.

Ono (2014) carried out an empirical study on expenditure–economic growth relationship in Japan over the period of 1960–2010. The focus of the study was testing the validity of Wagner's law and the Keynesian interpretation in the case of Japan. The results showed that Wagner's law applied for Japan and long run equilibrium was asymmetric.

Rosoiu (2015) assessed the effect of the government revenues and expenditures on the economic growth in Romania over the period of 1998–2014. This study employed few exogenous variables such as government expenditure, government revenue, inflation rate and interest rate to examine the

relationship between economic growth and said variables. The results revealed that increase in government expenditure leads to higher economic growth. Similarly, higher revenue also influenced to higher economic growth rate in Romania. Further, the study showed that a bidirectional relationship between government revenue and government expenditure.

Lupu et al. (2018) examined the importance of public expenditure, the functional structure, and economic growth using an Auto Regressive-Distributed Lag (ARDL) model for quarterly data from 1995–2015, for 10 selected Central and Eastern European countries. The results of the study revealed that expenditures on education and health care have a positive impact on the economy, while expenditures on defense, economic affairs, general public services, and social welfare have a negative impact on the economy.

Sriyalatha and Torii (2019) examined the long-term impacts of fiscal variables on economic growth in Singapore and Sri Lanka from 1972 to 2017. Autoregressive Distributed Lag (ARDL)-ECM approach were employed to determine the impact of fiscal variables on economic growth on time series data. The results revealed that government expenditure, government revenue and investment expenditure positively and significantly affect in Singapore's as well as Sri Lanka's economic growth in the long run. Moreover, the Toda-Yamamoto's Granger causality results showed that bidirectional causality between inflation rate and economic growth in Singapore.

This empirical paper differs from the above mainly in the use of more exogenous variables for the study with recent data and a different analytical model called ARDL. Analysis is done at aggregate level as well as disaggregates level over the period of 1972–2016.

3. Methodology and Model

This research used annual data dealing with GDP, government expenditure, revenue, inflation and interest rate data in Japan from 1972–2016 at the aggregate level. The study has also used disaggregate data on health expenditure, education expenditure and other variables to analyze the relationship with GDP growth rate in Japan. First, the combined effect of expenditure and other macroeconomic variables has been tested; and secondly, the study used the disaggregated data on expenditure for the analysis. Annual data were collected from several sources; such as www.adb.org/statistics and Asian Development Bank. The study employed the two models as specified below which use disaggregated level and aggregated level data respectively.

Model 1: $LnGDP_t = \beta_0 + \beta_1 LnHe_t + \beta_2 LnEd_t + \beta_3 LnRe_t + \beta_4 Int_t + \varepsilon_t$

Model 2: $LnGDP_t = \beta'_0 + \beta'_1 LnRe_t + \beta'_2 Int_t + \beta'_3 LnCPI_t + \beta'_4 LnGo_t + \varepsilon_t$

Where

LnGDP: the natural log of real GDP

LnCPI: the natural log of Consumer Price Index (to measure inflation rate)

LnGo: the natural log of Government expenditure

LnRe: the natural log of Revenue

Int: Interest rate
LnHe: the natural log of Health expenditure
LnEd: the natural log of Education expenditure

Estimation Technique

Different investigation methods are available in econometric literature to test the long-run equilibrium between variables of a model. Johansen and Juselius (1990), Engle and Granger (1987), and maximum likelihood test (suggested by Johansen, 1988; Johansen, 1991) are most widely applied by researchers. ARDL technique provides several benefits. First, this approach is facilitated to accommodate small sample sizes while maintaining reliability. Second, it is not a requirement of all variables to be integrated of the same order to apply ARDL technique. In case, variables of the model are integrated in different orders, I(1), I(0) or both, it estimate the short-and long-run parameters simultaneously. The approach will however crash in the presence of I (2) series. Third, this methodology supports eliminating the intensity of serial correlation of residuals by including sufficient number of lags. Fourth, a simple linear transformation is used to develop error correction model (ECM) from ARDL model (Shrestha and Chowdhury, 2005). Last, in ARDL technique endogeneity problem does not creep in and therefore its estimates and t-ratios are unbiased and reliable. In this study we employed the ARDL suggested by Pesaran *et al*. (2001) to examine the relationship between economic growth and other variables.

Results of the Analysis

For ARDL model, it is not an essential requirement to test the unit root property of the variables. Because ARDL can be used whether variables are integrated of order one, zero or both. However, this model is not appropriate if the variables are I (2) or higher. In order to confirm if any variable is integrated of order 2 or higher, Augmented Dickey Fuller (ADF) and Phillips Perron (PP) tests were employed. The results of ADF test and PP test are summarized in Table 1.

The results of the ADF and PP stationary tests for GDP, government expenditure and revenue show that both tests reject the null of non-stationary for the variables in levels. However, ADF and PP tests results show that the null hypothesis of unit root is rejected for all the variables at their first difference. Hence, it can be concluded that they are integrated of order 1 that is I (1) and all the variables at their first difference are stationary. Further, the results confirm that no series under consideration is integrated of order 2 or higher. This result makes the case stronger to examine the long-run association between the variables by employing the ARDL approach which is independent of the order of integration.

After estimating the suitability of the ARDL model, this study checks the autocorrelation effect and heteroskedasticity effect of estimated model. First to verify whether the residuals from the model are serially uncorrelated, we performed the Breusch-Godfery Langrage Multiplier (LM) test. The result is summarized in Table 2. Since the null hypothesis is that the residuals

are serially uncorrelated, the F-statistic p-value of 0.4832 and 0.4303 of Model 1 and 2 indicate that we fail to reject the null hypothesis. We therefore concluded that the residuals are serially uncorrelated. It suggests that the disturbance term relating to any variable has not been influenced by the disturbance term relating to another variable.

Similarly, testing for residual homoscedasticity, we have chosen Breusch-Pagan-Godfrey test. Since the null hypothesis is that the residuals are homoskedastic, the F-statistic p-value of 0.2776 and 0.1565 for Model 1 and 2 indicate that we fail to reject this null hypothesis even for a significance level of 10 per cent. We therefore concluded that the residuals are homoskedastic because the corresponding probability value is greater than at 5 per cent significant level.

In this study for testing the long run nexus (bound test), the Wald testing approach was considered. The following Table 3 shows the results of bound testing approach. It shows two critical bounds, such as upper and lower to test for cointegration. The lower bound is applied if the regressors are I (0) while the upper bound is used for I (1). If the *F*-statistic is greater than the upper critical value, we conclude in the favour of a long-run relationship. Nevertheless, if the *F*-statistic

Table 1 Results of Unit Root Test

Variable	Augmented Dickey Fuller (ADF) Test		Phillip-Perron (PP) Test	
	Level	First-Difference	Level	First-Difference
LnGDP	−4.445909**	4.848578**	4.109349**	−5.011824**
LnCPI	−7.974721***	−2.628545*	−15.74169***	−2.412576*
LnGo	5.108669**	−5.513312**	−7.045284**	−5.775590**
LnRe	−3.062339*	−5.626451**	−3.183909*	−5.609276**
Int	−1.371400	−6.324967**	−0.452783	−4.667960**
LnHe	−2.558808	−6.240367**	−2.488107	−10.65145**
LnEd	−2.180029	−7.941291**	−2.057819	−7.941291**

Notes: For ADF and PP tests, ** and * denote rejection of a unit root hypothesis based on Mackinnon (1991) critical values at 1 per cent and 5 per cent, respectively.

Table 2 Diagnostic tests Results

Diagnostic tests indicators	Model 1		Model 2	
	F-statistic	Prob. F	F-statistic	Prob. F
Breusch-Godfrey Serial Correlation LM Test	0.745299	0.4832	0.871244	0.4303
Heteroskedasticity Test: Breusch-Pagan-Godfrey	1.295462	0.2776	1.574970	0.1565

lies between upper and lower bounds, the inference will be inconclusive. The results of estimated F-test statistics are presented in Table 3. The estimated *F*-statistic for two models (*F*-statistic=15.46680 and 14.34832) are higher than the upper bound critical value at 1 per cent level of significance (4.37) respectively. This implies that the null hypothesis of no cointegration cannot be accepted at 1 per cent level and therefore there are cointegrating vectors existing among the variables. This result confirms that there is a long-run relationship between economic growth and other variables. The next step is to estimate the long run and short run coefficients of the ARDL model.

Since there are co-integrating vectors found among the variables we can estimate the long-run relationship. The estimated long run coefficient of the ARDL approach for two model specifications are reported in Table 4. The results of long run estimates of ARDL Model 1 suggest that revenue has statistically positive and significant impact on economic growth, whereas interest rate has statistically negative and significant impact on economic growth. Therefore, this result reveals that economic growth increases by 0.2428 per cent due to 1 per cent increase in revenue of the economy. According to estimates of ARDL model 2, inflation rate indicates negative and significant impact on economic growth while government expenditure and revenue have positive and significant impact on economic growth in Japan. Therefore, this result reveals that economic growth decreases by 0.8697 per cent due to 1 per cent increase in inflation rate.

The results of short-run dynamics using the ECM version of ARDL are reported in Table 5. The short-run elasticities are computed for the coefficients of the variables

Table 3 Results of ARDL Bounds Test

Test Statistic	Model		Critical Value (Pesaran et. al., 2001)		
	1	2	Significance Level	I(0) Lower Bound	I(1) Upper Bound
F-statistic	15.46680**	14.34832**	10%	2.2	3.09
			5%	2.56	3.49
			1%	3.29	4.37

Note: ** denote critical values at 1 per cent significance level.

Table 4 ARDL Long Run Estimates

Model 1			Model 2		
Variable	Coefficient	Prob.	Variable	Coefficient	Prob.
LnRe	0.242727***	0.0000	*LnCPI*	−0.869651**	0.0376
Int	−0.057647***	0.0000	*LnGo*	0.414236***	0.0005
LnHe	0.009279	0.5697	*LnRe*	0.328817***	0.0000
LnEd	0.103638*	0.0702	*Int*	−0.015220	0.1490
C	25.666499***	0.0000	C	14.153081***	0.0001

Note: ***,** and * denote critical values at 1 per cent , 5 per cent and 10 per cent respectively.

at their respective first difference. The short-run result of Model 1 shows that revenue and expenditure on education exert a positive impact on economic growth and statistically significant at the 1 and 5 per cent level, respectively. However, the rate of interest and expenditure on health are insignificant. The short-run result of Model 2 reveals that government expenditure and government revenue have a positive and significant impact on economic growth. Meanwhile inflation rate has a negative and significant impact. However, the rate of interest is insignificant in the short–run.

The coefficient of the error correction term (EC) implies a speed of adjustment from short run to long run. The larger the error term, the faster the economy returns to the equilibrium rate of growth following a shock. The estimated EC of Model 1 and 2 are 0.204467 and 0.387349, respectively. As expected, the EC term, here represented as CointEq(-1), is negative and significant at the 1 per cent level. This implies that about 20.45 per cent of any movements into disequilibrium are corrected for within one period in Model 1. While in Model 2 the estimated coefficient of EC implies that 38.73 per cent of short-run disequilibrium is eliminated in the current period.

Finally, stability of short-run and long-run coefficients is checked by Cumulative Sum (CUSUM) statistics. The graphs of CUSUM statistics for model 1 and 2 are shown in Figure 3 and 4, respectively. As the plots of CUSUM statistics is found within the critical bounds of 5 per cent level of significance, so the null hypothesis of stability of coefficients in the given regression cannot be rejected. This stability test confirms the reliability of all the ARDL models. It implies that short run and long run coefficients in the ARDL-Error Correction Model are stable. Our results suggest parameter consistency under

Table 5 ARDL Short-Run Cointegrating Results

Model 1			Model 2		
Variable	Coefficient	Prob.	Variable	Coefficient	Prob.
D(*LnRe*)	0.074226***	0.0001	D(*LnCPI*)	−0.313256	0.2504
D(*LnRe*(-1))	−0.001041	0.9488	D(*LnCPI*(-1))	−0.250220	0.2593
D(*LnRe*(-2))	−0.026475*	0.0854	D(*LnCPI*(-2))	−0.223396	0.1163
D(*Int*)	−0.003036	0.4091	D(*LnCPI*(-3))	−0.295228***	0.0120
D(*LnHe*)	0.001089	0.6887	D(*LnGo*)	0.132996	0.3495
D(*LnEd*)	0.017120**	0.0341	D(*LnRe*)	0.104400***	0.0000
CointEq(-1)	−0.204467***	0.0000	D(*LnRe*(-1))	−0.032000*	0.0987
			D(*LnRe*(-2))	−0.063365***	0.0010
			D(*Int*)	−0.001257	0.7917
			CointEq(-1)	−0.387349***	0.0000

Note: ***,** and * denote critical values at 1 per cent , 5 per cent and 10 per cent ,respectively.

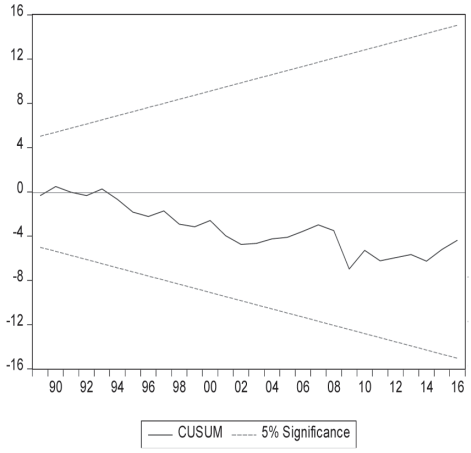

Figure 3 Stability Test of Model 1

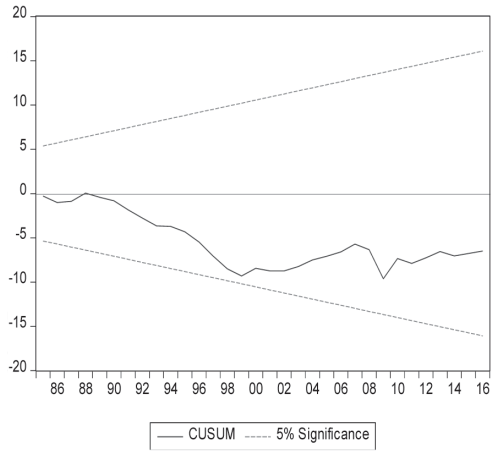

Figure 4 Stability Test of Model 2

both short and long run.

Concluding Remarks

The consequence of fiscal policy on macroeconomic activities has been one of the most unsettled issues and vital for designing appropriate economic policy for any government. Government expenditure as an instrument of fiscal policy can have significant impact on stabilization and economic growth of the economy. Hence, the main objective of this study is an attempt to examine the role of the components of government expenditures in economic growth of Japanese economy during the period of 1972–2016. The main contribution of this paper is to examine the short-run and long-run relationship between the composition of public expenditure and economic growth by using modern econometric techniques such as ARDL and bounds testing approach to co-integration for a single country case. To capture the effect of public expenditure on economic growth, we have incorporated two most important but different components of public expenditure: education expenditure and health expenditure. In addition to these main variables, we have also used inflation rate, government revenue and interest rate to capture the impact on economic growth in Japan.

The ADF and PP test are used to check for the stationary properties of the variables. All variables were stationary at first difference. The ARDL bounds tests confirm long run association among economic growth, government revenue, government expenditure, inflation rate and rate of interest aggregate level as well as disaggregate level.

The study finds that government revenue and rate of interest have a statistically significant, positive and negative impact on economic growth, respectively in the long-run. Health expenditure is insignificant. The results of Model 2 shows that government expenditure and revenue have statistically a positive and significant impact on economic growth while inflation rate has a statistically negative and a significant impact on economic growth in the long-run. Rate of interest is

insignificant in the long-run. These findings are in line with the Keynesian approach, which indicates a powerful effect of government spending on economic growth. The studies of Jiranyakul and Brahmasrene (2007) on Thailand, Sriyalatha (2009) on Sri Lanka, Sriyalatha and Torii (2019) on Sri Lanka and Singapore and Magazzino (2010) on Italy confirmed the validity of Keynesian law of public expenditure.

The short-run result indicates that the effect of government revenue and education spending on economic growth is statistically significant and positive. Meanwhile, the short-run result indicates that the effect of health spending and rate of interest on economic growth is statistically insignificant. The results of Model 2 indicate that the effect of inflation rate on economic growth is statistically significant and negative while government revenue has a positive, significant effect on economic growth. Further, it reveals that the effect of rate of interest and government expenditure on economic growth is statistically insignificant.

The results show that government revenue is a major driver of economic growth in Japan in both short-run and long-run. Expenditure on education also contributes positively towards the economic growth. For example, with increased spending on education each year, the government will be able to increase its economic growth in the long run. The results are consistent with the findings of other studies such as Lau et al (1993), Chun-Lin, Tin (2004). Thus, this study concludes that government should spend more on education for stimulating economic growth. Education is more prominent in the knowledge based economy since knowledge and human capital generated by education are vital for the economy than ever. The formation of human capital through education and training will contribute to economic growth of a nation. According to Lucas (1993), education and training are the most important source of growth in producing human capital with knowledge and skills. Thus, the government should allocate its expenditure towards productive sectors like education as it will stimulate the economic growth as well as raise the standard living of people in the country.

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