



A Study on Assessing Government Size, the Composition of Public Spending on Education and Economic Growth in the USA

Wing Yee Choi

George Mason University, USA.

Email: Wing.y.c1@gmail.com

Abstract

The paper aims to assess the effect of government size and the composition of public spending on education on economic growth in the USA. This study is quantitative, and the data has been gathered from the World Bank database for 60 years, from 1960 to 2019. The variables considered in the study include government size, GDP growth, inflation, FDI, GDP (current US\$), and government education expenditure (GEE) as a % of GDP in the USA. In terms of the analysis, the augmented Dickey–Fuller (ADF) has been used to determine the unit root. Moreover, the effect has been tested through the ADF and bounds tests. It has been determined from the analysis that GDP growth is dependent on the first lag, while there is a significant effect of government size and public expenditure on education on GDP. It was also found that the controlling effect of inflation is also significant. The results of this study are restricted to the USA. With respect to the implications, there is a huge significance of these results as the government of the USA can ensure economic growth while increasing educational expenses.

Keywords:

GDP
FDI
Inflation
Education
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1. Introduction

Countries worldwide have recently faced different episodes of financial crisis because of the inability of their respective governments to bridge the deficit between tax revenues and public expenditures. According to the study by [Divino, Maciel, and Sosa \(2020\)](#), the fiscal crisis faced by countries has common features which are mainly accompanied by social, political and financial distress because recovery is painful for society as it is dependent on government spending and increased tax rates. In addition, the performance of fiscal policy is largely influenced by the association between economy, the size of the government, economic growth and public expenditure ([Martins & Veiga, 2014](#); [Nartea & Hernandez, 2020](#)). The issues are based on the fact that some components pertaining to public expenditure are found to be more productive in terms of economic activity. Considering this perspective, a country may be able to enhance its economic situation by changing the composition and level of aggregate public spending.

As research emphasizes the positive and healing role of governments and their capacity during financial crises, a significant amount of focus has been placed on the influence of government size on the economic growth and progression of a country. Research initiated by [Asimakopoulou and Karavias \(2016\)](#) states that government size has a significant impact on economic progression. However, the impact of government size has different variants, for instance, an oversized government can exert a negative spillover effect, which can be caused by an increase in taxes and borrowing enormous amounts of funds to build large cash reserves. In contradiction of this phenomenon, it was stated that if the government spending too low it can negatively impact economic progression.

According to Nyasha and Odhiambo (2019), in order to better understand government size, it is important to understand a government's direct and indirect arms. The authorities and institutions that come under the direct arm are responsible for collecting taxes, allocating it to different channels that are further responsible for redistributing it toward the welfare of the public through subsidies and welfare grants. The purpose of the direct arm is to narrow down the distribution of funds to its monetary value. On the other hand, the indirect arm of the government is responsible for determining the costs and benefits associated with the distribution and providing subsidies in the form of tax allowance.

Tehranian, Abdi Seyyedkolae, Imani, and Zakeritabar (2020) stated that there are more ways to measure government size, the most prominent being expenditure, revenue, and employment. Government expenditure is mainly determined by the aggregate national accounts. Generally, the less the government spends, the smaller the size of the government is. Economic progression is not the only milestone a government sets for itself, rather it also focuses on improving the flow of funding toward public spending.

Bexheti and Mustafi (2015) stated that education is an important area, and its positive impact can be translated as an improved and enhanced education system which results in less unemployment. Lower unemployment can further be interpreted as reduced dependence on government relief initiatives, such as education-based assistance programs, and ultimately means greater tax revenues. The governments of many developed countries spend generously on education because it helps to promote economic growth. The benefits reaped from education not only benefit individuals and their families but also positively contributes to the welfare of the community (Buerger & Harris, 2020).

Specific to the US, education has a positive impact on economic progression, and public investment in education can contribute to forming a more productive workforce and a large labor market. In comparison to the least developed or developing nations, education has a positive and significant impact on the social welfare of a country. In the case of the US, a leading economy of the world, educational programs enhance labor participation and increase the labor capacity.

The current US government spending is estimated at \$4.829 trillion, where the federal budget for the current year covers 2021 (The Balance, 2020). Despite sequestration to curb government spending, the deficit has been increasing with the effort of the government to enhance economic growth.

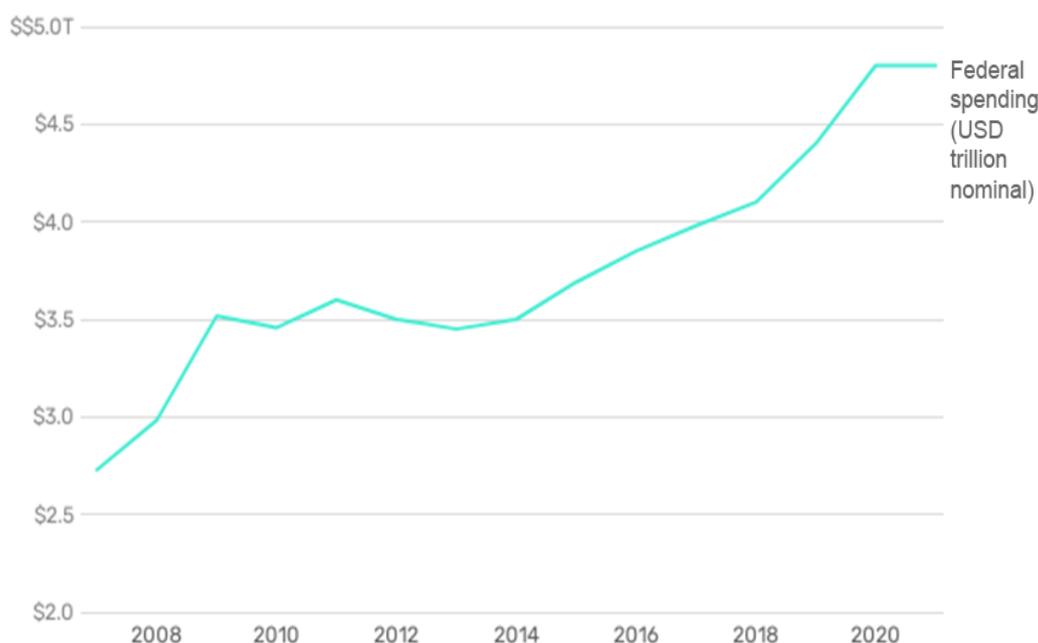


Figure 1. US federal spending by year.

Source: The Balance (2020).

After acknowledging the scope of the US federal spending, it is important, understand the breakdown of the US federal spending and the sources that help to improve the government size. According to the Tax Policy Center (2019), 50% of government spending is formed from individual income tax. In fact, since 1950 it has been considered as the most important source of federal spending. Apart from the individual tax income, there are various other sources, including corporate income tax, social insurance, and excise tax. Nonetheless, depending on the importance of the state, the US allocates its federal spending according to area. The highest amount of public spending (around \$1 trillion) is devoted to social security, which is further distributed to retirement benefits and the facilitation of veterans. The second highest spending is on Medicare and marketplace subsidies, which takes around 25% of the budget. The final distribution includes defense and international security; around \$697 billion is spent on national security and conducting overseas contingency operations.

An article by [Resilient Educator \(2020\)](#) analyzes 10 years of spending trends in US education. It was noted that in the last 10 years education remains the area of least interest for public spending allocators; less than 3% of the funds from a budget of \$3.8 trillion in 2015 was allocated to education. Regarding this public spending issue, studies have not produced conclusive evidence on the composition of public spending or if public spending has any significant impact on economic growth. Although [Nyasha and Odhiambo \(2019\)](#) emphasized the relation of public spending and economic growth, they were not able to provide much detail on the significance of public spending in the context of education.

The aim of this study is to assess government size and the composition of public spending on education and economic growth in the context of the USA. The steps taken are as follows:

- Analyze the impact of public spending on the economic growth of the USA.
- Determine the composition of public spending formulated by the US government.
- Analyze the impact of education on economic growth.
- Recommend a public spending strategy to improve the effectiveness of education in terms of economic growth.

2. Literature Review

For any economy to thrive it is immensely important that government spending sourced from individual and public taxes is allocated fairly and on ministries, such as education, so it contributes to the social welfare of the nation. Often, US and European countries are viewed as successful and accomplished countries that have improved their economic status. In order to better understand the relationship between government size and economic growth, research by [Schmidt and Wigerstedt \(2019\)](#) provides empirical evidence in the context of the EU. In order to compute more specific and focused results, the study considers the impact of government spending on economic growth and progression from 2000 to 2017. The study suggests that fair distribution and allocation of public funding has led to economic improvement in many European countries.

[Hajamini and Falahi \(2018\)](#) conducted an economic analysis on the EU to understand the positive effect of government size on economic growth, which is a controversial issue. As the government's focus and priorities can vary, the controversy mainly revolves around the fact that public spending refers to taxes payers' money and therefore it should be allocated toward economic progression. Public spending is considered a vital source of funding, whereas borrowing money for public projects is not vital or beneficial because public projects, such as education and health, are not meant for the purpose of generating revenue, rather they are for public welfare.

However, if a government borrows finances for public spending, it results in an increase in the financial costs of investment. In order to understand the government size and economic growth, we consider the relation the variables in the context of 14 European countries from 1995 to 2014. The empirical evidence of the study denotes a non-linear relationship between economic growth and government expenditure in light of the U-shaped Barrow curve.

The primary purpose of this study to explore the relation of economic growth and public spending in the US. [Mitchell \(2005\)](#) provides conclusive evidence of the impact of several government financing methods on economic progression. Instead of focusing solely on the positive relation between the size of the government and economic growth, the study enlisted several reasons for a relation denoting a negative impact. The most prominent negative effect is caused by displacement cost, which refers to the loss or displacement of revenue. Additionally, the negative effect of this loss includes the behavioral penalty cost, which means that the government discourages economically attractive choices. The study reached the conclusion that, regardless of whether public spending is financed through taxes or borrowing, government spending imposes high displacement and extraction costs. In the context of the USA, large government projects reduce the economic rate and economic growth; therefore, the following hypothesis proposed.

H1: Government size significantly influences the economic growth of the United States.

The other important variable of this study is education. According to [Hua \(2016\)](#), education is regarded as vital, and it is important to ensure a successful implementation of any public strategy. It is stated that in many countries, education is considered a vital tool for eliminating poverty. Research by [Tomić \(2015\)](#) analyzes the role of education in the European Union and the BRICS countries. It expresses that knowledge is a key factor in the development and progression of an economy. In an extensive investigation of the process of utilizing education for the purpose of economic progression, it is conclusively stated that many developed market economies prioritize investment in human resources through their national strategies, and many of the leading economies generously allocate funds for education in their public spending strategy. The importance of dedicating a portion of public spending to education is stressed by Adam Smith, who states that a nation depends on labor in production.

In addition, the labor can only show productivity in an organization, institution or country that invests in its human resources. The study reveals that education mainly supports the empowerment of the people and human resources of a country to work toward economic stability. In this modern era, education is considered a vital tool as it facilitates the process of technological development, which ultimately allows a country to gain a competitive edge. In the case of the European Union, Japan, the USA and BRICS countries, there is a positive correlation between public expenditure allocated to education and economic growth. The relationship between

public spending and education translates to a 1% increase in government expenditure on education, which leads to a 1% increase in economic growth.

Research by [Carpentier \(2006\)](#) provides a specific and conclusive context in relation to the allocation of funds from public spending to economic growth in the US. In the late 1990s, the investment in education vastly increased, leading to positive development in the socio-economic environment. [Obi, Ekesiobi, Dimnwobi, and Mgbemena \(2016\)](#) addressed the education outcome of public spending. They stated that regardless of the geographical position in most of the advanced economies, education is considered an important priority as it supports the rapid transformation of the economy. Education not only favorably works as a tool to alleviate poverty, it also improves countries' global representation and enhances the employment rate. Hence, the following hypothesis is proposed:

H2: Government size significantly influences the composition of public spending on education in the United States.

In addition to this, public spending on education is also dependent on the foreign direct investment in the country. This is because the increased FDI results in the increase of funds for the country. It has also been argued in the study on Pakistan by [Ali and Malik \(2017\)](#) that FDI helps a country to increase its expenses on the general public. In this manner, the control effect of FDI has been tested on the relationship of government size with the composition of public spending on education and economic growth in the United States.

H3: FDI significantly affects the relationship between government size and economic growth in the United States.

H4: FDI significantly affects the relationship between the composition of public spending on education and economic growth in the United States.

Inflation also plays a vital role in terms of increasing or decreasing government expenditure on public education. This is because increased inflation will reduce government expenses. It has also been stated in the study by [Mehrrara, Soufiani, and Rezaei \(2016\)](#) that government expenditure is dependent on the rate of inflation in the country. Therefore, the control effect of inflation has been tested on the relationship of government size with the composition of public spending on education and economic growth in the United States.

H5: Inflation significantly affects the relationship between government size and economic growth in the United States.

H6: Inflation significantly affects the relationship between the composition of public spending on education and economic growth in the United States.

3. Method

3.1. Description of the Variables

The variables used to measure government size are the average government expenditure as a percentage of GDP, government expenditure on education, and the real GDP of the USA.

3.2. Unit Root Test: Augmented Dickey–Fuller (ADF)

The study analyzes government size, the composition of public spending, and economic growth in the USA using time series data from 1990–2019. To test the stationarity of the data, the ADF test was carried out because it is necessary to highlight that the ADF forms the basis of the suppositions through the null hypothesis which exhibits the unit roots.

$$\Delta a_t = \mu_0 + \mu_1 t + \mu_2 a_{t-1} + \sum_{i=1}^n \alpha_i \Delta a_{t-1} + \varepsilon_t$$

In the above equation, Δ is the difference operator, ε_t represents the random error of stationarity, α refers to all the independent variables in the study, and a_t reflects the non-stationary series.

3.3. Autoregressive Distributed Lag (ARDL)

For the econometric assessment, the ARDL was used as it is regarded as the most important constituent for a single-equation regression.

$$P_t = \pi + \alpha XA_t + \vartheta_t$$

In the above equation, P_t signifies the dependent variable, XA represents the independent variables, ϑ_t represents the error terms, and α is the parameter estimate. Furthermore, the mathematical model for the developed ARDL model is presented as follows:

$$\Delta P_t = \pi_1 + \sum_{i=1}^{m1} \theta_{1i} \Delta P_{t-i} + \gamma_1 P_{t-1} + \gamma_2 XA_{t-1} + \vartheta_t$$

In addition, the short-term and long-term dynamics for the ARDL model are accessible through the subsequent mathematical models:

$$\Delta P_t = \pi_2 + \sum_{i=1}^{m2} \alpha_{2i} \Delta P_{t-i} + \sum_{j=0}^{n2} \alpha_{2j} \Delta XA_{t-j} + \vartheta_{2t}$$

$$\Delta P_t = \pi_3 + \sum_{i=1}^{m3} \gamma_{3i} \Delta P_{t-i} + \sum_{j=0}^{n3} \alpha_{3j} \Delta XA_{t-j} + \phi \varepsilon_{t-1} + \vartheta_{3t}$$

Here, ϕ signifies a statistically significant coefficient which is corrected for error.

3.4. Bounds Testing

The bound test is a powerful statistical tool that is used to evaluate the relationship with respect to time series data that is also jointly cointegrated. This technique is applied to evaluate the short- and long-run associations between the variables.

4. Results and Analysis

4.1. Descriptive Statistics

Table 1 depicts the descriptive statistics of the variables which have been considered in this study. It shows that the mean value for government size (as a % of GDP) is 20.13, which implies that the average US government size for the 60 years covered by the study is 20.13%. Additionally, the standard deviation for government size is determined to be 2.74, which depicts that the size of the US government will deviate by 2.74%. On the other hand, the mean value for GDP growth (annual %) is 3.43, which implies that the average GDP growth in the US over the 60 years is 3.43%. In addition to this, the standard deviation for GDP growth as an annual percentage is 2.53, which posits that the GDP growth of the US for the 60 years will deviate by 2.53%. In contrast to this, the mean value for inflation as an annual percentage is 3.72, which depicts that the average inflation of the USD over the 60 years is 3.72%. However, the standard deviation for US inflation is 2.77, which indicates that inflation over the 60 years deviated by 2.77%. Moreover, the mean value for FDI net inflows is 0.973, which means that the average value for FDI net inflows for the US over the 60 years is 0.973%. The standard deviation for FDI net inflows was computed to be 0.88, which implies that the US FDI net inflows over the 60 years deviated by 0.88%. Lastly, the mean value for government education expenditure (GEE) as a % of GDP was 4.55, which depicts that the average value for GEE of GDP for the US is 4.55%. In contrast to this, the standard deviation for GEE of GDP was computed to be 0.593, which indicates that the GEE of GDP for the US will deviate by 0.593%.

4.2. Augmented Dickey–Fuller (ADF)

Based on the previous patterns, testing for the unit root is considered to be significant for the purpose of forecasting and calculating the values. In addition to this, the ADF is also regarded as the scenario of no accidental shift with regard to the drift pertaining to the occurrence of a systematic pattern. As per the study by Papanoditis and Politis (2018), it is challenging to assess future values on the basis of historical data using conventional inferential statistics. In this manner, the researcher has used the ADF for the purpose of detecting the unit root.

Table 1. Descriptive Statistics.

Variable	Obs.	Mean	Std.	Min.	Max.
Government size (%)	60	20.132	2.741	14.551	26.159
GDP growth rate (%)	60	3.435	2.534	-2.536	9.587
Inflation rate (%)	60	3.720	2.778	-0.355	13.549
FDI to GDP (%)	60	0.973	0.889	-0.009	3.405
Education expenditure (GEE) of GDP (%)	60	4.551	0.593	2.926	5.424

Table 2. Augmented Dickey–Fuller (ADF).

Augmented Dickey–Fuller test statistic	t-statistic	Prob.*
Government size	-1.861	0.350
GDP growth annual	-4.483	0.000
Inflation annual	-2.398	0.142
FDI net inflows of GDP	-2.294	0.173
GEE of GDP	-3.227	0.018

Table 2 shows the augmented Dickey–Fuller (ADF) of the variables considered in this study. The null hypothesis of the ADF depicts that there is the presence of unit root in the data, while the alternate hypothesis depicts that there is no presence of unit root in the data. Therefore, it can be determined on the basis of the above information that there is unit root in government size, as $t = -1.861$ [$p = 0.35$], which is above the threshold of 0.05. On the other hand, the GDP growth annual was determined to have no presence of unit root,

as $t = -4.483$ [$p = 0.00$], which is below the threshold of 0.05. In addition to this, it has also been determined that there is the presence of unit root in annual inflation, as $t = -2.398$ [$p = 0.142$], which is above the threshold of 0.05. Moreover, there is also the presence of unit root in FDI net inflows of GDP, as $t = -2.294$ [$p = 0.173$], which is also above the threshold of 0.05. Furthermore, there was no presence of unit root in GEE of GDP, as $t = -3.227$ [$p = 0.0185$], which is below the threshold of 0.05.

4.3. Bounds Testing

In terms of the ARDL bounds test, it was identified that the F-statistic value was 10.641, while the t-value was determined to be -6.832. The study by Pesaran, Shin, and Smith (2001) suggested that the criteria of the bounds test is that the values for the F-statistics and t-statistics should be higher than their critical scores. Concerning this study, the F-statistic of 10.641 is higher than all the critical values of I(1); for instance, at a 1% significance level, the critical value of 5.83 is less than 10.641, indicating the presence of a long-run relationship (see Table 3). Therefore, a relationship between the variables exists.

Table 3. Bounds testing.

Model: F (Annual GDP growth, government size, annual inflation, FDI net inflows of GDP, GEE of GDP)						
Optimal lag length: ARDL (1,1,0,0,2)						
F = 10.641						
	10%		5%		1%	
	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
F	2.567	3.743	3.073	4.375	4.232	5.803
t	-2.543	-3.648	-2.876	-4.028	-3.541	-4.773

4.4. Autoregressive Distributed Lag (ARDL)

As it has been determined from the above ADF test that there was mixed stationarity among the variables, as several variables contain a unit root, the ARDL model has been conducted (Oluseyi, Olasehinde, & Eweke, 2017).

Table 4. Autoregressive distributed lag model for LPI (Long run).

Variable	Coefficient	Std. error	t-statistic	Prob.*
Long run				
Government size	-0.375***	0.128	-2.92	0.005
Annual inflation	-0.207**	0.097	-2.13	0.038
FDI net inflows of GDP	-0.079	0.321	-0.25	0.805
GEE of GDP	-2.959***	0.707	-4.17	0.00

Note: * Significant at 10%; ** Significant at 5%; *** Significant at 1%

Therefore, it can be determined from Table 4 that government size is significant in the long run, as $B = -0.375$ [$p = 0.005$], which is significant at 0.01. These findings are consistent with the study by Mitchell (2005). In addition to this, annual inflation was also significant in the long run, as $B = -0.207$ [$p = 0.038$], which is significant at 0.05. The FDI net inflows of GDP was also insignificant in the long run, as $B = -0.07$ [$p = 0.805$], which is above the threshold of 0.1. Lastly, the GEE of GDP was significant in the long run, as $B = -2.95$ [$p = 0.00$], which is significant at 0.01.

On the other hand, it can be determined with respect to the short run, that government size and GEE of GDP are both significant (p-values < 0.05) (see Table 5).

Table 5. Autoregressive distributed lag model for LPI (Short run).

Variable	Coefficient	Std. error	t-statistic	Prob.*
Short run				
Government size	-0.558**	.258	-2.16	0.036
GEE of GDP				
D1	-9.298***	1.703	-5.46	0.000
LD	6.787***	1.871	3.63	0.001
C	20.141***	3.170	6.35	0.000
R-squared	82.94%	F-statistic	-6.83	
Adjusted R-squared	80.04%	Prob (F-statistic)	0.000	

Note: * Significant at 10%; ** Significant at 5%; *** Significant at 1%

5. Discussion

Based on the above results, the first hypothesis, that government size significantly influences economic growth in the United States, is accepted, as the long-term effect of government size on the US economic growth was confirmed. The study by Mitchell (2005) also states that there is a huge influence of government financing on the economic progress of the country. In addition to this, the second hypothesis, that government size

significantly influences the composition of public spending on education in the US, has also been accepted, as the significant influence of government size on public spending on education in the US was confirmed. The effect of FDI on the relationship among government size, economic growth and the composition of public spending on education in the US was determined to be insignificant. The results are opposed to the findings of Ali and Malik (2017), which state that FDI helps a country to increase its expenditure on the general public. Moreover, the effect of inflation on the relationship among government size, economic growth and the composition of public spending on education in the US was determined to be significant. This result aligns with the findings of Mehrara et al. (2016), who found that government expenditure is dependent on the rate of inflation in the country.

6. Conclusion

Incompetence in terms of bridging a deficit between tax revenues and public expenditures has led to a fiscal crisis for most countries all over the world. This study emphasizes the assessment of government size, the composition of public spending on education, and economic growth in the US. The data was gathered from the World Bank's database for a period of 60 years, from 1960 to 2019. The variables used in the study are government size, GDP growth, inflation, FDI, GDP (current US\$), education expenditure, and GEE as a % of GDP. The unit root was tested with the help of the ADF, which determined the presence of unit root in certain variables. Therefore, due to the mixed stationarity of the variables, the ADF was conducted, which determined that GDP growth is dependent on the first lag, while there is a significant effect of government size, inflation and GEE of GDP. In addition to this, the bounds test determined that a relationship among the variables exists.

7. Limitations and Implications

There are several limitations of the study which must be considered by future researchers. The study is restricted to the USA; therefore, there is limited scope for the results of this research. It is suggested that future researchers increase the scope of the study by considering other countries. The results of this study are only significant for the economic development of the USA with regard to increasing expenditure on education in the country.

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