

PUBLIC EXPENDITURES BY SUB-DIVISION AND ECONOMIC GROWTH IN EUROPE

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Abstract

This paper analyzes the correlation between public expenditure and economic growth for 30 European countries over the period 1991 to 2012 using three econometric methods - OLS, LSDV and GMM. In order to test the link between government spending and economic growth, the research uses the United Nation Classification of the Functions of Government. By analyzing the sub-branches of public spending, we arrived at the conclusion that most of the public expenditures negatively affected economic growth.

Keywords:

economic growth, COFOG, economic crisis, public spending, panel data, GMM

JEL classification:

C23, C33, H50, H11, O4

Introduction

This research article aims at analyzing the evolution of budgetary expenditures by sub categories and their relationship with economic growth, for the EU 27 countries and three non-EU countries -Switzerland, Norway and Iceland during 1991 - 2012. For this endeavor we uses the United Nation division of government spending (Classification of the Functions of Government) and their sub classification and three econometrical regression methods – ordinary least square, least squares dummy variable and the generalized method of moments.

We propose a dynamic model estimated by using the ordinary least square, least squares dummy variable and the generalized method of moments. The econometric assumptions are based on the developments proposed by Arellano and Bover (1995), Blundell and Bond (1998) and Wooldridge (2002).

Recent empirical research shows that the structure of public spending is more important than the overall level of expenditure, providing a clearer picture for policy makers to intervene effectively in the economy and to achieve long-term sustainable growth.

The remainder of the article is divided as follows: Section 2 contains the literature review; section 3 presents the data used for the research; section 4 explains the methodology, section 5 the obtained results and section 6 concludes.

1. Literature review

The recent empirical studies show that the structure of public spending is more important than the overall level of expenditure, providing a clearer picture for policy makers as how to effectively intervene in the economy and how to achieve long-term growth. The economic research didn't focus on the effect of the sub categories of public expenditure on economic growth.

After the 1990s research in this area is mainly based on the studies made by Robert Barro and Sala-i-Martin. Robert Barro (1991) published a study for 98 developed and developing countries to capture the link between public investment and economic growth in the period 1965-1985. The relationship is positive but not statistically significant.

Devarajan et al.'s (1996) study was based on a panel of 43 developing countries. The period they had chosen was 1970-1990. For independent variables they used defense spending, education, health, transport and communications as both current and capital investment. Public expenditure was used as a percentage of total GDP. In order to eliminate the random fluctuations of gross domestic product, the authors use a moving average of period 5. Also public spending is constructed with a lag of five to GDP per capita, as expenditure takes a while to influence the economy. The expenditures on education can be considered long-term productive investments. Even if they do not produce results in year one, in year $t + 5$ they have enough time to materialize.

The authors concluded that the present growth of public current expenditure has a significant and positive influence on economic growth. Capital expenditures have a negative impact on GDP per capita, and therefore these expenses, even if they are productive, used in excess, can become unproductive for the economy.

The Romanian research literature studied the complex mechanism between public expenditure and economic growth. Iulian and Laura Braşoveanu (2008) conducted an econometric test to capture the correlation between expenditure (% of GDP) and economic growth (real growth rate of GDP and GDP / capita) in Romania during 1990-2011. The classification used by the authors divides public spending in three categories: productive spending (which stimulates growth), unproductive expenditure (braking effect of economic development) and other expenses. Adapting the econometric model proposed by Barro, Sala-i-Martin (1995), the authors chose to group the 10 government expenditures in three categories, namely productive expenditure (general public services, defense, public order and safety, education, health, public services and development, housing, environment and water, transport and communications), unproductive expenditure (culture, recreation and religion, economic affairs and social protection) and other expenses (other actions).

After applying statistical simulation, the authors found that all the categories of expenditure adversely affect economic growth in Romania.

The impact of public expenditure on economic growth is very important nowadays because the economic system was changed by the recent events, mainly the global economic crisis, the almost economic collapse of Greece and the European Union's ageing and debt problems.

2. Methodology

In order to capture the influence of public spending by sub classification and economic growth for the 30 countries analyzed, we chose a multiple linear regression model using panel data. Using GMM, OLS and LSDV methods we empirically estimated the effects public expenditures have on growth.

Public expenditure data by sub category was collected from the Eurostat database. Data on total public expenditure by sub category and GDP per capita were collected from statistical AMECO-Eurostat database. We started with the following simple regression:

$$y_{it} = a_0 + a_1 GE_{it} + a_2 D_{it} + u_{it} \quad i = 1, N, , t = 1, T \quad (1)$$

where,

y_{it} - $\ln(\text{GDP} / \text{capita})$;

GE_{it} is the vector of the only 7 of the 10 types of public expenditure.

D_{it} is a vector of dummy variables (Member State - Accession to the European Union, Crisis - economic and financial crisis of 2008, Development - developed or emerging countries)

u_{it} - two-component vector for statistical errors

Index i tracks the cross-sectional dimension of the dataset from 1 to 30 (thirty countries), while t is the time index running from 1991 to 2012.

$$u_{it} = \mu_i + \varepsilon_{it} \quad (2)$$

μ_i = individual fixed effects, by a normal distribution law $(0, \sigma_\mu^2)$

ε_{it} - error term, by a normal distribution law $(0, \sigma_\varepsilon^2)$

The dependent variable $\ln(\text{GDP} / \text{capita})$ measures the degree of growth by dividing GDP per capita in each country.

The model contains three dummy variables. **Member State** analyzes whether the EU accession for the countries of the sample has an influence on economic growth. **Crisis** reflects the emergence of the economic and financial crisis, so we want to observe its impact on economic growth. **Development** reflects the status of development of the countries analyzed, namely whether they are developed or developing countries.

According to the work of Bingxin Yu (2009) and Bond et al. (2002), for correcting the effects produced by the GMM model and for addressing unobserved heterogeneity as in models with fixed effects, we applied variable differentiation.

Before analyzing the links between private and public expenditure by category and economic growth, we will check the following conditions:

- a. If the data series of GDP / capita and public and private sectors are stationary
- b. If the series are cointegrated I (1)

Zaghini and Lamartine (2011), used Hadri, Levin-Lin-Chu, Breitung, Pesaran, Fisher tests to check the two above conditions. The same tests were used by Arpaia and Turrini (2008) to check stationary and cointegration for GDP / capita and the independent variables for a panel of homogeneous data. Since the panel data analyzed in this work is not balanced we should perform additional statistical tests to check stationarity and cointegration.

The econometric model we proposed has to be checked if it is valid or not. For determining whether we use a fixed effect model (FE) or a random effect one (RE) we will apply the Hausman test. This test is used by many econometricians to build models for unbalanced

panel data. Oscar Torres-Reyna (2014) recommends using Hausman , Wald, Fisher, Wooldridge tests.

3. Results

3.1. General public services

Following the Hausman, Wald, Woodridge, Parm and Fisher tests, we will use a fixed effects model. The model is heteroskedastic and the data series are uncorrelated and stationary. Sargan test results are favorable and reject the null hypothesis only for a lag of 4. Since the available data form a micro panel we consider that testing for stationarity is not necessary and also cross-sectional dependencies. These tests are suited for macro-panel data with variables analyzed over a longer period (20-30 years).

OLS and LSDV models have the same types of public expenditure that influence growth, namely general services and public debt transactions have a negative effects on GDP / capita. When increasing with 1% the general services and public debt transactions expenditures, GDP / capita reduces by more than 3.4% for the first and more than 4.2% for the latter.

A favorable and considerable effect on economic growth has basic research. The other independent variables analyzed by the above mentioned methods were statistically insignificant. In the GMM model for general public services, basic research has a positive effect on growth. On the other hand, executive and legislative organs, financial and fiscal affairs, external affairs, general services, general public services n.e.c. and public debt transactions have a negative impact. In terms of dummy variables, the economic crisis has had a negative influence on economic growth and EU membership a favorable effect.

3.2. Defence

After the Hausman, Wald, Woodridge, Parm and Fisher tests, we will use a fixed effects model. The model is heteroskedastic and the data series are uncorrelated and stationary. Sargan test results are favorable and reject the null hypothesis only for a lag of 6.

The OLS and LSDV models have the same types of public expenditure that influence economic growth, namely the military defence and defence n.e.c., with positive effect on GDP / capita. The 1% increase in spending on military defence and defence n.e.c., GDP / capita increases by 0.193% and more than 0.1% for the latter.

Foreign military aid has an adverse effect on economic growth. The other independent variables analyzed by the two mentioned methods were statistically insignificant. In the GMM model for defence, foreign military aid, defence n.e.c. and military defence had significant effects on growth. In an article published in 2009, Luca Pieroni (2009) concludes that this type of expenditure has a negative effect on economic growth in countries where the percentage of GDP for this sector is considerable. For countries where budget allocations for defense are not very big, Pieroni (2009) concluded that they do not have significant effect on economic growth. In terms of dummy variables, the economic crisis has had a negative influence on economic growth and EU membership a favorable effect.

3.3. Public order and safety

The next analyzed sector is the public order and safety. Following Hausman specification tests, we will use a model with variable effects. To see if we have a regression with variable

effects or a simple regression (OLS), we should use Breusch and Pagan Lagrangian multiplier test for random effects. The threshold probability for Breusch / Pagan test is greater than 5%, so we can say that the null hypothesis is rejected.

According to Wald, Woodridge, Parm and Fisher tests the model is heteroskedastic and the data series are uncorrelated and stationary. Sargan test results are favorable and reject the null hypothesis only for a lag of 6.

Police services and other public order and safety expenditures have a negative effect on GDP /capita. It can be seen that they have significant negative effect on the dependent variable. The other independent variables analyzed by the two methods were statistically insignificant.

In the GMM model police services also have a significant adverse effect on GDP / capita. Prison sector spending has a negative effect on growth for the countries analyzed. The 2008 financial crisis had a negative influence on economic growth and EU membership a favorable effect.

3.4. Economic affairs

According to the Hausman specification test, we will use a model with variable effects. To see if we have a regression with variable effects or a simple regression (OLS), we should use Breusch and Pagan Lagrangian multiplier test for random effects. The threshold probability for Breusch / Pagan test is greater than 5%, so we can say that the null hypothesis is rejected.

According to Wald, Woodridge, Parm and Fisher tests the model is heteroskedastic and the data series are uncorrelated and stationary. Sargan test results are favorable and reject the null hypothesis only for a lag of 4.

According to the models OLS and LSDV the first explanatory variable (general economic, commercial and labour affairs) has a significant effect on growth. The other independent variables analyzed by the above mentioned methods were statistically insignificant.

For the GMM model, agriculture, forestry, fishing and hunting, transport and communications expenditures have negative effect on economic growth in the period under review for the European countries that make up the panel data. Economic growth is positively influenced by fuel and energy expenditure.

Bhattacharya and Bhattacharya (2014) studied the causal relationship between energy consumption (electricity, coal and petroleum) and economic growth for India and China. In case of India a bidirectional causality running between coal consumption and economic growth is observed not only in the short run but also in the long run. A unidirectional causality is observed from petroleum consumption to economic growth. For China, a unidirectional causality is observed from economic growth to coal consumption and from petroleum consumption to economic growth in both short run and long run.

Mallick, H. (2009) examined whether energy use drives economic growth or vice versa in the Indian context during 1970-71 to 2004-05. Utilizing Granger causality test, the study suggests that it is the economic growth that fuels more demand for both crude oil and electricity consumption and it is the only growth of coal consumption that drives economic growth.

In terms of dummy variables, the economic crisis has had a negative influence on economic growth and EU membership a favorable effect.

3.5. Health

According to the Hausman specification test, we will use a model with variable effects. To see if we have a regression with variable effects or a simple regression (OLS), we should use Breusch and Pagan Lagrangian multiplier test for random effects. The threshold probability for Breusch / Pagan test is greater than 5%, so we can say that the null hypothesis is rejected. According to Wald, Woodridge, Parm and Fisher tests the model is heteroskedastic and the data series are uncorrelated and stationary. Sargan test results are favorable and reject the null hypothesis only for a lag of 6.

Medical products, appliances and equipment, hospital services, public health services and other health expenditures had a significant influence on growth. These types of public expenditure have adverse effect on economic growth in the period. The other independent variables analyzed by the OLS and LSDV methods were statistically insignificant.

According to the GMM model, public health services are not significant to influence economic growth, like in the other models. The three categories which significantly influenced GDP / capita are medical products, appliances and equipment, outpatient services and hospital services. The economic crisis has had a negative influence on economic growth and EU membership a favorable effect.

3.6. Education

An important sector to be analyzed is education. As mentioned in the case of health spending, this sector is considered to influence economic growth with a certain time lag.

After the Hausman, Wald, Woodridge, Parm and Fisher tests, we will use a fixed effects model. The model is heteroskedastic and the data series are uncorrelated and stationary. Sargan test results are favorable and reject the null hypothesis only for a lag of 5.

According to the OLS and LSDV models secondary education, tertiary education and subsidiary services to education expenditure have adverse effect on economic growth. It can be seen that this situation is found also in the GMM model, only subsidiary services to education expenditure is not included as a significant variable because they had a significance coefficient of over 12%. In terms of dummy variables, the economic crisis has had a negative influence on economic growth and EU membership a favorable effect.

3.7. Social protection

The last sub sector analyzed is that of social protection expenditure. Following the result of the Hausman, Wald, Woodridge, Parm and Fisher tests, we will use a fixed effects model. The model is heteroskedastic and the data series are uncorrelated and stationary. Sargan test results are favorable and reject the null hypothesis only for a lag of 4.

According to the OLS and LSDV models, old age, sickness and disability, unemployment, survivors and other social exclusion expenditures have a negative impact on economic growth.

For the GMM model, only old age and R&D social protection expenditures didn't influence growth. The remainder of the independent variables had a negative impact on economic

growth and only housing spending had a positive effect. In terms of dummy variables, the economic crisis has had a negative influence on economic growth and EU membership a favorable effect.

Conclusions

The paper analyzed the correlation between public expenditure at sub classification and economic growth for 30 European countries over the period 1991 to 2012 using three econometric methods - OLS, LSDV and GMM.

Regarding general public services the state should invest more in R&D so that the negative effect of the other variables will be canceled. Defence expenditures had a negative impact on growth from the spending in foreign military aid and military defence, but a positive effect from the investments in other defence expenditures. The result for public order and safety suggested that police services, prisons and other public order and safety expenditures had a significant and negative impact on growth.

According to the result obtained for economic affairs, especially from the GMM model, agriculture, forestry, fishing and hunting, transport and communication expenditures had a negative impact on economic growth. Only fuel and energy investment can be beneficiary.

Regarding health expenditure at sub classification, almost all of the variables analyzed had a negative impact on economic growth, between -3% and -11% reduction of GDP/capita. Medical products, appliances and equipment and other expenditures for health had the biggest impact on growth. Only R&D didn't influence the dependent variable.

Secondary education, Tertiary education and Subsidiary services to education had a negative influence on growth. Sala-i-Martin (1995), Devarajan (1996), Robert Barro (1991, 2013) considered that these types of expenditures are productive for the economy, but in the long run. The impact on economic growth is manifested only after a number of up to 5 years.

For the last sector analyzed, social protection, almost all of the independent variables had a negative impact on economic growth following the OLS, LSDV and GMM model. Only R&D for social protection didn't influence GDP/capita.

Our research can have a real impact on the literature. Analyzing each sub-branch of public spending, we determined which of the expenditures are favorable for growth and which ones have a negative impact.

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