Journal of Business, Economics & Finance ISSN: 2146 - 7943

PressAcademia

Journal of Business, Economics and Finance

Year: 2014 Volume: 3 Issue: 1

TESTING GROWTH EFFECTS OF EUROPEAN UNION STRUCTURAL FUNDS ACCORDING TO SIZE OF GOVERNMENT: A DYNAMIC APPROACH

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Keywords: Structural funds, dynamic panel method, size of government.

ABSTRACT

The aim of this study is to examine the relationship between European Union structural funds and economic growth rates of receiver countries. An econometric model is constituted and data are obtained in panel data form. The relationship is tested with system-Generalized Method of Moments (GMM), a dynamic panel method for 27 European Union countries between the period of 2000 and 2011. Data are divided into two samples according to size of government and model is re-estimated. Assuming capital accumulation and structural funds as endogenous, it is concluded that structural funds have no statistically significant effect on economic growth regardless of the sample choice.

1. INTRODUCTION

European Union which is constituted in order to ensure economic, political and social cooperation serves to some aims by using budget as a tool. European Union budget is financed by GNI shares of member countries, value added taxes (VATs), common trade tariffs etc. and it finances some common policies such as agriculture, energy, trade and environment. By this way competition power of different countries are balanced and positive effects of common policies support economic growth. In fourth multiyear financial framework which covers the period between 2007 and 2013, first sub category of European Union expenditure budget is sustainable growth. In addition, preservation and management of natural resources, strengthening the European Union as an area of freedom, security and justice, European Union as a global partner and administration expenditures which constitute other sun categories may affect economic growth, indirectly. In neoclassical Solow growth model; structural funds increase steady state income by improving physical capital. However that transition is from one steady state to another one, and is not continuous. Accordingly economic growth rate is not affected by public policies. Besides that, endogenous growth theory grants public policies an important role in the determination of growth rates in the long run.

Barro (1990) assumes public infrastructure as an input of private production function and hence public policies may affect long term growth by increasing marginal product of physical capital (Dall'erba and Gallo, 2004). Structural funds constitute an important share of European Union budget and in this study the effect of those funds on economic growth of member countries is tested empirically. 27 European Union member countries' data between the period of 2000 and 2011 is used and the relationship is tested with dynamic panel data analysis by using system-GMM method (Arellano and Bover, 1995). In addition this study relates with the question if the direction of effects differ with different size of governments. In order to examine that, countries are divided into two samples according to size of government and model is re-estimated. In the following section datum, methods and results of previous studies are examined. In third section, detailed information about methodology and data is given and model is estimated empirically. Econometrical tests are used in order to test the validity of instrumental variables and autocorrelation problem. The study concludes with empirical results and interpretations.

2. LITERATURE REVIEW

While analyzing the effects of structural funds it is important to realize (i) that the structural funds can be thought as an income transfer, (ii) they have to co-funded by the receiver country and that (iii) they have to be spent on pre-specified projects. Given those, it is impossible to formulate an unambiguous hypothesis on the expected effect of structural funds on economic growth. Depending on the circumstances, the effect can be positive, negative or zero (Ederveen, Groot and Nauis, 2006). Therefore, uncertainty about the issue is tried to be solved by empirical method and estimation results are of particular importance. The growth effects of structural funds were tested for both time series and cross- sections. There are also some studies that examined that relationship by using panel datum. Following those studies, panel data is used in this study, too. For this reason only the results of panel data studies are discussed in here. Garcia-Mila and McGuire (2001) tested the effect of structural funds on economic growth of receiver countries. They used data of 17 Spanian regions for two different time periods: 1977-1981 and 1989-1992. They observed no significant growth effect of structural funds.

Cappelen, Casellacci, Fagerberg and Verspagen (2003) examined the relationship with 1980-1997 data set for 9 countries. They concluded that structural funds affect economic growth in a positive way. Bussoletti and Esposti (2004) again observed a positive and significant relationship between structural funds and economic growth by using 1989-2000 data of 15 countries. Dall'erba and Gallo (2004) used sample of 145 European regions for the period of 1989-1999. They concluded that structural funds have a positive effect on economic growth but spillover effects are found to be very small. Puigcerver-Penalver (2004) examined the growth effects of structural funds in 15 countries for the period of 1989-2000. They found positive and significant growth effects of structural funds which serve to first objective. Rodriguez-Pose and Fratesi (2004) used data set of European NUTS2 regions for the period of 1989-1999. They found that only investments in education and human capital have middle term growth effects.

Beugelsdijk and Eijffinger (2005) used sample of 15 countries for the period of 1995-2001. They concluded that structural funds have a positive and significant effect on economic growth. Ederveen, Groot and Nauis (2006) used data set of 13 countries with the period of 1960-1995. Similarly, they found no significant effect on economic growth but they suggested that structural funds promote economic growth in the countries with "right institutions". Mohl and Hagen (2009) found insignificant effect of structural funds on economic growth for 124 NUTS Regions. Results and sample informations of previous studies are summarized in Table 1.

Table 1: Summary of Previous Empirical Studies

Study	Time Period	Cross Sections	Results
Garcia-Mila & McGuire (2001)	1977-1981 1989-1992	17 Spanian Regions	Structural funds have a no significant effect on economic growth.
Cappelen et al. (2003)	1980-1997	9 EU Countries	Structural funds have a positive and significant effect on economic growth.
Bussoletti & Esposti (2004)	1989-2000	15 EU Countries	Structural funds have a positive and significant effect on economic growth.
Dall'erba & Gallo (2004)	1989-1999	145 European Regions	Structural funds have a positive and significant effect on economic growth.
Puigcerver-Penalver (2004)	1989-2000	15 EU Countries	Structural funds have a positive and significant effect on economic growth.
Rodriguez-Pose & Fratesi (2004)	1989-1999	European NUTS2 Regions	Investments in education and human capital have middle term growth effects.
Beugelsdijk & Eijffinger (2005)	1995-2001	15 EU Countries	Structural funds have a positive and significant effect on economic growth.
Mohl & Hagen (2009)	1995-2005	124 NUTS Regions	Structural funds have a no significant effect on economic growth.
Ederveen, Groot & Nauis (2006)	1960-1995	13 EU Countries	Structural funds have a no significant effect on economic growth.

3. METHODOLOGY AND DATA

In order to test growth effects of structural funds in different member countries, panel data set is used. There are a number of advantages of using panel data compared to other methods. Panel data method offers work on models with more complex behavior (Gujarati, 2003) and helps to ensure more reliable results by reducing the linearity between variables (Baltagi, 2001). Dealing with both time dimension and cross sectional units, increases the number of observations and hence degrees of freedom. High degrees of freedom increase the reliability of parameter estimates. Lastly panel data is better suited to describe the dynamics of change (Baltagi, 2001, Hsiao, 2003). A data set of 27 European Union countries is used. These countries are: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and United Kingdom. Previous studies (Ederveen, de Groot and Nahuis, 2006; Mohl and Hagen, 2009) generally used saving or capital accumulation, human capital and population growth rate as explanatory variables. Similar to econometric approach of them; gross capital accumulation, labor force participation, school enrollment and structural funds are determined as explanatory variables. Different proxies such as number of patents or schooling rate are used for human capital accumulation in previous literature. In this study secondary school enrollment rates are used as a proxy of human capital. Datum of those and other explanatory variables are obtained from World Development Indicators 2013 (WB, 2013). Datum of structural funds which aims to serve growth and employment are obtained from European Union Commission Financial Budget Reports (EC, 1999).

In accordance with the previous studies econometric model is determined as follows:

$$GRPC_{it} = \beta_0 + \beta_1 GRPC_{it-1} + \beta_2 LABG_{it} + \beta_3 DCAP\_GDP_{it} + \beta_4 STR\_GDP_{it} + \beta_5 DSCH \quad (1)$$

GRPC: GDP per capita growth rate (%)
LABG: Labor force participation growth rate (%)
DCAP_GDP: Change in gross capital formation to GDP ratio (%)
STR_GDP: Structural Funds to GDP ratio (%)
DSCH: Change in school enrollment, secondary (% gross)

There may be some factors that affect structural funds and economic growth, simultaneously. In this case structural funds will have to be considered as an endogenous variable. If those effects are constant over time they are eliminated by fixed effects or by first differences. If these unobserved variables are not constant, methods such as instrumental variable estimators are necessary. However suitable instrumental variables are not available; identification may be based on internal instruments via a two-step system GMM estimator (Mohl and Hagen, 2009). For these reasons system GMM method is used in this study and structural funds variable is assumed as endogenous with capital accumulation variable.

Dynamic panel estimation method has some advantages. First, it eliminates **inadequencies** of static panel data estimates by giving unbiased and consistent results in case of the existence of correlation both between lagged dependent variable and error term and between explanatory variables and cross sectional effects (Greene, 2002). In addition, Blundell and Bond (1998) emphasized the importance of utilizing the extra moment conditions especially when N>T by showing that the lagged variables are poor estimates when there are continuous instrumental variables. Therefore dynamic model is estimated with the two-staged system-GMM method (Arellano and Bover, 1995) which takes the **heteroscedastic** structure of the error terms into consideration (Doornik and Hendry, 2001). In addition, this method is thought to be more efficient, **assymptoticaly** (Khadraoui, 2012). The estimation results are shown in Table 2. Econometric model is statistically significant as a whole according to Wald test statistic. Lagged dependent variable is insignificant at 10% level of significance. Capital accumulation variable is statistically significant and has a positive coefficient. So, capital accumulation has a positive effect on economic growth. This result is consistent with theoretical expectations such as Harrod-Domar growth model. Variable stating labor again has a positive and significant coefficient at 1% level of significance. Accordingly, labor force growth has a positive effect on economic growth.

Table 2: System-GMM Estimation Results for EU27 Countries

Dependent Variable: GRPC	
Two Step Arellano Bover Estimator	
Independent Variables	**EU27 (2000-2011)**
GRPC (-1)	0.0353 (1.62)
DCAP_GDP[a]	1.7100 (32.94)*
STR_GDP[a]	$-1.28*10^{-7}$ (-1.19)
LABG	0.2667 (7.62)*
DSCH	0.0146 (0.88)
CONSTANT TERM	2.5616 (19.82)*
Wald Statistic	1573.26*
Wald Probability	0.0000
Sargan Probability	1.0000
AR(1) Test	0.0075
AR(2) Test	0.2172

Note: *Figures in parenthesis are z statistics.*
** p<%1, ** p<%5, ***p<%10.*

a: *variable is included in the regression as endogenous.*

The coefficient of schooling variable is found to be negative and statistically insignificant at 10% level of significance. This may be surprising but it must be mentioned that school enrollment rate may not be a good indicator of human capital. That indicator may be missing in order to reflect the quality of education. In addition there are some studies which point to the insignificant or negative effects of education on economic growth (Islam, 1995; Pritchett, 2001; Rajkumar and Swaroop, 2002). Lastly, the coefficient of structural funds variable is found to be statistically insignificant. Accordingly, structural funds have no effect on economic growth in European Union member countries. This result is consistent with some previous studies such as Garcia-Mila and McGuire (2001), Ederveen, Groot and Nauis (2006) and Mohl and Hagen (2009). It is consistent also with neoclassical Solow growth model which indicates that public policies are not effective on economic growth.

The study continues with the Sargan test which proves validity of the instrumental variables. Null hypothesis which assumes that the instrumental variables are valid is tested against the alternative hypothesis which assumes invalidity of them. As the null hypothesis cannot be rejected, it is concluded that instrumental variables are valid. The result of autocorrelation test which proves the null hypothesis of "There is no second-order autocorrelation" for the residuals of first difference model are given in Table 2. Accordingly, there is a first order correlation and no second order correlation. As the lagged dependent variable is used in econometric model, first order correlation is an expected situation and does not constitute a problem.

The analysis continues with the creation of new samples according to government size. In order to measure government size, Fraser Institutes' 2011 size of government index data (Gwartney et al., 2013) **is** used. Accordingly, size of government is measured by different components such as government consumption, transfers and subsidies, government enterprises and investment, top marginal tax rate. These four components indicate the extent to which countries rely on the political process to allocate resources and goods and services. High value of index indicates bigger size of government (Gwartney et al., 2013). 27 countries are divided into two sub groups according to their index value. 14 countries' index values are bigger than EU27 average and rest 13 countries' index values are smaller than it. Model is re-estimated for that samples and results are shown in Table 3.

Table 3: System-GMM Estimation Results According to Size of Government

Dependent Variable: GRPC		
Two Step Arellano Bover Estimator		
Independent Variables	**EU14 (2000-2011)**	**EU13 (2000-2011)**
GRPC (-1)	0.0190 (0.20)	-1.1447 (-5.81)*
DCAP_GDP[a]	1.800 (9.28)*	2.0119 (12.43)*
STR_GDP[a]	$1.43*10^{-9}$ (0.00)	$-7.193*10^{-7}$ (0.73)
LABG	0.4143 (0.71)	0.3433 (2.41)**
DSCH	-0.0073 (-0.13)	0.0030 (0.25)
CONSTANT TERM	3.2519 (2.87)*	1.9177 (7.02)*
Wald Statistic	497.89*	214.18*
Wald Probability	0.0000	0.0000
Sargan Probability	1.0000	1.0000
AR(1) Test	0.0395	0.0586
AR(2) Test	0.4511	0.4097

Note: *Figures in parenthesis are z statistics.*
** p<%1, ** p<%5, ***p<%10.*

a: *variable is included in the regression as endogenous.*

As seen from Table 3, the only variable that is statistically significant in both of samples is capital accumulation variable. Accordingly, capital accumulation has a positive effect on economic growth. Our main concern is structural funds variable and estimation results show that it has a statistically insignificant effect on economic growth in both of samples. So, it is concluded that size of government does not matter about the effects on structural funds. In addition the magnitudes of the coefficients are very small which is consistent with EU27 estimation results. Therefore, it must be noted that if the effects of structural variables were significant, they would be very small or nearly zero. This result is consistent with Harrod-Domar and neoclassical growth models and indicates that public policies are not effective on economic growth.

4. CONCLUSION

The effect of European Union structural funds on economic growth is a controversial issue and empirical studies reached different results. Most of previous studies are based on static panel data estimations. However economic growth is a dynamic process and may be affected from previous growth rates. In addition a number of variables may be endogenous. As previous studies suggest these variables are considered to be structural funds and capital accumulation. For those reasons, in this study the relationship is tested with dynamic panel data approach and structural funds and capital accumulation variables are assumed as endogenous. Instrumental variables which are determined internally by system-GMM method are used instead of endogenous variables. As a result of Sargan Test instrumental variables are found to be valid. Explanatory variables such as labor growth rate and capital formation are found to be statistically significant and positive. Nevertheless, the coefficient of human capital variable is found to be insignificant. The coefficient of structural funds is insignificant. Same results are reached when 27 EU countries are divided into two sub samples. Accordingly, European Union structural funds have no effect on economic growth. This result is consistent with some previous studies (Garcia-Mila and McGuire, 2001; Ederveen, Groot and Nauis, 2006; Mohl and Hagen, 2009) and also with Harrod-Domar and neoclassical growth theory.

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