THE IMPACT OF LOCAL BUDGETARY SPENDING ON COMMUNITIES DEVELOPMENT

Florin OPREA[*], Bogdan FIRTESCU[**], Lenuta COJOCARIU[***], Paula TERINTE[****]

Abstract

Economic development within different countries has been seen in general as a task of central governments, especially in the case of unitary or more centralized states. According to a kind of "musgravian view" of public budget functions, central authorities were in many cases responsible for creation and implementation of comprehensive programs and policies, oriented to economic growth. However, despite this general approach, nowadays can be noticed that values as decentralization or subsidiarity are widely recognized, sustaining a trend of "glocalization", within which local authorities are gaining and play a key role for regional development. Moreover, the move and the spirit of "Europe of Regions" are granting now to local authorities more means and importance in the field of economic development, considering them plenary actors of policy-making and its implementation. On this background, our paper aims to emphasize the impact of local budgetary spending on regional development, with a special accent on country differences. Based on data collected from Organization for Economic Co-operation and Development (OECD) Statistics and Eurostat databases, our findings suggest that strengthening the role of local authorities and improving the framework of their actions could lead to enhanced economic development at this level. Our findings and recommendations could be useful both for national and European authorities, in their efforts to improve regional policies in order to alleviate economic discrepancies.

Keywords: local authorities, budgetary expenditures, economic growth, regional development

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Introduction

In the last decades, public sector has expanded his area, assuming more functions. In his expansion, local budgets gained a more important role, supporting the implementation of decentralized tasks from central level in almost all domains of local communities' life. Beyond the expenditures for general public services necessary for every public body, local budgets are nowadays spending in education, health, culture, social protection, public order and safety, economic affairs, environment, housing and community amenities, and even (some of them) in defense. Therefore, we may argue that local spending could exert a (positive) influence on local development, if their redistributive and productive efficiency are properly ensured. Within this study, we will take into consideration the regional level, considering that regions and their development became recently core elements of the European policies. Nonetheless, this approach is in line with the use of regions as territorial unit of statistical reports in European Union (NUTS).

Our analysis is placed in the above described context, representing an original research through the approach itself. This is occurring on the background of a poor exploration of the influence of local spending in determining the regional development, although extant literature mostly endeavored in shaping the contribution of government expenditures on the economic growth of a nation as a whole. Therefore, the main proposal is to analyze the impact of local budgetary spending on regional development, assuming that local expenditures are not used at their full potential in performing the regional development and increasing for real the state of well-being among citizens.

We employed in our analysis nine independent variables representing the components of local budgetary spending determined by functional classification, for 21 countries and sixteen years (2001-2016), emphasizing their impact on regional GDP growth rate.

The paper is organized as follows: Section 1 delivers the literature in the field; Section 2 presents methodology and data used; Section 3 delivers the results of our analysis and Section 4 provides conclusions.

1. Literature review

The impact of public spending on economic growth was the research subject beginning decades ago for many authors, endeavoring in shaping the contribution of government expenditures on the economic growth of a nation. For instance, Devarajan *et* al. (1996) conducted a research based on model using the Cobb-Douglas function for 43 developing countries and a timescale of 20 years (1970-1990). Through the estimated model, the authors considered productive and unproductive expenditures, attempting to answer how economic growth was affected by the composition of the government expenditures. The results show that all the expenditures considered being productive (e.g. capital expenditures,

transport and communication, education and health) had a negative or insignificant impact on economic growth. Instead, current expenditures as a broad category was the only one linked with a higher degree of economic growth. Similar views have been made previously; Prichet (1996) argued that public investment in developing countries is unproductive and inappropriate for the present. The result of his research shows that the proportion of current public investment can have too little influence on current economic growth.

At a smaller scale (21 OECD countries and for 20 years), Roller and Waverman (2001) analyzed the link between telecommunication infrastructure expenditure as one of the main category of public investment spending and economic growth. They found that the impact of these public spending categories and their effect on economic growth is low and insignificant from a statistical point of view. Others authors, Kormendi and Meguire (1985), Summers and Heston (1988) found evidence that defense and education expenditures represent government consumption and consequently are unproductive.

Alexiou (2009) found a positive and significant correlation between capital expenditure and growth, his research including some countries of the South Eastern Europe for the period 1995-2005, based on a casual coefficient (RC) regression estimator. The author points out that regardless of the destination, public spending is associated with a mechanism to stimulate economic growth and a mechanism to address social and economic disadvantages such as social cohesion, poverty, social conflicts, disparities between groups and regions. By addressing these issues, government spending may be an option for creating a stable environment which may favorite the economic development. Results of Alexiou (2009) are consisting with Easterly and Rebelo (1993), the authors revealing in a research built on multi cross-country regressions that the investment expenditures for transport and communication in developing countries contribute to economic growth.

Kelly (1997) conducted a cross-sectional study for the 1970-1998 period about the economic performances of 73 countries and using the method of Ordinary Least Squares for estimating economic growth as capacity of different categories of public expenditures. Contrary to other research studies, the Kelly's results confirm also a major contribution of public investment expenditures to economic growth. A beneficial impact of the government expenditures for the economic affairs was confirmed also by Burton (1991), Aschauer (1990), Birdsall, *et al*. (1995), Afonso and Auby (2019).

Along with Barro (1990), Easterly and Rebelo (1993) argued through their researches that public spending leads to economic growth up to a certain level of them, considered as an *optimum threshold*. Beyond this level, public spending can create distortions in the private sector. Consistently, another recent study (Aydin and Esen, 2019) show that the intervention state in economy through public spending to promote growth may be useful at a certain level, while beyond that point, they cannot have the expected effects. Using the Armey curve, empirical results show a non-linear relationship between the two variables, public spending

having a statistically significant positive effect on the economy when it is below a certain threshold.

Ghosh and Gregoriou (2006) conducted a similar study for 15 countries and a long interval of time (1972-1999). Using the GMM (General Method of Moments) techniques, their results indicated a negative correlation between the public capital expenditures and the economic growth, in line with Devarajan *et al*. (1996). The explanation refers in some cases to the corruption at the political level, the inefficient bureaucratic structures, and the poor quality of the public services. A negative correlation between some capital expenditures and economic growth is revealed also by Landau (1986), Scully (1989), Aschauer (1989), Munnel (1990). In the same sense, Forte and Magazzino (2011) showed that for EU member countries, on average with a 10% increase in public spending, GDP declined by 2.1%, claiming in this way the necessity of a reduction in public spending in order to record economic growth.

Concerning the role of local authorities in economic development, fiscal decentralization may not have the successful results as expected in all cases. For Peru's case, Loayza *et al*. (2011) stated that fiscal decentralization had little performance in providing public local services and particularly conceiving public investment projects. Furthermore, there are researches conducted at local level, indicating a negative correlation between some local expenditures and economic growth for undeveloped and developing countries, whereas in developed countries they are positively correlated (Jin and Zhang, 2011). Although it seems that the development level of a country have a substantial role in effectiveness of public spending, for contrary, in the same study is shown that productive expenditures exerts positive influence on economic growth nevertheless the economic stage of a country. A positive relationship between both state and local spending and economic growth was also found by Yamarik and Ojede (2013), but Meloche *et al*. (2004) revealed contrary results for European transition country where local spending has uncertain effects on economic growth.

Studying the Romanian case, Bilan *et al*. (2016), revealed that the local spending produces „no positive effect on territorial economic growth". Similar results were confirmed before by the same authors (Bilan and Oprea, 2015). Others researchers (Miller and Russek, 1997) found a negative correlation between expenditures on education, transportation and public safety and economic growth for U.S. jurisdiction. They argued that devoting less of total spending to education or to transportation and public safety is associated with higher state economic growth. A negative relationship between local spending and economic growth was also confirmed by Zhang and Zou (1998) and Gemmell *et al*. (2013).

On the other side, Channa and Faguet (2016) showed that decentralized education expenditures produce great qualitative effects in schools. On the other hand, decentralization of education in Poland case was appreciated as damaging the coordination of preschool education among local communities, increasing the inequalities of preschool education (Ahmad and Brosio, 2009). According to

Eskeland and Filmer (2007), decentralized education could have relevant result, but in condition of schools autonomy and participation. Finally, concerning decentralization of education, it could be agreed that it has not clear effect or necessary positive effect in delivering the service itself. As Di Gropello (2002) appreciates, this is depending on the form of decentralization (institutional and functional), the institutional conditions and the socioeconomic environment for each local community. In our opinion, these considerations are valid for all decentralized public tasks.

As a concluding remark, the extent literature comprises few researches approaching the relationship between local spending and economic growth, although from an overall perspective, the economic growth is influenced from local governance. By and large, the link between local public spending and economic growth remains a controversial topic, with various approaches and research methodologies, still maintaining attention of many researchers.

2. Data and methodology

The aim of this paper is to analyze the impact of local budgetary spending on regional development. We employed in our analysis nine independent variables representing the components of local budgetary spending determined by functional classification. As dependent variable, we employed the growth rate of the regional Gross Domestic Product (coded *GRGDP*) similar with other studies as Kelly (1997), Devarajan *et al*. (1996), Forte and Magazzino (2011), Bilan *et al.* (2016). Description of the variables employed in our analysis is presented in Table 1.

Table 1. Variable description

Variable	Description	Data Source
grgdp	Represents the annual growth rate of the mean European regional gross domestic product.	Eurostat
gredu	The annual growth rate of local expenditures on education. It characterizes the evolution of financial resources spent by local authorities supporting the education in their jurisdiction.	OECD Statistics
grrcar	The annual growth rate of local expenditures for recreation, culture and religion. It shows the evolution of the financial resources spent by local authorities in this domain in their community.	OECD Statistics
grhaca	The annual growth rate of local expenditures on housing and community amenities. It shows the evolution of the resources spent by local authorities in planning their territory.	OECD Statistics
greca	The annual growth rate of local expenditure for economic affairs, characterizing the evolution of the financial resources spent by local authorities in stimulating and developing their economy (capital expenditures).	OECD Statistics

Variable	Description	Data Source
grsp	The annual growth rate of local expenditure on social protection, showing the evolution of financial resources spent by local authorities for supporting citizens being in impossibility to work or those impoverished.	OECD Statistics
grhealth	The annual growth rate of local expenditure on health, characterizing the evolution of financial resources spent by local authorities for maintaining the general state of health for citizens in their collectivities.	OECD Statistics
grenvp	The annual growth rate of expenditures on local environment protection, describing the evolution of financial resources spent by local authorities for maintaining the environment (very often as investment expenditures).	OECD Statistics
grpoas	The annual growth rate of local expenditures on public order and safety, characterizing the evolution of financial resources spent by local authorities for maintain the general order and safety in their collectivities.	OECD Statistics
grgps	The annual growth rate of local expenditure on general public services, showing the evolution of the financial resources spent by local authorities for current needs (as goods, services, wages of employees).	OECD Statistics

Source: authors calculation

The selected independent variables are in line with other studies: Miller and Russek, 1997 – used local expenditures of education, transportation and public safety; Roller and Waverman, 2001 – used telecommunication infrastructure expenditure at national level; Eskeland and Filmer, 2007, – used decentralized education expenditure; Devarajan *et al*., 1996 - used education and health, transport and communication expenditures at national level; Mays and Smith, 2011 – used local health expenditures for US; Bilan *et al*., 2016 – used all categories of local functional expenditures for Romania). However, the independent variables are represented by the nine of ten components of Classification of the Function of Government (COFOG). The one which is not included in our analyses is referring to local defense, the reason being that this component has values equal to zero for the most countries of model's sample. According to the traditional theory, this function belongs to central government, given the national area of public needs referring to and its coverage. The other components of COFOG are well subject of fiscal and administrative decentralization, as they could better refer to local area of needs to successfully attempt. Decentralization of these expenditures is related to the context of fiscal federalism based on principles as optimization the budgetary system by layering the public administration and meeting the public needs at a closer level of citizens in order to fully accomplish them (Oates, 1999). So will be created premises for socio-economic development of communities and, thus for the all respective country.

In order to analyze the impact of local budgetary spending on regional development, this study looks for below premises to solve:

The local expenditures on general public services have negative impact on regional development as they are referring to current administration expenses (e.g. salaries), as unproductive destinations.

The local expenditures on public order and safety have positive impact on regional development, being targeted to ensure a proper environment for social and economic activities.

The local expenditures on economic affairs have significant impact on regional development, as capital expenditures are usually considered. Similar impact should be recorded in the case of the expenditures on environment protection and on housing and community amenities.

The local expenditures on health have a positive impact on regional development, mostly on long term. Similar results are expected also from local expenditures on education.

The local expenditures on recreation, culture and religion have positive impact on regional development.

The local expenditures on social protection have a negative impact on regional development.

The data we used in our model is of 21 countries from Europe (Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Lithuania, Luxembourg, Netherlands, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden), for a sixteen years period (2001-2016) as reported by Eurostat and OECD statistics databases. In Table 2 we present the descriptive statistics of our variables:

Table 2. Descriptive Statistics

Variable	*Obs*	*Mean*	*Std. Dev.*	*Min*	*Max*
grgdp	349	3.745244	5.534529	-21.38853	25.75972
gredu	368	3.187304	11.97312	-110.086	69.84848
grrcar	368	3.545327	10.93848	-56.61947	46.34366
grhaca	368	-6.083335	63.55627	-903.0304	95.63451
greca	368	2.451564	16.88184	-156.4518	53.01173
grsp	368	4.190559	15.43604	-169.0744	65.53531
grhealth	329	.0985294	36.11892	-338.8601	89.40719
grenvp	368	1.129444	34.88088	-573.1209	77.42047
grpoas	363	-.1069378	48.87308	-680	77.35849
grgps	368	-1.318625	88.42626	-1677.293	85.95037

Source: authors calculation

Our panel data sample contains variables that vary from 329 to 368 observations. Regarding our dependent variable, the growth of GDP has a mean of

3.745244 and standard deviation of 5.534529 and variation between -21.38853 and 25.75972.The correlation matrix (Appendix no. 1.) does not suggest any possible multicollinearity problems, as the largest correlation is 0.4357.

The panel data model is described through some restrictions such as parameter homogeneity (Croissant and Millo, 2008), for all *i,t*, applied to the general model (equation 1), resulting a linear model pooling all the data across *i* and *t* (equation 2). To model individual heterogeneity, the error term has two separate components μ_i and ε_{it}, μ_i being specific to the individual and not changing over time (equation 3). In the case of *fixed* or *random* effects models: the estimation depends on the properties of the error component, which may be either uncorrelated with the regressors (*random effects* model) or correlated (*fixed effects, within* or *least squares dummy variables* model).

$$y_{it} = \alpha_{it} + \beta_{it}^{T} x_{it} + u_{it} \quad (1)$$

$$y_{it} = \alpha + \beta^{T} x_{it} + u_{it} \quad (2)$$

$$y_{it} = \alpha + \beta^{T} x_{it} + u_{i} + \varepsilon_{it} \quad (3)$$

When time specific components are taken into consideration (e.g. Year) the error has three components:

$$u_{it} = u_i + \lambda_t + \epsilon_{it} \quad (4)$$

The individual component may be either independent of the regressors or correlated. If it is correlated, the ordinary least squares (OLS) estimator would be inconsistent, so it is customary to treat u_i as a further set of n parameters to be estimated, as if in the general model $\alpha_{it} = \alpha_i$ for all t. This is called the fixed effects (a.k.a. within or least squares dummy variables) model, usually estimated by OLS on transformed data, and gives consistent estimates.

Our fixed effects equation becomes:

$$\boldsymbol{grgdp_{it}} = \beta_1 gredu + \beta_2 grrcar + \beta_3 grhaca + \beta_4 greca + \beta_5 grsp + \beta_6 grhealth + \beta_7 grenvp + \beta_8 grpoas + \beta_9 grgps + \alpha + u_i + e_{it} \quad (5)$$

where:

u_i is correlated with the independent variables
e_{it} is the error term (idiosyncratic errors)
α – constant

The results are presented below.

3. Tests, results and discussions

In this section we present the specific tests for panel data and our results. To select the most appropriate model between random and fixed effects models we conducted the Hausman test (results are presented in Appendix no. 2). The results suggest that the fixed effects model is more suitable than the random effects model. Further test is Wald test for group wise heteroscedasticity in fixed effect regression model, which also suggest that fixed effect regression models are the most appropriate ones (see Appendix no. 3). Regarding the multicolinearity, in addition to correlation matrix inspection, we have employed the variance inflation factors (VIFs) and our results show that there are no problems, as correlation matrix already suggested.

Our variables had been tested for stationarity using different panel unit root tests, commonly operated in unbalanced panels. The outputs of the conducted tests imply that all data series included in the panel shows that all variables are stationary at levels (I(0)), so spurious regression problems could not appear.

In order to test the robustness of our results, we conducted both fixed and random effects models, and we have controlled for heteroscedasticity, autocorrelation and possible serial correlation with some lags (Hoechle, D., (2018)), using robust covariance matrix Driscoll-Kraay models (presented in Appendix 4 to 12). For testing the robustness of our results, we also computed different models, adding different independent variables in cascade (Appendix 4-12). In table 3 we present our OLS regression results, controlling for fixed effects (with robust standard errors and Driscoll-Kraay standard errors) on dependent variable (the GDP growth, coded grgdp).

Table 3. Results of fixed effects OLS (robust standard and Driscoll-Kraay errors), dependent variable grgdp (the GDP growth)

Variables	(1) **Fixed Effects (robust standard errors)** Dependent variable: **grgdp**	**(2)** **Fixed Effects (robust standard errors)** **Dependent variable:** **grgdp**	(3) **Fixed Effects (Driscoll-Kraay standard errors)** Dependent variable: **grgdp**	(4) **Fixed Effects (Driscoll-Kraay standard errors)** Dependent variable: **grgdp**
gredu	0.0507**	**0.0318***	0.0507**	0.0318*
	(0.0201)	**(0.0187)**	(0.0173)	(0.0159)
grrcar	0.123***	**0.0874****	0.123**	0.0874**
	(0.0387)	**(0.0318)**	(0.0429)	(0.0306)
grhaca	0.0120**	**0.00834*****	0.0120	0.00834
	(0.00499)	**(0.00177)**	(0.00694)	(0.00488)
greca	0.0793**	**0.0648*****	0.0793***	0.0648***
	(0.0279)	**(0.0120)**	(0.0220)	(0.0196)

Variables	(1) **Fixed Effects (robust standard errors)** Dependent variable: **grgdp**	**(2) Fixed Effects (robust standard errors) Dependent variable: grgdp**	(3) **Fixed Effects (Driscoll-Kraay standard errors)** Dependent variable: **grgdp**	(4) **Fixed Effects (Driscoll-Kraay standard errors)** Dependent variable: **grgdp**
grsp	0.0309	**0.0420**	0.0309	0.0420**
	(0.0357)	**(0.0274)**	(0.0193)	(0.0158)
grhealth	0.00518	**0.00187**	0.00518	0.00187
	(0.00819)	**(0.00474)**	(0.00880)	(0.00635)
grenvp	-0.000818	**-0.00237**	-0.000818	-0.00237
	(0.00293)	**(0.00340)**	(0.00570)	(0.00407)
grpoas	0.000966	**0.00103**	0.000966	0.00103
	(0.00301)	**(0.00245)**	(0.00215)	(0.00181)
grgps	0.0582	**0.0699****	0.0582***	0.0699***
	(0.0393)	**(0.0270)**	(0.0191)	(0.0192)
Constant	2.842***	**3.850*** **	2.842***	2.316***
	(0.300)	**(0.831)**	(0.676)	(0.386)
Observations	308	**308**	308	308
R-squared	0.356	**0.677**	-	-
Number of Countries	21	**21**	21	21
Unit effects (Country)	YES	**YES**	YES	YES
Time effects (Year)	NO	**YES**	NO	YES
Robust std. err.	YES	**YES**	YES	YES

Note: Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

From different models that we have employed, the second one has the largest R squared (0.677), meaning that this offer a better explanation of the evolution of the independent variable, as expected (we have controlled for fixed country and time effects). Our results, on full models (with all independent variables included – Table 3) indicate that the growth rate of local education (*gredu* variable) has a positive and statistical significant effect on the dependent variable, growth rate of regional gross domestic product (*grgdp* variable). If the growth rate of education expenditure grows with 1 unit, the GDP rate is rising with 0.0318 units. This is in line with Di Gropello (2002) and Channa and Faguet (2016), who found that the decentralization of education expenditures can deliver better education services. The growth rate of recreation, culture and religion expenditure (*grrcar* variable) has also a positive and statistical significant effect on the growth rate of regional GDP, (the value is 0.0874), being consistent with theoretical considerations and with other studies alike Helms (1985) or Jin and Zhang (2011). A third category of local public spending which has positive and statistical significant effect on the

dependent variable (value is 0.00834) is the growth rate of local housing and community amenities expenditure (*grhaca* variable), our results being also comparable with the results of other studies such as Helms (1985) and Anderson and Värja (2016). With respect to this expenditure category, the results meet our expectation, as this category of public expenditures is considered one of the most productive. The growth rate of local economic affairs expenditure (*greca* variable) represents the fourth local spending category which has positive and statistically significant impact on the growth rate of regional GDP (value is 0.0648). The bounds between these functions and the growth rate of regional GDP are mostly explained by the nature of these expenditures, representing investment expenditure. From this point of view, our results are similar with other studies, such as Alexiou (2009), who found a positive and significant correlation between capital expenditure and economic growth.

From theoretical perspective, whether the local functions mentioned above (education, recreation, culture and religion, housing and community amenities and economic affairs) are delivered from central or from local administration, these still should contribute to the growth of the economy, as they represent investment in human capital and also in social and economic life development. If these expenditures would represent discretionary transfers from central level to local level (mandatory expenses), the results on GDP growth rate would be similar to the results when these would be spent directly from central level. This is because in the situation of the mandatory expenses, local institutions would be considered only agents of central authorities, with reduced financial and administrative autonomy (as it is proved in practice). For contrary, if the mentioned expenditure would be directly financed and spent from local level, the results on GDP growth would be more fruitfully, the key being the real autonomy of local budgets. From these bases, though our results confirm positive effects on regional GDP growth rate, there are required further researches on the real financing sources for each distinct country. These are necessary in order to raise conclusions about the full potential of local public function, its influence on regional development and about the actual role of local authorities as partners in socio-economic life.

Some of the variables have a positive effect but statistically not significant on growth rate of regional GDP - the growth rates of: local social protection expenditure (*grsp* variable), local health expenditure (*grhealth* variable), local public order and safety expenditure (*grpoas* variable), local general public services expenditure (*grgps* variable).

The growth rates of local social protection and local general public services were expected to have negative impact on economic regional development as they represent rather public consumption expenditures, so unproductive. The results are similar to Devarajan *et al*. (1996), where current expenditures were having positive results on economic growth. In our study, the bound between of the two variables seems to be quit uncertain, anyway different from our expectation (negative effects). These could be explained probably by the fact that these expenditures may

have a sort of importance in daily consumption of the beneficiaries and giving the result it could mean that in our sample countries may be a slight share of recipients. Even though the effect of social protection growth rate on regional GDP growth rate is positive, categorically, this does not imply an expansive policy in matter of public social protection. Local authorities (and state authorities) should draw premises of minimize the number of recipients, meaning establish clear source of financing with clear criteria for eligible beneficiaries (where these are interpretable) and further concentrating on stimulating the economic development.

Similar explanations could be given for the links between the growth rate of local general public services expenditure and growth rate of the regional GDP, a good part of them being represented by salaries of public servants and some other current spending for public administration, with no added economic value.

The effects of local expenditures for public order and safety on the growth rate of the regional GDP (positive, but statistically not significant) may be also explained through the characteristics of service delivered from this level of administration. Even they create premises for a safety development of economic and social life, their results appear to be rather weak on regional GDP growth.

Local expenditures for health also have a positive but statistical not significant effect on regional GDP growth rate (0.00518). In contrast with our assumption, the results may be explained through the relative short timescale used in our calculations.

Lastly, the local expenditures on local environment protection (*grenvp* variable) have a negative but statistically not significant effect on the growth rate of the regional GDP. This result can be explained through the given destination for each country at local level for this category of public spending. If there would not be investment project, it would be more difficult to see the results in the economic growth rate.

Our results should draw attention for policy makers when conceiving and implementing public policy targeted on communities development. One should take into account the particularities of those expenditures, which have significant influence on the regional GDP growth rate - local economic affairs expenditure, local education expenditure, local recreation, culture and religion expenditure and local housing and community amenities expenditure. Having the scientific confirmation of their importance in determining the economic growth, policy makers should pay more attention to this categories when budgeting for future. Thus, referring to local education expenditure, our results confirm their purpose of investment in human capital, according to theoretical considerations. On this background, local authorities should give more interest on increasing spending for infrastructure, for supporting more the disadvantaged pupils and financing more education programs. Regarding economic affairs expenditure, local authorities should invest more, mainly in infrastructure and transport in order to better support the local economic growth. Also, policy makers should consider more about promoting (supporting) talents and take responsibilities of projects in the field of

recreation, culture and religion, considering that the sector could generate 1-5% of GDP (Orosz, 2018).

In order to ensure the financial resources for such activities, public authorities should increase first the efficiency of local public spending, by control mechanisms (especially for public procurements) and real cost-benefit analysis for each of their programs. Also, an increase of their administrative capacity can be supported by municipal associations, which means that regional development project should replace individual (municipal) interventions. Regional scale projects could be easier conceived and implemented thorough municipal associations, by putting together the necessary co-financing and apply for assisted financing.

Conclusions

The results of the study show that four of the nine variables included in regression have positive effect and statistically significant on regional development: the growth rate of local education expenditures, the growth rate of local recreation, culture and religion expenditures, the growth rate of local housing community and amenities expenditures and the growth rate of economic affairs expenditure. Therefore, the results represent a sign from the part of the local authorities in accomplishing their responsibilities successfully and further, a confirmation of their potential of diminishing the regional disparities. As consequence, the values as decentralization or subsidiarity must be strongly and continuously promoted, so local authorities developing their role as plenary actors of policy making and its implementation.

Another four of the nine variables have a positive effect on regional development but statistically insignificant: the growth rate of local social protection expenditures, the growth rate of local health expenditures, the growth rate of local public order and safety expenditures and the growth rate of local public services expenditures. The results of social protection expenditures may be explained by a minimum number of recipients and by the daily consumption financed through this category of expenditure, similar explanations could be found and for general public services expenditure. The results for local public order and safety expenditure are quite natural, their contribution to regional development is rather social than economic. Regarding the unexpected results of local health expenditure, they could be explained through the relative short timescale used in our calculations. However, it is required further research regarding their distribution and allocation, ensuring a non-discretionary and stable financing of them at local level. One of the nine variables, the growth rate of local environment protection expenditure has a negative but statistically not significant effect on regional development, contrary to our expectation.

The fact that local budgets expanded their functions under the central level should retain attention of public decision makers and they must establish some very prospects budgetary policies. Mainly, these have to relate to a rationale distribution

and allocation of public resources on appropriate destination and a stable legal framework, as local budgetary fully accomplish their role as partners in economic and social life of a nation. The main limitation of this study can refer to the data series, available for the 21 Europe countries taken into consideration only for sixteen years. As data will be available, further research will be conducted.

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Appendix 1. Pearson correlation matrix

	grgdp	gredu	grrcar	grhaca	greca	grsp	grhealth	grenvp	grpoas	grgps
grgdp	1.0000									
gredu	0.3499	1.0000								
grrcar	0.5039	0.3937	1.0000							
grhaca	0.1756	0.1021	0.1504	1.0000						
greca	0.4048	0.2106	0.3634	-0.0553	1.0000					
grsp	0.2811	0.2304	0.3729	0.0743	0.1588	1.0000				
grhealth	0.1185	0.1213	0.1132	-0.0106	0.0928	0.1204	1.0000			
grenvp	0.1398	0.0937	0.2160	0.1030	0.1586	0.1048	0.0146	1.0000		
grpoas	0.0544	0.1138	0.0929	-0.0246	0.0234	0.1063	0.1287	0.0118	1.0000	
grgps	0.3816	0.3483	0.4357	0.0982	0.2578	0.3152	0.0932	0.1876	0.1346	1.0000

Appendix 2. Hausman test

---- Coefficients ----				
	(b)	(B)	(b-B)	sqrt(diag(V_b-V_B))
	fix	rnd	Difference	S.E.
gredu	.0318176	.037882	-.0060644	.
grrcar	.0874381	.1207323	-.0332942	.
grhaca	.0083397	.0054129	.0029267	.
greca	.0647629	.0643681	.0003948	.
grsp	.0419614	.0392629	.0026985	.
grhealth	.0018653	.0017513	.000114	.
grenvp	-.0023727	-.0027704	.0003977	.
grpoas	.0010287	-.0015462	.0025749	.
grgps	.0699368	.0753161	-.0053793	.
year				
2002	-.6677653	-.6396545	-.0281108	.
2003	-1.663875	-1.575741	-.0881338	.
2004	1.311027	1.526183	-.2151557	.
2005	1.137309	.9993497	.1379593	.
2006	1.164964	1.133617	.0313464	.
2007	3.320251	3.362281	-.0420301	.
2008	-1.533972	-1.602935	.0689632	.
2009	-10.4226	-10.26907	-.15353	.
2010	-.1823578	-.1330598	-.049298	.
2011	.7210395	1.059399	-.338359	.
2012	-1.765178	-1.428071	-.3371068	.
2013	-2.276447	-2.054115	-.2223325	.
2014	-1.391037	-.9688021	-.4222351	.
2015	-.3676685	-.033117	-.3345515	.
2016	-1.630627	-1.26008	-.3705472	.
b = consistent under Ho and Ha; obtained from xtreg				

B = inconsistent under Ha, efficient under Ho; obtained from xtreg
Test: Ho: difference in coefficients not systematic
chi2(24) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 121.47
Prob>chi2 = 0.0000
(V_b-V_B is not positive definite)

Appendix 3. Modified Wald test for groupwise heteroscedasticity in fixed effect regression model

Modified Wald test for groupwise heteroskedasticity
in fixed effect regression model
H0: sigma(i)^2 = sigma^2 for all i
chi2 (21) = 58610.44
Prob>chi2 = 0.0000

Appendix 4. Results of fixed effects models on dependent variable grgdp

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Model:Fixed Effects Dependent variable: grgdp								
VARIABLES									
gredu	0.136***	0.0842**	0.0793**	0.0676**	0.0652**	0.0615**	0.0616**	0.0607**	0.0507**
	(0.0464)	(0.0323)	(0.0309)	(0.0263)	(0.0237)	(0.0234)	(0.0235)	(0.0233)	(0.0201)
grrcar		0.185***	0.175***	0.125***	0.117***	0.140***	0.139***	0.138***	0.123***
		(0.0427)	(0.0420)	(0.0390)	(0.0364)	(0.0390)	(0.0398)	(0.0398)	(0.0387)
grhaca			0.0110***	0.0134**	0.0130**	0.0119**	0.0118**	0.0120**	0.0120**
			(0.00382)	(0.00494)	(0.00486)	(0.00491)	(0.00490)	(0.00491)	(0.00499)
greca				0.0976***	0.0926***	0.0816***	0.0814***	0.0826***	0.0793**
				(0.0212)	(0.0220)	(0.0285)	(0.0287)	(0.0286)	(0.0279)
grsp					0.0414	0.0382	0.0382	0.0383	0.0309
					(0.0268)	(0.0360)	(0.0361)	(0.0365)	(0.0357)
grhealth						0.00579	0.00582	0.00562	0.00518
						(0.00769)	(0.00772)	(0.00793)	(0.00819)
grenvp							0.000738	0.000682	-0.000818
							(0.00238)	(0.00235)	(0.00293)
grpoas								0.00171	0.000966
								(0.00293)	(0.00301)
grgps									0.0582
									(0.0393)
Constant	3.336***	2.869***	2.990***	2.973***	2.852***	2.913***	2.914***	2.900***	2.842***
	(0.140)	(0.166)	(0.170)	(0.157)	(0.192)	(0.271)	(0.272)	(0.271)	(0.300)
Observations	349	349	349	349	349	310	310	308	308
R-squared	0.088	0.197	0.214	0.295	0.308	0.344	0.344	0.345	0.356
Number of country	22	22	22	22	22	22	22	21	21
Unit effects Country	YES	YES	YES	YES	YES	YES	YES	YES	YES
Time effects Year	NO	NO	NO	NO	NO	NO	NO	NO	NO
Robust	YES	YES	YES	YES	YES	YES	YES	YES	YES

Appendix 5. Results of random effects models on dependent variable grgdp

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Model:Random effects Dependent variable: grgdp								
gredu	0.134***	0.0773**	0.0738**	0.0629**	0.0601**	0.0651***	0.0650***	0.0626***	0.0533**
	(0.0477)	(0.0319)	(0.0309)	(0.0265)	(0.0237)	(0.0237)	(0.0238)	(0.0233)	(0.0219)
grrcar		0.193***	0.185***	0.135***	0.127***	0.151***	0.150***	0.150***	0.142***
		(0.0426)	(0.0418)	(0.0394)	(0.0372)	(0.0388)	(0.0397)	(0.0399)	(0.0397)
grhaca			0.00938***	0.0118***	0.0116***	0.0107***	0.0107***	0.0108***	0.00980***
			(0.00304)	(0.00407)	(0.00407)	(0.00406)	(0.00408)	(0.00408)	(0.00379)
greca				0.0976***	0.0927***	0.0810***	0.0809***	0.0826***	0.0785***
				(0.0214)	(0.0213)	(0.0276)	(0.0278)	(0.0276)	(0.0265)
grsp					0.0389	0.0378	0.0379	0.0379	0.0287
					(0.0280)	(0.0359)	(0.0359)	(0.0364)	(0.0356)
grhealth						0.00561	0.00566	0.00561	0.00509
						(0.00690)	(0.00696)	(0.00707)	(0.00703)
grenvp							0.000515	0.000369	-0.00143
							(0.00259)	(0.00257)	(0.00334)
grpoas								0.000568	-0.00104
								(0.00304)	(0.00323)
grgps									0.0635*
									(0.0384)
Constant	3.339***	2.863***	2.961***	2.940***	2.829***	2.903***	2.913***	2.887***	2.757***
	(0.418)	(0.314)	(0.336)	(0.366)	(0.435)	(0.427)	(0.429)	(0.429)	(0.435)
Observations	349	349	349	349	349	310	310	308	308
Number of country	22	22	22	22	22	22	22	21	21
Unit effects Country	YES	YES	YES	YES	YES	YES	YES	YES	YES
Time effects Year	YES	YES	YES	YES	YES	YES	YES	YES	YES
Robust	YES	YES	YES	YES	YES	YES	YES	YES	YES

Appendix 6. Results of Driscoll-Kraay fixed effects models on dependent variable grgdp

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Model:Fixed Effects Dependent variable: grgdp								
	Dependent								
gredu	variable:	0.0842**	0.0793**	0.0676***	0.0652***	0.0615***	0.0616***	0.0607***	0.0507**
	grgdp	(0.0318)	(0.0303)	(0.0219)	(0.0188)	(0.0189)	(0.0183)	(0.0183)	(0.0173)
grrcar		0.185***	0.175***	0.125***	0.117***	0.140***	0.139***	0.138***	0.123**
		(0.0469)	(0.0388)	(0.0294)	(0.0338)	(0.0431)	(0.0433)	(0.0441)	(0.0429)
grhaca			0.0110**	0.0134*	0.0130*	0.0119	0.0118	0.0120	0.0120
			(0.00500)	(0.00687)	(0.00707)	(0.00711)	(0.00729)	(0.00723)	(0.00694)
greca				0.0976***	0.0926***	0.0816***	0.0814***	0.0826***	0.0793***
				(0.0168)	(0.0191)	(0.0214)	(0.0223)	(0.0219)	(0.0220)
grsp					0.0414*	0.0382*	0.0382*	0.0383*	0.0309
					(0.0215)	(0.0206)	(0.0207)	(0.0203)	(0.0193)
grhealth						0.00579	0.00582	0.00562	0.00518
						(0.00812)	(0.00806)	(0.00818)	(0.00880)
grenvp							0.000738	0.000682	-0.000818
							(0.00576)	(0.00576)	(0.00570)

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Model:Fixed Effects Dependent variable: grgdp								
grpoas								0.00171	0.000966
								(0.00196)	(0.00215)
grgps									0.0582***
									(0.0191)
Constant	3.336***	2.869***	2.990***	2.973***	2.852***	2.913***	2.914***	2.900***	2.842***
	(0.928)	(0.865)	(0.779)	(0.719)	(0.734)	(0.663)	(0.670)	(0.679)	(0.676)
Observations	349	349	349	349	349	310	310	308	308
Number of groups	22	22	22	22	22	22	22	21	21
Unit effects Country	YES	YES	YES	YES	YES	YES	YES	YES	YES
Time effects Year	YES	YES	YES	YES	YES	YES	YES	YES	YES
Robust	YES	YES	YES	YES	YES	YES	YES	YES	YES

Appendix 7. Results of Driscoll-Kraay random effects models on dependent variable grgdp

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Model:Random Effects Dependent variable: grgdp								
gredu	0.134*	0.0773**	0.0738*	0.0629**	0.0601**	0.0651**	0.0650**	0.0626**	0.0533**
	(0.0695)	(0.0353)	(0.0347)	(0.0270)	(0.0238)	(0.0241)	(0.0238)	(0.0235)	(0.0232)
grrcar		0.193***	0.185***	0.135***	0.127**	0.151***	0.150***	0.150***	0.142**
		(0.0526)	(0.0488)	(0.0437)	(0.0471)	(0.0487)	(0.0476)	(0.0486)	(0.0514)
grhaca			0.00938*	0.0118*	0.0116*	0.0107	0.0107	0.0108	0.00980
			(0.00466)	(0.00621)	(0.00637)	(0.00647)	(0.00662)	(0.00660)	(0.00615)
greca				0.0976***	0.0927***	0.0810***	0.0809***	0.0826***	0.0785***
				(0.0145)	(0.0149)	(0.0177)	(0.0184)	(0.0180)	(0.0167)
grsp					0.0389	0.0378*	0.0379*	0.0379*	0.0287
					(0.0258)	(0.0207)	(0.0207)	(0.0203)	(0.0190)
grhealth						0.00561	0.00566	0.00561	0.00509
						(0.00835)	(0.00834)	(0.00845)	(0.00888)
grenvp							0.000515	0.000369	-0.00143
							(0.00576)	(0.00572)	(0.00570)
grpoas								0.000568	-0.00104
								(0.00239)	(0.00260)
grgps									0.0635**
									(0.0231)
Constant	3.339**	2.863**	2.961***	2.940***	2.829**	2.903***	2.913***	2.887***	2.757***
	(1.255)	(1.021)	(0.948)	(0.922)	(0.990)	(0.907)	(0.939)	(0.955)	(0.753)
Observations	349	349	349	349	349	310	310	308	308
Number of groups	22	22	22	22	22	22	22	21	21
Unit effects Country	YES	YES	YES	YES	YES	YES	YES	YES	YES
Time effects Year	NO	NO	NO	NO	NO	NO	NO	NO	NO
Robust	YES	YES	YES	YES	YES	YES	YES	YES	YES

Appendix 8. Results of fixed effects models by year on dependent variable grgdp

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Model:Fixed Effects Dependent variable: grgdp								
gredu	0.0921**	0.0653**	0.0607**	0.0530*	0.0522**	0.0450*	0.0449*	0.0441*	0.0318*
	(0.0401)	(0.0297)	(0.0291)	(0.0258)	(0.0230)	(0.0218)	(0.0221)	(0.0218)	(0.0187)
grrcar		0.127***	0.120***	0.0880**	0.0799**	0.107***	0.107***	0.107***	0.0874**
		(0.0409)	(0.0408)	(0.0374)	(0.0325)	(0.0347)	(0.0354)	(0.0353)	(0.0318)
grhaca			0.00796***	0.00991***	0.00916***	0.00786***	0.00787***	0.00798***	0.00834***
			(0.00205)	(0.00202)	(0.00172)	(0.00175)	(0.00173)	(0.00176)	(0.00177)
greca				0.0799***	0.0742***	0.0679***	0.0679***	0.0689***	0.0648***
				(0.0143)	(0.0117)	(0.0136)	(0.0135)	(0.0137)	(0.0120)
grsp					0.0537**	0.0523*	0.0523*	0.0525*	0.0420
					(0.0234)	(0.0279)	(0.0279)	(0.0281)	(0.0274)
grhealth						0.00310	0.00310	0.00275	0.00187
						(0.00421)	(0.00421)	(0.00450)	(0.00474)
grenvp							-0.000165	-0.000141	-0.00237
							(0.00272)	(0.00271)	(0.00340)
grpoas								0.00196	0.00103
								(0.00245)	(0.00245)
grgps									0.0699**
									(0.0270)
2002.year	-0.152	-0.673	-0.865	-0.903	-0.873	-0.754	-0.754	-0.620	-0.668
	(0.798)	(0.746)	(0.772)	(0.803)	(0.762)	(0.741)	(0.742)	(0.768)	(0.723)
2003.year	-2.101*	-2.279*	-2.410**	-2.027*	-1.986*	-1.870*	-1.871*	-1.779	-1.664
	(1.174)	(1.149)	(1.156)	(1.109)	(1.057)	(1.037)	(1.043)	(1.057)	(1.086)
2004.year	0.364	0.462	0.407	0.477	0.557	0.892	0.892	0.971	1.311
	(0.846)	(0.779)	(0.779)	(0.841)	(0.804)	(0.826)	(0.827)	(0.834)	(0.839)
2005.year	0.599	0.166	0.0915	0.139	0.758	0.793	0.794	0.945	1.137
	(0.811)	(0.746)	(0.753)	(0.884)	(0.852)	(0.856)	(0.858)	(0.921)	(0.937)
2006.year	1.319	0.949	0.884	0.595	0.629	0.962	0.962	1.034	1.165
	(1.190)	(1.119)	(1.187)	(1.287)	(1.274)	(1.349)	(1.353)	(1.356)	(1.230)
2007.year	2.728**	2.479**	2.287**	2.471**	2.697**	3.186***	3.185***	3.267***	3.320***
	(1.038)	(0.986)	(1.000)	(1.040)	(1.033)	(1.056)	(1.056)	(1.069)	(1.090)
2008.year	-2.076*	-2.622*	-2.842**	-3.028**	-2.933**	-1.516	-1.517	-1.451	-1.534
	(1.194)	(1.318)	(1.310)	(1.283)	(1.226)	(0.890)	(0.896)	(0.904)	(0.940)
2009.year	-	-	-11.77***	-11.10***	-11.09***	-10.66***	-10.66***	-10.57***	-10.42***
	12.55***	11.86***							
	(1.707)	(1.538)	(1.488)	(1.107)	(1.070)	(1.143)	(1.148)	(1.144)	(1.107)
2010.year	-1.659	-1.387	-1.400	-1.161	-0.990	-0.624	-0.625	-0.544	-0.182
	(1.554)	(1.461)	(1.420)	(1.461)	(1.392)	(1.479)	(1.489)	(1.502)	(1.457)
2011.year	-2.077	-1.471	-1.643	-0.689	-0.294	0.548	0.547	0.635	0.721
	(1.456)	(1.559)	(1.551)	(1.324)	(1.183)	(1.165)	(1.168)	(1.193)	(1.191)
2012.year	-3.952**	-3.095**	-3.375**	-2.913*	-2.268	-1.570	-1.571	-1.445	-1.765
	(1.518)	(1.418)	(1.429)	(1.415)	(1.358)	(1.179)	(1.181)	(1.213)	(1.062)
2013.year	-3.246**	-3.080**	-3.260**	-3.076**	-2.838**	-2.489**	-2.491**	-2.398**	-2.276**
	(1.276)	(1.166)	(1.187)	(1.242)	(1.131)	(1.025)	(1.032)	(1.056)	(1.049)
2014.year	-2.071*	-1.784	-2.022*	-1.866	-1.439	-1.384	-1.385	-1.298	-1.391
	(1.173)	(1.067)	(1.063)	(1.149)	(1.127)	(1.005)	(1.009)	(1.025)	(0.997)
2015.year	-0.764	-0.456	-0.582	-0.496	-0.214	-0.821	-0.821	-0.731	-0.368
	(1.456)	(1.361)	(1.372)	(1.453)	(1.363)	(1.001)	(1.003)	(1.022)	(1.071)
2016.year	-	-2.805**	-2.934***	-2.088**	-1.897**	-1.620*	-1.628	-1.514	-1.631
	3.330***								
	(0.954)	(1.036)	(1.028)	(0.945)	(0.862)	(0.926)	(1.004)	(1.020)	(0.977)

VARIABLES	(1) Model:Fixed Effects	(2)	(3) Dependent variable: grgdp	(4)	(5)	(6)	(7)	(8)	(9)
Constant	5.277***	4.839***	5.051***	4.765***	4.372***	4.083***	4.084***	3.983***	3.850***
	(0.881)	(0.829)	(0.839)	(0.858)	(0.798)	(0.815)	(0.820)	(0.843)	(0.831)
Observations	349	349	349	349	349	310	310	308	308
R-squared	0.475	0.520	0.528	0.579	0.601	0.662	0.662	0.663	0.677
Number of country	22	22	22	22	22	22	22	21	21
Unit effects Country	YES	YES	YES	YES	YES	YES	YES	YES	YES
Time effects Year	YES	YES	YES	YES	YES	YES	YES	YES	YES
Robust	YES	YES	YES	YES	YES	YES	YES	YES	YES

Appendix 9. Results of random effects models by year on dependent variable grgdp

VARIABLES	(1) Model:Random effects	(2)	(3) Dependent variable: grgdp	(4)	(5)	(6)	(7)	(8)	(9)
gredu	0.0922**	0.0623**	0.0588**	0.0513**	0.0498**	0.0515**	0.0514**	0.0499**	0.0379*
	(0.0409)	(0.0288)	(0.0284)	(0.0247)	(0.0216)	(0.0225)	(0.0227)	(0.0221)	(0.0209)
grrcar		0.134***	0.129***	0.0964**	0.0878***	0.140***	0.140***	0.142***	0.121***
		(0.0412)	(0.0413)	(0.0385)	(0.0337)	(0.0347)	(0.0355)	(0.0357)	(0.0334)
grhaca			0.00691***	0.00895***	0.00836***	0.00545***	0.00548***	0.00544***	0.00541***
			(0.00217)	(0.00180)	(0.00159)	(0.00151)	(0.00154)	(0.00155)	(0.00145)
greca				0.0802***	0.0744***	0.0676***	0.0677***	0.0691***	0.0644***
				(0.0152)	(0.0118)	(0.0133)	(0.0133)	(0.0137)	(0.0114)
grsp					0.0523**	0.0502*	0.0502*	0.0506*	0.0393
					(0.0242)	(0.0271)	(0.0272)	(0.0274)	(0.0270)
grhealth						0.00223	0.00223	0.00221	0.00175
						(0.00356)	(0.00357)	(0.00369)	(0.00409)
grenvp							-0.000588	-0.000632	-0.00277
							(0.00299)	(0.00301)	(0.00388)
grpoas								-0.000336	-0.00155
								(0.00280)	(0.00281)
grgps									0.0753***
									(0.0277)
2002. year	-0.152	-0.705	-0.872	-0.911	-0.883	-0.725	-0.728	-0.597	-0.640
	(0.798)	(0.745)	(0.769)	(0.795)	(0.755)	(0.723)	(0.726)	(0.750)	(0.690)
2003. year	-2.101*	-2.293**	-2.406**	-2.022*	-1.986*	-1.858*	-1.863*	-1.695	-1.576
	(1.176)	(1.153)	(1.162)	(1.113)	(1.062)	(1.041)	(1.049)	(1.054)	(1.085)
2004. year	0.365	0.464	0.418	0.488	0.562	0.992	0.991	1.157	1.526*
	(0.852)	(0.792)	(0.794)	(0.851)	(0.813)	(0.873)	(0.875)	(0.877)	(0.862)
2005. year	0.600	0.136	0.0719	0.120	0.722	0.642	0.643	0.789	0.999
	(0.818)	(0.753)	(0.761)	(0.885)	(0.842)	(0.874)	(0.876)	(0.943)	(0.964)
2006. year	1.320	0.921	0.866	0.577	0.609	0.826	0.825	0.977	1.134
	(1.198)	(1.124)	(1.183)	(1.282)	(1.269)	(1.348)	(1.354)	(1.359)	(1.221)
2007. year	2.728***	2.453**	2.290**	2.475**	2.687**	3.126***	3.124***	3.288***	3.362***
	(1.056)	(1.008)	(1.026)	(1.057)	(1.048)	(1.085)	(1.089)	(1.096)	(1.114)
2008. year	-2.076*	-2.659**	-2.849**	-3.038**	-2.947**	-1.694*	-1.698*	-1.546*	-1.603*
	(1.201)	(1.330)	(1.322)	(1.292)	(1.237)	(0.865)	(0.873)	(0.879)	(0.898)
2009. year	-12.55***	-11.83***	-11.74***	-11.07***	-11.07***	-10.60***	-10.60***	-10.43***	-10.27***

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Model:Random effects Dependent variable: grgdp								
	(1.711)	(1.537)	(1.493)	(1.110)	(1.073)	(1.118)	(1.123)	(1.127)	(1.080)
2010. year	-1.659	-1.380	-1.387	-1.146	-0.987	-0.689	-0.694	-0.532	-0.133
	(1.561)	(1.465)	(1.427)	(1.469)	(1.399)	(1.523)	(1.534)	(1.555)	(1.498)
2011. year	-2.077	-1.446	-1.590	-0.633	-0.263	0.767	0.764	0.948	1.059
	(1.469)	(1.588)	(1.587)	(1.333)	(1.194)	(1.135)	(1.139)	(1.159)	(1.159)
2012. year	-3.951***	-3.059**	-3.295**	-2.832**	-2.223	-1.283	-1.284	-1.107	-1.428
	(1.533)	(1.440)	(1.457)	(1.423)	(1.363)	(1.117)	(1.119)	(1.159)	(1.015)
2013. year	-3.245**	-3.093***	-3.241***	-3.054**	-2.839**	-2.358**	-2.364**	-2.217**	-2.054**
	(1.291)	(1.169)	(1.187)	(1.225)	(1.110)	(0.952)	(0.958)	(0.982)	(0.981)
2014. year	-2.057*	-1.768*	-1.967*	-1.813	-1.413	-1.046	-1.048	-0.879	-0.969
	(1.169)	(1.063)	(1.064)	(1.141)	(1.109)	(1.067)	(1.070)	(1.087)	(1.039)
2015. year	-0.750	-0.432	-0.536	-0.452	-0.188	-0.590	-0.591	-0.424	-0.0331
	(1.444)	(1.335)	(1.344)	(1.423)	(1.326)	(1.041)	(1.043)	(1.065)	(1.099)
2016. year	-3.316***	-2.769***	-2.875***	-2.029**	-1.857**	-1.292	-1.321	-1.146	-1.260
	(0.958)	(1.055)	(1.048)	(0.952)	(0.869)	(0.850)	(0.916)	(0.934)	(0.869)
Constant	5.269***	4.819***	4.997***	4.711***	4.342***	3.862***	3.865***	3.694***	3.535***
	(1.012)	(0.883)	(0.884)	(0.878)	(0.865)	(0.884)	(0.890)	(0.911)	(0.873)
Observations	349	349	349	349	349	310	310	308	308
Number of country	22	22	22	22	22	22	22	21	21
Unit effects Country	YES	YES	YES	YES	YES	YES	YES	YES	YES
Time effects Year	YES	YES	YES	YES	YES	YES	YES	YES	YES
Robust	YES	YES	YES	YES	YES	YES	YES	YES	YES

Appendix 10. Results of Driscoll-Kraay fixed effects models by year on dependent variable grgdp

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Model:Fixed Effects Dependent variable: grgdp								
gredu	0.0921	0.0653*	0.0607	0.0530*	0.0522*	0.0450**	0.0449**	0.0441**	0.0318*
	(0.0558)	(0.0370)	(0.0358)	(0.0293)	(0.0246)	(0.0190)	(0.0184)	(0.0181)	(0.0159)
grrcar		0.127***	0.120***	0.0880***	0.0799***	0.107***	0.107***	0.107***	0.0874**
		(0.0278)	(0.0229)	(0.0177)	(0.0193)	(0.0297)	(0.0290)	(0.0300)	(0.0306)
grhaca			0.00796**	0.00991*	0.00916*	0.00786	0.00787	0.00798	0.00834
			(0.00343)	(0.00507)	(0.00516)	(0.00527)	(0.00532)	(0.00529)	(0.00488)
greca				0.0799***	0.0742***	0.0679***	0.0679***	0.0689***	0.0648***
				(0.0180)	(0.0180)	(0.0197)	(0.0198)	(0.0194)	(0.0196)
grsp					0.0537**	0.0523**	0.0523**	0.0525**	0.0420**
					(0.0246)	(0.0181)	(0.0181)	(0.0179)	(0.0158)
grhealth						0.00310	0.00310	0.00275	0.00187
						(0.00530)	(0.00529)	(0.00549)	(0.00635)
grenvp							-0.000165	-0.000141	-0.00237
							(0.00398)	(0.00397)	(0.00407)
grpoas								0.00196	0.00103
								(0.00153)	(0.00181)
grgps									0.0699***
									(0.0192)

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Model:Fixed Effects Dependent variable: grgdp								
2001.year	3.246***	1.784***	2.022***	2.088***	1.439***	1.570***	1.628***	1.451***	1.534***
	(0.899)	(0.518)	(0.477)	(0.396)	(0.394)	(0.490)	(0.488)	(0.196)	(0.178)
2002.year	3.094***	1.110*	1.156**	1.186**	0.566	0.816	0.874	0.831***	0.866***
	(0.888)	(0.584)	(0.528)	(0.535)	(0.517)	(0.574)	(0.588)	(0.0780)	(0.0716)
2003.year	1.145	-0.495	-0.389	0.0609	-0.547	-0.300	-0.243	-0.328	-0.130
	(0.773)	(0.456)	(0.413)	(0.345)	(0.337)	(0.431)	(0.415)	(0.240)	(0.237)
2004.year	3.610***	2.246***	2.429***	2.565***	1.996***	2.463***	2.521***	2.422***	2.845***
	(0.735)	(0.392)	(0.360)	(0.316)	(0.300)	(0.325)	(0.342)	(0.303)	(0.269)
2005.year	3.846***	1.950***	2.113***	2.227***	2.198***	2.364***	2.422***	2.396***	2.671***
	(0.739)	(0.472)	(0.419)	(0.397)	(0.380)	(0.456)	(0.475)	(0.229)	(0.274)
2006.year	4.566***	2.733***	2.906***	2.683***	2.068***	2.533***	2.590***	2.485***	2.699***
	(0.684)	(0.426)	(0.376)	(0.424)	(0.401)	(0.455)	(0.480)	(0.157)	(0.169)
2007.year	5.974***	4.262***	4.308***	4.559***	4.137***	4.757***	4.814***	4.718***	4.854***
	(0.482)	(0.277)	(0.242)	(0.306)	(0.231)	(0.380)	(0.401)	(0.243)	(0.244)
2008.year	1.170	-0.838*	-0.820*	-0.940*	-1.493***	0.0546	0.111	0	0
	(0.718)	(0.477)	(0.426)	(0.508)	(0.472)	(0.566)	(0.596)	(0)	(0)
2009.year	-	-	-9.744***	-9.008***	-9.647***	-9.085***	-9.027***	-9.115***	-8.889***
	9.302***	10.08***							
	(0.410)	(0.120)	(0.157)	(0.102)	(0.295)	(0.256)	(0.222)	(0.597)	(0.537)
2010.year	1.587***	0.397	0.622**	0.927***	0.449**	0.947**	1.004***	0.907**	1.352***
	(0.537)	(0.234)	(0.219)	(0.167)	(0.171)	(0.324)	(0.333)	(0.319)	(0.325)
2011.year	1.169**	0.312*	0.378**	1.399***	1.145***	2.118***	2.176***	2.086***	2.255***
	(0.462)	(0.154)	(0.147)	(0.0496)	(0.182)	(0.140)	(0.174)	(0.506)	(0.457)
2012.year	-0.706**	-	-1.353***	-0.824***	-0.829***	0	0.0578	0.00613	-0.231
		1.312***							
	(0.308)	(0.0972)	(0.0963)	(0.181)	(0.112)	(0)	(0.233)	(0.576)	(0.518)
2013.year	0	-	-1.238***	-0.988***	-1.399***	-0.919***	-0.863**	-0.947**	-0.742*
		1.296***							
	(0)	(0.154)	(0.150)	(0.281)	(0.163)	(0.246)	(0.332)	(0.413)	(0.368)
2014.year	1.175***	0	0	0.222	0	0.186	0.244	0.153	0.143
	(0.224)	(0)	(0)	(0.219)	(0)	(0.215)	(0.287)	(0.469)	(0.432)
2015.year	2.482***	1.328***	1.440***	1.592***	1.225***	0.750**	0.807**	0.720	1.166**
	(0.501)	(0.195)	(0.189)	(0.203)	(0.136)	(0.257)	(0.288)	(0.439)	(0.421)
2016.year	-0.0836	-	-0.913***	0	-0.458**	-0.0498	0	-0.0630	-0.0967
		1.021***							
	(0.442)	(0.140)	(0.144)	(0)	(0.200)	(0.220)	(0)	(0.588)	(0.553)
Constant	2.031***	3.055***	3.030***	2.677***	2.933***	2.513***	2.455***	2.532***	2.316***
	(0.383)	(0.110)	(0.104)	(0.195)	(0.0678)	(0.166)	(0.245)	(0.422)	(0.386)
Observations	349	349	349	349	349	310	310	308	308
Number of groups	22	22	22	22	22	22	22	21	21
Unit effects	YES	YES	YES	YES	YES	YES	YES	YES	YES
Country Time effects	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year Robust	YES	YES	YES	YES	YES	YES	YES	YES	YES

Appendix 11. Results of Driscoll-Kraay random effects models by year on dependent variable grgdp

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Model:Random effects Dependent variable: grgdp								
gredu	0.0922	0.0623	0.0588	0.0513	0.0498	0.0515*	0.0514*	0.0499*	0.0379
	(0.0643)	(0.0418)	(0.0415)	(0.0352)	(0.0299)	(0.0272)	(0.0273)	(0.0268)	(0.0233)

VARIABLES	(1) Model:Random effects	(2) Dependent variable: grgdp	(3)	(4)	(5)	(6)	(7)	(8)	(9)
grrcar		0.134***	0.129***	0.0964**	0.0878**	0.140***	0.140***	0.142***	0.121**
		(0.0360)	(0.0349)	(0.0331)	(0.0330)	(0.0466)	(0.0459)	(0.0467)	(0.0503)
grhaca			0.00691*	0.00895*	0.00836	0.00545	0.00548	0.00544	0.00541
			(0.00354)	(0.00485)	(0.00482)	(0.00464)	(0.00466)	(0.00468)	(0.00439)
greca				0.0802***	0.0744***	0.0676***	0.0677***	0.0691***	0.0644***
				(0.0165)	(0.0149)	(0.0141)	(0.0140)	(0.0138)	(0.0131)
grsp					0.0523*	0.0502**	0.0502**	0.0506**	0.0393*
					(0.0296)	(0.0225)	(0.0227)	(0.0228)	(0.0215)
grhealth						0.00223	0.00223	0.00221	0.00175
						(0.00591)	(0.00592)	(0.00603)	(0.00673)
grenvp							-0.000588	-0.000632	-0.00277
							(0.00526)	(0.00525)	(0.00538)
grpoas								-0.000336	-0.00155
								(0.00186)	(0.00222)
grgps									0.0753***
									(0.0227)
2001.year	0	1.768**	1.967***	2.029***	0.883***	1.694***	1.284*	1.107	1.603***
	(0)	(0.605)	(0.617)	(0.444)	(0.153)	(0.152)	(0.674)	(0.713)	(0.127)
2002.year	-0.152***	1.063	1.094	1.118*	0	0.968***	0.556	0.510	0.963***
	(0.0131)	(0.706)	(0.681)	(0.550)	(0)	(0.0979)	(0.703)	(0.719)	(0.0900)
2003year	-2.101***	-0.525	-0.439	0.00665	-1.103***	-0.165	-0.579	-0.588	0.0272
	(0.145)	(0.539)	(0.531)	(0.377)	(0.203)	(0.208)	(0.633)	(0.642)	(0.231)
2004year	0.365*	2.232***	2.385***	2.517***	1.445***	2.686***	2.275***	2.265***	3.129***
	(0.189)	(0.452)	(0.461)	(0.320)	(0.250)	(0.256)	(0.430)	(0.450)	(0.201)
2005year	0.600***	1.904***	2.039***	2.149***	1.605***	2.336***	1.926***	1.896**	2.602***
	(0.184)	(0.569)	(0.568)	(0.425)	(0.385)	(0.209)	(0.649)	(0.655)	(0.299)
2006year	1.320***	2.690***	2.833***	2.606***	1.492***	2.520***	2.108***	2.085***	2.737***
	(0.248)	(0.510)	(0.514)	(0.410)	(0.150)	(0.124)	(0.600)	(0.626)	(0.140)
2007year	2.728***	4.221***	4.257***	4.504***	3.570***	4.820***	4.407***	4.395***	4.965***
	(0.481)	(0.326)	(0.314)	(0.250)	(0.331)	(0.215)	(0.531)	(0.545)	(0.224)
2008year	-2.076***	-0.891	-0.883	-1.009**	-2.064***	0	-0.415	-0.439	0
	(0.208)	(0.578)	(0.552)	(0.472)	(0.0922)	(0)	(0.653)	(0.682)	(0)
2009year	-12.55***	-10.06***	-9.778***	-9.040***	-10.19***	-8.907***	-9.319***	-9.320***	-8.666***
	(0.563)	(0.121)	(0.160)	(0.0993)	(0.653)	(0.468)	(0.298)	(0.312)	(0.399)
2010year	-1.659***	0.388	0.580*	0.883***	-0.103	1.005***	0.590	0.576	1.470***
	(0.417)	(0.257)	(0.283)	(0.153)	(0.430)	(0.256)	(0.491)	(0.508)	(0.274)
2011year	-2.077***	0.322*	0.376**	1.396***	0.620	2.461***	2.048***	2.056***	2.662***
	(0.503)	(0.155)	(0.153)	(0.0399)	(0.618)	(0.530)	(0.210)	(0.217)	(0.496)
2012year	-3.951***	-1.291***	-1.328***	-0.803***	-1.340*	0.411	0	0	0.175
	(0.681)	(0.132)	(0.137)	(0.234)	(0.691)	(0.661)	(0)	(0)	(0.621)
2013year	-3.245***	-1.325***	-1.274***	-1.025***	-1.956**	-0.664	-1.081***	-1.110***	-0.451
	(1.036)	(0.172)	(0.168)	(0.292)	(0.697)	(0.515)	(0.278)	(0.309)	(0.416)
2014year	-2.057**	0	0	0.215	-0.530	0.647	0.235	0.229	0.634
	(0.773)	(0)	(0)	(0.207)	(0.586)	(0.434)	(0.237)	(0.250)	(0.404)
2015year	-0.750	1.337***	1.431***	1.577***	0.696	1.103***	0.693*	0.684*	1.570***
	(0.453)	(0.225)	(0.234)	(0.179)	(0.428)	(0.327)	(0.377)	(0.387)	(0.319)
2016	-3.316***	-1.001***	-0.909***	0	-0.974	0.402	-0.0379	-0.0382	0.343

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Model:Random effects Dependent variable: grgdp								
year									
	(0.524)	(0.146)	(0.153)	(0)	(0.593)	(0.486)	(0.331)	(0.336)	(0.593)
Constant	5.269***	3.051***	3.031***	2.683***	3.459***	2.168***	2.582***	2.587***	1.932***
	(0.594)	(0.108)	(0.106)	(0.159)	(0.533)	(0.438)	(0.231)	(0.244)	(0.392)
Observations	349	349	349	349	349	310	310	308	308
Number of groups	22	22	22	22	22	22	22	21	21
Unit effects Country	YES	YES	YES	YES	YES	YES	YES	YES	YES
Time effects Year	YES	YES	YES	YES	YES	YES	YES	YES	YES
Robust	YES	YES	YES	YES	YES	YES	YES	YES	YES

Appendix 12. Results of random effects OLS and Driscoll-Kraay standard errors models on dependent variable grgdp

Variables	(1) OLS Regression Model:Random Effects. Dependent variable: **grgdp**	(2) OLS Regression Model:Random Effects. Dependent variable: **grgdp**	(3) Regression with Driscoll-Kraay standard errors Model:Random Effects Dependent variable: **grgdp**	(4) Regression with Driscoll-Kraay standard errors Model:Random Effects Dependent variable: **grgdp**
gredu	0.0533**	0.0379*	0.0533**	0.0379
	(0.0219)	(0.0209)	(0.0232)	(0.0233)
grrcar	0.142***	0.121***	0.142**	0.121**
	(0.0397)	(0.0334)	(0.0514)	(0.0503)
grhaca	0.00980***	0.00541***	0.00980	0.00541
	(0.00379)	(0.00145)	(0.00615)	(0.00439)
greca	0.0785***	0.0644***	0.0785***	0.0644***
	(0.0265)	(0.0114)	(0.0167)	(0.0131)
grsp	0.0287	0.0393	0.0287	0.0393*
	(0.0356)	(0.0270)	(0.0190)	(0.0215)
grhealth	0.00509	0.00175	0.00509	0.00175
	(0.00703)	(0.00409)	(0.00888)	(0.00673)
grenvp	-0.00143	-0.00277	-0.00143	-0.00277
	(0.00334)	(0.00388)	(0.00570)	(0.00538)
grpoas	-0.00104	-0.00155	-0.00104	-0.00155
	(0.00323)	(0.00281)	(0.00260)	(0.00222)
grgps	0.0635*	0.0753***	0.0635**	0.0753***
	(0.0384)	(0.0277)	(0.0231)	(0.0227)
2001.year		-		1.603***
		-		(0.127)
2002.year		-0.640		0.963***
		(0.690)		(0.0900)
2003.year		-1.576		0.0272
		(1.085)		(0.231)
2004.year		1.526*		3.129***

	(1)	(2)	(3)	(4)
	OLS Regression Model:Random Effects. Dependent variable: **grgdp**	OLS Regression Model:Random Effects. Dependent variable: **grgdp**	Regression with Driscoll-Kraay standard errors Model:Random Effects Dependent variable: **grgdp**	Regression with Driscoll-Kraay standard errors Model:Random Effects Dependent variable: **grgdp**
Variables				
		(0.862)		(0.201)
2005.year		0.999		2.602***
		(0.964)		(0.299)
2006.year		1.134		2.737***
		(1.221)		(0.140)
2007.year		3.362***		4.965***
		(1.114)		(0.224)
2008.year		-1.603*		0
		(0.898)		(0)
2009.year		-10.27***		-8.666***
		(1.080)		(0.399)
2010.year		-0.133		1.470***
		(1.498)		(0.274)
2011.year		1.059		2.662***
		(1.159)		(0.496)
2012.year		-1.428		0.175
		(1.015)		(0.621)
2013.year		-2.054**		-0.451
		(0.981)		(0.416)
2014.year		-0.969		0.634
		(1.039)		(0.404)
2015.year		-0.0331		1.570***
		(1.099)		(0.319)
2016.year		-1.260		0.343
		(0.869)		(0.593)
Constant	2.757***	3.535***	2.757***	1.932***
	(0.435)	(0.873)	(0.753)	(0.392)
Observations	308	308	308	308
R-squared		-		-
Number of country	21	21	21	21
Unit effects Country	YES	YES	YES	YES
Time effects Year	YES	YES	NO	YES
Robust	YES	YES	YES	YES