FIŠKÁLNA DECENTRALIZÁCIA A EKONOMICKÝ RAST V KRAJINÁCH EÚ Z PERSPEKTÍVY VEĽKOSTI KRAJINY, ŠTRUKTÚRY VEREJNEJ VLÁDY A VSTUPU DO EÚ

FISCAL DECENTRALIZATION AND ECONOMIC GROWTH IN EU COUNTRIES FROM THE COUNTRY SIZE, GOVERNMENT STRUCTURE, AND EU ACCESSION PERSPECTIVE

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ABSTRAKT

Cieľom článku je analyzovať vplyv fiškálnej decentralizácie na ekonomický rast krajín Európskej únie s ohľadom na veľkosť krajiny, počet vládnych úrovní a vstup krajiny do EÚ. Prostredníctvom panelových ekonometrických modelov využívajúcich rôzne druhy estimátorov je s využitím údajov z Eurostatu a Svetovej Banky pre vzorku krajín EÚ v období 1999-2019 odhadovaný vzťah medzi rastom HDP ako vysvetľovanej premennej a fiškálnej decentralizácie ako vysvetľujúcej premennej, pričom fiškálna decentralizácia je meraná rôznymi spôsobmi. Výsledky poukazujú na to, že model fixných časových efektov najlepšie odhaduje vzťah medzi analyzovanými premennými. Výsledky odhadnutých ekonometrických panelových modelov potvrdzujú počiatočnú výskumnú hypotézu, že fiškálna decentralizácia významne ovplyvňuje ekonomický rast, kde intenzita a smer koeficientu vysvetľujúcej premennej závisí od (1) veľkosti krajiny (2) počtu vládnych úrovní (3) obdobia vstupu krajiny do EÚ.

Kľúčová slova: *fiškálna decentralizácia, ekonomický rast, panelový model*
JEL klasifikace: *E62, H77*

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ABSTRACT

The aim of the paper is to examine the relationship between the fiscal decentralization and economic growth in European Union countries, with respect to the country size, the number of government level, and EU accession. The study was conducted on the basis of data from Eurostat and the World Bank. A sample of EU countries in the period 1999–2019 is investigated. Panel data models based on various estimators are employed to estimate the relationship between the growth of GDP as dependent variable and fiscal decentralization as explanatory variable, while fiscal decentralization is measured in different ways. The paper demonstrates that the time-fixed effects model best describes the dependence of GDP growth on fiscal decentralization as the main explanatory variable and other variables impacting economic growth. On the basis of estimated parameters of the econometric panel model, the original research hypothesis that fiscal decentralization has a significant impact on economic growth is proven, with the intensity and direction of impact depending on 1) the country's size; 2) the number of government levels; and 3) the period of the country's EU accession.

Keywords: *fiscal decentralization; economic growth; panel data model*

JEL Classification: *E62, H77*

INTRODUCTION

Studies of the impact of fiscal decentralization on economic growth boomed in the 1990s, which is reflected in the numerous papers presenting the results of empirical research conducted in certain countries or groups of countries. Slavinskaite, Novotny and Gedvilaitė (2020), Aristovnik (2012) or Rodríguez-Pose and Krøijer (2009) summarize the potential positive effects of fiscal decentralization on economic growth that consist in the possibility of tailoring the local public goods and services to local preferences and in enhanced competition among localities, which leads to innovative provision of public goods and services. Negative effects are mentioned in Davoodi and Zou (1998) or Maličká et al. (2017), when excessive fiscal decentralization lowers the economic growth by increasing public spending and generating additional bureaucracy costs.

In the studies, either only cross-section data or time-series data were used, or, which is most often the case, panel data representing a combination of cross-section data and time series data, while different indicators of the fiscal decentralization degree were used. Depending on the type of data (cross-section, time series,

and panel), for the purpose of examining the impact of fiscal decentralization on economic growth, different econometric models and estimation methods were used.

The results of empirical research on the dependence of economic growth on fiscal decentralization showed that this dependence is not universal and varies by country or group of countries and over time, implying that the strength and direction of impact of fiscal decentralization on economic growth depends on various factors such as country size, level of economic development, quality of political institutions, and more (Baskaran, Feld and Schnellenbach, 2016). Negative impacts of fiscal decentralization on GDP growth were found, e.g, in China (Zhang and Zou, 1998; Lin and Liu, 2000), in the US (Xie, Zou and Davoodi, 1999), in the OECD countries (Thiessen, 2003; Rodriguez-Pose and Ezcurra, 2011), in the Central and Eastern European countries (CEE) (Rodríguez-Pose and Krøijer, 2009), in the European countries (Pasichnyi et al., 2019), etc. Positive impact of fiscal decentralization on GDP growth was determined by Akai and Sakata (2002) in the US, Feld et al. (2004) in Switzerland, Qiao et al. (2008) in China, Gemmell, Kneller and Sanz (2013) and Blöchliger and Égert (2013) in the OECD countries, whereas, for example, Thornton (2007) determined that in the OECD countries there was no significant impact of fiscal decentralization on economic growth.

Regarding the impact of fiscal decentralization on economic growth, differences were found between developed and developing countries. Canavire-Bacarreza, Martinez-Vazquez and Yedgenov (2020), for example, determined, based on panel data for 70 countries in the period 1981–2010, a positive and significant impact of the share of subnational expenditure in total general government expenditure and the share of subnational revenue in total general government revenue on the economic growth of a group of developed countries, and showed that the impact of these explanatory variables on economic growth of a group of developing countries in the analyzed period was not significant.

Empirical research of the impact of fiscal decentralization on economic growth can be divided into two groups, depending on whether the impact was examined at the level of a group of countries or within one country. Most of the

research belonging to the first group refers to research at the level of the OECD countries (Thiessen, 2001, 2003; Bodman, 2011; Rodriguez-Pose and Ezcurra, 2011; Baskaran and Feld, 2013; Blöchliger, 2013; Blöchliger and Égert, 2013; Gemmell, Kneller and Sanz, 2013; Filippetti and Sacchi, 2016a; Filippetti and Sacchi, 2016b), and EU countries (Szarowská, 2014; Maličká et al., 2017; Slavinskaitė, 2017; Carniti et al, 2019; Pasichnyi et al, 2019; Slavinskaite, Novotny and Gedvilaitė, 2020).

Much more empirical research on the impact of fiscal decentralization on economic growth, especially in the last two decades, has been conducted at the country level, including the following countries: the US (Xie, Zou and Davoodi, 1999; Akai and Sakata, 2002; Bojanic, 2018), Switzerland (Feld et al., 2004), Nigeria (Cyril, 2016; Sylvester and Ade, 2017), Spain (Carrion-i-Silvestre, Espasa and Mora, 2008; Cantarero and Gonzales, 2009; Cantarero and Perez, 2012; Lago-Peñas, Fernandez-Leiceaga and Vaquero-García, 2017), Italy (Di Liddo, Magazzino and Porcelli, 2018); India (Ganaie et al, 2018), Malaysia (Hasnul, 2015), Bali (Kusuma and Badrudin, 2016), Columbia (Lozano-Espitia, Julio-Román and Lozano-Espitia, 2015; Lozano-Espitia and Julio, 2016), Slovakia (Maličká et al., 2017), Ukraine (Melnyk et al., 2018; Trusova et al., 2019), Indonesia (Nursini, 2019), Vietnam (Nguyen and Anwar, 2011; Thanh and Canh, 2020), China (Zhang and Zou, 1998; Lin and Liu, 2000; Qiao et al. 2008; Yang, 2016; Sun, Chang and Hao, 2017), Russia (Yushkov, 2015), and Germany (Baskaran, Feld and Necker, 2017).

It is obvious that the relationship between the fiscal decentralization and economic growth is examined in a large number of the empirical literature. However, observed results are often ambiguous or even opposite. Obviously, they differ according to the economic circumstances, public sector structure, administration, etc., of a concrete country or a sample of countries, while the time period is an important factor, too.

Anyway, different results have incited this research and the aim of the paper is to contribute to the existing empirical literature by providing an analysis that reflects on different conditions of the countries in the EU sample. The subject of this paper is to examine the impact of fiscal decentralization on the economic growth of EU countries in the period 1999–2019. The main goal of

this paper is to elicit the nature of the relationship between the fiscal decentralization and GDP growth of EU countries and to elicit whether this relationship varies according to the sample structure by creating various subsamples. In fact, the research has two basic hypotheses: 1) fiscal decentralization in the EU countries negatively affects their economic growth; and 2) the dependence of economic growth on fiscal decentralization is affected by the size of the country, the year of accession to the European Union, and the number of government levels. The first hypothesis stems from the heterogeneity of the EU sample (from the economic as well as political point of view), which has importantly increased after the extension of the EU caused by the accession of less developed, mainly post-communist countries in Europe. The second hypothesis is based on the findings of Horváthová et al. (2012), which point to a possible effect of different countries' characteristics including the aspects of their initial economic conditions and/or political factors leading to different government structures in terms of fiscal federalism.

1 DATA AND METHODOLOGY

The study used the Eurostat and World Bank data for 28 European Union member states[1] in the period 1999–2019. The panel data approach is employed in the research.

In line with the approach of Horváthová et al. (2012), three indicator-variables were determined for measuring the fiscal decentralization degree: 1) EXPDEC variable defined as the ratio between total local government expenditure (as percent of GDP) and total general government expenditure (as percent of GDP); 2) REVDEC variable reflecting the share of total local government revenue (as percent of GDP) in total general government revenue (as percent of GDP); and 3) TAXDEC variable representing the share of total local government tax revenue (as percent of GDP) in total general government tax revenue (as percent of GDP). On the basis of the coefficient of determination and the Akaike information criterion, TAXDEC was selected as the most adequate measure of the impact of fiscal decentralization on economic growth.

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[1] The study also covers the United Kingdom, which was a member of the EU at the time of the sample observations.

In order to quantify the "pure" impact of fiscal decentralization on economic growth, the following variables were included in the basic model: government consolidated gross debt (as percent of GDP), foreign direct investment (as percent of GDP), investment (as a sum of business investment (as percent of GDP) and household investment (as percent of GDP)) and government investment (as percent of GDP). Those variables represent the basic components of the GDP growth. Their selection was inspired by the relevant correspondent literature, e.g. Slavinskaite, Novotny and Gedvilaitė, (2020), Pasichnyi et al. (2019) or Maličká et al. (2017).

For testing the stated hypotheses, the pooled ordinary least squares model, fixed effects model, time-fixed effects model and random effects model were used, while the impact of the country's size, period of accession to the European Union and the number of government levels were studied. According to the year of EU accession, the countries were divided into two groups: the countries that joined before 2004 and the countries that joined the European Union after 2004. According to size, the EU countries were divided into three strata (based on Horváthová et al., 2012): small countries (up to 10 million inhabitants), medium-sized countries (countries with 10 to 30 million inhabitants) and large countries (countries with over 30 million inhabitants), while according to the number of government levels, they were classified into two groups: the countries with 1 or 2 government levels and the countries with 3 or more government levels.

Basic regression panel model is determined as follows:

$$GDP\_G_{i,t} = \beta_0 + \beta_1 F_{i,t} + \beta_2 GOV\_DEB_{i,t} + \beta_3 FDI_{i,t} + \beta_4 GI_{i,t} + \beta_5 I_{i,t} + u_{i,t}$$
$$i = 1,\ldots,N; \; t = 1,\ldots,T \tag{1}$$

where:

$GDP\_G_{i,t}$ = Annual percentage growth rate (percent of GDP),
$FD_{i,t}$ = Fiscal decentralization,
$GOV\_DEB_{i,t}$ = Government consolidated gross debt (as percent of GDP),
$FDI_{i,t}$ = Foreign direct investment (as percent of GDP),
$GI_{i,t}$ = Government investment (as percent of GDP),

$I_{i,t}$	= Sum of business investment and household investment (as percent of GDP),
$u_{i,t}$	= Error term,
N	= Number of observation units (countries) in the sample,
T	= Time period covered by observations in the sample.

In the first data analysis, the stationarity of each individual variable included in the model was examined. The Levin-Lin-Chiu test and the Harris-Tzavalis test examined the stationarity of variables for which there were all observations in the panel (strongly balanced panel), while the Im–Pesaran–Shin test examined the assumption about the stationarity of variables for which data were missing for individual years of the analyzed period in individual countries (unbalanced panel). After conducting the tests of stationarity of variables included in the model, the original variables – government consolidated gross debt, government investment, and investment that did not meet the requirement of stationarity based on first log difference – were transformed into new variables DGOV_DEB, DGI and DI, so the model (1) was transformed into the following model:

$$GDP\_G_{i,t} = \beta_0 + \beta_1 FD_{i,t} + \beta_2 DGOV\_DEB_{i,t} + \beta_3 FDI_{i,t} + \beta_4 DGI_{i,t} + \beta_5 DI_{i,t} + u_{i,t}$$
$$i = 1,\dots,N; \, t = 1,\dots,T \tag{2}$$

where FD variable presents the selected measure of fiscal decentralization FD.

The model (2) parameters were estimated first by using the pooled ordinary least squares (POLS), which implies that the random error $u_{i,t}$ has a normal distribution with mean zero and constant variance and is not correlated with explanatory variables, i.e. there is no endogeneity in the model. As known, the consequence of endogeneity in the model, in addition to the bias and unreliability of the estimated parameters, is an unnoticed heterogeneity that has a significant systematic impact on the dependent variable (Stock and Watson, 2019). To eliminate the consequences of unobserved heterogeneity, the assumption is introduced that the omitted variable does not vary with

respect to the comparative dimension, so the disturbance term in the model was decomposed into two components:

$$u_{i,t} = \mu\_i + v_{i,t} \tag{3}$$

where μ_i denotes individual specific effects and $v_{i,t}$ remainder disturbance that varies over time and countries.

In addition, we used the fixed effects model (FEM), time-fixed effects model (T-FEM), and the random effects model (REM), which are based on three different assumptions about variable μ_i, while using the Hausman test to assess the adequacy of the random effects model in the analysis.

Since the Hausman test found that the FEM presents more adequate econometric specification than the REM, the appropriate tests were used in the analysis: the Pesaran CD (cross-sectional dependence) test, which is used to test whether the residuals are correlated across entities (contemporaneous correlation), the Lagrange-Multiplier test used to test for the existence of first-order autocorrelation, and the modified Wald test for groupwise heteroskedasticity in the fixed effects regression model.

2 EMPIRICAL RESULTS AND DISCUSSION

On the basis of calculated descriptive statistics measures, it was determined that the average value of the EXPDEC variable (the share of total local government expenditure in total general government expenditure) for EU countries in the period from 1999 to 2019 was 22.7%, similar to 23.5%, which was the average value of the REVDEC variable (the share of total local government revenue in total general government revenue), while the average value of the TAXDEC variable (the share of total local government tax revenue in total general government tax revenue) was only 12.4% (see Table 1).

Tab. 1 »Descriptive statistics of explanatory variables

	EXPDEC	REVDEC	TAXDEC
Mean	0.227	0.235	0.124
Median	0.207	0.217	0.092
Max	0.663 (Denmark, 2017)	0.661 (Denmark, 2010)	0.356 (Sweden, 2003)
Min	0.011 (Malta, 2017)	0.013 (Malta, 2018)	0.013 (Cyprus, 2016)
Std. deviation	0.129	0.126	0.095

Source: Own computation

In the analyzed period, the largest share of local expenditure in total government expenditure (66.3%) was recorded in Denmark in 2017 and the lowest (1.1%) in Malta in 2017. The largest share of local revenue in total revenue (66.1%) was also recorded in Denmark in 2010 and the lowest (1.3%) in Malta in 2018. The highest share of local government tax revenue in general government tax revenue (35.6%) was in Sweden in 2003 and the lowest in Cyprus (1.3%) in 2016.

There is high correlation among variables EXPDEC, REVDEC, and TAXDEC. The correlation coefficient between EXPDEC and REVDEC is 0.99, between EXPDEC and TAXDEC 0.67, and between REVDEC and TAXDEC 0.67.

The correlation coefficients between GDP growth and each of the indicator--variables are negative, with the correlation coefficient between GDP growth and TAXDEC being the highest.

Based on the estimation results shown in Table 2, we can see that of the observed three variables-indicators of the degree of fiscal decentralization, only the TAXDEC variable is statistically significant ($p < 0.05$). The calculated values of the coefficient of determination and the Akaike information criterion also indicate that POLS Model 3, which includes the TAXDEC variable, has the highest descriptive power, i.e. it represents the best analytical description of the dependence of GDP growth on explanatory variables.

Tab. 2»POLS model statistics with indicator-variables included

	POLS Model 1	POLS Model 2	POLS Model 3
EXPDEC	-1.095 (0.961)		
REVDEC		-1.051 (0.991)	
TAXDEC			-3.101 * (1.216)
DGOV_DEB	-13.077 *** (1.115)	-13.020 *** (1.114)	-12.986 *** (1.107)
FDI	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)
DGI	2.909 *** (0.730)	2.901 *** (0.730)	2.948 *** (0.725)
DI	13.053 *** (1.464)	13.042 *** (1.464)	13.015 *** (1.456)
_cons	2.865 *** (0.259)	2.862 *** (0.272)	3.005 *** (0.198)
Adj. R-squared	0.506	0.506	0.512
AIC	2207.157	2207.334	2201.934
F-test	97.139	97.068	99.261
Prob>F	0.000	0.000	0.000

*Notes: Standard errors in parentheses; * p<0.05, ** p<0.01, *** p<0.001*
Source: Own computation

The relationship between the fiscal decentralization (TAXDEC) and economic growth is negative. The increase of the degree of fiscal decentralization leads to a decrease in GDP growth. In principle, it opposes to the idea mentioned, e.g., in Aristovnik (2012) or Rodríguez-Pose and Krøijer (2009), which states that the greater the degree of fiscal decentralization, the greater the potential for economic efficiency

and growth. In addition, Rodríguez-Pose and Krøijer (2009) observed a negative relationship between the local expenditure and shifted transfers (corresponding to the EXPDEC and REVDEC variable) and economic growth and positive relationship when taking into account local tax revenue (corresponding to TAXDEC variable). On the contrary, in this paper, a negative relationship has been observed. This might be explained by the construction of the TAXDEC variable. While Rodríguez-Pose and Krøijer (2009) have mentioned local tax revenue originating in taxes assigned to local government levels, many countries employ the system of sharing tax revenues, which results in formal tax autonomy of local governments. Due to the persistent vertical fiscal imbalance, the reliance of local governments on central government is important (Propheter, 2019) and shared tax presents a quasi-transfer (additionally with characteristics of a non-earmarked transfer) shifted to local budgets. However, the negative impact of fiscal decentralization is stressed to the effect that excessive shift of sources to sub-national levels enhances the public spending, increases the cost of bureaucracy, and thus decelerates the economic growth (Davoodi and Zou, 1998; Maličká et al., 2017).

In the next step of the analysis, the FEM and the REM were estimated, while only one statistically significant fiscal decentralization variable (TAXDEC variable) is employed in the estimations. The Hausman test showed that the FEM is superior to the REM (Statistic Chi2 of 21.96, p-value = 0.001). The Pesaran's test of cross-sectional independence demonstrated that the T-FEM is superior to the FEM (p-value =0.000). It can also be observed that the T-FEM has a higher value of the coefficient of determination and a lower value of the AIC information criterion. On the basis of the conducted Lagrange-Multiplier test (F (1, 25) = 3.247; Prob > F = 0.0836), the hypothesis on the existence of first-order auto-correlation was rejected. On the other hand, on the basis of the modified Wald test for groupwise heteroskedasticity in the fixed effects regression model (chi2= 4663.61; Prob>chi2 = 0.0000), the hypothesis that there is no residual homoske-dasticity was rejected. Given this finding, the Huber-White variance-covariance matrix was used in the further analysis, which modifies the estimated variance--covariance matrix using the least squares method, thus ensuring robustness of statistical estimation in relation to heteroskedasticity in the model.

Based on the results displayed in the Table 3, we support our previous finding that

fiscal decentralization (measured as the share of total local government tax revenue in total general government tax revenue) has a statistically significant negative impact on the economic growth of EU countries in the period 1999–2019. A similar conclusion was reached by Pasichnyi et al. (2019), who investigated the impact of fiscal decentralization on the economic growth of selected European countries, including a large body of the EU members, and Thiessen (2003) and Rodriguez-Pose and Ezcurra (2011), who analyzed the impact of fiscal decentralization on the economic growth of the OECD countries. The results of empirical research conducted in China (Zhang and Zou, 1998; Lin and Liu, 2000) and by Xie, Zou and Davoodi (1999) in the US also showed that the impact of fiscal decentralization on the economic growth of these countries is significant and negative.

Tab. 3»Panel model statistics with the TAXDEC variable included as the fiscal decentralization degree measure

	POLS Model 1	POLS Model 2	POLS Model 3	POLS Model 3
TAXDEC	-3.101 * (1.216)	-11.291 (6.483)	-3.013 ** (1.073)	-3.864 (2.137)
DGOV_DEB	-12.986 *** (1.107)	-14.313 *** (1.016)	-8.831 *** (1.097)	-14.031 *** (1.019)
FDI	0.001 (0.001)	-0.000 (0.001)	0.001 (0.001)	0.000 (0.001)
DGI	2.948 *** (0.725)	-2.255 *** (0.655)	2.998 *** (0.692)	2.462 *** (0.660)
DI	13.015 *** (1.456)	11.484 *** (1.325)	9.841 *** (1.406)	11.879 *** (1.334)
_cons	3.005 *** (0.198)	4.091 *** (0.830)	2.907 *** (0.175)	3.129 *** (0.346)
Adj. R-squared	0.512	0.554	0.621	
Chi2				598.251
AIC	2201.934	2068.416	2064.163	
F-test	99.261	122.414	42.951	
Prob>F	0.000	0.000	0.000	0.000

*Standard errors in parentheses; * p<0.05, ** p<0.01, *** p<0.001*
Source: Own computation

To elicit whether the relationship between the fiscal decentralization and GDP growth varies according to the sample structure, the sample of 28 EU countries was divided into several subsamples. As mentioned hereinbefore, three additional variables were included in the research: the date of EU accession, the country size, and the number of government levels, which we assumed could increase or decrease the impact of fiscal decentralization on the economic growth of EU countries. The results of estimations made are displayed in Table 4.

First, the results of estimations for the two groups of EU countries regarding their EU accession are presented (for countries that joined the European Union before 2004 and for countries that joined the European Union after 2004). This classification of EU countries, inspired by Horváthová et al. (2012), partially bears on research made by Rodríguez-Pose and Krøijer (2009), Aristovnik (2012) or Slavinskaite, Novotny and Gedvilaitė (2020), who deal with the impact of fiscal decentralization on economic development in CEE countries (with the exception of Portugal in the sample of Slavinskaite, Novotny and Gedvilaitė, 2020). Based on the obtained results, even if the fiscal decentralization variable is not statistically significant, it can be concluded that there are differences in intensity but not in the direction of the impact of fiscal decentralization on the economic growth of countries belonging to these groups of EU countries. In the case of countries that joined the EU after 2004, the findings contradict those of Slavinskaite, Novotny and Gedvilaitė (2020) or Aristovnik (2012). In addition, Aristovnik (2012) mentions that the examined relation is in the case of CEE countries weak, which roughly corresponds with our findings that the fiscal decentralization variable is not statistically significant when investigating its effect on economic growth in the countries in question.

Tab. 4»Regression analysis of the impact of the date of EU accession, the country size, and the number of government levels

	Date of EU accession		Country size			Government levels	
	Before 2004	**After 2004**	**Large**	**Medium-sized**	**Small**	**(1-2)**	**(3-5)**
TAXDEC	-2.280	-2.466	15.719 **	3.598	-5.099 ***	-3.822 **	6.156 **
	(1.292)	(1.583)	(4.728)	(2.436)	(1.281)	(1.173)	(2.319)
DGOV_DEB	-11.018 ***	-7.930 ***	-11.133 **	-5.933 *	-8.407 ***	-8.405 ***	-12.564 *
	(1.764)	(1.293)	(3.604)	(2.825)	(1.325)	(1.185)	(4.786)
FDI	0.003 **	-0.008 *	0.612 ***	-0.007	0.000	0.001	0.017
	(0.001)	(0.004)	(0.116)	(0.013)	(0.001)	(0.001)	(0.022)
DGI	1.571	2.602 **	2.532	2.482 *	2.714 **	2.787 ***	2.787 ***
	(1.216)	(0.832)	(1.883)	(1.151)	(0.970)	(0.754)	(0.754)
DI	8.828 ***	8.177 ***	4.458	10.736 ***	9.667 ***	9.443 ***	5.318
	(1.882)	(1.844)	(4.422)	(2.886)	(1.833)	(1.520)	(4.913)
_cons	2.026 ***	3.824 ***	-2.128 **	1.835 ***	3.651 ***	3.273 ***	0.800 *
	(0.227)	(0.244)	(0.782)	(0.337)	(0.227)	(0.198)	(0.345)
Adj. R-squared	0.557	0.743	0.690	0.548	0.691	0.654	0.532
AIC	1053.384	907.088	285.160	546.936	1100.445	1613.263	361.013
F-test	19.319	23.186	16.159	6.975	27.561	33.104	4.282
Prob>F	0.000	0.000	0.000	0.000	0.000	0.000	0.002

*Notes: T-FEM; Standard errors in parentheses; * $p<0.05$, ** $p<0.01$, *** $p<0.001$*
Source: Own computation

The next (centre) part of Table 4 shows the estimated values of panel model parameters for three groups of EU countries: large countries, medium-sized countries, and small countries. Based on the obtained results, it can be concluded that the country size variable affects the dependence of GDP growth on fiscal decentralization. Unlike the group of large countries, where fiscal decentralization has the strongest impact (significant and positive) on economic growth, fiscal decentralization negatively affects economic growth of small EU countries. The

positive impact of fiscal decentralization on economic growth of large countries has been determined by, for example, Akai and Sakata (2002) in the US and Qiao et al. (2008) in China. Large countries tend to be more decentralized due to spatial aspects. For instance, Germany is a federation and Spain and Italy are emerging federations that have been increasing the autonomy of sub-national governments. France is a unitary state, but has a three tiered sub-national government. In addition, small EU countries such as Estonia, Lithuania, Bulgaria, and many other countries usually have two government levels. In the last part of Table 4, based on Horváthová et al. (2012), EU countries were divided into two groups according to the number of government levels. The first group consisted of countries with only one or two levels of government, while the second group consisted of countries with three or more levels of government. The estimation results show that the impact of fiscal decentralization on economic growth is significant in both groups of countries – negative in the group of countries with one or two levels of government and positive in the countries with three or more levels of government. This result is consistent with the result we obtained by examining the impact of the country size on the dependence of economic growth on fiscal decentralization, given that large countries have a higher number of government levels compared to smaller countries.

CONCLUSION

The results of empirical research have shown that fiscal decentralization significantly affects economic growth of EU countries. When EU countries are viewed as a whole, the impact of fiscal decentralization on economic growth is negative. The impact of fiscal decentralization on economic growth depends on the size of the country and on the number of levels of government. Economic growth of large EU countries is positively affected by fiscal decentralization, while in small EU countries, the impact of fiscal decentralization on economic growth is negative. The factor of the EU accession does not seem to be crucial, when the division of the EU sample according to the date of the country's accession to the EU is irrelevant in terms of the impact of fiscal decentralization on economic growth. In countries with a large number of levels of government, fiscal decentralization has a positive effect on economic growth, while in countries with a small number of

levels of government, the impact of fiscal decentralization on economic growth is negative.

Although the paper contributes to research on the relationship between fiscal decentralization and economic growth, it is obvious that in the future attention should be dedicated to the expression of the degree of fiscal decentralization. Exclusion of "formal" local resources in terms of shared tax revenue from the investigation might bring different results.

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Appendix 1: »Description of variables

Variable type	Label	Description	Source
Dependent variable	GDP_G	Annual percentage growth rate of GDP at market prices based on constant local currency. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products.	World Bank
Main explanatory variables	GDP_G	Annual percentage growth rate of GDP at market prices based on constant local currency. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products.	World Bank
	REVDEC	Total local government revenue (as percent of GDP)/Total general government revenue (as percent of GDP)	Eurostat
	TAXDEC	Total local government tax revenue (as percent of GDP)/Total general government tax revenue (as percent of GDP)	Eurostat
Explanatory variables	GOV_DEB	Government consolidated gross debt	Eurostat
	FDI	Foreign direct investments. Direct investment in the reporting economy (flows) (as percent of GDP)	Eurostat
	I	Investment. Sum of business investment (as percent of GDP) and Household investment (as percent of GDP)	Eurostat
	GI	Government investments (as percent of GDP)	Eurostat
Transformed explanatory variables	DGOV_DEB	First log difference of variable GOV_DEB	
	DI	First log difference of variable I	
	DGI	First log difference of variable GI	
Control variables	GOV_LVL	Number of government levels. Total score for given country is calculated upon complexity of its public administration structure.	Horváthová et al. (2012) and Council of European Municipalities and Regions (2012)
	Year of EU accession	All countries from the sample were divided into two groups: 1) countries that joined the EU until 2004; 2) countries that joined the EU after 2004	Own
	Country size	All EU member states were divided by size into 3 categories: 1) small countries (below 10,000,000 inhabitants); 2) medium-sized countries (with 10,000,000 to 30,000,000 inhabitants); 3) large countries (with over 30,000,000 inhabitants)	World Bank

Appendix 2: »Graphs of real GDP growth rate

**Graph 1: »**Dynamic GDP growth in EU countries, 1999–2019.
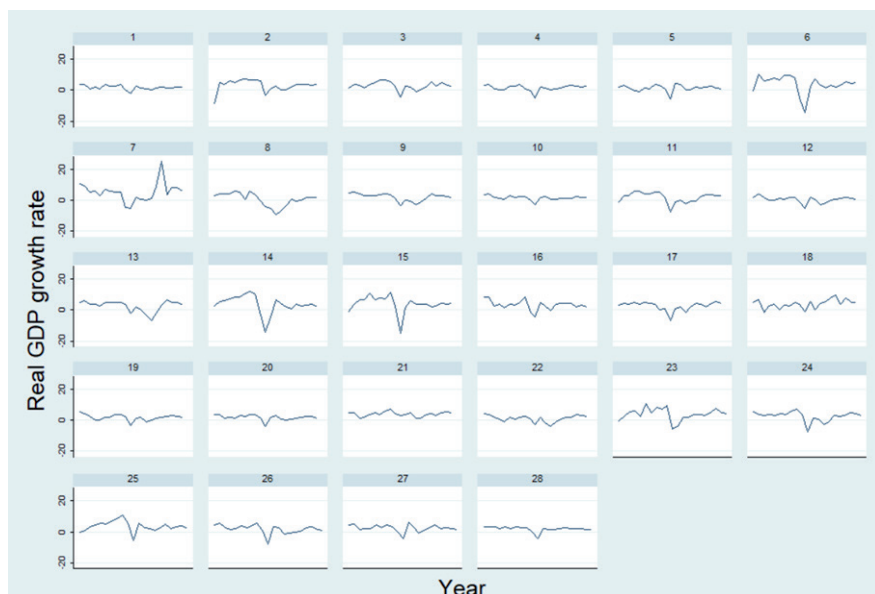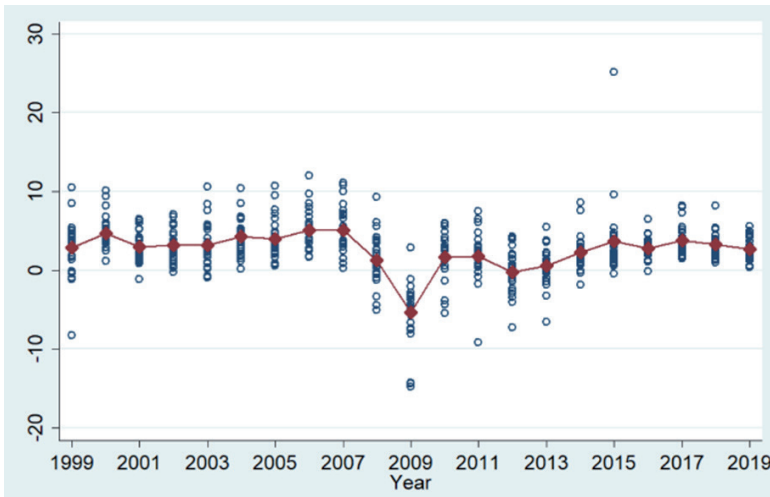

Source: Own research

Legend:

ID	Country	ID	Country	ID	Country	ID	Country
1	Belgium	8	Greece	15	Lithuania	22	Portugal
2	Bulgaria	9	Spain	16	Luxembourg	23	Romania
3	Czech Republic	10	France	17	Hungary	24	Slovenia
4	Denmark	11	Croatia	18	Malta	25	Slovakia
5	Germany	12	Italy	19	Netherlands	26	Finland
6	Estonia	13	Cyprus	20	Austria	27	Sweden
7	Ireland	14	Latvia	21	Poland	28	United Kingdom

Graph 2: » Real GDP growth rate: by country
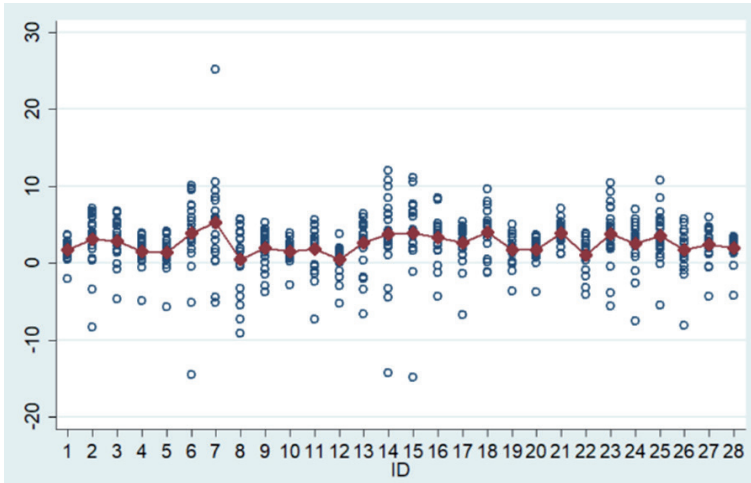
Source: Own research

Graph 3: » Real GDP growth rate: by year

Source: Own research