Gheorghe Zane Institute for Economic and Social Research

Economy and Contemporary Society

Journal homepage: ecs-journal.ro

The Impact of Fiscal Decentralization on Selected Macroeconomic Variables at the County Level in Romania from 1999 to 2023

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ARTICLE INFO

Article history:
Received 28 August 2024
Revised 10 October 2024
Accepted 30 October 2024
Published 29 November 2024

JEL classification:
C23; H11; H72

Keywords:
Fiscal decentralization
Regional analysis
Public performance

ABSTRACT

In addition to the information held at the national level, regional statistics can provide extremely valuable information regarding disparities at the local level. Thus, this paper explores the impact of fiscal decentralization on some important macroeconomic parameters at the subnational level. The article uses a panel econometric model to analyze the impact of fiscal decentralization on variables such as employment, nominal salary and gross added value at the county level in Romania in the period 1999–2023. We used the method of ordinary least squares and the techniques of extrapolation, interpolation, and Granger causality. The findings reveal that fiscal decentralization can improve certain parameters, but at the same time it must comply with certain conditions for a substantial effect at the local level. Beyond the need for a certain level of responsibility and local institutional autonomy, for a relevant impact, the decentralization process also requires a better correlation between the decentralization of local expenditures and revenues and an effective prioritization of objectives.

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The paper is a partial capitalization (only a subchapter) of the one entitled Descentralizarea fiscală între deziderat și provocare – o analiză asupra echilibrelor bugetare locale la nivelul României [Fiscal decentralization between aspiration and challenge – an analysis of local budget balances in Romania] by Alina Georgeta Ailincă, project that will be completed within the "Victor Slăvescu" Center for Financial and Monetary Research, "Costin C. Kiriţescu" NIER, Romanian Academy.

DOI: 10.59277/ecs.2024.29.3

1. Introduction

The analysis of macroeconomic indicators can prove to be a valuable source of information regarding the future economic trajectory and what needs to be done at the national level, but alongside this, an analysis at the regional level, at the county level, can show the real temporary irregularity in achieving the economic and social objectives. In addition to the analysis of the budget elements at the county level, more precisely the dissection of the income and expenditure elements, either viewed comparatively between counties, or viewed at the level of each county in their dynamics over time, an important analysis should focus on the impact of these elements on other macroeconomic variables.

Thus, this article explores the impact of fiscal decentralization on some important macroeconomic parameters at the subnational level. The article uses a panel econometric model to analyze the impact of fiscal decentralization on variables such as employment, nominal salary and gross added value at the county level in Romania in the period 1999–2023. Data sources are extremely varied such as Eurostat, the National Institute of Statistics (NIS), AMECO, regional data of the Ministry of Finance, etc. as well as numerous international studies and analyses. Although fiscal decentralization can contribute to an increase in local responsibility and autonomy, it is equally the consequence of the processes of improving local responsibility, the consequence of the improvement of macroeconomic parameters analyzed at the local level. Thus, it is obvious that there must be a substantial correlation between the decentralization of revenues and expenditures for an efficiency of results, but equally, fiscal decentralization must not be seen as an objective in itself, but only as an effective means of improving fiscal-budgetary performance at the local level. Therefore, the correct establishment of objectives and the prioritization of those that have a high traction power in solving regional social asymmetries must be put in front of any decentralization objective achieved only for the sake of increasing local fiscal-budgetary power.

2. Literature Review

Although fiscal decentralization speaks of an empowerment of local government regarding the power to make spending, taxing and financing decisions at the subnational level (Ebel & Yilmaz, 2003), nevertheless there are many variants of the definition of decentralization, for each often meaning everything and completely different, sometimes overlapping and sometimes substantially different from what local autonomy means (Martinez-Vazquez et al., 2015). Despite the differences, the advantages and disadvantages of fiscal decentralization are often studied, focusing on

case studies and especially on what has worked well, at the level of good practices that can be taken over to other countries or regions of the world, having numerous measurement methods, variables involved and estimated effects (Rodden, 2004; Enikolopov & Zhuravskaya, 2007; Rondinelli, 1990; Neyapti, 2010; Fedelino & Ter-Minassian, 2010; Voigt & Blume, 2012; Ponce-Rodríguez et al., 2012; Filippetti & Sacchi, 2013; Gemmell et al., 2013; OECD, 2021). Fiscal decentralization can improve the performance of public sectors (Oates, 1999), being an increasingly used way in recent decades considered to improve public policies and trust in them (Garman et al., 2001; Hooghe et al., 2010; Martinez-Vazquez et al., 2015).

Analyzing fiscal decentralization and government finance at the sub-national level in low- and middle-income countries, Bahl and Bird (2018) point out that although international good practices matter for implementing good fiscal decentralization, personal experience, specific case study of each country, particularizing to the realities on the ground is the most important for an optimal result, as there are no universally valid solutions.

Regarding the effects in the economy, Hanif et al. (2020) analyzes how fiscal decentralization affected the economic growth of 15 developing federations from 2000 to 2015 based on the Generalized Method of Moments (GMM), concluding that fiscal decentralization, of both revenue and expenditure, has a significant, positive impact on economic growth.

Studying the effects of fiscal decentralization in the fields of health and education, through an instrumental analysis of the Tobit variable in various countries, Nakatani et al. (2022) conclude that there are negative effects of fiscal decentralization on health outcomes, but that decentralization of education spending by subnational governments improves educational outcomes. Regarding democracy, analyzing the relationship between fiscal decentralization and government spending, Obeng (2021) notes that the negative effect of fiscal decentralization diminishes as the level of (participatory) democracy increases.

Analyzing the problem of poverty, Wang and Deng (2023), using the neural network method based on administrative units in China, find that the increase in financial autonomy at the county level in China significantly increases the level of regional natural poverty, and the positive impact of fiscal decentralization at the county level on the index natural poverty is different in regions with different mechanisms of natural poverty formation, however, optimized fiscal decentralization is favourable to alleviating natural poverty.

Regarding regional studies, there are numerous case studies on countries or regions in Europe, South America, Africa and Asia, but few studies focus strictly on

Romania (Profiroiu & Profiroiu, 2006; Manta, 2007; Onofrei et al., 2022, etc.). In this context, this article can prove its usefulness in supplementing with useful information on the effects of fiscal decentralization of revenues and expenditures for Romania's counties.

3. Methodology

We used the method of ordinary least squares (estimating the relationship between a dependent variable and one or more independent variables by minimizing the sum of the squared differences (errors) between the observed values and the predicted values) and the techniques of extrapolation (estimating or predicting values beyond the range of known data points by assuming that the underlying trend or pattern continues), interpolation (estimating values within the range of known data points by leveraging the continuity of the trend between these points), and Granger causality (determining whether one time series can predict another).

The analysis refers to the relationship between a series of macroeconomic indicators such as employment, nominal gross salary, gross added value and the fiscal decentralization of income and expenditure respectively. The study period is 1999–2023, and the method is ordinary least squares estimation. Where the data stops in the previous period for example 2021, or most frequently 2022, they are extended by various methods of extrapolation and forecasting, and where they are missing in the series, interpolation methods are used. Therefore, the results should be viewed with caution. At the same time, using the panel technique, one must take into account the rather large heterogeneity of information. For this reason, as well as the need to supplement the data, the results should be viewed with some caution. However, given that the data refer only to Romania, despite a local heterogeneity, they present at least national level systematization. The final number of observations obtained is 1050, informational volume can be considered relevant, but further studies can take into account the expansion of the data series (for example from 1990). At the same time, future analyzes can also focus on informational details at the level of municipalities or cities, or make a distinction between urban and rural areas, etc.

4. Results and Discussion

First of all, in order to identify the link between the evolution of the independent indicators and the dependent variable, a series of specific indicators of Eurostat, the Ministry of Finance and the National Institute of Statistics (NIS) of Romania presented in the table below (Table 1) will be selected. Later, some aspects of the statistical description will be presented.

Table 1. Presentation of variables and data sources

Acronym for Indicators	Description of Indicators	Unit of Measure	Source
ESC	Share of employment at the county level in employment at the national level	%	Eurostat
SNANSC	The share of nominal average net wage earnings on activities at the county level in the average net wage earnings at the national level	%	National Institute of Statistics of Romania, TEMPO online
SGVAC	Share of gross value added (GVA) per county in total gross value added at national level	%	Eurostat
IFDC	The share of county income in total income at the national level or the fiscal decentralization of revenues at the county level	%	Ministry of Development, Public Works, and Administration of Romania (2024)
EFDC	Share of county expenditures in total expenditures at national level or fiscal decentralization of expenditures at county level	%	Ministry of Development, Public Works and Administration of Romania (2024)
GDPSC	Share of GDP per county in total national GDP	%	Eurostat
SPOPC	Share of population by county in total population	%	Eurostat

Source: Author's systematization and processing by calculating as a percentage, based on the value at national level

Primary data: Eurostat initial indicators, NIS (TEMPO), Ministry of Finance, AMECO

Thus, in order to analyze the interrelationship between the independent indicators and the dependent variable – in turn, being chosen: employment, nominal net salary and gross added value at the county level, we first study the statistical properties of the variables, such as the mean value, standard deviation, skewness and kurtosis (Table 2).

The standard deviation, with some exceptions (notably for the SNANSC variable), appears in most cases to be close to the mean, suggesting clustering around the mean. The closeness between the average value and the median value, for almost

all the studied variables, leads to the conclusion of a relatively symmetrical distribution.

The information regarding the asymmetry of the distribution of the probability of a random variable in the vicinity of the mean (skewness) shows us through the positive and substantial values that the tail of the distribution is on the right, being substantially distorted. For all variables studied, the kurtosis is substantially above 3, indicating that the distribution is leptokurtic, producing more values than a normal distribution. The result of the Jarque-Bera test, which can further confirm whether the distribution is normal or not, will not be commented as the series is still small for this test (below 2000 observations) and for small samples the test is not reliable enough. Based on the above information, an augmented Dickey-Fuller unit root test (ADF) can be constructed.

Table 2. Statistical description of the chosen variables

	ESC	SNANSC	SGVAC	IFDC	EFDC	GDPSC	SPOPC
Mean	2.381357	90.299010	2.379012	0.412594	0.355348	2.378203	2.428516
Median	1.955051	87.371670	1.651964	0.372122	0.320925	1.649613	2.153561
Maximum	12.699800	146.848000	25.104360	4.669360	3.576745	25.104360	9.591640
Minimum	0.810776	71.134700	0.620940	0.000198	0.000173	0.518165	0.987972
Std. Dev.	1.644525	12.706310	3.354616	0.491167	0.422963	3.368969	1.300006
Skewness	3.666811	1.647857	5.463723	4.715678	4.654195	5.463620	3.252785
Kurtosis	20.760980	6.511110	34.158430	32.699180	31.529740	34.108560	17.687230
Jarque-Bera	16154.000	1014.546	47698.720	42480.890	39400.910	47562.670	11289.120
Probability	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sum	2500.425	94813.960	2497.963	433.224	373.115	2497.113	2549.942
Sum Sq. Dev.	2836.980	169361.300	11804.870	253.066	187.664	11906.100	1772.826
Observations	1050	1050	1050	1050	1050	1050	1050

Source: Author's processing and calculation, using EViews 9

Next, we present the results of the augmented Dickey-Fuller unit root test, the results of the correlation matrix, the regression equations showing the link between the proposed variables, as well as the results of the Granger causality, where we only considered links with a probability below 5%.

Table 3 demonstrates that all the variables used in this investigation are stable at order 0, without the need to proceed to the first difference. However, in building the regression model, we will also take into account the information regarding the first difference, as well as the quadratic form of some variables (see the population at the county level) to also investigate possible non-linearities (Sow and Razafimahefa (2015) applied the quadratic form to the fiscal decentralization variable).

Table 3. The results of augmented Dickey-Fuller unit root tests for the selected variables

Variables ADF	T-statistic	Mackinnon Critical Value at 5 %	P-value	Integration Order	Observations
ESC	-4.973499	-3.414103	0.0002	I(0)	Stationary
SNANSC	-5.623905	-3.414103	0.0000	I(0)	Stationary
SGVAC	-4.850861	-3.414103	0.0004	I(0)	Stationary
IFDC	-4.176499	-3.414182	0.0050	I(0)	Stationary
EFDC	-4.254084	-3.414182	0.0038	I(0)	Stationary
GDPSC	-5.062053	-3.414103	0.0002	I(0)	Stationary
SPOPC	-5.028069	-3.414103	0.0002	I(0)	Stationary

Source: Author's processing and calculation using EViews 9

Table 4 shows the correlation matrix between the independent variables and the dependent variable (even if it is successively viewed as occupation (ESC), average gross nominal wage (SNANSC) and gross value added (SGVAC)).

Table 4. Correlation matrix of the chosen variables

	ESC	SNANSC	SGVAC	IFDC	EFDC	GDPSC	SPOPC
ESC	1						
SNANSC	0.641	1					
SGVAC	0.919	0.709	1				
IFDC	0.749	0.472	0.778	1			
EFDC	0.749	0.470	0.779	0.994	1		
GDPSC	0.918	0.708	1.000	0.775	0.776	1	
SPOPC	0.938	0.637	0.893	0.712	0.713	0.893	1

Source: Author's processing and calculation using EViews 9

The results are interesting and worth commenting on. Thus, we observe that although the correlation values are highly significant, suggesting that the problem could also be autocorrelation between the data, the values for fiscal decentralization of revenues and expenditures in relation to the three dependent variables (ESC, SNANSC, SGVAC) are still within some reasonable range (up to 0.800). Considering that all the data are constructed as percentage values, as weights at the county level from the national level, some homogeneity of the data and a higher degree of information correlations are expected. We thus observe, based on the correlation matrix, that SGVAC, followed by ESC and less by SNANSC, is best explained by the process of fiscal decentralization of revenues and expenditures, respectively, at the county level.

Based on the correlation matrix, the regression equations verified in this subsection are as follows:

$$ESC = f(IFDC, GDPSC, SPOPC) \quad (1)$$
$$SNANSC = f(IFDC, GDPSC, D(SPOPC)^2) \quad (2)$$
$$SGVAC = f(IFDC, GDPSC, D(SPOPC)) \quad (3)$$
$$ESC = f(EFDC, GDPSC, SPOPC) \quad (4)$$
$$SNANSC = f(EFDC, GDPSC, D(SPOPC)^2) \quad (5)$$
$$SGVAC = f(EFDC, GDPSC, D(SPOPC)) \quad (6)$$

The equations are represented by the form:

$$Y=\alpha+\beta1x1+\beta2x2+\beta3x3+\varepsilon$$

where:

Y = the dependent variable, chosen successively: ESC – Share of employment at the county level in employment at the national level (%); SNANSC – Share of average net nominal wage earnings on activities at county level in average net wage earnings at national level (%); SGVAC – Share of the gross added value (GVA) of the counties in the total gross added value at national level (%);

A = Constant; β1-3 = slope of variables x1–x3 – coefficients; x1–x6 = regression coefficients or independent variables, more precisely: IFDC – Share of county revenues in total revenues at the national level or fiscal decentralization of revenues at the county level; EFDC – Share of county expenditures in total expenditures at national level or fiscal decentralization of expenditures at county level; GDPSC – Share of GDP per county in total national GDP in % SPOPC – Share of population per county in the total population; ε = error term. To explain the variable SNANSC, the independent variable SPOPC is preferred in the first difference quadratic form.

Thus, we observe (Table 5) that for the first and third desired indicators to be explained (ESC and SGVAC) the R-squared and adjusted R-squared are extremely high, the Probability (F-statistic) is also adequate. And for the second equation R-squared and adjusted R-squared the values 0.51926 and 0.51788 can also be considered relevant.

However, the coefficient of fiscal decentralization is relatively satisfactory in the case of the first equation (the one that explains employment behavior) and substantial and negative in the case of the second equation (which explains the behavior of wages – SNANSC), meaning that fiscal decentralization does not

necessarily support parameter of the average gross nominal salary at the county level, but rather reduces it substantially.

Table 5. Results of the regression equations that have income decentralization among the independent variables

Method: Least squares and included 1050 observations				**Coefficient**	**t-Statistic**	**Probability**
Dependent variable	ESC	Independent variable	C	0.107335	2.375335	0.0177
R-squared	0.913316		IFDC	0.219177	4.535737	0.0000
Adjusted R-squared	0.913067		GDPSC	0.171256	15.60427	0.0000
F-statistic	3673.61		SPOPC	0.731438	28.55805	0.0000
Prob(F-statistic)	0.0000		Durbin-Watson stat		0.579806	
Method: Least squares and included 1050 observations				**Coefficient**	**t-Statistic**	**Probability**
Dependent variable	SNANSC	Independent variable	C	84.65832	237.239	0.0000
R-squared	0.51926		IFDC	-5.37999	-6.02282	0.0000
Adjusted R-squared	0.51788		GDPSC	3.333199	24.86182	0.0000
F-statistic	376.2448		D(SPOPC)^2	-0.43836	-2.551	0.0109
Prob(F-statistic)	0.0000		Durbin-Watson stat		0.148953	
Method: Least squares and included 1050 observations				**Coefficient**	**t-Statistic**	**Probability**
Dependent variable	SGVAC	Independent variable	IFDC	0.049356	7.818971	0.0000
R-squared	0.999593		GDPSC	0.990377	1009.246	0.0000
Adjusted R-squared	0.999593		D(SPOPC)	-0.09905	-18.7879	0.0000
Akaike info criterion	-2.54334					
Schwarz criterion	-2.529163		Durbin-Watson stat		2.003556	

Source: Author's processing and calculation using EViews 9

The results are relatively similar in the case of expenditure. The probability for the total equations chosen is adequate, being below 0.05. Thus, these variables can be confidently accepted in the models. Control variables such as GDP and population

are considered in the relevant literature to be highly relevant and explanatory for the dependent variables pursued. It is possible that, along with population, decentralization can act as a factor to move wages away from national targets, sometimes leading to the local postponement of the reduction of wage asymmetries. However, the results must be analyzed with caution, in the sense of looking for all the explanations necessary to understand the deep and real links between the dependent and independent variables investigated.

Therefore, following the links revealed by the Granger causality, we can see that really only the decentralization of expenditures can explain the decentralization of revenues, and in general the dependent variables, ESC, SNANSC and SGVAC, explain the process of fiscal decentralization at the local level rather than being explained by this process of decentralization of incomes and expenditures, respectively.

Table 6. The results of regression equations that include expenditure decentralization among the independent variables

Method: Least squares and included 1050 observations				**Coefficient**	**t-Statistic**	**Probability**
Dependent variable	ESC	Independent variable	C	0.10755	2.378948	0.018
R-squared	0.913245		EFDC	0.2498	4.438828	0.000
Adjusted R-squared	0.912997		GDPSC	0.171577	15.60757	0.000
F-statistic	3670.33		SPOPC	0.731721	28.55941	0.000
Prob(F-statistic)	0.0000		Durbin-Watson stat		0.582583	
Method: Least squares and included 1050 observations				**Coefficient**	**t-Statistic**	**Probability**
Dependent variable	SNANSC	Independent variable	C	84.69004	237.6891	0.0000
R-squared	0.520705		EFDC	-6.547828	-6.287577	0.0000
Adjusted R-squared	0.519329		GDPSC	3.366525	24.99549	0.0000
F-statistic	378.4288		D(SPOPC)^2	-0.46277	-2.689301	0.0073
Prob(F-statistic)	0.0000		Durbin-Watson stat		0.150573	
Method: Least squares and included 1050 observations				**Coefficient**	**t-Statistic**	**Probability**
Dependent variable	SGVAC	Independent variable	EFDC	0.058679	7.996377	0.0000
R-squared	0.999594		GDPSC	0.990214	1007.851	0.0000
Adjusted R-squared	0.999594		D(SPOPC)	-0.09915	-18.8346	0.0000
Akaike info	-2.54587					

criterion					
Schwarz criterion	-2.531694		Durbin-Watson stat	2.005515	

Source: Author's processing and calculation using EViews 9

Table 7. Granger causality test resulting in the 5% probability limit

Pairwise Granger Causality Tests
Date: 08/13/24 Time: 13:42
Sample: 1 1050
Lags: 2
Obs:1048

Null Hypothesis	F-Statistic	Probability
ESC does not Granger Cause SNANSC	3.07874	0.0464
ESC does not Granger Cause IFDC	23.4128	0.0000
ESC does not Granger Cause EFDC	23.0329	0.0000
SPOPC does not Granger Cause ESC	347.354	0.0000
SGVAC does not Granger Cause SNANSC	6.81914	0.0011
SNANSC does not Granger Cause IFDC	13.3009	0.0000
SNANSC does not Granger Cause EFDC	12.9061	0.0000
GDPSC does not Granger Cause SNANSC	6.62754	0.0014
SPOPC does not Granger Cause SNANSC	66.1975	0.0000
SGVAC does not Granger Cause IFDC	31.6604	0.0000
SGVAC does not Granger Cause EFDC	30.6518	0.0000
GDPSC does not Granger Cause SGVAC	11.3021	0.0000
SGVAC does not Granger Cause GDPSC	6.35221	0.0018
SPOPC does not Granger Cause SGVAC	257.938	0.0000
EFDC does not Granger Cause IFDC	12.1567	0.0000
GDPSC does not Granger Cause IFDC	30.78	0.0000
SPOPC does not Granger Cause IFDC	45.4841	0.0000
GDPSC does not Granger Cause EFDC	29.9033	0.0000
SPOPC does not Granger Cause EFDC	43.8225	0.0000
SPOPC does not Granger Cause GDPSC	215.776	0.0000

Source: Author's processing and calculation using EViews 9

5. Conclusion

As can be seen, although the specialized literature abounds in studies on fiscal decentralization, or more specifically on the decentralization of revenues or the decentralization of expenditures, or on local autonomy, on the impact of decentralization, or on increasing the efficiency of the decentralization process, few studies focus strictly on Romania.

Thus, the article aimed to evaluate the impact of the fiscal decentralization of revenues and expenditures on other variables such as: employment at the county level

(expressed as a share of employment at the national level), net average nominal wage earnings at the county level (also expressed as a share at the national level) and the gross added value (GVA) per county (also expressed as a share at the national level). The period of analysis is 1999–2023, the data being panel systematized, and the data sources are NIS of Romania, AMECO, Eurostat, with additions of information including from the World Bank. The results, although encouraging, must be viewed with caution in the sense that where data were missing, an interpolation process was carried out, and where they needed to be expanded, an extrapolation process was carried out. Therefore, the results reflect more of an influence of fiscal decentralization (revenue and expenditure respectively) on gross value added and employment and less on nominal net average wage earnings. In fact, fiscal decentralization (both in terms of revenues and expenditures, more substantially in the case of expenditures) presents negative coefficients in relation to nominal net wage earnings (expressed as county-level shares of average nominal net wage earnings), a fact that indicates that for the increase of these nominal net wage gains fiscal decentralization is not an encouraging factor, on the contrary. It is likely that certain investment programs, with incentives to homogenize earnings, to flatten wage differences at the national level, would be rather desirable for a corresponding boost regarding the net average wage at the regional county level. In the interpretation of the results, successive legislative changes must also be taken into account, which rather shifted the tax burden to low wages, and the transfer of social contributions to the responsibility of the employee starting in 2018 put pressure on average nominal wages and allowed a substantial gap between gross wages and the net ones. That is why the analysis on gross average wages would probably have been much better positively correlated with fiscal decentralization, both in terms of revenues and expenditures.

In addition, if we look at the results of Granger causality we notice that rather the dependent variables influence the independent variables, including the decentralization of revenues and expenditures, so that the fiscal decentralization of revenues and expenditures must be viewed in this limiting context as an impact. At the same time, we notice that there is a link between the decentralization of revenues and that of expenditures, the decentralization of expenditures influencing the decentralization of revenues at the county level in Romania. Therefore, fiscal decentralization is not an eminently positive or negative process; it has advantages and disadvantages, being a tool at the service of central and local authorities to support the local economy, as well as the national one.

Regarding the limits of the study, it focuses strictly on Romania, it has a relatively limited time series, which could be extended in the future based on the availability of data, the dependent variables can be chosen with a greater granularity and a better connection with fiscal decentralization depending on the availability of data, and the model could be extended to other countries and regions of the world. These aspects, but also many others, will be taken into account in future studies.

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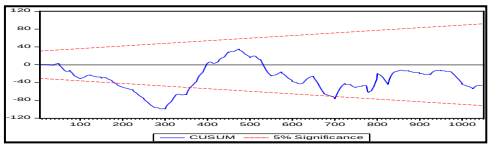
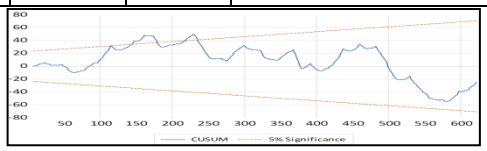
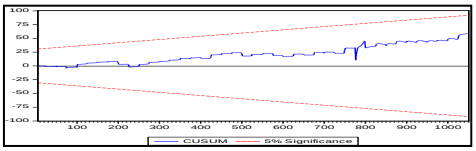
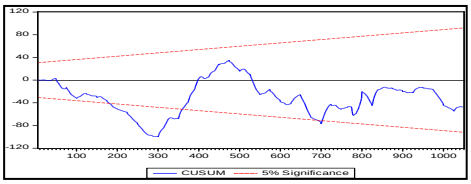
Table 8. Additional tests and robustness checks for fiscal decentralization of incomes at county level

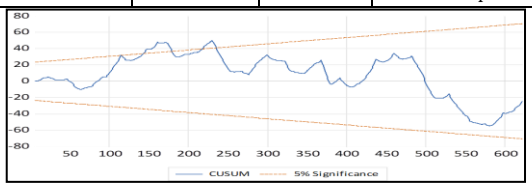
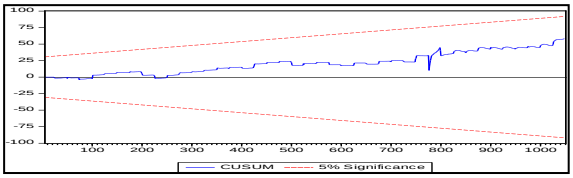
Dependent variable	ESC			
Fact-finding checks	F - Statistics			P-value
Ramsey RESET - Stability test	88.7527			0.0000
Heteroskedasticity Test: Breusch-Pagan-Godfrey	60.6335			0.0000
LM test	684.7078			0.0000
Multicollinearity test for initial equation	Coefficient variance	Centered VIF	Result analysis	Observations
IFDC	0.002335	2.513414	VIF<10	No interconnectivity of independent variables
GDPSC	0.00012	6.099758	VIF<10	No interconnectivity of independent variables
SPOPC	0.000656	4.946532	VIF<10	No interconnectivity of independent variables
CUSUM test				
Dependent variable	SNANSC			
Fact-finding checks	F - Statistics			P-value
Ramsey RESET - Stability test	329,3792			0.0000
Heteroskedasticity Test: Breusch-Pagan-Godfrey	13,51357			0.0000
LM test	3212,414			0.0000
Multicollinearity test for initial equation	Coefficient variance	Centered VIF	Result analysis	Observations
IFDC	0.797926	2.590438	VIF<10	No interconnectivity of independent variables
GDPSC	0.017974	2.747206	VIF<10	No interconnectivity of independent variables
D(SPOPC)^2	0.029529	1.105124	VIF<10	No interconnectivity of independent variables
CUSUM test				
Dependent variable	SGVAC			
Fact-finding checks	F - Statistics			P-value
Ramsey RESET - Stability test	6.55198			0.0106
Heteroskedasticity Test: Breusch-Pagan-Godfrey	142.6129			0.0000
LM test	0.970567			0.03792
Multicollinearity test for initial equation	Coefficient	Centered	Result	Observations

	variance	VIF	analysis	
IFDC	3,98E-05	3,749253	VIF<10	No interconnectivity of independent variables
GDPSC	9,63E-07	3,74317	VIF<10	No interconnectivity of independent variables
D(SPOPC)	2,78E-05	1,004078	VIF<10	No interconnectivity of independent variables
CUSUM test				

Source: Author's processing and calculation using EViews 9

Table 9. Additional tests and robustness checks for fiscal decentralization of expenditures at county level

Dependent variable	ESC			
Fact-finding checks	F - Statistics			P-value
Ramsey RESET - Stability test	90.21391			0.0000
Heteroskedasticity Test: Breusch-Pagan-Godfrey	62.96506			0.0000
LM test	681.8178			0.0000
Multicollinearity test for initial equation	Coefficient variance	Centered VIF	Result analysis	Observations
EFDC	0.003167	2.525868	VIF<10	No interconnectivity of independent variables
GDPSC	0.000121	6.11503	VIF<10	No interconnectivity of independent variables
SPOPC	0.000656	4.945859	VIF<10	No interconnectivity of independent variables
CUSUM test				
Dependent variable	SNANSC			
Fact-finding checks	F - Statistics			P-value
Ramsey RESET - Stability test	333.932			0.0000
Heteroskedasticity Test: Breusch-Pagan-Godfrey	15.46016			
LM test	3185.296			0.0000
Multicollinearity test for initial equation	Coefficient variance	Centered VIF	Result analysis	Observations
EFDC	1,084496	2,618738	VIF<10	No interconnectivity of independent variables
GDPSC	0,01814	2,78088	VIF<10	No interconnectivity of independent variables
D(SPOPC)^2	0,029611	1,111527	VIF<10	No interconnectivity of

				independent variables
CUSUM test				
Dependent variable	SGVAC			
Fact-finding checks	F - Statistics			P-value
Ramsey RESET - Stability test	6.490679			0.0398
Heteroskedasticity Test: Breusch-Pagan-Godfrey	145.3723			0.0000
LM test	0.923193			0.0110
Multicollinearity test for initial equation	Coefficient variance	Centered VIF	Result analysis	Observations
EFDC	5.38E-05	3.767319	VIF<10	No interconnectivity of independent variables
GDPSC	9.65E-07	3.761807	VIF<10	No interconnectivity of independent variables
D(SPOPC)	2.77E-05	1.00363	VIF<10	No interconnectivity of independent variables
CUSUM test				

Source: Author's processing and calculation using EViews 9

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