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DIRECT AND INDIRECT EFFECTS OF FISCAL DECENTRALIZATION ON ECONOMIC GROWTH

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Abstract

This paper examines the direct and indirect effects of decentralization on economic growth that take place through transmission channels such as government efficiency, control of corruption, public sector size and the quality of living. A dynamic nature of growth, potential endogeneity and the distinction between short and long run effects are taken into account. Our findings support proactive government approach, including fiscal policy measures to stimulate demand, prevent decline of production and employment and rebuild trust in institutions. They question the current prevalent thinking about the beneficial effects of the reduction of public expenditure on economic growth.

Keywords: fiscal decentralization, economic growth, direct and indirect effects, dynamic analysis; European countries

JEL: H7, O4

1. INTRODUCTION

Past decades have witnessed the transfer of accountability and responsibility for the provision and financing of public goods and services from central to lower government levels. The motives for fiscal decentralization range from the creation of an efficient entrepreneurial-like system for the provision of public services in developed countries over the urge to resist political pressures on public expenditure in the developing world to the transition from

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centrally planned to market economy in Central and Eastern Europe. It is now widely held that closer contact of local units with a population paves the way for better understanding of public needs, costs of public service provision and more efficient resource allocation. Furthermore, fiscal decentralization enhances participation of citizens in local administration and planning of future development. Together, these factors lead to higher accountability of local public servants, lower corruption and higher living standards and growth.

The aforementioned benefits of decentralization have spurred academic interest in this topic. There is now substantial evidence on the direct impact of former on the economic growth. However, the process of decentralization and its relationship with economic growth is far too complex to be encompassed with direct effects of former on the latter. This is mainly due to the fact that decentralization manifests itself through a number of dimensions and influences processes recognized as determinants of growth such as institutional quality, government size or the quality of human capital. Neither indirect transmission channels of decentralization on economic growth nor its multidimensional nature have received substantial attention in the existing literature. Furthermore, existing work on decentralization does not take into consideration factors such as the dynamic nature of growth, reverse causality between growth and decentralization or the potential endogeneity of the latter.

Bearing the above said in mind, this paper investigates effects of fiscal decentralization on economic growth in 24 developed and developing economies over 2005-2012 period. In modelling, both direct and indirect effects of fiscal decentralization on economic growth are included. The potential endogeneity of decentralization and correlation of growth with its past realizations is taken into account. The analysis distinguishes between short and long run effects of decentralization on growth introducing the dynamic panel methodology to the research on the relationship between fiscal decentralization and growth. Modelling of decentralization acknowledges multidimensional nature of this process unlike prevalent approach in the literature that focuses solely on individual dimensions of decentralization. The paper is structured as follows. Section two puts forward the theoretical framework of the relationship between fiscal decentralization, economic growth and development and an overview of empirical literature. Third section presents model of investigation. Dataset and methodology are explained in section four. Empirical results are dealt with in section five. Finally, section six concludes.

2. FISCAL DECENTRALIZATION, ECONOMIC GROWTH AND DEVELOPMENT

Over past decades economic theory has yielded arguments both in favour and against fiscal decentralization. For proponents, the greater palette of local public services and tax packages together with better insight over local economic, social and fiscal conditions can better meet heterogeneous preferences and needs of citizens and business entities (Tiebout, 1956; Brennan and Buchanan, 1980; Faguet, 2004; Barankay and Lockwood, 2007). Arguments against decentralization are centred around uneven quality in provision of public services and widening of regional development gaps due to lower skills of local administrative employees and the inability to exploit economies of scale in tax collection and in provision of public services. According to the decentralization theorem (Oates, 1972), through decentralization the economy can achieve a competitive market-like outcome in a provision of public goods and services, improve allocative efficiency of public sector and increased growth and welfare.

According to leviathan hypothesis (Brennan and Buchanan, 1980), fiscal decentralization constrains efforts of central government to extract resources of its citizens. The mobility of population and business entities penalizes inefficient governance and can lead to fiscal competition between local governments which constrains excessive taxation and public sector size while increasing efficiency in provision of public goods and services (Thiessen, 2003). Evidence from vast amount of literature appears to support theoretical predictions about negative relationship between fiscal decentralization and the size of public sector (Grossman, 1989, Joulfaian and Marlow, 1990 and 1991, Jin and Zou 2002, Rodden, 2003, Prohl and Schneider, 2009). It appears that the motivation of local units to increase own revenues in combination with budget constraints act as an incentive for efficient allocation of funds and greater efforts in their collection.

Positive effects of decentralization lead to increased efficiency of the entire public sector and promote cooperation between different fiscal levels. Through decentralization the burden of central government activities is being passed on lower administrative levels. At the same time, local units are given the opportunity to implement innovations and experiment with new developmental and fiscal policies and programs which, if proven successful, can be applied at the central level. Local initiative can lead to more innovative and efficient approach to provision of public services and more efficient use of public assets. However, the realization of the above effects depends on flexibility, innovativeness and creativity in governance.

The satisfaction of final beneficiaries of public goods is revealed through elections. This acts as an incentive for increased transparency and accountability, as well as investment of efforts in the knowledge about public preferences (Hunther and Shah, 1998; Fisman and Gatti, 2002; Arikian 2004; Lederman et al. 2005; Freille et al., 2007; Lessmann and Markwardt, 2010; Fiorino et al., 2012). It could be concluded that fiscal decentralization has a beneficial effect on political participation of citizens at the local level. Furthermore, greater participation of citizens in decision making about local development questions implies increased transparency and accountability of public governments and thus better corruption control. These effects are particularly emphasized in countries characterized by greater geographical surface, regional economic heterogeneity and ethnical, racial, cultural and linguistic diversity.

Negative sides of delegation of responsibilities over local development to lower levels have been identified in the literature as well. The failure to accompany the transfer of responsibility for provision of certain public services with adequate transfer of funds can erode the quality of provided services such as education or primary health care which has negative implications on productivity and long run growth. Those negative effects can be offset through predefinition of minimal standards in the provision of public services, adequate transfer of funds to local units as well as ex post control over quality and level of the provision of public services. Another common feature of decentralization is increased employment in public administration. In smaller local units employees often lack adequate education and attainment for exploitation of advantages of a decentralized system. Large costs of local tax collection can also reduce revenues of local units. Potential for corruption can exist due to lack of responsibility and influence of local elites (Prud'homme, 1995; Thiessen, 2003; Bardhan and Mookherjee, 2000 and 2005).

Another argument against fiscal decentralization suggests that it inhibits economic growth through vertical imbalances, regional inequalities and difficulties in coordination of macroeconomic policy (Tanzi, 1996). The distributional inequalities can arise from the gap between available revenues and the required costs of local units. Prud'homme (1995) suggests that increased fiscal competition between local units due to decentralization increases attractiveness of wealthier local units characterized by better quality of human capital, access to markets and more developed infrastructure for mobile factors of production. The ability of these units to provide better public goods and services arises from a wider tax basis. Moreover, these units have the ability to provide public services of comparable quality to

those provided by poorer units but with a lower tax burden. The general message is that mobile households and business entities will prefer wealthier local units and thus increase their tax base and widen regional fiscal gap.

Main potential macroeconomic risks associated with decentralization encompass increased fiscal pressure and lower fiscal discipline. Numerous authors suggest that fiscal decentralization increases local public expenditure, deficit and public debt, thus reducing the effectiveness of stabilization policies (Prud'homme, 1995; Tanzi, 1996; Fornasari et al., 2000; Dabla-Norris and Wade, 2002). The key to successful decentralization therefore lies in the development of multilevel public finance system that enables effective and efficient provision of public services while maintaining macroeconomic stability. However, the imposition of budget limitations at the local and regional level is often constrained by politics.

Modelling approach to decentralization and growth prevalently takes place through direct relationship between the two (Iimi, 2005; Blochliger et al., 2013). Findings from this literature range from positive (Desai et al., 2003) over negative (Davoodi and Zou, 1998; Woller and Phillips, 1998; Martinez – Vazquez and McNab, 2006; Thornton, 2007; Rodriguez – Pose and Ezcura, 2010; Baskaran and Feld, 2012) to the hump – shaped relationship (Thiessen, 2003; Bodman and Ford, 2006). Reported findings reveal sensitivity to the variables reflecting the intergovernmental fiscal framework, the period of analysis, geographical area under consideration and the choice of an empirical approach. Gemmell et al. (2013) note that revenue and expenditure dimensions of decentralization have opposing effects on economic growth and that the overall effects of decentralization are visible in the long run. Moreover, it is suggested that the causality of the relationship between decentralisation and growth may however run in the reverse direction with development being the root rather than the consequence of decentralisation (Oates 1972; Tanzi, 1996).

Previously mentioned arguments for the introduction of decentralization such as improved efficiency of public sector, better quality of the provision of public services and a higher standard of living have to impact on the economic growth. From there it follows that the impact of decentralization on economic growth also takes place through indirect transmission channels. According to New Institutional Economics (North, 1994; Williamson, 1996; Edison, 2003; Rodrik, 2004) the way in which institutions are managed in order to create a stable, transparent and predictable business environment facilitates growth. Poor public administration paves the way for risk and uncertainty, weak protection of ownership rights all of which have adverse effect on the efficiency of the allocation of resources and on the economic growth (Sala-and–Martin, 2002). According to Acemoglu et al. (2003) poor

macroeconomic performance can be associated with weak institutions such as low protection of investors, widespread corruption and absence of control over political elites. Similar findings have been reported for transition countries, those with low levels of revenues and closed economies (Sachs and Warner, 1995).

The general finding from empirical literature is that corruption has adverse effect on economic growth through the reduction of domestic and foreign direct investment, obstacles for doing business and entrepreneurship, negative impact on international trade and price stability and suboptimal allocation of public expenditure (Brunetti et al., 1999; Li et al., 2000; Gyimah-Brempong, 2002; Mendez and Sepulveda, 2006; Campos et al., 2010; Ugur and Dasgupta, 2011). Additionally, it leads to an increase in prices of goods and services purchased by state and diversifies the structure of public expenditure towards areas where bribes are easier to collect. The work of some authors suggests, however, that corruption can have a beneficial impact on economic performance (Egger and Winner, 2005; Aidt, 2009) as corruptive practices enable faster resolution of problems in economies characterized by a complex bureaucracy and poor legislative framework.

Public governance and economic growth are in a mutually reinforcing relationship. Better quality of institution comes at financial costs and thus can only be afforded by wealthier countries (Svensson, 2005). Moreover, the desire of elites to maintain political power and earn support of voters reduces inclination towards corruption (Aidt and Dutta, 2008). Furthermore, corruption is often related with shorter life expectancy, lower levels of education and trade openness, all of which are determinants of economic growth, thus suggesting a potential endogeneity problem (Peyton and Belasen, 2010).

According to one line of thinking, large public expenditure can jeopardize economic growth through an increase in costs of financing and through the creation of differences in productivity growth between public and private sector (Davoodi and Zou, 1998). Most studies report negative relationship between the size of public sector and growth (Dar and AmirKhalkali, 2002; Romero – Avila and Strauch, 2008, Afonso and Furceri, 2010; Bergh and Karlsson, 2010) although the work of Agell et al. (2006) and Colombier (2009) suggests that the relationship between the two is positive. Impact of government (expenditure) size on economic growth is closely related to the quality of institutional framework, which leads to potential endogeneity of the former (Afonso and Furceri, 2010). Increased public expenditure can be associated with distortions in taxation and regulatory activities, less efficient provision of services and potential corruption. The nature of automatic stabilizers acts as an additional

source of endogeneity. The economic downturn increases this kind of expenditures, while adverse effects take place during expansion.

Endogenous growth models emphasize the importance of human capital for economic growth (Lucas, 1988; Romer, 1990; Barro, 1990). Education determines the productivity of labor, innovativeness and technological progress (Krueger and Lindahl, 2001; Hanushek and Wossmann, 2007). The quality of human capital indirectly influences economic growth through income redistribution. Higher education of population reduces poverty and unproductive government transfers. More educated population is often characterized by smaller families (a smaller number of children) and increased own willingness to invest in education of future generations, thus reducing various types of family expenditures. Furthermore, educated citizens have better opportunities of self – employment which helps to reduce unemployment transfers. Higher levels of human development are more easily achieved in economically developed countries. UNDP (2013) notes that countries with very high values of human development index (HDI) have been about 20 times higher GDP per capita than countries with low HDI.

Previously mentioned studies reveal several stylised facts about the relationship between fiscal decentralization and economic growth. It is evident that decentralization influences growth both directly and indirectly. Indirect impact was neglected in the analysed literature. Additionally, the analysis of its effects depends on the observed dimension of decentralization. While pieces of evidence on the expenditure side of decentralization are mostly negative, the opposite finding holds in the case of revenue decentralization. An important drawback of the existing body of knowledge is its reliance on static econometric techniques. In the work of the majority of authors, panel dimension of data is ignored, which leads to a loss of efficiency in estimation. Moreover, the existing studies largely neglect the possibility of reverse causality between decentralization and growth as well as potential endogeneity of the former, which questions the validity of the reported results. Finally, the existing studies do not take into consideration the dynamic nature of growth. Present study aims to fill some of these gaps.

3. MODEL OF INVESTIGATION

Building on theoretical and empirical foundations of the previous section, a model is developed that takes into account direct impact of fiscal decentralization on economic growth, as well as its indirect effects through the relationship with development goals. With respect to

the latter it is assumed that decentralization provides better insight into needs and preferences of inhabitants and business entities, motivates more efficient governance of public sector and leads to active role of local population. In a parallel development, the need for more transparent behaviour of local government and its accountability arises. Together, these processes manifest themselves in improved perception about efficiency of public governance and corruption control, reduced public expenditure and higher living standard. The final outcome of all these processes is higher economic growth (Figure 1). It is expected that realization of these processes does not happen instantaneously. Rather they develop over time for which reason the full effects of decentralization will be visible only in the long run.

The analytical development of the model presented in Figure (1) takes place through several regressions. The modeling of direct effects of decentralization in general form can be expressed as:

$$Growth_{it} = f(Growth_{it-1}, FD_{it}, CONTROL_{it}) \quad (1)$$

In the above equation, the dependent variable is defined as annual growth of GDP per capita taken from World Development Indicators database. Direct channels of decentralization in equation (1) (FD_{it}) encompass both revenue and expenditure dimensions. Two indicators of revenue decentralization include the share of revenues of the local unit in total revenues of state (FDREV) and the share of revenues of the local unit in GDP (REVGDP). On the expenditure side, decentralization is measured by the share of local units' expenditure in total government expenditure (FDEXP) and in GDP (EXPGDP). Finally, the model includes variable labelled vertical fiscal imbalance (VFI), the share of national government's transfers to local units in total government expenditure. The data for construction of these indicators is obtained from OECD's Fiscal Decentralization database. A positive sign is expected for all of these variables.

A starting point in the modelling of indirect decentralization effects on the economic growth is Barro and Sala-i-Martin (1992) analysis of over 90 countries in the 1965 – 1985 periods. According to their findings, economic growth is positively correlated with the investment intensity, level of education and life expectancy. For this reason, indirect effects in equation (2) include developmental variables (DV): NI-HDI, SIZEEXP, GE, CORUP. Non – income human development index (NI – HDI), is a version of previously defined HDI index without income component. The data for this variable were derived from United Nations Development Programme (UNDP) database. Furthermore, the above-mentioned study suggests that the size of the public sector is negatively correlated with GDP growth.

Using data from OECD Fiscal Decentralization database a variable SIZEEXP is defined as the ratio between the total government expenditure and GDP. Finally, the model also includes two variables that measure the quality of institutions, namely government efficiency (GE) and corruption control (CORUP). These variables were built on the basis of data from World Bank Worldwide Governance Indicators database.

Model for analysis of indirect effects of fiscal decentralization on economic growth takes the form of:

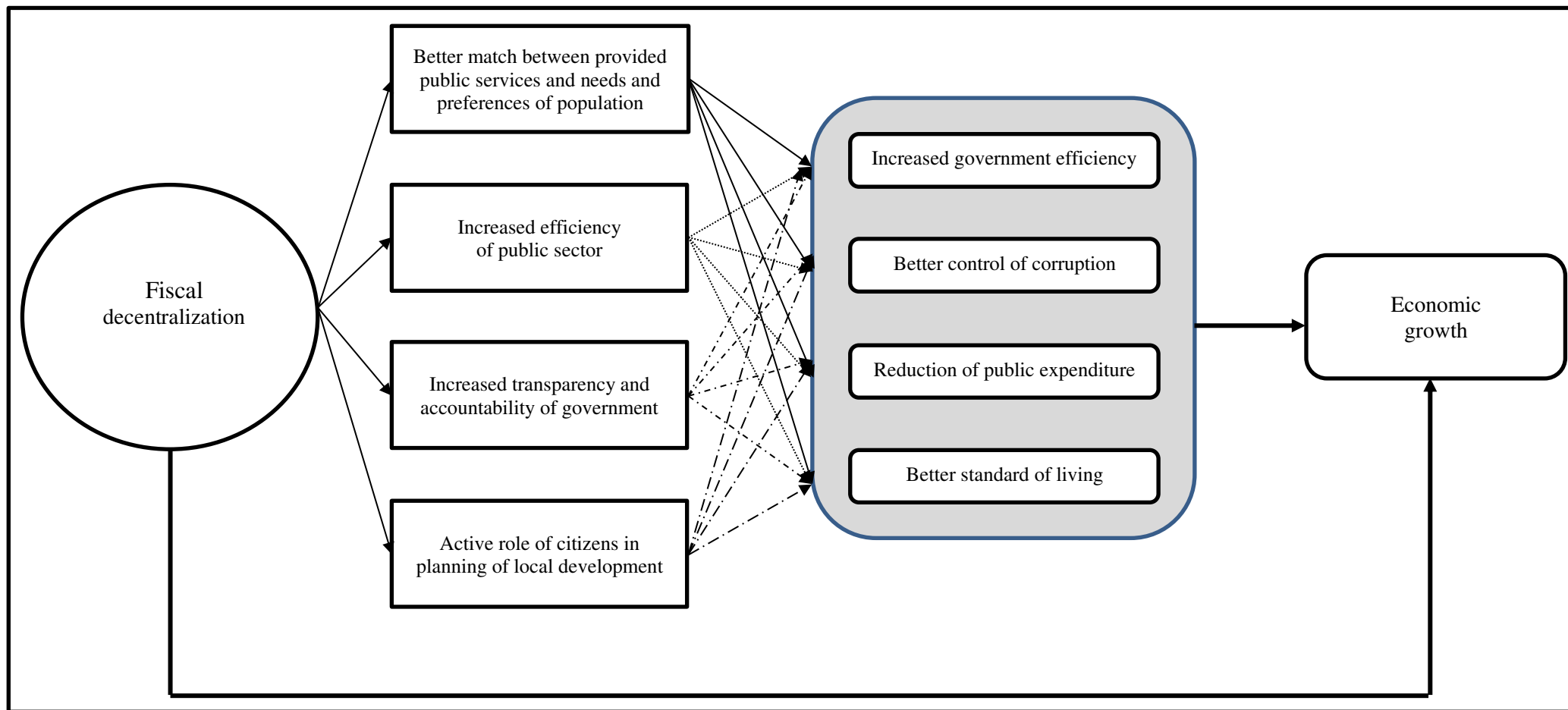
$$DV_{it} = f(DV_{it-1}, FD_{it}, CONTROL_{it}) \quad (2a)$$

$$Growth_{it} = f(Growth_{it-1}, DV_{it}, CONTROL_{it}) \quad (2b)$$

The dependent variables in equation (2a) are previously defined measures of national development objectives while fiscal decentralization is measured with previously defined indicators. From there, the residuals are obtained and inserted in equation (2b) that relates improvements in domestic development objectives with economic growth. This way, the indirect effects of decentralization are modelled through their impact on national development objectives. However, such modelling approach also suggests that any analysis of the relationship between decentralization and growth must take into account potential endogeneity of the former. These issues have largely been neglected by previous literature, but it will be dealt with within the present study.

The model also includes a number of control variables recognized as determinants of economic growth in the existing literature. Bearing in mind the sample size and data availability, index of technological development (TAI), share of investment in GDP (INVEST), unemployment rate (UNEM), trade openness (OPEN) and country area size (AREA) are included. Economists have for a long time recognised the importance of knowledge and technology for the economic growth (Solow, 1956; Romer, 1986; 1990; Aghion and Howitt, 1998). Following Desai et al. (2003) and using data from World Bank's WDI database, an index has been calculated that takes into account creation and acceptance of new technologies and usage of old basic technologies. A positive sign is expected for this variable.

Figure 1: Theoretical model of the indirect and direct effects of fiscal decentralization



Source: Authors

Traditional economic theory postulates that due to diminishing returns investment does not influence the long-run rate of growth (Mankiw et al., 1992; King and Levine, 1993; Sala – i – Martin, 1996). However, findings of numerous empirical studies suggest that there is a positive relationship between rates of investment and growth (Barro, 1991; Levine and Renert, 1992; Barro, 1996; Caselli et al., 1996; Barro and Sala – i – Martin, 1995; Barro et al., 1997). Using data from International Monetary Fund’s (IMF) World Economic Outlook Database, a variable defined as the share of total investment in GDP is included. A positive sign is expected on this variable.

The inclusion of control variable for the unemployment is motivated with the fact that persistent unemployment has negative impact on the economic growth. On the one hand, long – term unemployment erodes skills and knowledge of workers thus reducing their attractiveness to labor market. High levels of unemployment also reduce aggregate demand through lower consumption and investment in physical and human capital. Moreover, unemployment is negatively correlated with satisfaction with government and public administration and living standard while it increases public expenditure through demand for additional social transfers. The variable UNEMP is defined as the ratio between unemployed persons and total labor force and it is constructed using data from World Bank WDI database. A negative sign is expected for this variable.

Jamison et al. (2003) note that trade openness strongly influences economic growth. Greater openness can be associated with output fluctuations, while free movement of capital increases tax competition and thus has a negative effect on government size (Coricelli, 2005). Openness is associated with knowledge transfer and foreign direct investment. For this reason, trade openness, defined as the ratio between the sum of exports and imports and GDP, is expected to have a positive impact on economic growth. Finally, the model includes a variable defined as size of the country in km². As noted in the previous section, larger states can be associated with complex administration for which reason a negative effect on growth can be expected (Kurtz and Schrank, 2007). However, traditional economic theory also postulates that the size of a country is an important driver of economic growth. To this end, there are no a priori expectations about the sign of this variable.

4. METHODOLOGY AND DATASET

Estimation of the previously described models is undertaken with the use of system dynamic panel GMM estimator. Longitudinal nature of the database suggests that suitable

estimator should be selected from the group of panel estimators. Furthermore, current rates of economic growth can be related to their past realizations. Finally, several studies mentioned earlier point to the existence of mutually reinforcing relationship between variables representing development objectives and indicators of fiscal decentralization. The implication of the above is that measures of decentralization are likely to be correlated with some of the unobserved factors. Finally, it needs to be emphasized that the impact of decentralization becomes completely realized only in the long run. For this reason, analysis should take into consideration the distinction between the short and the long run.

The method capable of addressing all of the above-mentioned issues is dynamic panel estimator (Arellano and Bond, 1991; Arellano and Bover, 1995; Blundell and Bond, 1998) which is a part of the family of Generalised Method of Moments (GMM) estimators. In the presence of endogeneity, dynamic panel estimator can yield unbiased and consistent estimates using instruments found within the system. Among available dynamic panel estimators the system two-step estimation procedure is chosen. This way, the potential bias due to lagged levels of series being close to a random walk is avoided and inclusion of time-invariant variables is enabled. Moreover, by using a two step estimator estimation procedure is made robust to the modeled patterns of heteroscedasticity and cross-correlation. Finally, as the standard errors obtained in the two-step procedure are known to be downward biased Windmeijer correction is applied to the two-step standard errors.

Dynamic analysis enables distinction between short and long run effects of decentralization and control variables on the dependent variable. Long run effect can be calculated as product of short run coefficient and long – run multiplier while the standard error and t – statistics for this coefficient can be obtained with the use of delta method (Papke and Wooldridge, 2008.). The above described method is applied to the dataset of 24 countries from both Western and Central and Eastern Europe² covering 2005 – 2012 period which makes the overall sample of 168 observations. The choice of the analyzed countries is based on the availability of data for the construction of used variables.

In comparison with earlier studies, current research presents an advancement in several ways. This primarily refers to the methodological approach that takes into consideration the correlation between economic growth and its past realizations. Furthermore, used methodology enables control for potential endogeneity of several variables. As noted in earlier sections, the potential endogeneity of fiscal decentralization and economic growth has

² Austria, Belgium, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Ireland, Iceland, Italy, Luxembourg, Hungary, Netherlands, Norway, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, United Kingdom.

been recognized by theoretical literature for a long time but empirical studies have largely neglected this issue. Finally, the existing studies largely suggest that the impact of fiscal decentralization on economic growth is achieved in the long run, thus neglecting the short run effects.

5. DISCUSSION OF FINDINGS

The starting point in the analysis of direct effects of decentralization on economic growth is the model:

$$Growth_{it} = c + \alpha Growth_{it-1} + \beta_1 FD_{it} + \beta_2 TAI_{it} + \beta_3 Invest_{it} + \beta_4 Unemp_{it} + \beta_5 Open_{it} + \beta_6 Areakm2_{it} + \sum_{2007}^{2012} year_t + u_i + v_{it} \quad (3)$$

The dependent variable in the above equation is the annual rate of GDP per capita growth. Right hand side of the equation includes lagged dependent variable and variable FD which measures the direct impact of fiscal decentralization. As noted earlier, five indicators are used to measure these effects, defined as ratio between local government revenues and total national government revenues (FDREV), ratio between local government revenues and GDP (REVGDP), vertical fiscal imbalance index (VFI), ratio between local government expenditures and total expenditure of national government (FDEXP) and ratio between local government expenditure and GDP (EXPGDP). Taking into account that the above mentioned variables present different measures of the theoretical concept of fiscal decentralization, they enter the model interchangeably. Such an approach also enables testing the robustness of the relationship between fiscal decentralization and economic growth using different indicators.

The estimation of indirect effects of decentralization is built on the previously mentioned hypothesis about the impact of fiscal decentralization on national development objectives which, in turn, influence economic growth. To this end, four indicators defined as government efficiency index (GE), corruption control index (CORUP), public sector size index (SIZEEXP) and non-income human development index (NI – HDI) are employed. As previously, these indices enter the model separately as they reflect different measures of the same theoretical concept, but also in order to evaluate the robustness of the results. The model can be expressed as follows:

$$Growth_{it} = c + \alpha Growth_{it-1} + \beta_1 DV_{it} + \beta_2 TAI_{it} + \beta_3 Invest_{it} + \beta_4 Unemp_{it} + \beta_5 Open_{it} + \beta_6 Areakm2_{it} + \sum_{2007}^{2012} year_t + u_i + v_{it} \quad (4)$$

Both equations (3) and (4) include control variables defined earlier. TAI index controls for the level of technological progress. Share of investment in GDP is measured with variable INVEST, while variable UNEMP controls for the unemployment rate. Openness of the economy is controlled with variable OPEN while variable AREAKM2 controls for the area size of the country. In addition to these variables model also includes categorical variables for the analyzed years taking the first two years as a base. The use of these variables controls for potential cross-sectional dependence due to universal time – shocks.

In both estimations lagged dependent variable is treated as predetermined, while indicators of fiscal decentralization and development objectives as well as the share of investment in GDP are treated as endogenous. In instrument matrix these variables are instrumented with own lagged levels and differences while exogenous variables enter instrument matrix on their own. The following two sections present key findings of estimation. Prior to interpretation of results, relevant model diagnostics were examined in order to determine the validity of estimates. The tables with results of these tests can be found in the Appendix. All diagnostics relevant for dynamic panel estimators provide support to chosen specifications and enable the interpretation of results.

5.1. DIRECT EFFECTS OF DECENTRALIZATION ON ECONOMIC GROWTH.

Findings from estimation of direct effects of decentralization on growth are obtained through five specifications, where the decentralization is measured with indices FDREV, REVGDP, FDEXP, EXPGDP and VFI respectively. Table 1 summarizes the short-run direct effects of fiscal decentralization on economic growth and it reveals that the coefficient on lagged dependent variable is highly significant and positive. This signals that the current growth rate depends also on its past realizations.

Table 1. Direct impact of fiscal decentralization on the economic growth – short run

Variables/Specification	1	2	3	4	5
<i>Lagged dependent variable</i>	0.24*	0.27*	0.42***	0.44***	0.54***
<i>Constant</i>	-16*	-24**	-10	-12	0.71
<i>FDREV</i>	0.31*	-	-	-	-
<i>REVGDP</i>	-	0.72**	-	-	-
<i>FDEXP</i>	-	-	0.09*	-	-
<i>EXPGDP</i>	-	-	-	0.22*	-
<i>VFI</i>	-	-	-	-	-0.07*
<i>TAI</i>	2.62	13.32	1.90	3.58	2.92
<i>Invest</i>	0.46**	0.54***	0.29	0.38	0.09
<i>Unemp</i>	0.13	0.41	0.12	0.18	0.05
<i>Open</i>	0.01	0.01	0.01***	0.01**	0.01
<i>Areakm2</i>	-0.01	-0.01	-0.0002	-0.001	-0.001

Source: Authors' calculations

Note: ***, **, *refer to statistical significance at 1%, 5% and 10% level respectively.

p-values estimated using two – step dynamic panel method with Windmeijer robust standard errors.

Time dummy variables included.

Turning to the most important issue, the direct effects of decentralization on growth, a positive and significant coefficient is obtained in specifications 1 – 4, which suggests that both expenditure and revenue dimensions of decentralization facilitate economic growth. However, the impact of VFI indicator, measure of vertical fiscal imbalances to growth is negative. This finding suggests that decentralized systems in which local governments rely more on own revenues are more efficient than those where the emphasis is on the transfers from the central government.

Table 2: Direct impact of fiscal decentralization on economic growth – long run

Variables/Specification	1	2	3	4	5
<i>FDREV</i>	0.40*	-	-	-	-
<i>REVGDP</i>	-	0.99**	-	-	-
<i>FDEXP</i>	-	-	0.16*	-	-
<i>EXPGDP</i>	-	-	-	0.39*	-
<i>VFI</i>	-	-	-	-	-0.15*
<i>TAI</i>	3.42	18.21	3.28	6.34	6.40
<i>Invest</i>	0.60***	0.73***	0.50	0.68*	0.19
<i>Unemp</i>	0.17	0.56	0.21	0.31	0.10
<i>Open</i>	0.02	0.02	0.02***	0.02**	0.02
<i>Areakm2</i>	-0.01	-0.01	-0.001	-0.003	-0.002

Source: Authors' calculations

Note: ***, **, *refer to statistical significance at 1%, 5% and 10% level respectively.

p-values estimated with delta method

Analysis of long – run effects in Table 2 suggests that all variables retain their significance and sign in the long run. The magnitude of coefficients is approximately 1.3 to 2 times larger than their short run counterparts. On the one hand, this finding confirms findings from earlier literature about the complete influence of decentralization on economic growth in the long run. On the other hand, reported results also question the validity of arguments put forth by some authors about the absence of short – run effects of decentralization on economic growth.

5.2. INDIRECT EFFECTS OF DECENTRALIZATION ON DEVELOPMENT OBJECTIVES AND ECONOMIC GROWTH

The investigation of indirect effects examines as previously, the robustness of the relationship between fiscal decentralization and development objectives with use of different

decentralization indicators. In general form, the model for investigation of effects of decentralization on development objectives can be defined as:

$$DV_{it} = c + \alpha DV_{it-1} + \beta_1 FD_{it} + \beta_2 Fedunit_{it} + \beta_3 Botelect_{it} + \beta_4 Averagepop_{it} + \beta_5 Rlaw_{it} + \beta_6 Areakm2_{it} + \beta_7 Open_{it} + \beta_8 Unemp_{it} + \sum_{2007}^{2012} year_t + u_i + v_{it} \quad (5)$$

In equation (5) the dependent variable measures the improvement in achievement of national development objectives through four previously defined indicators: index of perception of control over corruption (CORUP), index of perception about government efficiency (GE), index of improvement in living standard (NI-HDI) and index of size of public sector (SIZEEXP). Right hand side of the equation includes lagged dependent variable and measure of fiscal decentralization defined in already described manner as FDREV, REVGDP, VFI, FDEXP and EXPGDP. Model also includes a set of categorical variables OPEN, AREAKM2 and UNEMP as well as annual time dummies defined previously. In addition to these, model includes two categorical variables FEDUNIT and BOTELECT taking value of one if the country has a federal organization or if it has local and regional elections respectively. Finally, model controls for country population with variable AVERAGEPOP and for the rule of law (RLAW). Lagged dependent variable and measures of fiscal decentralization are treated as endogenous and thus instrumented with own lagged levels and differences. In the remainder of the paper results are presented for variables of key interest. In all subsections measures of fiscal decentralization enter interchangeably resulting with five specifications defined as previously.

5.2.1. Impact of decentralization on control of corruption

All variables measuring decentralization are highly significant, with similar magnitude and the same sign (Table 3). It can thus be concluded that a stronger role for local and regional governments (decentralization) positively influences perception about the control of corruption. Among control variables, findings from four specifications suggest that greater rule of law increases perception about control of corruption. Similarly, significant coefficients with negative sign are found on controls for regional and local elections as well as federal state organization. This signals that perception of control of corruption is lower if there is a larger administrative mechanism at lower levels of government. Finally, coefficient on lagged dependent variable is strongly significant and positive.

Variables/Specification	1	2	3	4	5
<i>Lagged dependent variable</i>	0.61***	0.79***	0.59***	0.73***	0.63***
<i>Constant</i>	0.18	0.05	-0.32	-0.04	-0.85**

<i>FDREV</i>	0.03**	-	-	-	-
<i>REVGDP</i>	-	0.05*	-	-	-
<i>FDEXP</i>	-	-	0.01***	-	-
<i>EXPGDP</i>	-	-	-	0.01**	-
<i>VFI</i>	-	-	-	-	0.01*
<i>Rlaw</i>	0.38**	0.13	0.50*	0.35*	0.61***
<i>Open</i>	-0.001	0.0002	0.0004	-0.0001	-0.001
<i>Botelect</i>	-0.53**	-0.33**	-0.21	-0.13**	0.24
<i>Unemp</i>	0.004	0.01	0.01	0.0004	-0.01
<i>Fedunit</i>	-0.39***	-0.24***	-0.21**	-0.09**	-0.06
<i>Areakm2</i>	-0.0004	-0.0002	0.0001	-0.0001	-0.00001
<i>Averagepop</i>	1e-06	1e-06	-7e-07	-6e-07**	-5e-06*

Source: Authors' calculations

Note: ***, **, *refer to statistical significance at 1%, 5% and 10% level respectively.

p-values estimated using two – step dynamic panel method with Windmeijer robust standard errors.

Time dummy variables included.

Table 4 provides corresponding long run coefficients. All variables are measuring fiscal decentralization retain their signs and significance. The magnitude of obtained coefficients is 2.5-3 times higher than one in the short run. Similar finding holds for control variables.

Table 4. Impact of fiscal decentralization on the control of corruption – long run

Variables/Specification	1	2	3	4	5
<i>FDREV</i>	0.07***	-	-	-	-
<i>REVGDP</i>	-	0.24**	-	-	-
<i>FDEXP</i>	-	-	0.04*	-	-
<i>EXPGDP</i>	-	-	-	0.04**	-
<i>VFI</i>	-	-	-	-	0.04*
<i>Rlaw</i>	0.98***	0.60	1.21***	1.31***	1.65***
<i>Open</i>	-0.002	0.001	0.001	-0.0003	-0.002
<i>Botelect</i>	-1.35***	-1.60**	-0.52	-0.48**	0.65
<i>Unemp</i>	0.01	0.03	0.01	0.001	-0.01
<i>Fedunit</i>	-1.00**	-1.16	-0.51	-0.32	-0.15
<i>Areakm2</i>	-0.001	-0.001	0.0001	-0.0002	0.0001
<i>Averagepop</i>	3e-06	7e-06	-2e-06	-2e-06**	-0.00001**

Source: Authors' calculations

Note: ***, **, *refer to statistical significance at 1%, 5% and 10% level respectively.

p-values estimated with delta method

5.2.2. Impact of decentralization on government efficiency

Results from Table 5 do not reveal major departure from previously reported findings. Apart from a statistically significant and positive sign on lagged dependent variable, all measures of fiscal decentralization have positive and statistically significant coefficient. This signals that decentralization also paves the way for more efficient public governance.

Table 5. Impact of fiscal decentralization on the government efficiency – short run

Variables/Specification	1	2	3	4	5
<i>Lagged dependent variable</i>	0.42*	0.57*	0.52***	0.56***	0.67***

<i>Constant</i>	0.38	0.15	-0.09	0.03	-0.33
<i>FDREV</i>	0.02*	-	-	-	-
<i>REVGDP</i>	-	0.02*	-	-	-
<i>FDEXP</i>	-	-	0.02**	-	-
<i>EXPGDP</i>	-	-	-	0.02**	-
<i>VFI</i>	-	-	-	-	0.01*
<i>Rlaw</i>	0.40*	0.33	0.24	0.30*	0.36***
<i>Open</i>	-0.001	-0.0002	0.0003	0.0001	-0.001
<i>Botelect</i>	-0.39*	-0.14	-0.16	-0.03	0.15
<i>Unemp</i>	0.002	0.003	0.01	0.002	0.002
<i>Fedunit</i>	-0.33**	-0.10*	-0.26*	-0.09*	-0.05
<i>Areackm2</i>	-0.0002	-0.0002	-0.0002	-0.0002	-0.0001
<i>Averagepop</i>	9e-07	4e-07	-4e-07	-4e-07	-3e-06*

Source: Authors' calculations

Note: ***, **, *refer to statistical significance at 1%, 5% and 10% level respectively.

p-values estimated using two – step dynamic panel method with Windmeijer robust standard errors.

Time dummy variables included.

Long run effects of decentralization on government efficiency (Table 6) retain their significance and sign in all cases except for variable measuring vertical fiscal imbalances (VFI). The magnitude is about 2.5 times higher than in the case of short run coefficients which is in line with previous findings. Among control variables, again rule of law is significant in all specifications while findings on other control variables vary across specifications.

Table 6. Impact of fiscal decentralization on the government efficiency – long run

Variables/Specification	1	2	3	4	5
<i>FDREV</i>	0.04**	-	-	-	-
<i>REVGDP</i>	-	0.05*	-	-	-
<i>FDEXP</i>	-	-	0.04*	-	-
<i>EXPGDP</i>	-	-	-	0.04*	-
<i>VFI</i>	-	-	-	-	0.02
<i>Rlaw</i>	0.68**	0.76***	0.50*	0.68***	1.11***
<i>Open</i>	-0.001	-0.001	0.001	0.0002	-0.002
<i>Botelect</i>	-0.67**	-0.33**	-0.33	-0.07	0.45
<i>Unemp</i>	0.003	0.01	0.02	0.004	0.01
<i>Fedunit</i>	-0.57**	-0.24*	-0.53	-0.21**	-0.14
<i>Areackm2</i>	-0.0004	-0.001**	-0.0003	-0.001	-0.0002
<i>Averagepop</i>	2e-06	1e-06	-9e-06	-1e-06	-9e-06

Source: Authors' calculations

Note: ***, **, *refer to statistical significance at 1%, 5% and 10% level respectively.

p-values estimated with delta method

5.2.3. Impact of decentralization on the size of public sector

So far, national development objectives were analysed through measures of public governance quality. However, theoretically hypothesized advantages of decentralization can be addressed along lines of leviathan hypothesis. For this reason, the impact of

decentralization on the size of the public sector is investigated in this section (Table 7). Findings are compatible with previous ones. All measures of fiscal decentralization are significant with a positive sign, a finding not consistent with leviathan hypothesis. Bearing in mind that the analysis covers a period of the recent global economic downturn the impact of decentralization on increased public expenditure can be associated with measures introduced by governments to combat recession. Similar to preceding specifications, the lagged dependent variable is significant and positive. Among control variables, a significant and negative impact of greater openness is found in three specifications measuring decentralization through revenue side. This is consistent with the efficiency hypothesis according to which higher public expenditure and related increase in taxation erode international competitiveness of domestic business entities. In turn, the latter impose pressure on reduction of public expenditure under threat of reallocation to other countries. Other control variables are mostly insignificant.

Table 7. Impact of fiscal decentralization on the public sector size – short run

Variables/Specification	1	2	3	4	5
<i>Lagged dependent variable</i>	0.63***	0.66***	0.71***	0.86***	0.54***
<i>Constant</i>	22.5**	21.1*	15.6	6.63	18.57**
<i>FDREV</i>	0.28***	-	-	-	-
<i>REVGDP</i>	-	0.33*	-	-	-
<i>FDEXP</i>	-	-	0.37*	-	-
<i>EXPGDP</i>	-	-	-	0.21*	-
<i>VFI</i>	-	-	-	-	0.12*
<i>Rlaw</i>	0.23	-0.25	-3.01	-0.85	2.10
<i>Open</i>	-0.03*	-0.03*	-0.02	-0.01	-0.03*
<i>Botelect</i>	-7.89***	-6.42	-7.72	-2.31	-2.27
<i>Unemp</i>	0.04	0.05	0.04	0.03	0.06
<i>Fedunit</i>	-4.76**	-3.12	-5.79	-1.71	-3.68*
<i>Areakm2</i>	-0.004	-0.002	-0.001	-0.001	0.004
<i>Averagepop</i>	9e-06	8e-06	-2e-06	5e-08	-0.00004**

Source: Authors' calculations

Note: ***, **, *refer to statistical significance at 1%, 5% and 10% level respectively.

p-values estimated using two – step dynamic panel method with Windmeijer robust standard errors.

Time dummy variables included.

Long run results are different from the ones reported before (Table 8). With exception of specification 2, none of fiscal decentralization measures are significant in the long run. It follows from the above that there is no relationship between fiscal decentralization and public sector size in the long run. Previously mentioned efficiency hypothesis seems to hold in the long run as well.

Table 8. Impact of fiscal decentralization on the public sector size – long run

Variables/Specification	1	2	3	4	5
<i>FDREV</i>	0.76	-	-	-	-
<i>REVGDP</i>	-	0.99***	-	-	-
<i>FDEXP</i>	-	-	1.30	-	-
<i>EXPGDP</i>	-	-	-	1.54	-
<i>VFI</i>	-	-	-	-	0.25
<i>Rlaw</i>	0.63	-0.73	-10.5	-6.05	4.55*
<i>Open</i>	-0.09**	-0.08**	-0.07	-0.04	-0.07**
<i>Botelect</i>	-21.2*	-18.96**	-26.8	-16.5	-4.91
<i>Unemp</i>	0.11	0.13	0.14	0.20	0.13
<i>Fedunit</i>	-12.8	-9.21*	-20.1	-12.24	-7.97*
<i>Arealm2</i>	-0.01	-0.01	-0.004	-0.004	0.01
<i>Averagepop</i>	0.00002	0.00002	-7e-06	0.00003	-0.0001**

Source: Authors' calculations

Note: ***, **, *refer to statistical significance at 1%, 5% and 10% level respectively.

p-values estimated with delta method

5.2.4. Impact of decentralization on the improvement of living standard

As final part of the investigation of the relationship between fiscal decentralization and development objectives, the impact of former on the living standard improvement index is investigated. Short run findings confirm our expectations (Table 9). Fiscal decentralization coefficients are significant and positive in all five specifications. This implies that decentralization positively influences living standard improvement in fields such as education, health or longevity (all of which are components of the dependent variable). Such finding is in line with arguments about better insight of local governments in public needs and preferences of households and business entities. Findings on control variables exhibit variation similar to ones found in the previous sections. In specifications 2, 4 and 5 negative and significant coefficients are found on control of the level of unemployment, consistent with well-established negative effects of unemployment on the living standard.

Table 9. Impact of fiscal decentralization on the non-income living standard – short run

Variables/Specification	1	2	3	4	5
<i>Lagged dependent variable</i>	0.89***	0.97***	0.99***	0.97***	0.88***
<i>Constant</i>	0.10	0.02	-0.002	0.02	0.04
<i>FDREV</i>	0.002*	-	-	-	-
<i>REVGDP</i>	-	0.0003**	-	-	-
<i>FDEXP</i>	-	-	0.0004*	-	-
<i>EXPGDP</i>	-	-	-	0.0003*	-
<i>VFI</i>	-	-	-	-	0.001**
<i>Rlaw</i>	-0.001	-0.002	-0.004	-0.002	0.01
<i>Open</i>	0.00003	0.00001	0.00002*	0.00002	0.0001
<i>Botelect</i>	-0.01	0.001	0.0002	0.002	0.03***
<i>Unemp</i>	0.00002	-0.0002**	0.0001	-0.0001*	-0.001***

<i>Fedunit</i>	-0.01	0.001	-0.003	0.001	0.003
<i>Areakm2</i>	-0.00001	1.29e-06	-2e-06	1.64e-06	0.00002**
<i>Averagepop</i>	1e-07	1.57e-08	7e-09	1.23e-09	-2e-07**

Source: Authors' calculations

Note: ***, **, *refer to statistical significance at 1%, 5% and 10% level respectively.

p-values estimated using two – step dynamic panel method with Windmeijer robust standard errors.

Time dummy variables included.

Long run coefficients of fiscal decentralization (Table 10) are all non-significant which suggests the non-existence of the relationship between decentralization and living standard in the long run. Similar finding holds for control variables as well.

Table 10. Impact of fiscal decentralization on the non-income living standard – long run

Variables/Specification	1	2	3	4	5
<i>FDREV</i>	0.01	-	-	-	-
<i>REVGDP</i>	-	0.01	-	-	-
<i>FDEXP</i>	-	-	0.17	-	-
<i>EXPGDP</i>	-	-	-	0.01	-
<i>VFI</i>	-	-	-	-	0.01
<i>Rlaw</i>	-0.07	-0.07	-1.92	-0.07	0.05
<i>Open</i>	0.0002	0.001	0.01	0.001	0.0004
<i>Botelect</i>	-0.13	0.03	0.08	0.06	0.25
<i>Unemp</i>	0.0002	-0.007	0.03	-0.01	-0.01
<i>Fedunit</i>	-0.13	0.04	-1.53	0.04	0.02
<i>Areakm2</i>	-0.0001	0.0001	-0.001	0.0001	0.0002
<i>Averagepop</i>	1e-06	6e-07	3e-06	-	-1e-06

Source: Authors' calculations

Note: ***, **, *refer to statistical significance at 1%, 5% and 10% level respectively.

p-values estimated with delta method

Results on the relationship between fiscal decentralization and development objectives are shown in Table 11. As it can be seen from there with the exception of SIZEEXP, variable measuring size of the public sector, all measures of fiscal decentralization have expected signs. Hence, the positive impact of fiscal decentralization on development objectives such as government efficiency, control of corruption and a higher living standard is confirmed. However, the expectation of reduction of the size of public sector, known as leviathan hypothesis, was not confirmed.

Table 11. Summary of findings on the impact of fiscal decentralization on development objectives

	GE	CORUP	SIZEEXP	NIHDI
<i>FDEXP</i>	+	+	+	+
<i>FDREV</i>	+	+	+	+
<i>REVGDP</i>	+	+	+	+
<i>VFI</i>	+	+	+	+
<i>EXPGDP</i>	+	+	+	+

Note: * short run only

5.2.5. Impact of development objectives on economic growth

As a final step in the analysis of the impact of decentralization on economic growth of the residuals from the previous stages have been inserted in the growth equation. To this end, four specifications were constructed where transmission channels are defined as government efficiency (GE) in specification 1, control of corruption (CORUP) in specification 2, public sector size (SIZEEXP) in specification 3 and non-income human development index (NI-HDI) in specification 4.

Table 12: Indirect impact of fiscal decentralization on economic growth – short run

Variables/Specification	1	2	3	4
<i>Lagged dependent variable</i>	0.38***	0.25***	0.42***	0.23***
<i>Constant</i>	-12	-6.7*	-12	-22**
<i>GE</i>	4.39*	-	-	-
<i>CORUP</i>	-	2.04***	-	-
<i>SIZEEXP</i>	-	-	0.17*	-
<i>HDI</i>	-	-	-	0.18*
<i>TAI</i>	-0.32	-1.13	4.26	0.99
<i>Invest</i>	0.29*	0.30***	0.22	0.33**
<i>Unemp</i>	0.27	0.08	0.06	0.004
<i>Open</i>	0.001	-0.002	0.003	0.002
<i>Areakm2</i>	-0.002	-0.002	-0.002	0.001

Source: Authors' calculations

Note: ***, **, *refer to statistical significance at 1%, 5% and 10% level respectively.

p-values estimated using two – step dynamic panel method with Windmeijer robust standard errors.

Time dummy variables included.

Results in Table 12 provide further support to the thesis about the relationship between current growth and its past realizations. The magnitude of coefficient varies between 0.25 and 0.42 which is comparable to earlier estimates. Obtained results also provide support for the thesis about the indirect effects of decentralization on economic growth in the short-run. In all specifications, a positive and statistically significant coefficient is obtained. Such finding is further evidence of the complexity of the relationship between fiscal decentralization and economic growth. Among other variables, a positive impact of investment is reported in all but specification 3.

Table 13: Indirect impact of fiscal decentralization on economic growth – long run

Variables/Specification	1	2	3	4
<i>GE</i>	7.04*	-	-	-
<i>CORUP</i>	-	2.73**	-	-
<i>SIZEEXP</i>	-	-	0.30	-
<i>HDI</i>	-	-	-	0.24**
<i>TAI</i>	-0.51	-1.51	7.28	1.30
<i>Invest</i>	0.47*	0.41***	0.37	0.43**
<i>Unemp</i>	0.44	0.10	0.10	0.01

<i>Open</i>	<i>0.001</i>	<i>-0.003</i>	<i>0.01</i>	<i>0.003</i>
<i>Arealm2</i>	<i>-0.003</i>	<i>-0.002</i>	<i>-0.004</i>	<i>0.001</i>

Source: Authors' calculations

Note: ***, **, *refer to statistical significance at 1%, 5% and 10% level respectively.
p-values estimated with delta method

Analysis of long – run effects in Table 13 further supports our expectations. With the exception of public sector size, all indicators of development objectives are significant with a positive sign. A magnitude of coefficient is between 1.3 and 1.7 times larger than short run effects which is further evidence of a hypothesis about complete effects of decentralization being visible in the long run.

6. CONCLUSION

Past thirty years have witnessed trends of fiscal decentralization and various reforms of local fiscal systems in both developed and developing countries. Such developments have been driven by both economic and political motives. While in developed countries decentralization was instrument for reorganization of state with the aim of better provision of a growing number of public services, in developing world decentralization was driven by sluggish economic growth, macroeconomic instability, inefficient public administration and political pressures. In transition economies, decentralization was a part of the movement from centrally – planned to market economy. Evidence from all groups of countries suggests that the achievement of decentralization is a challenging task. The achievement of national development objectives depends on successful delegation and complementarity of responsibilities between central government and lower governmental levels, as well as between private and public sector, in the provision and financing of public services.

Bearing the above said in mind, the objective of this paper was to explore the impact of fiscal decentralization on economic growth while taking into account multidimensional nature of transmission channels between the two. For this reason a model was developed that takes into account the dynamic nature of growth, direct and indirect transmission channels of decentralization, its potential endogeneity and the distinction between short and long run effects. These issues have largely been ignored in earlier empirical research.

The obtained results provide support to both direct and indirect effects of decentralization on economic growth. Particularly interesting are findings related to vertical fiscal imbalances and size of the public sector. The former suggests that countries where local governments rely more on own revenues rather than transfers from the central level are more prosperous. The latter finding contradicts Leviathan hypothesis and suggests that increase in size of the public

sector facilitates economic growth. Such finding questions the current prevalent thinking about the beneficial effects of public sector reforms, aimed at the reduction of public expenditure, on economic growth.

Bearing in mind the fact that the analyzed period covers the most recent global economic downturn, our findings are consistent with evidence on recovery of individual economies. It is well established that countries where fall of private spending had been supplemented with public expenditure were among the first to embark on the road to recovery. Together these findings are consistent with theoretical propositions that favor proactive government approach, including fiscal policy measures to stimulate demand, prevent decline of production and employment and rebuild trust in institutions. Furthermore, our findings are on track of recommendations of policy makers. As noted by European Union's European Framework for Action, a fiscal stimulus is required for growth of demand, protection of production and workplaces.

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Appendix

Table A1. Model diagnostics – direct effects of decentralization

Diagnosics/specification	FDREV (1)	REVGDP (2)	FDEXP (3)	EXPGDP (4)	VFI (5)
Number of observations	168	168	168	168	168
Number of groups (countries)	24	24	24	24	24
Wald test	716***	1174***	358***	861***	678***
Hansen J test	14.86	8.97	3.60	5.73	1.25
Probability> chi2	0.14	0.94	0.61	0.45	0.87
Arellano-Bond 1 st order autocorrelation	-2.22	-1.96	-2.66	-2.90	-2.98
Probability>chi2	0.03	0.05	0.00	0.00	0.00
Arellano-Bond 2 nd order autocorrelation	-0.06	-1.25	-1.38	-1.25	-1.30
Probability>chi2	0.95	0.21	0.17	0.21	0.19

Source: Authors' calculations

Table A2. Model diagnostics – effects of decentralization on corruption control

Diagnosics/specification	FDREV (1)	REVGDP (2)	FDEXP (3)	EXPGDP (4)	VFI (5)
Number of observations	168	168	168	168	168
Number of groups (countries)	24	24	24	24	24
Wald test	3088***	4348***	3909***	27228***	10386.43***
Hansen J test	6.60	8.12	5.92	3.89	7.93
Probability> chi2	0.36	0.23	0.31	0.27	0.54
Arellano-Bond 1 st order autocorrelation	-1.77	-2.03	-2.19	-1.98	-2.79
Probability>chi2	0.07	0.04	0.03	0.05	0.01
Arellano-Bond 2 nd order autocorrelation	-0.08	-0.07	-0.24	-0.47	-0.48
Probability>chi2	0.94	0.95	0.81	0.64	0.63

Source: Authors' calculations

Table A3. Model diagnostics – effects of decentralization on government efficiency

Diagnostics/specification	FDREV (1)	REVGDP (2)	FDEXP (3)	EXPGDP (4)	VFI (5)
Number of observations	168	168	168	168	168
Number of groups (countries)	24	24	24	24	24
Wald test	1204***	6910***	583***	1401***	974***
Hansen J test	10.19	0.55	0.62	3.25	2.63
Probability> chi2	0.25	0.91	0.73	0.20	0.45
Arellano-Bond 1 st order autocorrelation	-2.38	-2.27	-3.20	-3.60	-3.56
Probability>chi2	0.02	0.02	0.00	0.00	0.00
Arellano-Bond 2 nd order autocorrelation	0.47	1.32	1.29	1.16	0.69
Probability>chi2	0.64	0.19	0.20	0.25	0.49

Source: Authors' calculations

Table A4. Model diagnostics – effects of decentralization on public sector size

Diagnostics/specification	FDREV (1)	REVGDP (2)	FDEXP (3)	EXPGDP (4)	VFI (5)
Number of observations	168	168	168	168	168
Number of groups (countries)	24	24	24	24	24
Wald test	3248***	776***	490***	1393***	665***
Hansen J test	4.69	6.37	5.30	9.35	7.29
Probability> chi2	0.97	0.78	0.95	0.31	0.51
Arellano-Bond 1 st order autocorrelation	-1.51	-1.57	-1.58	-1.45	-1.45
Probability>chi2	0.13	0.12	0.11	0.15	0.15
Arellano-Bond 2 nd order autocorrelation	1.25	1.31	1.28	1.23	1.18
Probability>chi2	0.21	0.19	0.20	0.22	0.24

Source: Authors' calculations

Table A5. Model diagnostics – effects of decentralization on living standard

Diagnostics/specification	FDREV (1)	REVGDP (2)	FDEXP (3)	EXPGDP (4)	VFI (5)
Number of observations	168	168	168	168	168
Number of groups (countries)	24	24	24	24	24
Wald test	2816***	27449***	20782***	15353***	1880***
Hansen J test	8.33	5.87	3.32	7.10	6.56
Probability> chi2	0.40	0.21	0.65	0.42	0.59
Arellano-Bond 1 st order autocorrelation	-2.07	-2.47	-2.47	-2.34	-2.22
Probability>chi2	0.04	0.01	0.01	0.02	0.03
Arellano-Bond 2 nd order autocorrelation	-1.92	-0.97	-1.25	-0.82	0.12

Probability>chi2	0.06	0.33	0.21	0.41	0.91
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Source: Authors' calculations

Table A6. Model diagnostics – effects of development objectives on growth

Diagnosics/specification	GE (1)	CORUP (2)	SIZEEXP (3)	NI-HDI (4)
Number of observations	168	168	168	168
Number of groups (countries)	24	24	24	24
Wald test	456***	659***	2291***	789***
Hansen J test	12.80	13.21	7.02	6.68
Probability> chi2	0.24	0.28	0.43	0.46
Arellano-Bond 1 st order autocorrelation	-2.97	-2.67	-2.81	-2.62
Probability>chi2	0.00	0.00	0.00	0.00
Arellano-Bond 2 nd order autocorrelation	-1.45	-1.37	-0.98	-1.47
Probability>chi2	0.15	0.17	0.33	0.14

Source: Authors' calculations