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State fragility and fiscal decentralization in EU ex-communist countries in a public choice approach

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Abstract:

While in J. Buchanan clubs theory, the decentralized governments should supply only public goods suited to their spatial dimension, for G. Tullock the decentralization should prevail over spatial dimension of the public goods to broaden individuals' control on government. For A. Peacock too, devolution responds to the demand of participation against the irrelevance of the individuals in centralization, but an extended "dispersive revolution" might increase rather than decrease the "government failures". Under Coase theory of the firm, applied to the government as firm, contracting out is limited by the cost of the deterioration of the power control.

We here, therefore, investigates the impact of the quantitative dimension of fiscal decentralization on the political robustness of the considered states in term of fragility, for 10 European Union (EU) ex-communist countries, over the period 1995-2012, by a panel-model approach. The main results show that between state fragility and fiscal decentralization there is a relationship with inverted-U and U shapes, analogous to the BARS (Barro, Armev, Rahn, and Scully) curve relating the government size to GDP growth.

Fragility is low under reduced revenues inequality and inflation rate, and rises when the urbanization and democratization decrease, under given level of political rights. The relation between the fragility curve and the BARS curve may need further research.

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Keywords: state fragility, fiscal decentralization, connection, analysis

JEL-codes: H70, H77, E62, C23

1. How much fiscal decentralization in a club approach? The state fragility issue in a union of states

1.1. Both James Buchanan and Gordon Tullock have devoted an extensive attention to the fiscal federalism as a government system, with a plurality of governments at the lower level, providing given types of public goods. The joint book of Buchanan and Tullock (1962) on the “Calculus of consent”, leads to a conception of multilevel government with extensive decentralization. The cost of reaching the agreement of bargaining is, from the social point of view, wasteful. A mean to reduce them is to organize the collective activity at the smallest unit level.¹ There is a conflict between this criterion of optimal size of the government and the fact that the benefits of many collective goods can be extended to a wide area with a reduction of the marginal cost of the supply². In principle, to determine the optimal size of the government one should compare the gain in marginal cost of the extension and the increase of the marginal cost of reaching the agreement, in order to equalize them. These costs tend to decrease in homogeneous communities. A social pact for an intergenerational long run has more probability of success among homogenous individuals. Decentralization assures more survival, being easier to find homogeneity at a lower level of government, among individuals who are living together since many generations, and share common customs. If there are many governments offering the same type of collective goods on different territories, one may choose among the various governments. According to Buchanan and Tullock (1962), this competition increases the efficiency of the supply and, through the mobility, increases the homogeneity of preferences and, therefore, the effectiveness of the supply. Because of the competition among governments, the respect of the constitution of club-governments may be quasi automatic (Leeson, 2011). Indeed, if the rules of the club are not respected, the dissenting members leave the club, which diminishes the importance of the politicians ruling the club, thus they are not reappointed. If better administrations emerge, the club grows in importance. Therefore, clubs with good respected rules tend to survive more. The third reason has to do with the transaction costs. The consent among the rules among homogenous voters it is easier and the transaction costs are lower. They diminish, with a multiplicity of competing governments because those who dissent may leave the club to enter in another, more homogeneous to them. To sum up, the optimal constitution needs a multi-government, with decentralization, which allows more freedom of choices. But the criteria for the devolution to the lower levels are different and may be weighted differently.

Buchanan (1965, 1974, 1990, 1995, 1996, 1997a-b, 2001) theorized the multilevel governments and unions of governments under the paradigms of clubs of individuals, with homogenous preferences, joining to share goods of common use up to their congestion and the maximum possible freedom of opting out to get better their public choices. This implies a restriction to the functions of any level of government, not only as for the redistributive functions, but also for the others, to allow the competition between governments, up to the top level. On the other hand, Tullock (1969, 1994a-b) and Tullock et al. (2002) maintain that the homogeneity of preferences and the interest of the individuals to control the public choice may induce to prefer a decentralization also for public goods, which following an abstract principle of economies of scale, could be assigned to higher levels. Thus, among the two public choice scholars, there is a different relevance of exit and voice in the enforcement of the good government. Buchanan

¹ Buchanan and Tullock (1962), pp. 111-112.

² Buchanan and Tullock (1962), pp. 113-114.

stresses the relevance of exit to have a sort of “competitive market of public goods”. Tullock, on the other hand, emphasises the relevance of voice³, by the minimization transaction and information cost that is possible by the devolution of the decision to lower levels of government. Clearly, the size of the decentralization remains undetermined, depending from the trade-off among exit and voice. However, this is not the end of the story. Indeed, both Buchanan and Tullock discuss of fiscal federalism in the perspective of a “too big” central government. Decentralization is an improvement also because contrast with the tendency of the central government to grow, by taking advantage of its power position similarly to a big monopolistic company.

Hunter and Peacock (1973), and Peacock (1976a-b) present many similarities with the contributions of Buchanan and Tullock, in contract-bargaining terms. Peacock introduces the damages to redistribution if the lower level regions are not aided by the others, the costs of increased bureaucratic and political structures, and the perspective of a dispersive revolution motivated by the demand of more participation. The clash of powers originating the devolution may not necessarily follow the rational pattern of the clubs model. The devolution does not necessarily decrease exploitations and discriminations, as Rowley and Peacock (1975) note. Indeed, the same authors state that the possibility of exit is necessarily limited at the regional and local level also for mobile labour and capital, due to the loss of the external economies enjoyed in the residence place. Excessive devolution may conflict with the need of coordination of a country that becomes member of a union of states (Peacock 1979)⁴. Here emerges the relevance of the theory of the firm as organization of Coase (1937, 1972) in fiscal federalism, with the central government as a firm that decentralizes its activity to lower level government. An over excessive decentralization may endanger the vertical integration generating fragility of the organization.

This issue is, a fortiori, important for the European countries of the former Comecon-Soviet bloc, which have entered in the EU area either directly or by association to it, because their democratic states structure are new and not yet consolidated. Furthermore, the “fragility of the government” issue here is as a peculiar relevance, because these countries, which belong to the EU or aim to enter in it, need a fiscal and regulatory power of their central government and their local governments to conform to the “rules” of the EU club. Any central government of the member states must present to the EU a general government budget, with the deficit or surplus resulting from the aggregation of the public expenditures and revenues at all levels of governments. The central government is also responsible of the aggregate public debts of the country. A moderate inflation rate is another requisite. Stability of the exchange rate with the EU is also required (i.e. the balance of payment tending to equilibrium).

1.2. The fragility of the states in relation to its core functions may be defined in various ways at the conceptual and at the measurement level, with different methodologies and indicators, according to different perspectives. It has received an increased attention since the end of the last century, in relation to the issues of economic development and peace, not yet in terms of risk of fiscal-financial failure, as for the participation to a union of states. There are five main Fragility Indexes: (i) Failed States Index of the Fund for Peace of Washington; (ii) CPIA (Country Policy

³ We are here referring to Hirschman (1970).

⁴ The issue of the risk of fragmentation caused by a dispersive devolution hinted by Alan Peacock, in particular, as for the United Kingdom, has re-emerged in a different perspective considering the consequences of the Scotland referendum as for the effects of financial fragility for the British finances.

and Institutions) Index of DAC of OECD; (iii) Brookings Index of State Weakness in developing world; (iv) Indicator of Failed and Fragile States of CIPF (Country Indicator of Foreign Policy) of Carleton University (Ottawa, Canada) and Canadian International Development Agency; and (v) States Fragility Index of the Centre for Systemic Peace of Vienna (VA-USA).

The Failed States Index of the Fund for Peace is the most inclusive Index of Fragility as it considers all the states of the world with more than 500 inhabitants. It is an extremely broad index consisting of information collected from a thousand of Reports organized in social, political and economic indicators distributed in main 12 indicators, each consisting of 14 indicators.⁵ This index, likely because of its nature, lacks of transparency. It is not suited for our econometric analysis, both because of it is mix of qualitative judgements and quantitative data and covers issues that go much beyond the themes of the fragility of the state as for its core functions. However, some sub-indexes of it could be worth of econometric application in our research.

The Index CPIA (Country Policy and Institutions Assessment) of DAC of OECD, available since 1999, appears methodologically more germane to our type of inquiry.⁶ The ratings reflect a variety of indicators, observations, and judgments mainly originated in the World Bank and on relevant publicly available indicators. Unfortunately, this index merely covers less developed countries, being an instrument to address the aid the less underdeveloped countries by the OECD developed countries.

The Index of State Weakness of the developing countries of the Brookings Institutions, in Washington D.C., covers 141 developing countries, inclusive of the Eastern European former communist countries (Serbia, Croatia, Slovakia, Albania, Moldova, Romania, Bulgaria, Hungary, Poland and Latvia).⁷ Unfortunately, does not include all the former communist Eastern European countries, belonging to EU (Czech Republic, Estonia and Slovenia are among the developed countries). Furthermore, obviously excludes the other EU countries.

The Failed and Fragile States Index of the Canadian International Development Agency covers 197 less developed and developed states⁸. This index is conceived as an instrument for foreign aid to less develop countries too.⁹

⁵ The list includes: four social indicators (demographic pressure, refugees, group grievance, human flight and brain drain), two economic indicators (uneven economic development, and poverty and economic decline), and six political and military indicators (state legitimacy measured by corruption, basic public services, human right and rule of the law, security apparatus, factional elites, and external interventions).

⁶ Scores are assigned on the basis of 16 criteria (20 until 2003), grouped in four equally weighted clusters: Economic Management, Structural Policies, Policies for Social Inclusion and Equity, and Public Sector Management and Institutions. It has been used by Bertocchi and Guerzoni (2012) to analyse the State fragility in sub-Saharan Africa, by probit and OLS models, for the period 1999-2007. Institutional sector, especially the civil liberties and the number of revolutions, have a significant impact on state fragility. In a work on the same sub-Saharan Africa, Asongu and Kodila-Tedika (2013), by employing probit and logit models, for the same period, with this Index show that political interference, rent seeking and lobby have a positive impact on state fragility.

⁷ It includes 20 indicators relating to the Economic basket, the Political Basket, the Security Basket, and the Social Welfare Basket.

⁸ Mixing qualitative information and statistical data, the index informs on three issues (i.e. Authority, Legitimacy and Capacity), with six clusters (i.e. Governance; Economics; Security and Crime; Human Development; Demography; and Environment). Scenario generation based on trend lines is an important part of the analysis.

⁹ Daudelin and Samy (2008) by cross-sectional and panel models, for the period 1990-2004, find that the financial aids offered by Canada to 25+2 priority states are strongly correlated with the level of state fragility and have reduced it. Carment et al. (2008) also follow the topic of Canadian's aids and obtain the same positive impact of aids on fragility.

Finally, the State Fragility Index, presented yearly by “Global Report on Conflict, Governance, and State Fragility” of the Centre for Systemic Peace, measures the level of state fragility by the two points of view of effectiveness and legitimacy, on four classes of performance indicators of security, political, economic, and social. Therefore, there are eight simple indicators drawn from sources indicated in the Report. “Security effectiveness” is captured by an Index of Residual Wars, indicating exposure to violence, while “Security legitimacy” is measured by the State Repression Index, referring to the public order. “Political effectiveness” illustrates the regime/governance stability, while “Political legitimacy” reveals the regime/governance inclusion. “Economic effectiveness” is captured by GDP per capita, while “Economic legitimacy” represents the share of manufacturing export on the total merchandise export. “Social effectiveness” is measured by the Human Development Indicator of the World Bank, and “Social legitimacy” by the Infant Mortality Rate. The range of 0 means “no fragility”, while the level 25 denotes “extreme fragility”. Between these points there are the levels of moderate fragility and low fragility. This index includes all the East-European former communist countries and the EU developed countries for a broad number of years. Being synthetic, transparent and base on objective sources, this index seems to be the best one for our econometric analysis.

1.3. In the last decades, the fiscal decentralization on the ex-communist Eastern European countries has been investigated and disputed together with their non easy transition process, from a centralized system to a decentralised one. These Eastern European countries have in common the lack of capital, weak civil society and the impact of the European Union and of other international organisations on them (Farkas 2011, p.15). Gurr (1993) argues that the devolution of powers and the increase of group autonomy are good incentives to settle the ethnic conflict and civil wars. Decentralization of tax, spending and regulatory powers by these European countries is considered a potential determinant for state fragility by Illner (2010).

Most studies of state fragility and fiscal decentralization, in the less developed countries however, focus on non-European underdeveloped countries, with non-conclusive results. India and Nigeria are analysed by Hechter (2000), who agrees with Gurr (1993) on the positive effects of decentralization.¹⁰

Bird and Ebel (2005) highlights the importance of fiscal decentralization in the poverty reduction, attenuation of some local disparities and avoidance of social conflicts. Similarly, Boex et al. (2006) emphasise there is a special connection between fiscal decentralization and poverty reduction, which reduces the level of state fragility. According to Norris (2008), in his worldwide research, in which the focus is on less developed countries, the decentralization has a positive impact on democratic participation and government quality, being a good incentive for accommodating the cultural diversity in fragile multinational states. However, by generating dilution of the unitary structure, it increases the state fragility. Brinkerhoff and Johnson (2008)

¹⁰ Other researches of fiscal fragility in underdeveloped countries focus on factors not necessarily related to the decentralization of Government. Vallings and Moreno-Torres (2005) consider that weak political institutions and limited political participations are the main factors for state fragility. Guillaumont and Guillaumont Jeanneney (2009), in a descriptive paper, evidence that ‘fragility’ leads to ‘vulnerability’ by impoverishment, social unrest, criminality and civil wars. Xu (2010) analyses 101 countries in a cross-sectional way. The author shows that the state stability, captured by State Fragility Index, is jeopardised by population growth. He also finds that the urbanization and democratization tend to reduce the fragility status. Developing a theoretical model of state fragility for underdeveloped countries, Besley and Persson (2011) claim that the government cannot deliver minimal public services to their citizens and the risk for political violence is very high.

argue that the decentralization process must be very carefully implemented, to avoid the state fragmentation and political instability. Brancati (2008) maintains that decentralization relaxes the ethnic tensions by transferring the control in political, social, and economic affair areas. But this devolution process can indirectly increase the ethnic conflict, because reinforces the ethnic identities and spurs secessionism. Boex (2009) is circumspect about the capacity of devolution to improve the intra-state stability and of reducing the conflicts.

Based on these theoretical contributions, we investigate the impact of fiscal decentralization on state fragility in the EU ex-communist countries. The paper extends the public choice literature by revealing new findings regarding the determinants of state fragility. Secondly, explores the connection between fiscal decentralization and state fragility by using for the first time a nonlinear panel approach. Finally, the analysis offers important information for EU ex-communist countries in their fiscal devolution process, helping to preserve their state integrity.

The rest of the paper it is as follows: Section 2 reveals the data and methodology, while Section 3 contents the empirical results. Section 4 concludes.

2. Data and methodology

2.1. The impact of fiscal decentralization on the state fragility is explored based on an unbalanced panel dataset, with 10 cross-sections (10 EU ex-communist countries), and 18 years (i.e. the period is 1995-2012), by using a panel model approach. The targeted countries are Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovak Republic and Slovenia. The choice of panel estimations derives by the fact that such model better capture the complexity of human behaviour than a single cross-section or time series data, as Hsiao (2007) notes.

Two main variables have been selected for this analysis: the state fragility, as dependent variable, and fiscal decentralization, as interest variables. The main function is as follows:

$$\tau = f(\delta), \quad (1)$$

τ is the level of state fragility, measured by the Fragility States Index, offered by “Global Report on Conflict, Governance, and State Fragility” of the Centre for Systemic Peace, while δ denotes the degree of fiscal decentralization.

The independent variable fiscal decentralization (δ) measures the degree of power devolution of taxing and spending to sub-national levels of government. For sensitivity, we select five indicators in order to capture (δ).

The first regressor, the Revenue Decentralization Indicator, formulated by Escolano et al. (2012), represents the ratio of local tax revenues on general government revenues. The second one is the Expenditure Decentralization Indicator, also proposed by the same Escolano et al. (2012), and captures the ratio of local expenditures on general government expenditures. The third regressor is the Production-Revenue Indicator, proposed by Akai and Sakata (2002), and reveals the arithmetic mean of the previous indexes. The fourth regressor is the Fiscal Decentralization Index of Vo (2008) and reveals the geometric mean of fiscal autonomy (the ratio of local tax revenues to local expenditures) and fiscal importance (the ratio of local expenditures to general government expenditures).

The last regressor, proposed by Martinez-Vazquez and Timofeev (2009), is the Composite Ratio of Decentralization, being calculated as fraction between Revenue Decentralization Indicator and (1-Expenditure Decentralization Indicator).

In all cases, the independent interest indicators are expressed as percentage, with values from 0 (minimum level of decentralization) to 100 (maximum level of decentralization). The measures used to calculate these five composite indexes are: the local tax revenues, the local expenditures, the general government revenues and the general government expenditures, as given in Eurostat (online) database 2014.

In order to validate the main hypothesis, we consider an OLS naive panel-model, with this form:

$$\tau_{it} = \alpha + \beta \delta_{it} + \varepsilon_{it}, \quad (2)$$

where α is the intercept, β represents the slope, i is the country, t denotes the time and remainder, while ε_{it} is the error term, which varies over both country and time.

We also test the function for nonlinearity, following 2 and 3 degrees of polynomial order. In the same time, the effect of fiscal decentralization is isolated entering two sets of control variables: one inspired from economic literature, and another one derived from political and demographic areas. In this case, the extended cubic panel-model becomes:

$$\tau_{it} = \alpha + \beta_0 \delta_{it} + \beta_1 \delta_{it}^2 + \beta_2 \delta_{it}^3 + \sum_{k=1}^n \beta_k X_{k,it} + \mu_i + \lambda_t + \varepsilon_{it}, \quad (3)$$

where $\beta_{0,1,2}$ are the coefficients of interest variables δ , δ^2 and δ^3 , β_k is the coefficient of control independent variable k by n type, X represents the control independent variable, μ_i is the stands for country fixed effects, and λ_t is the time-specific effects that controls for unaccounted common time-varying factors.

A first group of control variable includes the GDP growth, the GDP per capita growth (in US dollars), GINI index, the inflation rate, the trade and the balance of direct investments. GDP growth reveals the annual percentage growth rate of GDP based on US dollar currency. According to Gurr's (1970) deprivation theory (i.e. when GDP rises, the gap between expectations and capabilities reduces), one expects that GDP growth rate has a negative impact.

Aside of this, we connect the pair GDP growth - state fragility with the BARS curve, according to Forte and Magazzino (2011). Analyzing the EU countries, they find an inverted U-shape relationship between public expenditure to GDP share and the GDP growth. When the size of government increases, the level of GDP raises, reaches a maximum level and after that, it falls. As the GDP growth is negatively correlated with the state fragility, the increase of the government size will increase the GDP level, reducing the state fragility. Furthermore, when the government size exceeds the optimal point, the GDP decreases and raises the level of state fragility. We validate the BARS curve for our targeted countries, and the Forte and Magazzino's (2011) results by using a quadratic panel approach between GDP and size of government. The size of government is captured by the public expenditure as percentage of GDP.

We anticipate that GDP per capita growth rate, as annual percentage growth rate of GDP per capita based on US dollar currency, to be positively correlated with State Fragility Index.¹¹ GINI

¹¹ The same results offer Bertocchi and Guerzoni (2012).

index captures the distribution of income or consumption expenditure among individuals or households within an economy deviates from an equal distribution. If the value 0 shows a complete equality, the level 100 denotes a complete inequality. With Xu (2010) one may expect that the reduction of GINI inequality index has a positive impact on the dependent variable.

The third control variable, the inflation rate as the yearly cost for the average consumer of acquiring a basket of goods and services. Based on Paldam (1987), one may expect a positive correlation between inflation rate and State Fragility Index. The fourth control variable, represented by the sum of exports and imports of goods and services measured as percentage of GDP, is the trade. As in Goldstone et al. (2005), one may expect a negative correlation between trade and state fragility. The last control variable, the balance of direct investments, is given by the direct investment outflows minus the inflows as share of GDP. One can expect, according to Bertocchi and Guerzoni (2012), that an excess of out flows on inflows is positive correlated with the state fragility Index.

The source of data for all economic control regressors and public expenditures as percentage of GDP is the World Bank (online) database 2014, excepting the balance of direct investments, which has been taken from World Competitiveness (online) database 2012.

The second set of control variables contains political and demographic determinants, such as: the level of democratization, the urbanization degree, the index of civil liberties and the index of political rights. One may expect that, as Feng (1997) notes, the democratization is negatively correlated with state fragility. The level of democratization is captured by Polity2 index, which measures the degree of democratization¹². We consider other two political variables: Index of Civil Liberties and Index of Political Rights.

Index of Civil Liberties shows the degree of freedom regarding the expression, assembly, association, education, and religion. Index of Political Rights reveals the degree of freedom related to elections, political competitiveness and rights of minority groups to be represented in politics and government.¹³ According to Bertocchi and Guerzoni (2012), the Index of Civil Liberties may be correlated with the state fragility. One may expect when the degree of freedom is low, the State Fragility Index increases as results of a strong autocracy. When the degree of freedom is high, the State Fragility Index may also increase in a country of young democracy. Similarly may happen with the Index of Political Rights.

The last control variable is the degree of urbanization i.e. the share of people living in urban areas on total population.¹⁴ As Xu (2010) notes, the result may be ambiguous: a positive effect may appear because the people from urban areas have high standards of living and do not participate to destabilise the state, but a negative connection may emerge as result of the social inequality in urbanized areas.

The coefficients of variables are treated as elasticities (i.e. in percentage or in natural logarithm forms), excepting the variables with not strictly positive values, such as the State Fragility Index and the index of democratization.

The sources of data and descriptive statistics of variables are in Appendix in Table 1 and 2.

¹² With ranges from +10 (strongly democratic) to -10 (strongly autocratic), the Polity2 index is available at Polity™ IV Project Political Regime Characteristics and Transitions, 1800-2013 online databases 2013.

¹³ The scale of intensity is from 1 to 7, where 1 denotes the greatest degree of freedom, while 7 is the smallest degree of freedom. Both variables are taken from Freedom House (online) database 2014.

¹⁴ Our source of data is World Bank online database 2014.

2.2. We perform five scenarios, for the five fiscal decentralization variables. For each of them, scenario, we employ two OLS panel models with the interest variable and the control regressors: one linear (only with the interest variable) and another one nonlinear, by polynomial type (with both square and cube of interest explanatory variables). We present two tests: the Breusch-Pagan/Cook-Weisberg for heteroskedasticity, and the Breusch-Pagan LM test for cross-sectional dependencies.

The panel models might have data homogeneity. We test this propriety by performing cross-section fixed-effects models. The random-effects estimator required that the number of cross-section to be more than number of coefficients. As the number of cross-section ($N=10$) is less than the number of coefficients ($T=14$), the random-effects estimator is not consistent in our case. F-test permits to choose between pooled models and fixed-effects models, while Modified Wald and Breusch-Pagan LM tests check for heteroskedasticity and cross-sectional dependencies, respectively. If such problems appear, we follow Hoechle (2007), who suggests correcting them by applying a fixed-effect regression with Driscoll and Kraay (1998) standard errors. The advantage of this estimator is that the standard errors are robust to disturbance, being heteroscedastic, autocorrelated with $MA(q)$ and cross-sectionally dependent.

Another choice for obtaining robust standard errors is to follow a feasible generalized least squares (FGLS) approach, feasible then $N < T$ ($10 < 14$, in our case), popularized by Kmenta (1986). In this case, the standard errors are robust to disturbance and assumed to be heteroscedastic, contemporaneously cross-sectionally correlated and autocorrelated of type $AR(1)$. Heteroskedasticity and cross-sectional dependencies also are tested in FGLS estimations.

Finally, we deal with any endogeneity related to fiscal decentralization and State Fragility Index (i.e. especially the existence of reverse causality between them) by employing Two-Stages Least Squares (TSLS) regressions. The instruments are the lagged values of fiscal decentralization, square and cube of fiscal decentralization. We verify the TSLS models for heteroskedasticity through Pagan-Hall test and investigate the results of endogeneity adjustment by performing Wu-Hausman F-test. If the heteroskedasticity still is persistent, it is required to follow the Arellano and Bond (1991) and Blundell and Bond's (1998) generalized method-of-moment (GMM) estimators. Unfortunately, as Roodman (2009) notes, such estimators are not consistent under panels with large T and small N , as in our case.

Separately, in order to connect the GDP growth control variable with the size of government, and to validate the BARS curve in the case of EU ex-communist countries, for the period 1995-2012, we perform several quadratic panel regressions, by following the same econometric steps as in the previous scenarios. The dependent variable is \ln of GDP, while the independent variables are the square of public expenditures as percentage of GDP and public expenditures as percentage of GDP.

3. Results

Table 3 in Appendix shows the matrix of correlations of the explanatory variables, which confirms that there are no multicollinearity problems, as all correlation coefficients are less than 0.8, in module. The table also evidences strong correlations between fiscal decentralization indexes, leading to maintain that they correctly capture the same basic idea of fiscal decentralization. Tables 4-8, in Appendix, present the panel outputs of both linear and nonlinear approaches, as for the impact of fiscal decentralization on State Fragility Index, for the period

1995-2012, in the 10 EU ex-communist countries. The tables show the results of the five different variables, adopted to capture the fiscal decentralization.

In all cases, the **linear set** of models 1 illustrates that the variable δ is significant and negatively correlated with the State Fragility Index in each of five performed scenarios, i.e. the State Fragility Index increases when the level of decentralization decreases. This means that, in the EU ex-communist countries, the accentuated devolution process of revenues and spending supplies financial strength to sub-national governments, attenuating in this way the internal conflicts.

Between control variables, GDP per capita growth rate, inflation rate, ln of civil liberties and ln of political rights are significant and positively correlated with State Fragility Index in all five scenarios, confirming the literature findings (Paldam, 1987; Bertocchi and Guerzoni, 2012). Also significant, but with negative signs are GDP growth rate, trade and index of democratization. These results also fit the conclusions of Gurr (1970), Goldstone et al. (2005) and Feng (1997).

GINI index, balance of direct investments and degree of urbanization are not conclusive.

The **nonlinear approach** of analysis offers additional interesting results. Firstly, we tested for the level of polynomial order, by checking different order of interest variable δ , from 2 to 4. For the orders 2 and 3, the coefficients of interest variable are significant, while for the order 4 they become not conclusive. Consequently, we assume that there is a cubic nonlinear relationship between state fragility and fiscal decentralization.

In all five cases, the F-tests for homogeneity (with values between 11.84 and 12.97, and attached p-values of 0.000), show that fixed-effects models are more appropriate to capture the connection between variables. Unfortunately, the results of the modified Wald tests put in evidence the heteroskedasticity in all considered fixed-effects estimations (the p-values are 0.000, without exceptions). Cross-sectional dependences are also found in these panel models. The null hypothesis of cross-sectional independence cannot be rejected at 1% level of significance only in the cases of Production-Revenue Indicator and Composite Ratio of Decentralization. Thus, the corrections made by using Driscoll and Kraay with fixed-effects and FGLS estimators are more appropriate. We also dealt with endogeneity issues, by employing TSLS models. Wu-Hausman F tests for endogeneity in TSLS estimations reveal that the null cannot be rejected (p-values between 0.136 and 0.318), all regressors being exogenous. All such models suffer from heteroskedasticity, as the attached p-values of followed Pagan-Hall tests are 0.000, rejecting the null hypothesis of homoskedasticity in disturbance. Arellano and Bond (1991), and Blundell and Bond's (1998) GMM estimators are required in such situations, but cannot be followed as our panels have large T and small N.

Given all these methodological considerations, we select the Driscoll and Kraay with fixed-effects model as more appropriate approach to explain the cubic relationship between State Fragility Index and fiscal decentralization.

The first scenario considers the Revenue Decentralization Indicator as interest variable. Cube of Revenue Decentralization Indicator and Revenue Decentralization Indicator are significant in all estimations and positively correlated with dependent variable. Square of Revenue Decentralization Indicator is significant, but with negative sign. Between control variables, three are not conclusive: GDP per capita growth, trade, and index of civil liberties. GDP growth, index of democratization and degree of urbanization are significant, with negative impact on State Fragility Index, conforming to the literature main findings. The coefficients of GINI index, inflation, balance of direct investments and ln of political rights, significant and having positive signs, also confirm the literature results.

Similar results offer the second scenario, which takes into account the Expenditure Decentralization Indicator. In this scenario, the balance of direct investment is not conclusive, while GDP per capita growth rate becomes significant, with negative impact on dependent variable. This output mirrors the existing literature findings (e.g. Bertocchi and Guerzoni, 2012). When Production-Revenue Indicator is considered, the cube of Production-Revenue Indicator and Production-Revenue Indicator again are significant, with positive signs, while square of Production-Revenue Indicator remains significant, but negatively correlated with State Fragility Index. The control variable trade and ln of civil liberties are not conclusive. The rest of explanatory variables are significant, confirming the literature.

The scenario with the Fiscal Decentralization Index registers similar outputs as in the previous scenario. However, the international trade becomes significant but with positive sign, thus contradicting the main literature findings (Goldstone et al., 2005). By contrast, the GDP growth, GDP per capita growth and balance of direct investments are not conclusive.

In the last scenario of the Composite Ratio of Decentralization, GDP growth, GDP per capita growth and balance of direct investments remain not conclusive. International trade is not significant too. All rest of explanatory variables maintain both significance and signs.

Summarizing, the main findings offer robust estimations for the existence of a cubic nonlinear relationship between State Fragility Index and fiscal decentralization. The rest of control regressors partially confirm the main findings from literature, the differences being the vector of particular used sample and specific methodological panel followed treatments. The state fragility is higher under accentuated revenues inequality and high level of inflation, while urbanization reduces the fragility. Even if political rights are relatively modest, the level of democratization improves the state stability.

Considering the coefficients of variables, the State Fragility function in respect to fiscal decentralization has a particular tendency illustrated in Figure 1, in Appendix.

We also note that:

$$\delta : [0,100] \rightarrow [0,105] \quad (4)$$

The cubic function related to the fiscal decentralization has an oscillating trend, with two critical points: one maximum ($\tau_{\max.}$) and another minimum ($\tau_{\min.}$). δ_{1a} and δ_{1b} are the roots of the first derivative cubic function, while δ_2 is the root of the second derivative of the same function. The state fragility cubic function increases to δ_{1a} , diminishes between two critical points (δ_{1a} , δ_{1b}), and rises from δ_{1b} . Starting to the inflection point $\tau_{\inf.}$, τ slowly decreases. Therefore, the relationship between State Fragility Index and fiscal decentralization is cubic, with inverted-U and U shapes. Whatever, we stress that the results need to be very cautiously interpreted due to potential unfixed endogeneity.

Furthermore, the Table 9 in Appendix shows the panel estimations regarding the impact of government size on the GDP. The OLS model 1 reveals that the coefficient of square of government size is significant and negatively correlated with GDP. The homogeneity is checked through the fixed and random effects model estimations. Based on the F-test and Hausman test, the fixed effects model seems to be more appropriate to describe the quadratic function between GDP and size of government. Unfortunately, this estimation reveals heteroskedasticity and cross-sectional dependence. We try to correct these issues through Driscoll and Kraay with fixed-effects, and FGLS estimations. Even so, the endogeneity issue of government size should also be fixed (i.e. the existence of reverse causality between GDP and size of government). We deal with

this endogeneity by performing a TSLS model. The used instruments are the lags of square of government size and government size. Wu-Hausman F test for endogeneity in TSLS estimations shows that all regressors are exogenous, while the attached p-value of Pagan-Hall test, with a level of 0.037, enforces that the disturbance is homoskedastic. In this situation, the TSLS approach is more appropriate than the GMM estimators. However, Arellano and Bond (1991), and Blundell and Bond (1998) state that GMM estimators are not required for large T and small N, as in our case. Concluding, TSLS can be considered to explain the quadratic connection between GDP and government size, with inverted U-shape, validating the existence of BARS curve, and Forte and Magazzino's (2011) outputs for the EU ex-communist countries.

4. Conclusions

In the public choice approach to fiscal federalism by Buchanan, and Tullock, and Peacock, decentralization has a positive meaning, but with a controversial size. Coase's theory of the firm, applied to the government as organization, warns about the limits of the contracting out that erode the hierarchical structure. By using a panel model approach, for the period 1995-2012, we find that the connection between state fragility and fiscal decentralization is nonlinear, by cubic form, with inverted-U and U shapes. There are three main fiscal devolution stages in respect to state fragility. In the first stage, of "incipient fiscal decentralization", the state fragility increases when fiscal decentralization increase as the sub-national governments fight for much more fiscal autonomy. In the second stage of "recommended fiscal decentralization zone", the prosecution of fiscal decentralization process reduces the state fragility, as consequence of a comfortable fiscal autonomy status of the sub-national governments. As the fiscal devolution process goes forward, the state fragility increases and the country enters in the "dangerous fiscal decentralization zone", as there are risks of disaggregation and secession. From this stage on, any increase of fiscal decentralization may shift the state to collapse.

Connecting these elements with the BARS curve and Forte and Magazzino's (2011) results, we also note that the state fragility cubic curve (SFI) has different behavior under the size of government's impact (Figure 2, in Appendix). When the size of government tends to be minimal or maximal, the GDP decreases and shifts upward the fragility cubic curve, from SFI to SFI', increasing the state fragility level. Otherwise, when the size of government tends to reach the optimal point, the GDP increases toward a maximal level, shifting downward the fragility cubic curve, from SFI to SFI''. This shift will reduce the level of state fragility.

Clearly, the policy implication is that fiscal decentralization in EU ex-communist countries reduces the state fragility up to a point. After this point, the effect is inverted. At the same time, the governments in these countries may reinforce the state stability by smoothing the revenues inequalities and the inflation rate and by stimulation the urbanization. Special attention deserves democratization and political rights. On this ground, a maximal policy effect, which minimizes the state fragility, can be obtained if the size of government tends to reach the optimal point and where the GDP is at its maximum.

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Appendix

Table 1: The source of data

Variable	Source of data
Index of State Fragility	Marshall and Cole (2014), Annual “Global Report on Conflict, Governance, and State Fragility”, available on Center for Systemic Peace online database.
Revenue Decentralization Indicator	Calculated based on local tax revenues and general government revenues offered by Eurostat online database 2014
Expenditure Decentralization Indicator	Calculated based on local expenditures and general government expenditures offered by Eurostat online database 2014
Production-Revenue Indicator	Calculated based on local tax revenues, general government revenues, local expenditures and general government expenditures offered by Eurostat online database 2014
Fiscal Decentralization Index	Calculated based on local tax revenues, general government revenues, local expenditures and general government expenditures offered by Eurostat online database 2014
Composite Ratio of Decentralization	Calculated based on local tax revenues, general government revenues, local expenditures and general government expenditures offered by Eurostat online database 2014
GDP	World Bank online database 2014
Public expenditures	World Bank online database 2014
GDP per capita	World Bank online database 2014
GINI	World Bank online database 2014
Inflation	World Bank online database 2014
Trade	World Bank online database 2014
Balance of direct investments	World Competitiveness online database 2012
Index of democratization	Polity™ IV Project Political Regime Characteristics and Transitions, 1800-2013 online databases 2013
Degree of urbanization	World Bank online database 2014
Civil liberties	Freedom House online database 2014
Political rights	Freedom House online database 2014

Table 2: Descriptive statistics

Variable	Mean	Median	Maximum	Minimum	Std. Dev.	Obs.
Index of State Fragility	1.865079	1	9	0	2.221182	126
Revenue Decentralization Indicator	0.245068	0.251669	0.384546	0.075299	0.060172	126
Expenditure Decentralization Indicator	0.232168	0.240266	0.339778	0.051735	0.055225	126
Production Revenue Indicator	0.238618	0.250734	0.35033	0.063517	0.057014	126
Fiscal Decentralization Index	0.472194	0.48452	0.596346	0.239965	0.059939	126
Composite Ratio of Decentralization	0.325969	0.336654	0.551839	0.079407	0.099301	126
GDP	9.25E+10	5.10E+10	5.29E+11	4.35E+09	1.04E+11	126
Public expenditures	0.416893	0.412053	0.558312	0.331776	0.054641	126
GDP per capita	9480.841	8104.052	26989.65	1579.348	5853.829	126
GINI	0.307131	0.303925	0.3764	0.2424	0.035314	126
Inflation	0.069226	0.0463	0.552235	-0.035514	0.089772	126
Trade	1.196143	1.249259	1.805012	0.460479	0.333101	126
Balance of direct investments	-0.046105	-0.035229	0.018595	-0.287465	0.044704	126
Index of democratization	9.277778	9.5	10	6	0.926403	126
Degree of urbanization	0.634261	0.664945	0.74513	0.49948	0.077879	126
Civil liberties	1.579365	2	3	1	0.541896	126
Political rights	1.18254	1	3	1	0.407937	126

Table 3: Matrix of correlations of explanatory variables

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	
Revenue	(1)	1														
Decentralization Indicator																
Expenditure	(2)	0.952	1													
Decentralization Indicator																
Production Revenue	(3)	0.989	0.987	1												
Indicator																
Fiscal	(4)	0.945	0.980	0.973	1											
Decentralization																
Index																
Composite Ratio of	(5)	0.994	0.959	0.989	0.939	1										
Decentralization																
GDP	(6)	0.598	0.532	0.573	0.475	0.627	1									
GDP per capita	(7)	0.040	0.009	0.025	0.004	0.025	0.192	1								
GINI	(8)	0.222	0.343	0.283	0.301	0.259	0.037	-0.226	1							
Inflation	(9)	-0.317	-0.314	-0.319	-0.316	-0.299	-0.174	-0.441	0.020	1						
Trade	(10)	-0.186	-0.097	-0.145	-0.047	-0.213	-0.406	0.401	-0.109	-0.363	1					
Balance of direct	(11)	0.235	0.140	0.192	0.109	0.229	0.227	0.392	0.069	-0.060	-0.109	1				
investments																
Index of	(12)	0.169	0.046	0.111	0.047	0.154	0.197	0.324	-0.140	-0.451	0.037	0.179	1			
democratization																
Degree of	(13)	0.347	0.434	0.393	0.462	0.339	-0.067	-0.198	0.100	-0.241	0.253	-0.271	-0.158	1		
urbanization																
Civil liberties	(14)	-0.221	-0.231	-0.229	-0.218	-0.231	-0.066	-0.352	0.009	0.506	-0.401	-0.074	-0.346	-0.243	1	
Political rights	(15)	-0.213	-0.191	-0.205	-0.185	-0.208	-0.293	-0.795	-0.036	0.327	-0.337	-0.325	-0.339	0.115	0.422	1

Table 4: The impact of Revenue Decentralization Indicator on State Fragility Index

Variable	Model						Expected sign
	1	2	3	4	5	6	
Revenue Decentralization Indicator	-4.941*** (1.633)	80.63*** (23.19)	61.697*** (21.52)	61.69*** (14.26)	80.63*** (21.85)	103.4*** (32.72)	+/-
Revenue Decentralization Indicator ²		-379.7*** (105.1)	-307.08*** (107.6)	-307.08*** (70.85)	-379.79*** (99.08)	-471.18*** (164.8)	+/-
Revenue Decentralization Indicator ³		521.8*** (151.4)	432.8*** (160.3)	432.8*** (100.2)	521.80*** (142.7)	631.58** (262.06)	+/-
GDP growth	-50.22*** (12.87)	-50.58*** (12.48)	-15.62 (12.35)	-15.62** (8.535)	-50.58*** (11.76)	-49.09*** (13.407)	-
GDP per capita growth	49.41*** (12.76)	49.66*** (12.39)	14.18 (12.309)	14.182 (8.533)	49.66*** (11.67)	48.12*** (13.334)	+
GINI	-0.775 (2.413)	-0.590 (2.316)	13.67*** (3.863)	13.67*** (1.773)	-0.590 (2.183)	-0.243 (2.446)	+
Inflation	3.641*** (1.112)	3.905*** (1.072)	2.929** (1.236)	2.929** (1.179)	3.905** (1.010)	3.974*** (1.094)	+
Trade	-0.810*** (0.301)	-0.933*** (0.315)	0.295 (0.467)	0.295 (0.344)	-0.933 (0.297)	-1.100** (0.452)	-
Balance of direct investments	-1.957 (1.962)	-0.606 (1.923)	2.079 (1.589)	2.079* (1.115)	-0.606 (1.812)	-0.238 (2.027)	+
Index of democratization	-0.851*** (0.099)	-0.817*** (0.095)	-0.743*** (0.086)	-0.743*** (0.089)	-0.817*** (0.090)	-0.796*** (0.099)	-
Ln of civil liberties	3.192*** (0.353)	3.039*** (0.348)	0.827* (0.429)	0.827 (0.620)	3.039*** (0.328)	2.934*** (0.381)	+/-
Ln of political rights	0.861*** (0.264)	0.899*** (0.251)	1.273*** (0.207)	1.273*** (0.241)	0.899*** (0.237)	0.891*** (0.258)	+/-
Degree of urbanization	-1.016 (1.235)	-0.415 (1.195)	-40.17*** (6.863)	-40.17*** (7.826)	-0.415 (1.126)	-0.145 (1.256)	+/-
Constant	11.65*** (1.685)	5.269** (2.367)	25.98*** (4.529)	25.98*** (5.018)	5.269** (2.230)	3.367 (2.735)	+/-
Type of estimation	Pooled OLS	Pooled OLS	Fixed effect OLS	Driscoll-Kraay with fixed effect	FGLS	TSLS-IV	
R-squared	0.881	0.894	0.764	0.764		0.892	
F-test for fixed effects			12.97 Pr.=0.000				
Breusch-Pagan/Cook-Weisberg for heteroskedsticity/ Modified Wald test for heteroskedasticity/Pagan-Hall test	chi2= 26.67 Pr.>Chi2 =0.000	chi2= 29.57 Pr.>Chi2 =0.000	chi2= 279.7 Pr.=0.000		chi2= 74.83 Pr.>Chi2 =0.000	chi2= 35.11 Pr.>Chi2 =0.000	
Breusch-Pagan LM test for cross-sectional dependencies			chi2= 54.69 Pr.>Chi2 =0.023		chi2= 51.29 Pr.=0.047		
Wu-Hausman F-test for endogeneity						F=1.187 P-val.=0.318	
Wooldridge's test for serial autocorrelation	F=10.54 Pr.=0.011	F=9.8 Pr.=0.014					
Number of observations	165	165	165	165	165	165	

Note: (a) (...) denotes the standard error; (b) ***, **, and * denote significance at 1, 5 and 10 % level of significance, respectively.

Table 5: The impact of Expenditure Decentralization Indicator on State Fragility Index

Variable	Model						Expected sign
	1	2	3	4	5	6	
Expenditure Decentralization Indicator	-5.775*** (1.824)	77.93*** (22.61)	56.91** (25.17)	56.91*** (11.43)	77.93*** (21.31)	106.07*** (28.21)	+/-
Expenditure Decentralization Indicator ²		-403.3*** (122.1)	-319.73** (148.35)	-319.73*** (68.94)	-403.3*** (115.09)	-523.9*** (158.4)	+/-
Expenditure Decentralization Indicator ³		594.6*** (204.8)	491.39* (251.29)	491.39*** (108.1)	594.6*** (193.07)	746.6*** (279.66)	+/-
GDP growth	-47.909*** (12.84)	-44.25*** (12.64)	-15.57 (12.46)	-15.57* (7.932)	-44.25*** (11.91)	-40.03*** (14.073)	-
GDP per capita growth	47.26*** (12.73)	43.58*** (12.55)	14.403 (12.445)	14.403* (7.938)	43.58*** (11.82)	39.34*** (13.98)	+
GINI	0.488 (2.480)	1.956 (2.445)	13.98*** (3.880)	13.98*** (2.101)	1.956 (2.304)	3.223 (2.876)	+
Inflation	3.528*** (1.115)	3.962*** (1.065)	2.975** (1.311)	2.975* (1.424)	3.962*** (1.004)	4.147*** (1.102)	+
Trade	-0.756** (0.290)	-0.874*** (0.308)	0.382 (0.467)	0.382 (0.349)	-0.874*** (0.290)	-1.056** (0.419)	-
Balance of direct investments	-2.315 (1.925)	-0.842 (1.895)	2.082 (1.593)	2.082 (1.214)	-0.842 (1.786)	-0.398 (1.975)	+
Index of democratization	-0.884*** (0.098)	-0.853*** (0.093)	-0.737*** (0.085)	-0.737*** (0.087)	-0.853*** (0.087)	-0.840*** (0.094)	-
Ln of civil liberties	3.179*** (0.352)	2.978*** (0.350)	0.904** (0.438)	0.904 (0.673)	2.978*** (0.330)	2.814*** (0.397)	+/-
Ln of political rights	0.867*** (0.262)	0.909*** (0.247)	1.275*** (0.208)	1.275*** (0.278)	0.909*** (0.233)	0.902*** (0.256)	+/-
Degree of urbanization	-0.819 (1.248)	0.076 (1.238)	-37.94*** (6.918)	-37.94*** (8.620)	0.076 (1.167)	0.427 (1.316)	+/-
Constant	11.48*** (1.676)	5.275** (2.219)	25.19*** (4.562)	25.19*** (5.512)	5.275** (2.091)	2.939 (2.492)	+/-
Type of estimation	Pooled OLS	Pooled OLS	Fixed effect OLS	Driscoll-Kraay with fixed effect	FGLS	TSLs-IV	
R-squared	0.819	0.897	0.764	0.761		0.894	
F-test for fixed effects			11.84 Pr.=0.000				
Breusch-Pagan/Cook-Weisberg for heteroskedsticity/ Modified Wald test for heteroskedasticity/Pagan-Hall test	chi2=26.20 Pr.>Chi2=0.000	chi2=29.02 Pr.>Chi2=0.000	chi2=1454.29 Pr.=0.000		chi2=82.85 Pr.>Chi2=0.000	chi2=31.98 Pr.>Chi2=0.002	
Breusch-Pagan LM test for cross-sectional dependencies			chi2=59.16 Pr.>Chi2=0.008		chi2=56.40 Pr.=0.016		
Wu-Hausman F-test for endogeneity						F=1.883 P-val.=0.136	
Wooldridge's test for serial autocorrelation	F=10.13 Pr.=0.012	F=10.15 Pr.=0.012					
Number of observations	165	165	165	165	165	165	

Note: (a) (...) denotes the standard error; (b) ***, **, and * denote significance at 1, 5 and 10 % level of significance, respectively.

Table 6: The impact of Production-Revenue Indicator on State Fragility Index

Variable	Model						Expected sign
	1	2	3	4	5	6	
Production-Revenue Indicator	-5.454*** (1.742)	85.19*** (23.40)	68.62** (25.53)	68.62** (15.26)	85.19*** (22.05)	104.22*** (27.53)	+/-
Production-Revenue Indicator ²		-422.64*** (116.5)	-367.1** (140.5)	-367.1** (85.89)	-422.64*** (109.8)	-491.8*** (145.3)	+/-
Production-Revenue Indicator ³		607.6*** (182.8)	549.4** (225.7)	549.4** (136.5)	607.6*** (172.3)	676.2*** (245.3)	+/-
GDP growth	-49.12*** (12.84)	-48.23*** (12.52)	-17.02 (12.45)	-17.02* (7.768)	-48.23*** (11.79)	-44.66*** (13.654)	-
GDP per capita growth	48.39*** (12.73)	47.43*** (12.43)	15.74 (12.41)	15.74* (7.742)	47.43*** (11.71)	43.83*** (13.57)	+
GINI	-0.158 (2.436)	0.546 (2.352)	13.43*** (3.885)	13.43*** (1.835)	0.546 (2.216)	1.396 (2.605)	+
Inflation	3.566*** (1.113)	3.965*** (1.063)	2.670** (1.305)	2.670* (1.383)	3.965*** (1.002)	4.097*** (1.089)	+
Trade	-0.795*** (0.296)	-0.882*** (0.317)	0.282 (0.468)	0.282 (0.347)	-0.882*** (0.299)	-1.105** (0.452)	-
Balance of direct investments	-2.090 (1.942)	-0.464 (1.911)	2.201 (1.588)	2.201* (1.165)	-0.464 (1.801)	-0.206 (1.974)	+
Index of democratization	-0.866*** (0.098)	-0.831*** (0.093)	-0.738*** (0.085)	-0.738*** (0.087)	-0.831*** (0.088)	-0.812*** (0.096)	-
Ln of civil liberties	3.184*** (0.352)	3.011*** (0.348)	0.905** (0.433)	0.905 (0.664)	3.011*** (0.328)	2.859*** (0.389)	+/-
Ln of political rights	0.860*** (0.263)	0.912*** (0.248)	1.271*** (0.207)	1.271*** (0.259)	0.912*** (0.234)	0.897*** (0.257)	+/-
Degree of urbanization	-0.881 (1.243)	-0.053 (1.211)	-38.75*** (6.853)	-38.75*** (8.303)	-0.053 (1.141)	0.178 (1.271)	+/-
Constant	11.58*** (1.679)	4.863** (2.309)	25.20*** (4.536)	25.20*** (5.284)	4.863** (2.176)	3.126 (2.496)	+/-
Type of estimation	Pooled OLS	Pooled OLS	Fixed effect OLS	Driscoll-Kraay with fixed effect	FGLS	TSLs-IV	
R-squared	0.881	0.896	0.764	0.764		0.894	
F-test for fixed effects			11.84 Pr.=0.000				
Breusch-Pagan/Cook-Weisberg for heteroskedsticity/ Modified Wald test for heteroskedsticity/Pagan-Hall test	chi2= 26.53 Pr.>Chi2 =0.000	chi2= 26.53 Pr.>Chi2 =0.000	chi2= 543.42 Pr.=0.000		chi2= 82.85 Pr.>Chi2 =0.000	chi2= 34.50 Pr.>Chi2 =0.001	
Breusch-Pagan LM test for cross-sectional dependencies			chi2= 56.54 Pr.>Chi2 =0.015		chi2= 56.40 Pr.=0.016		
Wu-Hausman F-test for endogeneity						F=1.554 P-val.=0.207	
Wooldridge's test for serial autocorrelation	F=10.38 Pr.=0.012	F=9.98 Pr.=0.013					
Number of observations	165	165	165	165	165	165	

Note: (a) (...) denotes the standard error; (b) ***, **, and * denote significance at 1, 5 and 10 % level of significance, respectively.

Table 7: The impact of Fiscal Decentralization Index on State Fragility Index

Variable	Model						Expected sign
	1	2	3	4	5	6	
Fiscal Decentralization Index	-4.064** (1.668)	193.08*** (68.58)	165.02** (74.35)	165.02*** (35.81)	193.08*** (64.62)	105.3 (210.5)	+/-
Fiscal Decentralization Index ²		-442.01** (169.1)	-395.48** (185.1)	-395.48*** (88.37)	-442.01*** (159.37)	-189.3 (554.3)	+/-
Fiscal Decentralization Index ³		319.3** (134.9)	298.03** (146.3)	298.03*** (69.62)	319.3** (319.32)	90.05 (468.39)	+/-
GDP growth	-49.46*** (13.04)	-45.44*** (12.67)	-14.84 (12.52)	-14.84 (7.871)	-45.44*** (11.94)	-34.76* (19.246)	-
GDP per capita growth	48.82*** (12.93)	44.83*** (12.57)	13.65 (12.50)	13.65 (7.871)	44.83*** (11.84)	34.36* (18.99)	+
GINI	-0.416 (2.479)	1.437 (2.385)	15.16*** (3.814)	15.16*** (1.663)	1.437 (2.248)	3.298 (3.174)	+
Inflation	3.791*** (1.129)	3.662*** (1.093)	2.991** (1.329)	2.991*** (0.860)	3.662*** (1.030)	4.066*** (1.365)	+
Trade	-0.628** (0.288)	-0.797*** (0.299)	0.567 (0.465)	0.567* (0.304)	-0.797*** (0.282)	-1.309* (0.729)	-
Balance of direct investments	-2.541 (1.960)	-1.075 (1.889)	1.902 (1.605)	1.902 (1.187)	-1.075 (1.780)	-0.925 (2.057)	+
Index of democratization	-0.878*** (0.100)	-0.848*** (0.094)	-0.747*** (0.087)	-0.747*** (0.082)	-0.848*** (0.089)	-0.824*** (0.102)	-
Ln of civil liberties	3.233*** (0.357)	2.998*** (0.350)	0.836* (0.433)	0.836* (0.623)	2.998*** (0.330)	2.669*** (0.534)	+/-
Ln of political rights	0.903*** (0.266)	0.970*** (0.251)	1.351*** (0.209)	1.351*** (0.273)	0.970*** (0.236)	0.893*** (0.291)	+/-
Degree of urbanization	-1.180 (1.282)	-0.385 (1.224)	-39.09*** (6.967)	-39.09*** (8.229)	-0.385 (1.153)	0.230 (1.430)	+/-
Constant	12.31*** (1.755)	-16.87* (9.301)	6.410 (9.902)	6.410 (7.722)	-16.87* (8.765)	-7.965 (25.35)	+/-
Type of estimation	Pooled OLS	Pooled OLS	Fixed effect OLS	Driscoll-Kraay with fixed effect	FGLS	TSLs-IV	
R-squared	0.877	0.894	0.756	0.756		0.892	
F-test for fixed effects			12.60 Pr.=0.000				
Breusch-Pagan/Cook-Weisberg for heteroskedasticity/Modified Wald test for heteroskedasticity/Pagan-Hall test	chi2=27.82 Pr.>Chi2=0.000	chi2=31.56 Pr.>Chi2=0.000	chi2=1883.79 Pr.=0.000		chi2=70.25 Pr.>Chi2=0.000	chi2=27.41 Pr.>Chi2=0.010	
Breusch-Pagan LM test for cross-sectional dependencies			chi2=66.72 Pr.>Chi2=0.001		chi2=66.51 Pr.=0.001		
Wu-Hausman F-test for endogeneity						F=1.760 P-val.=0.159	
Wooldridge's test for serial autocorrelation	F=10.35 Pr.=0.012	F=10.23 Pr.=0.012					
Number of observations	165	165	165	165	165	165	

Note: (a) (...) denotes the standard error; (b) ***, **, and * denote significance at 1, 5 and 10 % level of significance, respectively.

Table 8: The impact of Composite Ratio of Decentralization on State Fragility Index

Variable	Model						Expected sign
	1	2	3	4	5	6	
Composite Ratio of Decentralization	-3.281*** (1.001)	36.12*** (11.65)	68.62** (25.53)	24.95** (9.690)	36.12*** (10.98)	51.67*** (14.46)	+/-
Composite Ratio of Decentralization ²		-130.5*** (37.76)	-367.1** (140.5)	-97.11*** (35.08)	-130.5*** (35.58)	-177.3*** (48.49)	+/-
Composite Ratio of Decentralization ³		130.7*** (38.36)	549.4** (225.7)	100.27*** (37.87)	130.7*** (36.14)	171.65*** (52.04)	+/-
GDP growth	-48.56*** (12.80)	-49.25*** (12.59)	-17.02 (12.45)	-14.22 (12.33)	-49.25*** (11.87)	-46.65*** (13.601)	-
GDP per capita growth	47.78*** (12.68)	48.45*** (12.50)	15.74 (12.41)	12.885 (12.294)	48.45*** (11.78)	45.82*** (13.53)	+
GINI	-0.236 (2.419)	-0.168 (2.351)	13.43*** (3.885)	13.86*** (3.868)	-0.168 (2.215)	0.441 (2.550)	+
Inflation	3.617*** (1.101)	4.059*** (1.075)	2.670** (1.305)	3.256*** (1.203)	4.059*** (1.013)	4.199*** (1.102)	+
Trade	-0.880*** (0.305)	-0.966*** (0.320)	0.282 (0.468)	0.288 (0.470)	-0.966*** (0.301)	-1.196*** (0.447)	-
Balance of direct investments	-1.984 (1.938)	-0.756 (1.923)	2.201 (1.588)	2.047 (1.592)	-0.756 (1.813)	-0.374 (2.008)	+
Index of democratization	-0.854*** (0.098)	-0.827*** (0.095)	-0.738*** (0.085)	-0.743*** (0.086)	-0.827*** (0.089)	-0.804*** (0.098)	-
Ln of civil liberties	3.144*** (0.352)	3.005*** (0.351)	0.905** (0.433)	0.784* (0.428)	3.005*** (0.331)	2.855*** (0.387)	+/-
Ln of political rights	0.850*** (0.262)	0.880*** (0.251)	1.271*** (0.207)	1.262*** (0.208)	0.880*** (0.237)	0.863*** (0.259)	+/-
Degree of urbanization	-0.900 (1.224)	-0.223 (1.213)	-38.75*** (6.853)	-39.77*** (6.873)	-0.223 (1.143)	0.123 (1.283)	+/-
Constant	11.38*** (1.670)	7.344*** (2.016)	25.20*** (4.536)	27.41*** (4.507)	7.344*** (1.900)	5.588** (2.223)	+/-
Type of estimation	Pooled OLS	Pooled OLS	Fixed effect OLS	Driscoll-Kraay with fixed effect	FGLS	TSLS-IV	
R-squared	0.882	0.894	0.762	0.764		0.891	
F-test for fixed effects			12.87 Pr.=0.000				
Breusch-Pagan/Cook-Weisberg for heteroskedsticity/ Modified Wald test for heteroskedasticity/Pagan-Hall test	chi2= 26.25 Pr.>Chi2 =0.000	chi2= 30.32 Pr.>Chi2 =0.000	chi2= 237.26 Pr.=0.000		chi2= 71.63 Pr.>Chi2 =0.000	chi2= 33.18 Pr.>Chi2 =0.001	
Breusch-Pagan LM test for cross-sectional dependencies			chi2= 55.51 Pr.>Chi2 =0.019		chi2= 51.61 Pr.=0.044		
Wu-Hausman F-test for endogeneity						F=1.371 P-val.=0.255	
Wooldridge's test for serial autocorrelation	F=10.40 Pr.=0.012	F=9.49 Pr.=0.015					
Number of observations	165	165	165	165	165	165	

Note: (a) (...) denotes the standard error; (b) ***, **, and * denote significance at 1, 5 and 10 % level of significance, respectively.

Table 9: The impact of government size on the GDP

Variable	Model					
	1	2	3	4	5	6
Public expenditure ²	-68.099*** (25.29)	-31.377* (2.163)	-32.282** (16.136)	-31.377 (30.085)	-68.099*** (25.08)	-94.502** (49.79)
Public expenditure	65.25*** (21.62)	24.111* (13.65)	25.47* (13.78)	24.11 (26.67)	65.25*** (21.44)	88.249** (41.933)
Constant	9.293** (4.561)	19.95*** (2.891)	19.54*** (2.929)	19.95*** (5.686)	9.293** (4.523)	4.415 (8.704)
Type of estimation	Pooled OLS	Fixed effect OLS	Random effect GLS	Driscoll-Kraay with fixed effect	FGLS	TSLS-IV
R-squared	0.157	0.045	0.044	0.045		0.157
F-test for fixed effects		47.16 Pr.=0.000				
Hausman test for random effects			16.51 Pr.=0.000			
Breusch-Pagan/Cook-Weisberg for heteroskedsticity/Modified Wald test for heteroskedasticity/Pagan-Hall test	chi2= 0.87 Pr.>Chi2 =0.349	chi2= 278.85 Pr.>Chi2 =0.000			chi2= 367.06 Pr.>Chi2 =0.000	chi2= 6.591 Pr.>Chi2 =0.037
Breusch-Pagan LM test for cross-sectional dependencies		chi2= 685.46 Pr.=0.000			chi2= 612.4 Pr.=0.000	
Wu-Hausman F-test for endogeneity						F=0.333 P-val. =0.716
Wooldridge's test for serial autocorrelation	F=873.2 Pr.=0.000					
Number of observations	180	180	180	180	180	180

Note: (a) (...) denotes the standard error; (b) ***, **, and * denote significance at 1, 5 and 10 % level of significance, respectively.



δ	0	δ_{1a}	δ_2	δ_{1b}	100
$f'(\delta)$	+++++++	0	-----	0	+++++++
$f''(\delta)$	-----	-----	0	+++++	+++++
Trend of $f(\delta)$	Increase	$\tau_{max.}$	Decrease	$\tau_{min.}$	Increase
Form of function			$\tau_{inf.}$		

Figure 1: The tendency of cubic state fragility function in respect to fiscal decentralization

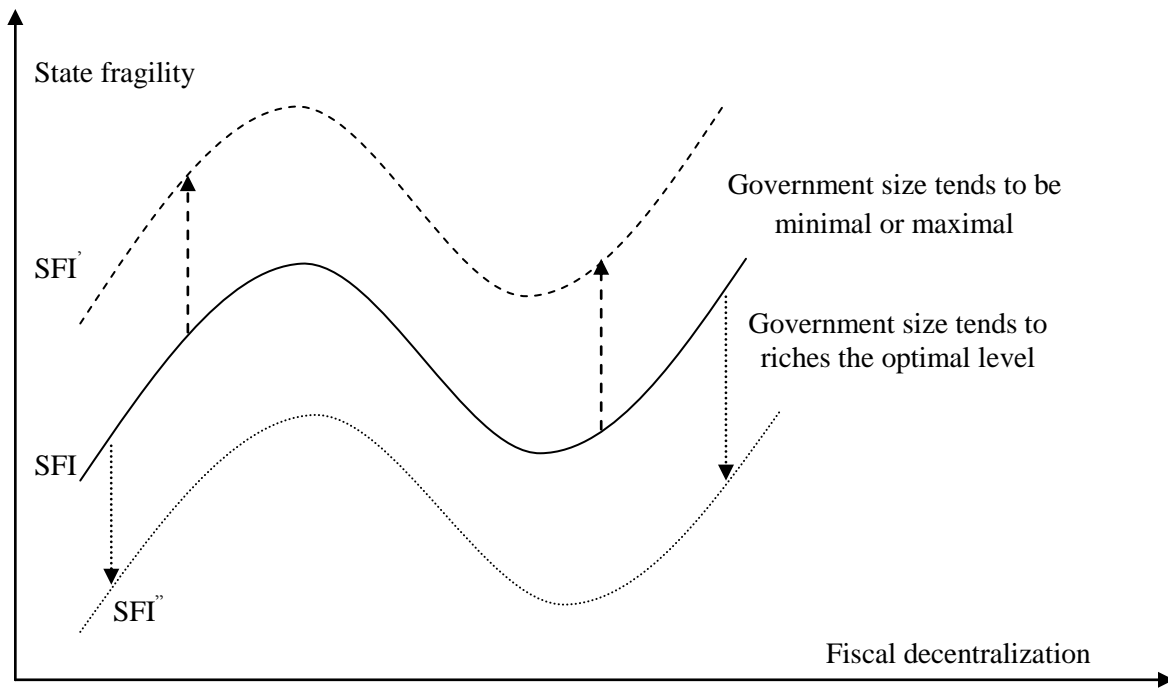


Figure 2: The impact of government size on state fragility