

# Government Size, Decentralization and Growth: a BARS Curve Approach Based on Italian Regional Data

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## Abstract

This paper provides empirical evidence in support of the inverted U-shaped relationship between public expenditure and economic growth, known in the literature as BARS curve, considering also the role played by fiscal decentralization. Our empirical analysis, based on a new panel data from Italian regions over the 1996-2009 period, shows that the bell shape relationship between public expenditure and growth predicted by the BARS curve is not independent from the level of fiscal decentralization.

Keywords: BARS curve; decentralization; Italian Regions; public expenditure; economic growth; panel data

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## 1. Introduction

The aim of this paper is twofold. As a first contribution, it provides an empirical test for the existence of the inverted U-shaped relationship between public expenditure and economic growth, known in the literature as BARS curve (Barro, 1989; Armey, 1995; Rahn and Fox, 1996; Scully, 1994, 1995), using a panel of local governments based on data from Italian regions over the 1997-2009 period. As a second contribution, for the first time the BARS curve approach is used to study the relationship between fiscal decentralization and growth.

The general consensus in the theoretical economic literature of the last 30 years (consider, for example, Romer, 1986; Lucas, 1988; Barro, 1989, 1990a; Rebelo, 1991) is that government plays an important role in the growth process by different transmission channels. As a result, also the empirical literature that studies the relationship between government size and economic growth has flourished during the last 30 years providing, however, contrasting evidence that leaves the debate still open on what is the sign of the relationship<sup>1</sup>.

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<sup>1</sup>The political environment is another relevant factor that affects growth. Alesina et al. (1996) use data on 113 countries from 1950 to 1982 to show that GDP growth is significantly

In order to explain these contrasting results, the recent literature on public expenditure and growth emphasizes mainly the existence of an empirical relationship between government size and GDP growth which takes the form of an inverted U-shaped curve, sometimes called the Armey curve (Armey, 1995) or also the “BARS curve” referring to Barro (1989), Armey (1995), Rahn and Fox (1996), and Scully (1994, 1995), the main economists who developed this idea. The empirical research produced so far in this field aims to test the existence of such a relationship in different countries by means of a wide range of econometric techniques, which share a common characteristic: all involve the use of national data. Examples are given by Scully (2003), Vedder and Gallaway (1998) Tanzi and Schuknecht (2007), Pevcin (2004, 2008), and Magazzino (2010).

Moreover, in recent years a parallel empirical literature evolved over the analysis of the relationship between fiscal decentralization and economic growth. Although the general consensus seems to move more into the direction of a positive relationship, based on the idea that greater decentralization on the spending side is expected to deliver greater efficiency in the provision of public goods and services, at the moment the empirical evidence provides also in this case unclear results. For instance, Lin and Liu (2000), Thießen (2001), Akai and Sakata (2002), Iimi (2005), Martinez-Vazquez and McNab (2003), Stansel (2005), Bodman e Ford (2006), and Akai et al. (2007) give evidence that supports the existence of a positive relationship between fiscal decentralization and economic growth; instead, Davoodi and Zou (1998), Zhang and Zou (1998), Davoodi et al. (1999), Rodriguez-Pose and Bwire (2004), and Thornton (2007) show evidence in the opposite direction.

The absence of clear results both in the empirical literature concerning the impact of government size on economic growth and in the studies on the relationship between fiscal decentralization and growth, creates the room for other investigations that involve new approaches. In our opinion, applying the BARS curve approach using sub-national governments data rather than national ones (as done so far in the literature) offers the opportunity to test - in an empirical model - both the impact exerted by government size and fiscal decentralization on economic growth.

Therefore, the main contribution of this study would be the construction of a bridge between the empirical literature on BARS curve and that studies regarding the impact of fiscal decentralization of economic growth. To that end, we construct a new and unique dataset based on a panel of Italian sub-national governments (regions) over the 1997-2009 period. In fact, Italian regions are supposed to be a good laboratory for applied analyses, inasmuch as they share relevant common institutional features, having been characterized by an intense

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lower in countries and time periods with a high propensity for government collapse. In a more recent paper, Jong-a-Pin (2009) also found that higher degrees of political instability lead to lower economic growth. With regards to private investment, Alesina and Perotti (1996) showed that socio-political instability generates an uncertain politico-economic environment, raising risks and reducing investment. Political instability also leads to higher inflation, which decreases growth, as shown in Aisen and Veiga (2006).

process of fiscal decentralization over the period of our analysis.

The most important innovation of our estimates concerns the inclusion, in the econometric model, of a number of interaction variables that would be able to capture the combined effect of decentralization and government size on growth dynamics. To our knowledge, for the first time the BARS curve approach has been used in order to test the impact of expenditure and tax revenue decentralization on economic activity.

Moreover, a dataset based on sub-national governments has never been used in empirical studies on the BARS curve, and we suggest that our “local” approach can attenuate some of the weaknesses of the recent empirical analysis based on panel data. First, the fact that they consider national data affected by huge degree of heterogeneity, which the fixed effect estimators may not be able to grab, leading to a serious problem of omitted variables (consider, for example, the difficulty of taking into account the impact of changes in the institutional framework of each country that may occur in different years). Second, they provide a value for the optimal government size which is a sort of benchmark for all the countries included in the analysis. This makes sense only if the countries included in the dataset are following homogeneous growth paths. If this assumptions does not hold, there may be some conceptual problems in using panel data based on different countries, despite the advantages that this econometric technique shows when compared to early time-series analysis, or early cross-sectional analysis.

Our final results provide evidence that supports the existence of a combined effect of decentralization and government size on economic growth, leading us the conclusion that the BARS curve assumption should be extended to a more articulated framework focused not only on the size of government but also on its composition between central and local authorities.

In particular, our results confirm the existence of the inverted U-shaped relationship between public expenditure and economic growth only when the level of expenditure decentralization is below the threshold value of 32%, in this case we estimate an optimal size of government close to the 52% in terms of public expenditure over GDP, supporting the idea that a perfect mixed economy is the best environment to favour economic growth. The optimal government size remains almost constant when the impact of fiscal decentralization is taken into account and higher decentralization stimulate higher output growth: from 2.6% when the decentralization index is fixed to 0%, to 3.0% when decentralization index is fixed close to 32%. Moreover, we observe that when decentralization is close to the threshold value of 32% a sub-optimal value in the government size leads to a lower loss in terms of GDP growth rate with respect to low decentralization. Thus, in this case, decentralization seems to be a sort of “insurance” against temporary shocks that affect public expenditure (government size) leading to better results in terms of economic growth with respect to centralization.

When the level of fiscal decentralization exceeds the threshold value of 32%, keeping constant the government size at 52% would lead to a drop in the output growth. In this case the optimal policy to enhance economic growth, according to our estimates, is the contemporaneous contraction of the government size

and expansion of expenditure decentralization. For example, the combination of: government size close to 35%, and fiscal decentralization close to 47%, is compatible with a rate of growth of 3.05%. These findings are not completely surprising because they match with the general trend observed among OECD countries where, if one excludes the nordic countries (Denmark, Finland, and Sweden), the correlation between government size and expenditure decentralization is roughly -0.35. For example, United States present a small government size and high degree of decentralization, instead France shows an opposite situation.

Besides this introduction, the rest of the paper is organized as follows: section 2 provides a literature review focused both on the relationship between government size and economic growth, and on the relationship between fiscal decentralization and growth; section 3 shows the econometric strategy and the data, while section 4 discusses the results of our estimates. Finally, section 5 concludes. Tables and figures are placed in the appendix, where we also describe in more details the institutional framework of Italian regions.

## 2. Public spending, fiscal decentralization and growth: a brief literature review

### 2.1. Linear relationship between government size and growth

Most of the “first generation” empirical literature (prior to the late 90’s-early 00’s) on the relationship between government size and economic growth is based on the linear formulation of the relationship between public expenditure (as a proxy of the size of the public sector) and GDP growth<sup>2</sup>. The evidence provided by this “first generation” literature is not conclusive, although the number of papers in support of a negative relationship between public expenditure and growth is slightly larger.

In particular, Robinson (1977), Ram (1986), and Grossman (1988, 1987) found evidence of a positive relationship between public spending and growth; Landau (1983), Grier and Tullock (1987), Barro (1990b), and Engen and Skinner (1992) provided evidence in line with a negative relationship; instead, Kormendi and Meguire (1985), and Hsieh and Lai (1994) found no significant relationship.

Hansson and Henrekson (1994) tested the effect of different kinds of government expenditure on productivity growth in the private sector showing that government transfers, consumption and total outlays have consistently negative effects, while educational expenditure has a positive effect, and government investment has no effect on growth. Following the same research line, Devarajan

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<sup>2</sup>It is important to underline here if public expenditure is, *per se*, a questionable measure of public sector size. In fact, it does not take into account other institutional factors that help to capture the real structure and dimension of government size (at all possible levels), such as the vertical structure of government tiers, the political and electoral system, the bureaucratic weight of government on the open market functioning, etc. Despite this consideration, probably because of the difficulties in considering other context factors relevant to public expenditure, spending has been largely used as measure of government size in almost all empirical papers.

et al. (1996) used data from 43 developing countries over 20 years, showing that an increase in the share of current public expenditure has positive and significant growth effects. By contrast, the relationship between the capital component of public expenditure and per capita GDP growth is negative.

Agell et al. (1997), using a simple cross-country regressions, claimed that the empirical evidence did not allow any conclusion on the direction of the relationship between economic growth and the size of the public sector because point estimates are very sensible to the set of control variables included in the model. In a reply to Agell et al. (1997), Folster and Henrekson (1999) argued that their conclusions were based on previous empirical studies, and on their own regressions, without evaluating the econometric problems that arise. They extended the model, showing that once a number of econometric issues are investigated, the relationship between growth and public expenditure may be more robustly negative than it first appears.

In a subsequent paper, Folster and Henrekson (2001) extended their previous econometric model, conducting a panel data analysis on a sample of rich countries covering the 1970-95 period. Their general findings are that the more econometric problems are addressed, the more robust the relationship between government size and economic growth appears to be negative.

## 2.2. From linear specifications to BARS curve

The natural question that derives from the ambiguous results of the first generation literature is whether there is an optimal “size of government” in relation to the GDP growth maximization, allowing for a non-linear relationships between government expenditure and economic growth. It is clear that, although the advantage of a small government sector reflects the greater efficiencies resulting from fewer policy-induced distortions (such as the tax burden), this does not imply automatically that the optimal policy is one that minimizes the size of government. In fact, a too-small public sector could be ineffective in providing the legal, administrative, and governance infrastructure critical for growth, as well as for offsetting market failures. Therefore, it seems reasonable to suppose that the relationship between government size and growth is far from being monotonic.

The empirical literature, starting from the late 90’s, investigated the possibility of a non-linear relationship emphasizing the existence of an inverted U-shaped curve between government size and GDP growth (Armey, 1995; Rahn and Fox, 1996; Barro, 1989; Scully, 1994, 1995).

The seminal idea on the functional form of a BARS curve is due to Armey (1995), who proposed a curve with a bell’s shape, showing the relationship between the ratio of public expenditure to GDP and the variation of GDP, as a measure of the general welfare of a country (Figure 1). In other words, he suggested a relationship similar to the Kuznets curve<sup>3</sup> between government ex-

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<sup>3</sup>A Kuznets curve (Acemoglu and Robinson, 2002) is the graphical representation of Simon Kuznets’ hypothesis that as a country develops, there is a natural cycle of economic inequality

penditure and economic growth, and indicates that the form of the relationship between government size and economic growth should be modeled as a quadratic function<sup>4</sup>.

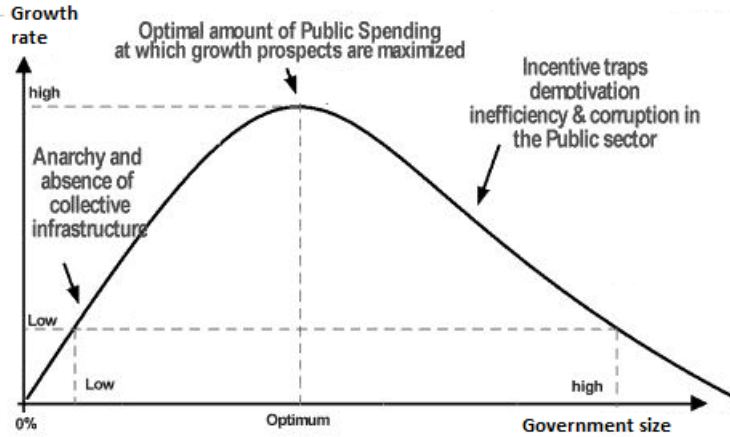


Figure 1: Armey curve

The idea behind the curve's shape is related to our previous considerations: too low level of public expenditure would not allow the state to guarantee the functioning of the market economy, and therefore a positive GDP growth rate. On the other hand, very high rates of public expenditure on GDP would discourage citizens from investing and producing because of the high fiscal burden associated with such endeavors. Moreover, in general public expenditure productivity is lower than that of private expenditure (Aschauer, 1989). The growth enhancing features of government start to diminish when the adverse effects of a big government result in a reduction of output growth. Excess infrastructure lowers benefits per dollar spent while higher tariffs and taxes demotivate imports and exports. Further expansions of government contributes to a further decline in output (Vedder and Gallaway, 1998)<sup>5</sup>.

driven by market forces which at first increases inequality, and then decreases it after a certain average income is attained.

<sup>4</sup>The Armey curve is a statistical relationship which shares some analogies with the Laffer curve (Buchanan and Lee, 1982), a U-shaped relationship between tax revenues and tax rates.

<sup>5</sup>The literature on the BARS curve suffers from a lack of theory since no work provides a comprehensive explanation of the inverted U relationship between government size and economic growth. More often, to justify the existence of an optimal government size, the literature merely refers to the theory of market failures that would clearly define the state's prerogatives (natural monopoly, externalities, ...). As long as governments stick to their prerogatives, government size would be efficient, but beyond it, it would become detrimental to economic growth. However, this explanation of government size optimality cannot properly account for the existence of state failures *per se*, which makes public intervention costly even within the frame of its prerogatives. That leads to the proposal of a theoretical explanation of

From the empirical point of view, the introduction of a non-linear relationship between public spending and GDP growth made the debate shift from seeking a direction in the correlation between government size and growth to the determination of optimal government size.

There are still relatively few studies in the recent literature that empirically test the occurrence of the BARS curve. However, all papers that embarked in this kind of analysis have found evidence in line with the existence of an inverted U-shaped relationship between government expenditure and economic growth, with few exceptions.

Vedder and Gallaway (1998), using a time-series approach, provided empirical evidence supporting the existence of the BARS curve for the United States, Canada, Denmark, Italy, Sweden, and UK. Their empirical specification corresponds to the following model:

$$Y_t = \beta_0 + \beta_1 G_t + \beta_2 G_t^2 + \delta_i year_{dummies} + \gamma U_t + \varepsilon_t \quad (1)$$

where:  $t$  are the indices associated to each year;  $Y$  is the rate of output growth;  $G$  corresponds to government expenditure as a percentage of GDP;  $U$  is a set of control variable in order to capture business cycles, such as the unemployment,  $\varepsilon_t$  is the stochastic component. The presence of the BARS curve is verified if  $H_0 : \beta_1 > 0$  and  $H_0 : \beta_2 < 0$  can not be rejected.

The subsequent empirical literature makes use of different sets of control variables, conserving the basic structure of the model. Moreover, more recent studies tend to use panel data estimations rather than just a time series approach.

The main source of disagreement regards the level of the optimal government's size, usually expressed in terms of public expenditure as a percentage of GDP. Scully (2000, 2002, 2003) found that economic growth rates are maximized when public expenditure is approximately equal to the fifth part of the aggregate income. Some studies on the US, performed on relatively long periods, found an optimal size of around 20% (see for example Peden, 1991 and Scully, 1994). Other studies, focused on European countries' observations for very recent periods establish optimal rates closer to 30% (see Chao and Grubel, 1998; Forte and Magazzino, 2011; Magazzino, 2012). Handoussa and Reiffers (2003) studied the relationship between government size and economic growth in the case of Tunisia. Using data for the three decades from 1968 to 1997, the authors established that 35% of government expenditure as a percentage of GDP is the ideal government size.

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the BARS curve combining the costs and benefits (as shown in Figure 1) of public spending (Facchini and Melki, 2013).

### *2.3. Fiscal decentralization and economic growth*

In recent years a parallel empirical literature evolved over the analysis of the relationship between fiscal decentralization<sup>6</sup> and economic growth. Although the general consensus seems to move more into the direction of a positive relationship based on the idea that greater decentralization on the spending side is expected to deliver greater efficiency in the provision of public goods and services, at the moment the empirical evidence provides unclear results.

For instance, the following papers provide evidence that supports the existence of a positive relationship between fiscal decentralization and economic growth: Lin and Liu (2000) considering 28 Chinese provinces over the period 1970-1993, Thießen (2001) using a panel of OECD countries between 1975-1995, Akai and Sakata (2002) considering USA states between 1992-1996, Iimi (2005) using a dataset of 51 countries between 1997 and 2001, Martinez-Vazquez and McNab (2003) using a panel of 52 countries between 1992 and 1997, Stansel (2005) constructing a dataset of 314 US metropolitan areas between 1060 and 1990, Bodman e Ford (2006) using a panel of OECD countries between 1975-1995, Akai et al. (2007) considering again a panel of USA states between 1992 and 1996.

Instead, the following studies provide evidence in line with a negative relationship between fiscal decentralization and economic growth: Davoodi and Zou (1998) using a sample of 46 countries in the period from 1970 to 1989, Zhang and Zou (1998) using a panel of 28 Chinese provinces between 1980-1992, Davoodi et al. (1999) using a panel of USA states between 1948-1999, Rodriguez-Pose and Bwire (2004) focusing their analysis on 3 federal countries (Germany, India and the United States) and 3 countries that want to adopt a decentralized system (Italy, Mexico and Spain), Thornton (2007) considering a panel of 19 OECD countries over the period 1980-2000.

## **3. The data and the empirical strategy**

The absence of clear-cut results in the two strands of literature discussed in the previous section motivates our empirical strategy of testing the existence of the BARS curve at subnational level in order to estimate, in the same empirical model, both the impact exerted by government size and fiscal decentralization on economic growth.

To that end, we construct a new and unique dataset based on a panel of Italian subnational governments over the 1996-2009 period. Our analysis is focused on the fifteen Italian regions with ordinary statutes<sup>7</sup>. We have excluded

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<sup>6</sup>Fiscal decentralization is mainly measured as the ratio of local government expenditures over general government expenditure, few studies consider the decentralization in terms of fiscal revenues using the ratio of local tax revenue over general government tax revenue, and only Stansel (2005) used the number of local governments as a measure of fiscal decentralization.

<sup>7</sup>The regions of Abruzzo (L'Aquila), Apulia (Bari), Basilicata (Potenza), Calabria (Catanzaro), Campania (Naples), Emilia-Romagna (Bologna), Latium (Rome), Liguria (Genoa), Lombardy (Milan), Marches (Ancona), Molise (Campobasso), Piedmont (Turin), Tuscany



from the sample the five special regions<sup>8</sup>, since there are obvious differences in the mechanisms that regulate total public expenditure in these regions<sup>9</sup>.

We think that our “local” approach allows us to estimate the BARS curve, as well as the optimal size of government, using an institutionally homogeneous panel of observations. In this respect, our setting presents several advantages, given that it is reasonable to assume a similar structure of preferences, input prices and broad institutional arrangements throughout the country, furthermore, Italian regions have a common legal and institutional framework and share the same financing mechanisms.

Since 1972, the year of their formation, regional governments have gained an increasing active role on the spending side. In particular, after the 2001 Constitutional reform, regional governments gained greater autonomy. According to articles 117 and 119 of the Italian Constitution, regional governments’ expenditure decisions are related to the health care, social services, education and culture, housing, viability and transports, infrastructure and economic development. Yet, this role is not exclusive, as the regions exercised their legislative power in compliance with the limits set by the national law, however, during the last years the political power of regional governments has experienced a huge increase (see Appendix B and table 5 for details). Local authorities (8101 municipalities and 111 provinces), although are characterised by a much longer history, manage a smaller amount of public expenditure sharing responsibilities with the other levels of governments in the following sectors: land management and environment (water, sewage, public hygiene), local transport, local police, culture and recreation, education (nursery schools, training programmes).

On the revenue side, up to the early 90’s, regional governments did not have either autonomy nor the power to set tax rates, regional revenues essentially deriving from grants of central governments. A very limited autonomy was introduced in 1992, whereas in 1998 the power to set both the rate of the regional business tax (IRAP) and piggyback personal income tax was established, providing regional governments with a discrete degree of revenue autonomy. During the last twenty years also local authorities have gained much more fiscal autonomy, in particular municipalities through the introduction of the municipal property tax in 1992 and municipal income surtax in 2001. However, the degree of expenditure decentralization is still much larger than the degree of revenue decentralization.

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(Florence), Umbria (Perugia).

<sup>8</sup> The regions of Friuli-Venezia Giulia, Sardinia, Sicily, Trentino-Alto Adige, and Valle d’Aosta enjoy particular forms of autonomy, according to special statute adopted by constitutional law. Furthermore, the Trentino-Alto Adige region encompasses the Autonomous Provinces of Trento and Bolzano (art. 116). The special statute regions have a higher level of legislative autonomy from the central government by virtue of a special statute that allows them to make laws in more fields than the other fifteen regions do.

<sup>9</sup> Moreover, as a robustness check we also exclude the region Lazio in which Rome, the capital of Italy, is located.

### 3.1. The data

For the econometric analysis we use data listed in Table 2. Data on regional GDP are taken from the recent reconstruction of official Italian Regional Economic Accounts provided by the Italian National Statistical Institute (ISTAT). These provide a detailed time-homogeneous series for the years 1996-2009 (ISTAT, 2010), followed by other short series (ISTAT, 2012) which correct some of the estimates of the previous dataset.

Data on decomposition of expenditure and revenue among different tiers of Italian levels of governments are taken from the Regional Public Accounts (RPA) produced by ISTAT et al., 2012, a database created jointly by the Italian National Institute of Statistics (ISTAT), the State General Accounting Department (RGS), the Organization for Economic Co-operation and Development (OECD) and other central and local institutions.

The database provides annual data on public sector and it allows for the analysis of various sub-aggregates, covering different macro-areas and administrative regions, sector classifications, economic categories, definitions of government expenditure, and final expenditure recipients. The public sector comprises, in addition to general government, a sector consisting of central and subnational entities that operate in public services segment, subjected to direct or indirect control over their management by public entities and/or receiving financing from such entities.

In the RPA database, data on expenditures are consolidated, i.e. each entity is represented as a final expenditure unit by eliminating flows between entities in the same level of government. Therefore, it is possible to clearly distinguish between expenditures of central, and subnational administrations, allowing to create decentralization measures as ratios of subnational expenditures to total public expenditures.

We measure the level of fiscal decentralization as the fraction of public spending under control of the subnational governments in the total public expenditure (central, regional and local government) allocated to each region as a geographic entity<sup>10</sup>. Instead, the size of government is measured as the percentage of the total public expenditure (central and regional and local governments) registered in each region over the GDP of the regional economy. In order to capture the level of fiscal decentralization from the revenue side we computed the ratio between subnational own tax revenue and local current expenditure ( $VFI$ ), which correspond to an inverse measure of vertical fiscal imbalance, this terms should also capture the impact of different fiscal policies followed by local governments. Therefore, for each region  $i$ , our measures of governments size ( $govsize$ ), fiscal decentralization ( $fiscaldec$ ), and vertical fiscal imbalance ( $VFI$ ) are the following:

$$govsize_{it} = \frac{CG_{it} + RG_{it} + LG_{it}}{GDP_{it}} \quad (2)$$

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<sup>10</sup>Given the small degree of fiscal autonomy compared to the level of expenditure autonomy, we decided to measure the level of fiscal decentralization from the expenditure side.

$$fiscaldec_{it} = \frac{RG_{it} + LG_{it}}{CG_{it} + RG_{it} + LG_{it}} \quad (3)$$

$$VFI_{it} = \frac{RF_{it} + LF_{it}}{RG_{it} + LG_{it}} \quad (4)$$

where:

- $CG_{it}$  = Central government total expenditure in region  $i$  and year  $t$ ;
- $RG_{it}$  = Regional government total expenditure in region  $i$  and year  $t$ ;
- $LG_{it}$  = Local governments (provinces and municipalities) total expenditure in region  $i$  and year  $t$ ;
- $GDP_{it}$  = Total output of in region  $i$ . and year  $t$ ;
- $RF_{it}$  = Regional government total own fiscal revenues in region  $i$  and year  $t$ ;
- $LF_{it}$  = Local governments (provinces and municipalities) own fiscal revenues in region  $i$  and year  $t$ .

We also use data on context variables taken from various sources. Political variables are taken from the Italian Ministry of the Interior; census data are taken from DEMO ISTAT; and data on the degree of openness (import-export) of the regional economies are taken from Territorial Indicators of ISTAT. Table 3 shows the main descriptive statistics.

Figure 2 in appendix A shows the graph of GDP growth rates<sup>11</sup> for the 15 Italian regions considered over the period 1996-2009. Here, one can observe the clear decline of GDP growth rates after 2007, corresponding to the economic-financial crisis. In general, all regions considered shows low levels of growth in the after-crisis period. Moreover, it is possible to observe a clear common growth path followed by all regional economies.

Figure 3 in appendix A depicts the evolution of the size of government (*govsize*) over time for the Italian ordinary regions. Despite the fact that expenditure competencies are the same for all regions considered, they show very different levels of government size. The region that registers, on average, the smallest government size is Veneto, with an average value below 40%, while Calabria is the region with the higher size with a percentage of public expenditure over GDP close to 65%.

Figure 4 in appendix A shows how the decentralization index (*fiscaldec*) changed over time for the Italian ordinary regions. As we can see, starting from 1996 there is a general increasing trend in the expenditure decentralization. However the decentralization of expenditures remain in general under the 30% of total public expenditures with few exceptions, especially after 2006. Region

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<sup>11</sup>Growth rates have been computed as log-differences of real GDP.

Lazio, where the capital city Rome, is located is a clear outlier due to the higher presence of central administration activity, this motivates the exclusion of Lazio from the regression sample as a robustness check.

### 3.2. Empirical model

The previous review of the literature shows the recent focus on the use of panel data analyses in order to test the existence of the BARS curve. Panel data methodology allows us to control for individual countries' heterogeneity as well as to obtain more information through increased variability, less collinearity among variables and greater degrees of freedom. Panel data are better able to study the dynamics of adjustment and to identify and measure some effects not detectable in pure cross-section and time-series data.

In our empirical study, we are introducing some new elements to the analysis, i.e. the role of fiscal decentralization. In particular, our dynamic econometric model, reported in equation 5 in a semi-matrix notation, is an extension of the model used by Forte and Magazzino (2011):<sup>12</sup>

$$g_{it} = \beta_1 g_{ovsize}_{i(t-1)} + \beta_2 g_{ovsize}^2_{i(t-1)} + \delta' D_{it} + \zeta' V_{it} + \gamma_1' I_{it}^D + \gamma_2' I_{it}^V + \theta' C_{i(t-1)} + \eta' T + \sum_{j=1}^J \phi_j g_{i(t-j)} + \alpha_i + \varepsilon_{it}, \quad (5)$$

where:

- $i$  is the regional index and  $t$  is the year index;
- $g$  is the growth rate of regional GDP approximated by the first difference of the logarithm of GDP;
- $g_{ovsize}$  is the total expenditure-GDP ratio;
- $D$  is a second order polynomial of our measure of expenditure decentralization (*fiscaldec*)

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<sup>12</sup>They used data on 27 EU member states from 1970 to 2009 in order to estimate, by means of GLS-RE and GMM-Diff (Anderson-Hsiao) estimators, the BARS curve in the European context. The lack of additional variables which can better capture the institutional and economic differences between the heterogeneous countries included in the analysis could lead to an omitted variables problem (even if the FE specification, theoretically, should capture this aspect). Thus, they broke up the panel in several theoretical homogeneous sub-groups of countries. In fact, the question of heterogeneity is one of the main weaknesses in the use of panel data analysis. The question is that "pooling" many countries in order to find a common optimal government size does not make much sense if one considers countries which are too different in terms of government competencies or public spending mechanisms. They estimated that, in accordance with the peak of the BARS curve, the expenditure-GDP ratio varies from approximately 37% to 43%, depending on the sub-group considered. The estimates' results are similar in the static and dynamic specifications of the model.

- $V$  is a second order polynomial of an inverse measure of the vertical fiscal imbalance ( $VFI$ ) computed as the ratio between subnational own tax revenue and local current expenditure, this terms should capture the different impact of different fiscal policies followed by local governmets;
- $I^D$  represents the interaction term obtained by multiplying  $D_{it} \times (govsize_{i(t-1)} + govsize_{i(t-1)}^2)$ , in order to capture the effect of the interactions between the government size and the level of expenditure decentralization;
- $I^V$  represents the interaction term obtained by multiplying  $V_{it} \times (govsize_{i(t-1)} + govsize_{i(t-1)}^2)$ , in order to capture the effect of the interactions between the government size and the local fiscal policy;
- $C$  is a set of variables which includes census, political, and economic controls;
- $T$  is a quadratic trend
- $\alpha_i$  captures the unobserved heterogeneity;
- $\varepsilon_{it}$  is the idiosyncratic stochastic component.

In line with the literature, we do not expect to reject the  $H_0 : \beta_1 > 0$  and  $H_0 : \beta_2 < 0$  in order to obtain an inverted U-shaped curve (parabola) which relates the GDP growth to government size confirming the existence of the BARS curve. Instead, we do not have any prior about the sign of  $\gamma_1$ . As stated before, though there is a growing empirical literature which relates decentralization to economic growth, to our knowledge it is the first time that the BARS curve approach is used in order to investigate the impact of decentralization on economic growth.

Panel analyses<sup>13</sup> have been conducted through Generalised Methods of Moments (GMM) estimation for panel data. In particular, we used the Arellano and Bond (1991) estimator, which consists in taking the equation to be estimated in first-differences in order to eliminate the specific-effect component. Then, lagged levels of the right-hand side variables are used as instruments.<sup>14</sup>

The use of the dynamic estimations by difference GMM estimator is necessary because, when working with data on public expenditure and GDP, problems of endogeneity and autocorrelation are likely to arise. When such econometric problems exist, the traditional panel data estimators (Pooled OLS, Fixed Effects and Random Effects) do not yield consistent estimates. Whilst the GMM dynamic panel data methods can simultaneously deal with the problem of persistence and endogeneity.

As reported in equation 5, we included the first and the second lag of the dependent variables considering that the third lag did not resulted statistical

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<sup>13</sup>For a detailed analysis of panel modelling used see, among others: Baltagi (2005), Wooldridge (2002), and Roodman (2009).

<sup>14</sup>The alternative GMM system by Blundel and Bond (1998) has not been used given the small number of observations.

significant, and that our test on the autocorrelation in the error component are satisfied by this choice. Moreover, all variables, with the exception of *fiscaldec* and the inverse measure of vertical fiscal imbalance, have been lagged by one period. In particular, we have found, conducting a general to specific analysis, that the government size, census variables, inflation rate, the degree of openness, and political preferences affect the growth rate registered in the next year; instead, variables related to the behaviour of subnational governments exert a more contemporaneous impact of the rate of growth. This can be due to the fact that subnational governments expenditure is more directed toward the allocation function (health care, public transports, environmental services) that generates a more contemporaneous impact on the output growth. Instead, central government expenditure includes mainly the redistribution activity that exerts a smaller direct impact on the rate of growth.

As regards the IV procedure, our set of instrumental variables is composed as follows:

- first of all we use the differences of the GDP growth rate, the government size and the squared government size starting from lag 3 (GMM-style instruments);
- subsequently, we use as additional instruments the logarithm of population, the margin of victory of the ruling party (measured in terms of difference of seats in regional assemblies), the inflation rate and the degree of openness of the economy computed as the ratio between the sum of import and export and the regional GDP of each region (IV-style instruments);
- in conclusion, we also include demographic variables in IV-style instruments, such as the percentage of children (0-14 years old) and the percentage of elderly (65 and more years old), the life expectancy at 65 years, and the infant mortality rate. The last set of variables are considered strictly exogenous regressors and serves as standard instruments with one column in the instrument matrix per variable, therefore, they do not appear in the estimates output.

#### 4. Results

Table 4 in appendix A reports the results for six different specifications of the empirical model in (5), they differ in relation to the structure of the variables used to measure the degree of fiscal decentralization and their interaction with the polynomial of the government size.

The interaction between the the polynomial of the government size and the square of *fiscaldec* and *VFI* did not resulted significant in any regression and generated a huge problem of collinearity, therefore the final model presents (column 6 of table 4) only the interaction between the the polynomial of the government size and the first order terms of *fiscaldec* and *VFI* polynomial.

As a first result we have that the BARS curve is identified at the subnational level only if we take into account also the impact of fiscal decentralization. It

is possible to observe that the coefficients associated to government size and squared government size exhibit always the expected signs but are statistically significant only in columns 4-6, where we include the interaction terms between the polynomial of the government size and fiscal decentralization, which means that the relationship between public expenditure and growth is strictly linked to the government vertical structure (at least in the Italian case).

As regards the impact of fiscal decentralization, both *fiscaldec* and its squared value show always significant coefficients (positive and negative, respectively), providing evidence in favour of a non-linear direct relationship between decentralization and economic growth, which may also explain the contrasting results presented by the empirical literature so far.

In our estimates, the inverse measure of vertical fiscal imbalance (*VFI*) shows an ambiguous effect that, when statistically significant, provides evidence in favour of a negative impact: it seems that the negative effect caused by tax competition prevails on the positive effect caused by the increased accountability<sup>15</sup>. Moreover, the interaction between *VFI* and government size is never statistically different from zero, supporting the idea that what matters, in the interaction between government size and decentralization, is the level of expenditure allocated at different levels of governments rather than the level of subnational authorities' fiscal autonomy.

Therefore, we have a clear-cut result showing that both government size and fiscal decentralization affect the level of economic growth in a non-linear way describing an inverted U-shaped relationships. On the other hand, the interactions terms describe an opposite path: the impact of  $govsize \times fiscaldec$  is negative; instead, the impact of  $govsize^2 \times fiscaldec$  is positive<sup>16</sup>. The main consequence of the last result regards the fact that for values of *fiscaldec* above the threshold level *fiscaldec* the BARS curve disappears. Instead, there is always an optimal level of fiscal decentralization at a given government size. Yet, this point will be discussed in more details in the next subsection.

In conclusion, regarding the control variables we observe that only the inflation rate shows, as we expected, a negative and statistically significant effect. Instead, the other variables do not show any impact statistically different from zero.

In the rest of the analysis we rely on the point estimates reported in column

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<sup>15</sup>About the influence on *VFI* on growth, we know that the specialized literature provides a number of reasons for which the alignment of revenue and expenditure functions of subnational governments could have an ambiguous effect on efficiency and growth. In fact, a smaller *VFI* could have a positive impact due to the increased accountability (Jin and Zou, 2002; Borge and Rattsø, 2003; Eyraud and Lusinyan, 2012; Boetti et al., 2012, for the Italian case). On the other hand, the decentralization of tax revenue may lead to an excess of fiscal competition between subnational governments that, in turn, could negatively affect efficiency and growth (Zodrow and Mieszowski, 1986) or even to a race to the bottom in taxation (Wildasin, 1989), inducing an underprovision of public goods.

<sup>16</sup>As discussed before the interactions between  $govsize \times fiscaldec^2$  and  $govsize^2 \times fiscaldec^2$  have been omitted because their coefficients did not appear statistically significant and their presence generated a huge variance inflation because of collinearity problems.

(6) of table 4 in appendix A, which is the most complete model, since it includes the full polynomial function in terms of government size and decentralization.

#### 4.1. Optimal Government size and Decentralization

Coefficients point estimates reported in model (6) of table 4 in appendix A allows us to study the relationship between government size and growth considering different degrees of fiscal decentralization, as well as how the optimal level of fiscal decentralization is responding to different level of government size.

First of all, we are interested in the context of no decentralization ( $d = 0$ ). In this case, we discover a classical BARS curve as reported in the following equation 6:

$$g = 10.251s - 9.835s^2. \quad (6)$$

where  $g$  is the GDP growth rate,  $s$  is the government size. We are interested to the region of the domain in which  $s \in [0, 1]$ .

Figure 5 in appendix A graphs the estimated BARS curve based on equation 6 assuming no decentralization. The maximum of such a curve is located in correspondence of the optimal government size, which is equal to 52.112% of the economy. The correspondent maximum value of the GDP growth rate is about 2.67%. This value is just theoretical, without taking into account the impact of the other control variables included in the model. Therefore, under the assumption of a complete centralized system, our results support the idea that a perfect mixed economy is the best environment to favour economic growth.

When the impact of fiscal decentralization is taken into consideration the equation of the BARS curve becomes as follows:

$$g = 10.251s - 9.835s^2 + 10.462d - 3.182d^2 - 32.244ds + 30.941ds^2 \quad (7)$$

where  $g$  is the GDP growth rate,  $s$  is the government size, and  $d$  is the decentralization index.

Figure 6 in appendix A shows the graph of the estimated BARS curve based on equation 7 considering different degrees of government size decentralization. We restrict the range of variations between a realistic interval for both measures: 35%-60% for government size and 5%-60% for fiscal decentralization<sup>17</sup>.

From the analysis of equation 7 it is possible to show that  $fiscaldec \simeq 32\%$ . As long as the level of fiscal decentralization remains below the threshold of 32%, the inverted U-shaped relationship between the size of government and the rate of growth is verified, the optimal level of government remains almost constant, close to 52%, and the correspondent rate of growth is increasing with

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<sup>17</sup> According to the 2011 OCED general government accounts, the country with the lowest ratio between public expenditure and GDP is Switzerland (35%), the country with the highest ratio is Denmark (58%) the total average is around 48%, instead the country with the lowest level of expenditure decentralization is Greece (5%), the country with the highest level of expenditure decentralization is Switzerland (51%).



the level of fiscal decentralization, as shown in figure 6 and reported in the following table 1<sup>18</sup>.

Table 1: Decentralization index, government size and growth

Decentralization index	Optimal size of Government	Max GDP growth rate
0.0%	52.1%	2.67%
10.0%	52.1%	2.85%
20.0%	52.1%	2.96%
25.0%	52.1%	2.99%
30.0%	52.2%	3.00%
32.0%	53.7%	3.01%

Moreover, our estimates show that when government size remains close to 52%,  $\overline{fiscaldec}$  corresponds also to the optimal value of fiscal decentralization; thus, when the BARS curve is validated, the combination  $govsize \simeq 52\%$  and  $fiscaldec \simeq 32\%$  provides the optimal government structure, which maximize the output growth.

Before studying what happens when fiscal decentralization exceed the threshold value, it ought to be noted that when  $fiscaldec < \overline{fiscaldec}$  the impact of change in the government size with respect to the optimal size is smoothed. By other words, when decentralization is high (remaining under the critical value) a sub-optimal value in the government size leads to a lower loss in terms of GDP growth rate with respect to low decentralization. Hence, decentralization seems to be a sort of “insurance” against temporary shocks that affect public expenditure (government size) leading to better results in terms of economic growth with respect to centralization. This can be seen in figure 6, where the surface is almost flat in correspondence to the the threshold value<sup>19</sup>.

If the level of fiscal decentralization exceeds the threshold value of 32% - keeping constant the government size at 52% - would lead to a drop in the output growth. As shown by figure 6, when  $fiscaldec > \overline{fiscaldec}$  the optimal policy to enhance economic growth, according to our estimates, involves the contraction of the government size and the expansion of fiscal decentralization. Figure 7 helps to visualize this last point (in this figure the optimal level of fiscal decentralization is reported in relation to the government size). Despite the quadratic shape, the optimal values for  $fiscaldec$  are generally decreasing with the government size, leading us to the conclusion that when  $fiscaldec < \overline{fiscaldec}$  decentralization and government size can move in the same direction to stimulate the economic growth, instead when  $fiscaldec > \overline{fiscaldec}$  the optimal policy involves the opposite strategy. Moreover, the combination between low government size and high fiscal decentralization, according to our estimates, should stimulate higher growth than the combination between high government

<sup>18</sup>The maximum GDP growth rate refers to the interaction between decentralization and government size without considering all other variables which influence the growth process.

<sup>19</sup>This point clearly deserves an in-depth theoretical analysis that goes beyond the scope of this paper, and that we leave to further extensions.

size and low fiscal decentralization.

Nevertheless, these findings are not completely surprising since they are in line with the general trend observed among OECD countries where - if one excludes the nordic countries (Denmark, Finland, and Sweden) - the correlation between government size and expenditure decentralization is roughly -0.35. For example, United Staes present a small government size but high degree of decentralization, whereas France shows an opposite situation.

#### *4.2. Robustness Checks*

In order to test the internal validity of our results we have performed several robustness checks.

As first step, we checked the robustness of the dynamic estimates conducting the Arellano-Bond autocorrelation test to verify that the error terms in the levels equation are not autocorrelated. If this condition holds, then the error terms in the first-difference equation presents negative first-order autocorrelation, and 0 second order autocorrelation. The Arellano-Bond test for autocorrelation - which is applied to the first differenced residuals - reports a P-value smaller than 0.05 for all estimations, confirming that residuals are AR(1), as expected in the first differences. The Arellano-Bond test applied to the second differenced residuals reports a P-value greater than 0.05 for all estimations. As a result, it is possible to reject the hypothesis of autocorrelation in second differences, concluding that the error term in the levels equation is not autocorrelated.

Afterwards, we used the Sargan test in order to check the validity of the included instruments. In our estimates we register P-values of the Sargan test greater than 0.05, so we can confirm the validity of the instruments (under the null hypothesis, the estimates are not weakened by many instruments).

To test the validity of the specification reported in table 4 in Appendix A, we reported in appendix C a series of estimates considering the following hypothesis as robustness check:

- First we control the robustness of the results substituting the quadratic trend with year dummies (see table 6);
- subsequently, we check how the results can change using a classical Fixed Effect model instead of the more sophisticated GMM dynamic panel data model (see table 7);
- as a further robustness check, we restrict the sample excluding Lazio, the region in which is located Rome where most the activity of the central government takes place. Lazio, in fact, is an outlier in terms of the level of fiscal decentralization and government size due to the high presence of central administrations in its territory (see table 8).

Notwithstanding, final results remain qualitative the same with all alternative specifications of the baseline model reported in table 4 in appendix A.

## 5. Conclusions

In the recent decades, there has been a general growth in the size and aim of government, due to the institution of modern welfare state systems and interventions in the economic process. At the same time, a number of countries - and Italy in particular - are decentralizing public expenditure to lower tiers of government. Concurrently, rates of economic growth in the EU countries have undergone a systematic reduction through time.

Within the theoretical framework provided by the BARS curve, we empirically analysed the combined effect of government size and decentralization on regional growth. Using Italian regional data we have found the following results:

- the first one is that, when the degree of decentralization is reasonably low (below the 32% of expenditure decentralization), a BARS curve has been successfully found, and the optimal government size remains almost constant, assuming a value close to the 52%, supporting the idea that a perfect mixed economy is the best environment to favor economic growth;
- second, when below the threshold value of 32%, the decentralization process attenuates the negative impact of sub-optimal expenditure policy on growth;
- however, when fiscal decentralization exceeds the 32%, the inverted U-shaped relationship between government size and growth disappears, showing that the theoretical framework of the BARS curve is not independent from the vertical structure of government;
- finally, although the direct relationship between fiscal decentralization and economic growth follows a robust inverted U-shaped pattern, according to our estimates, higher levels of fiscal decentralization can always stimulate economic growth, if coupled with a government size close to 52% when decentralization remains below the critical value of 32%, if coupled with a contraction of government size when decentralization is pushed above this threshold.

The main policy implication that can be drawn for Italy is that the composition of expenditure (across regions and sectors), rather than its size, should be taken into account to stimulate the economic growth. In fact, average figures show a government size close to 52% and a degree of expenditure decentralization of 28%.

In our opinion, these conclusions may represent a good starting point for further research about the impact of decentralization on government size. In particular, further analysis will be also necessary in order to investigate the possible different impact of decentralization on disaggregated expenditure, mainly at current and capital level (Forte and Magazzino, 2014).

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## APPENDIX

### *Appendix A - Tables and Figures*

Table 2: Data sources

Variable	Source
Regional real GDP	Regional Economic Accounts - ISTAT
Population and census	DEMO ISTAT
Price consumption index (no tobacco)	ISTAT
Political variables	Italian Ministry of Interior
Import and export - Extra UE	Territorial Indicators - ISTAT
Public expenditure and fiscal revenues	Regional Public Accounts - ISTAT/OECD/RGS

Table 3: Descriptive statistics, 1996-2009

	N	mean	SD	min	max
Real regional GDP growth rate	195	0.01	0.02	-0.06	0.08
Government size (% GDP)	210	0.52	0.09	0.34	0.74
Expenditure decentralization index (% total expenditure)	210	28	4	14	36
Inverse measure of vertical fiscal imbalance (% total local expenditure)	196	0.43	0.15	0.11	1.00
Inflation rate	195	0.02	0.01	0.01	0.03
Export - Extra UE (%GDP)	135	17.97	9.69	0.91	34.39
Import - Extra UE (%GDP)	135	15.10	8.57	1.52	39.08
Centre-Left regional government (dummy)	210	0.62	0.49	0.00	1.00
Margin of victory (no. of seats in regional parliament)	210	12.30	4.69	6.00	25.00
Population (millions)	210	3.25	2.34	0.32	9.80
Population 0-14 (% total population)	195	0.14	0.02	0.10	0.19
Population over 65 (% total population)	195	0.19	0.03	0.13	0.26
Life expectancy over 65 (no. of years)	165	19.12	0.75	16.77	20.47
Infant mortality rate	165	10.37	4.23	0.00	26.57
Total expenditure CG (%GDP)	210	38	7	24	55
Total expenditure LG (%GDP)	210	6	1	4	0.10
Total expenditure RG (%GDP)	210	8	3	3	16
Own tax revenue CG (% total local expenditure)	210	26	2	21	32
Own tax revenue LG (% total local expenditure)	210	2	0	1	3
Own tax revenue RG (% total local expenditure)	210	3	1	0	7

Notes: CG: Central Government; RG: Regional Government; LG: Municipalities and Provinces



Table 4: Dynamic point estimates (Dependent variable: regional GDP growth rate)

VARIABLES	1 GMM-DIFF	2 GMM-DIFF	3 GMM-DIFF	4 GMM-DIFF	5 GMM-DIFF	6 GMM-DIFF
L.GDP growth rate	-0.170837 (0.125)	-0.149977 (0.121)	-0.099570 (0.128)	-0.128080 (0.128)	-0.124228 (0.140)	-0.126168 (0.145)
L2.GDP growth rate	-0.302936*** (0.096)	-0.313906*** (0.098)	-0.299247*** (0.085)	-0.360811*** (0.096)	-0.357631*** (0.098)	-0.362502*** (0.101)
L.Government size	0.089311 (0.085)	0.800439 (0.662)	0.578050 (0.669)	9.754416*** (3.260)	10.080415** (3.902)	10.251555** (3.964)
L.Squared government size		-0.630896 (0.577)	-0.430574 (0.580)	-9.188172*** (2.921)	-9.637898** (3.633)	-9.835981** (3.716)
L.Government size*Dec. index				-31.825793** (11.362)	-32.051995** (12.214)	-32.244210** (12.358)
L.Squared gov. size*Dec. index				30.180721*** (10.148)	30.599505** (11.154)	30.941034** (11.346)
L.Government size*VFI measure					-0.721946 (1.849)	-0.859969 (1.912)
L.Squared gov. size*VFI measure					0.855238 (1.870)	1.129247 (1.991)
L.Government size*VFI measure*Dec. index						-0.582088 (0.798)
Decentralization index			0.268133** (0.125)	9.970264*** (3.117)	9.985321*** (3.267)	10.462615*** (3.462)
Squared decentralization index				-2.609327** (0.998)	-2.614898** (0.995)	-3.182998** (1.137)
Vertical fiscal imbalance measure			0.047248** (0.017)	0.214338*** (0.065)	0.339617 (0.443)	0.444438 (0.473)
Squared vertical fiscal imbalance measure				-0.155442** (0.057)	-0.136940* (0.072)	-0.161835** (0.073)
Population	0.074335 (0.202)	0.126078 (0.210)	0.176645 (0.198)	-0.071841 (0.239)	-0.041688 (0.204)	-0.027708 (0.192)
L.Centre-Left Government	0.002125 (0.009)	0.001079 (0.008)	0.000410 (0.008)	0.000584 (0.008)	0.000885 (0.008)	0.000461 (0.008)
L.Difference Maj.-Min seats in reg. ass.	-0.000042 (0.001)	0.000020 (0.001)	-0.000045 (0.001)	-0.000141 (0.001)	-0.000161 (0.001)	-0.000113 (0.001)
L.Inflation rate	-1.692248*** (0.327)	-1.653902*** (0.320)	-1.912438*** (0.320)	-1.713992*** (0.555)	-1.765948*** (0.504)	-1.838342*** (0.482)
L.Openness	0.042960 (0.064)	0.053003 (0.063)	0.079606 (0.067)	0.077666 (0.060)	0.078320 (0.062)	0.086245 (0.062)
Year	2.254000** (0.869)	2.030517* (1.082)	2.534299** (0.988)	0.420865 (1.720)	0.632162 (1.589)	0.723633 (1.602)
Squared year	-0.000563** (0.000)	-0.000507* (0.000)	-0.000633** (0.000)	-0.000106 (0.000)	-0.000159 (0.000)	-0.000181 (0.000)
Observations	120	120	120	120	120	120
Number of Regions	15	15	15	15	15	15
AR(1) test statistic	-3.177	-3.263	-3.159	-3.064	-2.990	-2.971
P-value of AR(1) statistic	0.00149	0.00110	0.00158	0.00218	0.00279	0.00297
AR(2) test statistic	-1.557	-1.030	-0.272	-0.0727	-0.0306	-0.132
P-value of AR(2) statistic	0.120	0.303	0.786	0.942	0.976	0.895
Sargan statistic	107.4	112.0	109.4	108.6	109.3	109.4
Degrees of freedom for Sargan statistic	89	106	107	103	101	100
P-value of Sargan statistic	0.0897	0.325	0.418	0.333	0.270	0.244

Notes: Robust Standard Errors in parentheses  
\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

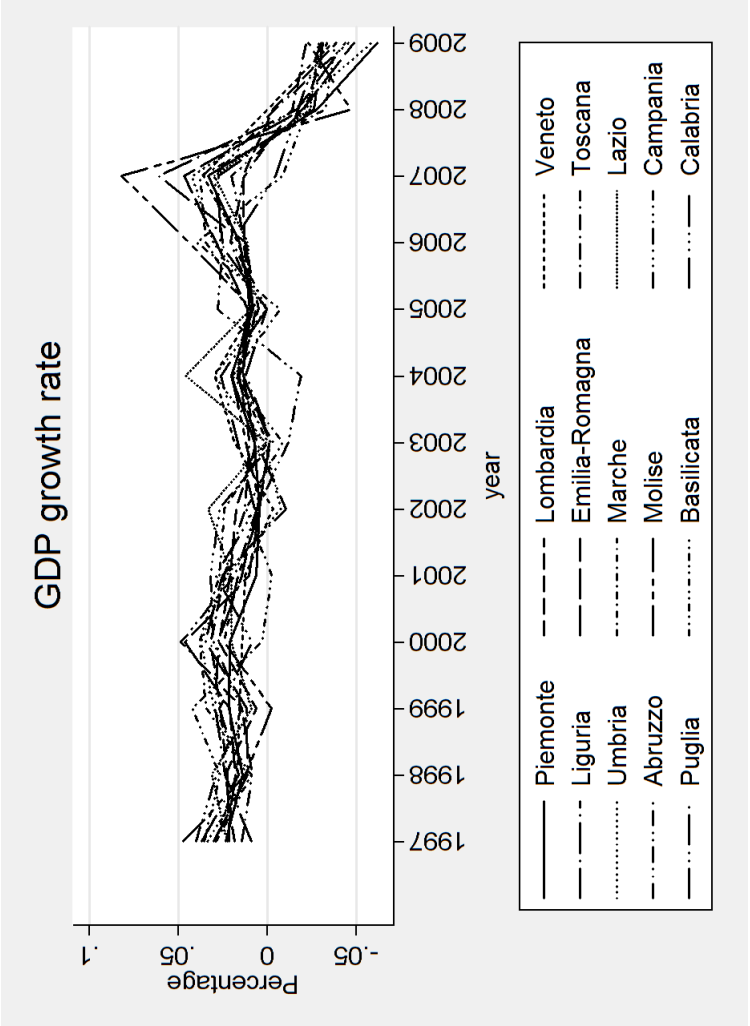


Figure 2: GDP growth rate over time - 15 Italian regions

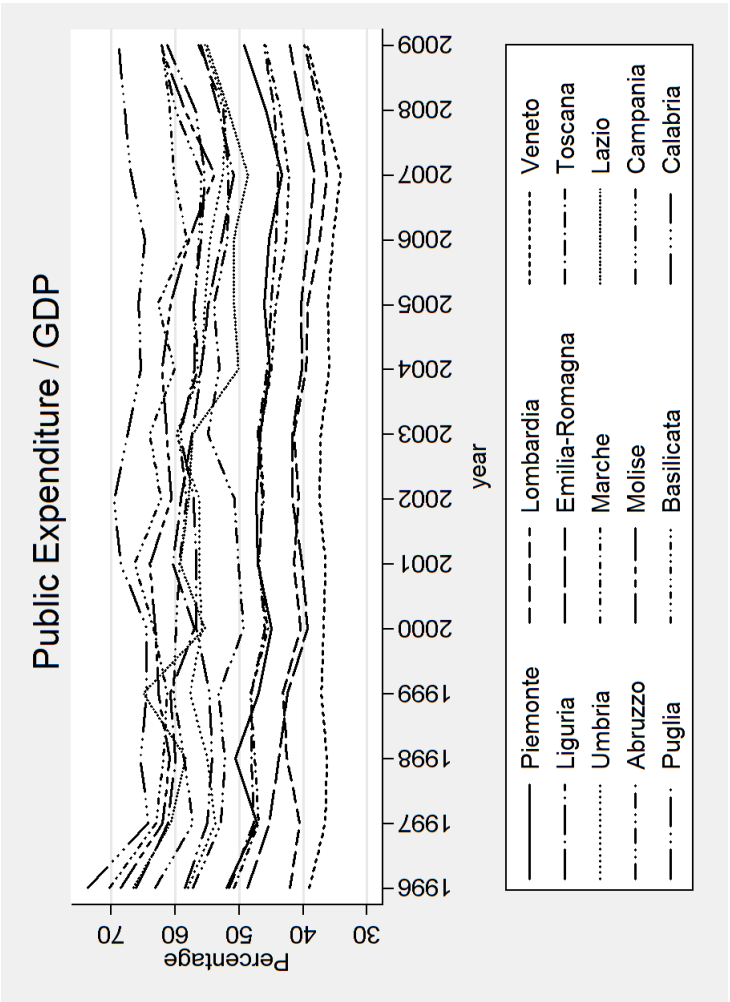


Figure 3: Government size over time, 15 Italian regions

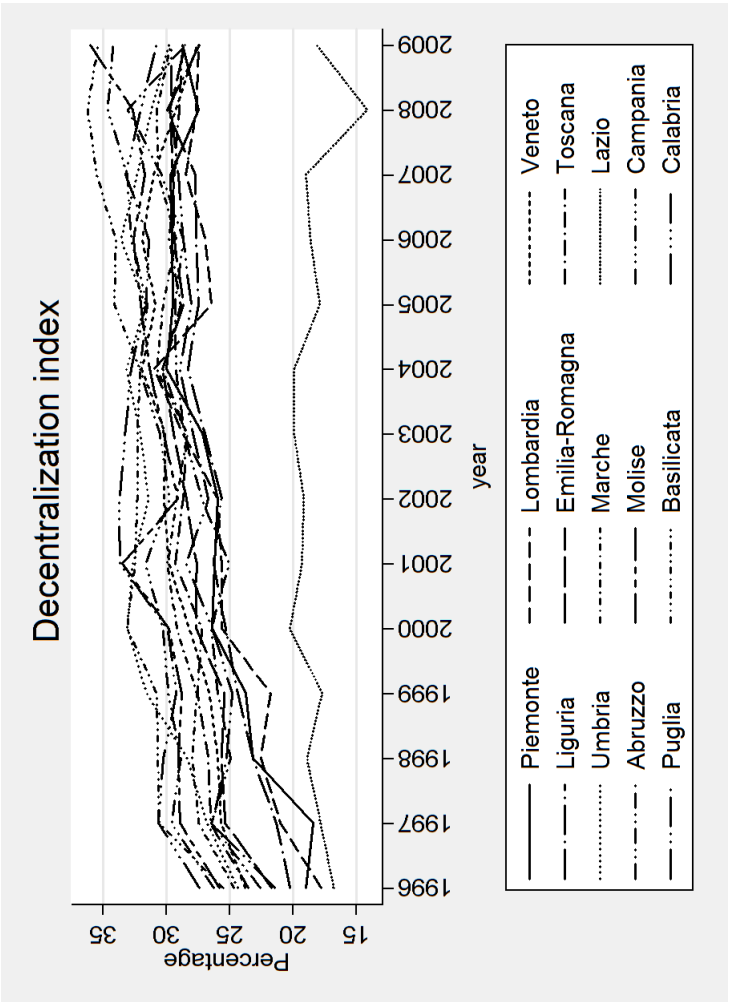


Figure 4: Decentralization index over time, 15 Italian regions

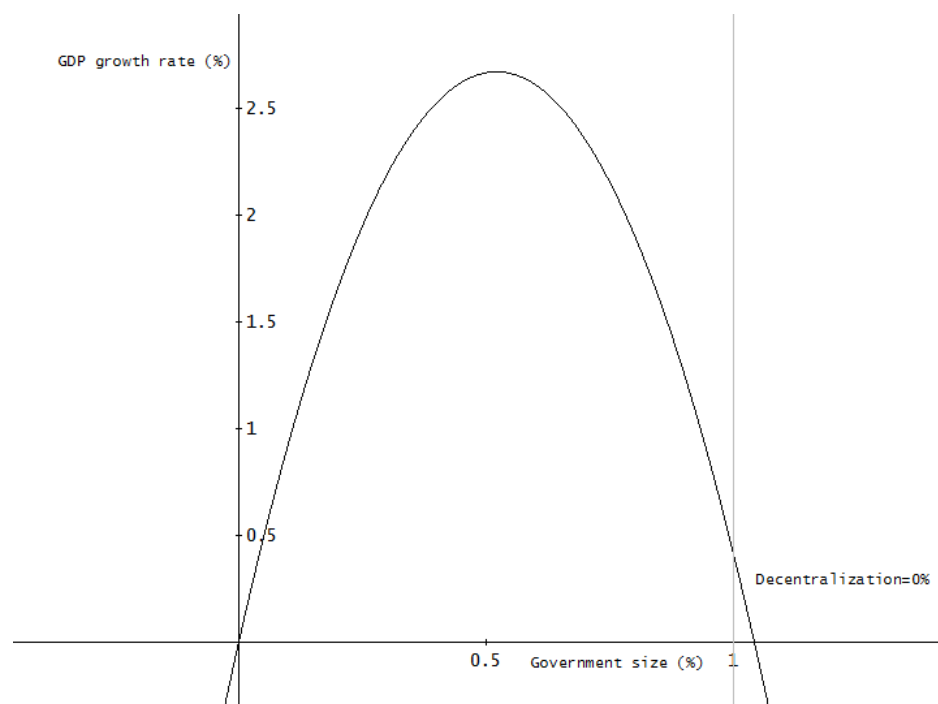


Figure 5: Estimated BARS curve without expenditure decentralization

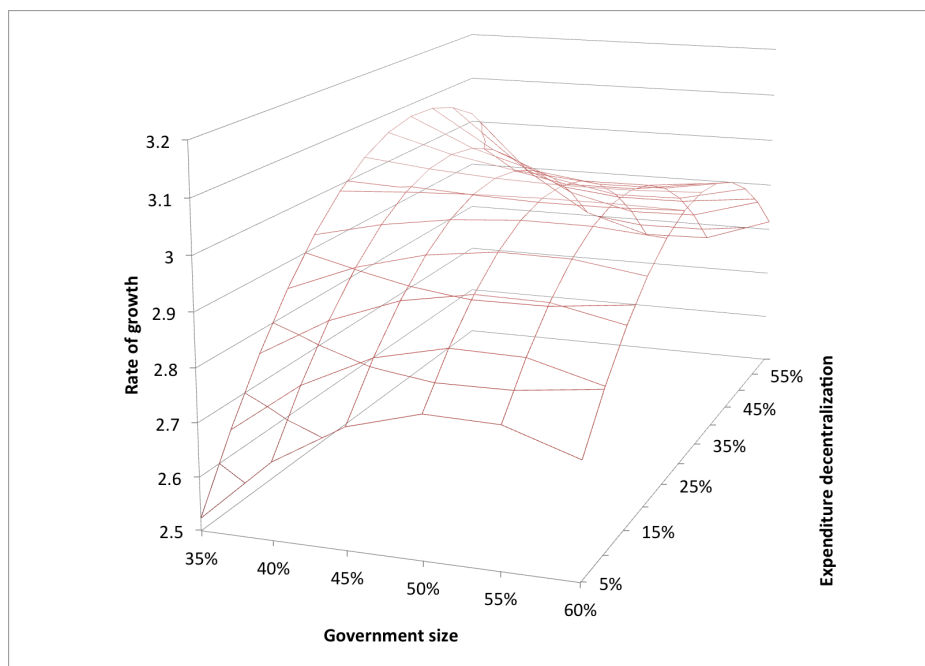


Figure 6: Estimated BARS curve with expenditure decentralization

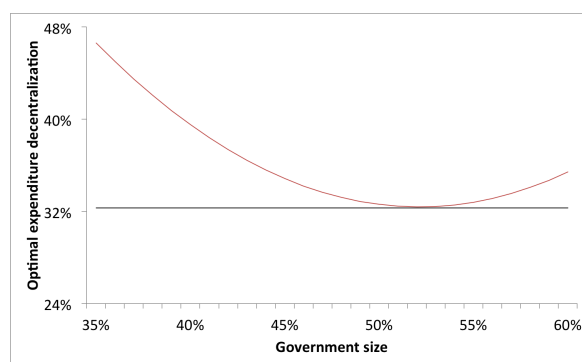


Figure 7: Optimal expenditure decentralization and government size

### *Appendix B - Italian Regions: institutional framework*

Italy is a unitary democratic parliamentary republic ruled by a central government with three sub-national levels: 20 regions (*regioni*), 111 provinces (*province*), and 8101 municipalities (*comuni*).

As regards the regional governments, the most important sub-national level of government, the development of Italian regionalism can be roughly divided into three stages: the early times (1948-1972), the implementation of regional autonomy (1972-1999), and the new constitutional framework (from 1999 on), which remains in the process of implementation (Bilancia et al., 2010).

Between 1972 and 1999, the autonomy regime was implemented in a long and complex process and the political support for creating a system of regional self-government. The largest set of reforms began with the law on reorganization of the ministerial bureaucracy (Law No. 400/1988, rationalizing decision-making procedures and formalizing the role of the *Conferenza permanente per i rapporti tra lo Stato, le Regioni e le Province autonome* (Standing Conference for Cooperation between the State, the Regions and the Autonomous Provinces), a cooperative body established to discuss issues of regional interest. Law No. 142/1990 included a number of provisions aimed at improving the efficiency of the *comuni* (municipalities) and *province* (provinces). Law No. 81/1993 was a significant step toward raising awareness of local self-government, with the introduction of direct elections for *sindaci* (mayors) and *presidenti di provincia* (provincial presidents). Four non-constitutional laws, the so-called Bassanini laws (Law n. 59/1997; 127/1997; 191/1998 and 50/1999), were approved by the center-left majority, constituting a substantive, if not formal constitutional change, because they redesigned the division of legislative and administrative competencies, enumerating those of the central government and making the regions responsible for the remainder.

The most important constitutional reform after 1948 was introduced in 2001 (Constitutional Law No. 3/2001), when the division of legislative and administrative powers between the central and regional governments was drastically changed: from this time onward, the legislative powers of the central government and the fields of concurrent legislation (i.e., those in which the regional governments can legislate only within the framework of general guidelines established in national law) were listed in the constitution (Art. 117 Const.). All remaining legislation belongs to the regional government in a way that resembles the typical residual power clause of federal constitutions. The 2001 reform plainly qualifies the regions as “constituent parts of the Italian Republic and as autonomous levels of government” (Art. 114 Const.). Table 5 shows the distribution of expenditure competencies for central and regional government.

Since the beginning of the 90s provinces and, in particular, municipalities have been characterised by intense increase in their fiscal autonomy with the introduction of the municipal property tax in 1992 and the income surtax in 2001. Instead, from the expenditure side, their competences have remained almost unchanged over the last twenty years mainly in the sectors of land management and environment (water, sewage, public hygiene), local transport, local police, culture and recreation and education (nursery schools, training programmes).

Table 5: Expenditure competencies division between CG and RGs

Exclusive state competencies	Shared competencies	Exclusive regional competencies
a) foreign policy, Europe, citizenship; b) immigration; c) relations with religious bodies;  d) armed forces; e) currency, finance, competition, fiscal equalization; f) national and European elections, referendums; g) state PA; h) public order and security except for local administrative police; i) citizenship and residence; j) civil and criminal justice; k) determination of minimal levels of services across national territory; l) basic norms of education; m) social security; n) customs and border controls; o) weights, measures, time and statistics;  p) care of environment, ecosystem and cultural artifacts;	a) international and European relations of Regions; b) health and safety at work; c) education, but respecting autonomy of educational institutions, and professional training; d) research and innovation; e) health;  f) food;  g) sports; h) civil protection;  i) territorial government; j) ports and civil airports; k) major transport and navigation networks;  l) communications;  m) energy; n) supplementary welfare; o) harmonization of public expenditure and taxes; p) promotion of culture;  q) savings banks; r) regional credit funds.	All other matters are within the competence of the regions.

With regard to the electoral and political regional system, until the reform passed in February 1995, the Regional Council was elected under a proportional system and the legislators held office for a 5-year term. The number of legislators varied according to the regional population and, in the regions with special statutes, was established by the relevant statute.

In February 1995 the central government introduced a new regional electoral system. This reform completed the renewal that involved the electoral systems of all levels of government. The main issue in the parliamentary debate was the proportion of seats to be assigned by a majority method. This indicated a desire to change the previous simple proportional system to a new system in order to



stimulate electoral accountability of regional politicians. The new electoral rules state that 20% of seats in the regional parliaments are assigned by the majority method. Specifically, 80% of the legislators are elected on the basis of provincial lists and the remaining 20% by a majority system on the basis of regional lists. This was sufficient to guarantee the formation of a government by the winning coalition creating bipolar political space that also favored the change of the form of government from parliamentary to presidential. However, it was In 1999 with a small constitutional reform (Constitutional Law No. 1/1999) that the direct elections for regional presidents was formally introduced.

In special regions, however, the special statutes did not allow the central government to introduce the new electoral system by ordinary law. As a result, the special regions changed their previous proportional/parliamentary system only some years after the normal regions, since the required constitutional law was only passed by the central government in 2001 (art. 123).

Following a political reform that took place in 1992, mayors and provincial presidents are directly elected for five-year terms<sup>20</sup> and are subject to a two-term limit.

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<sup>20</sup>Four years if elected before year 2000.

## Appendix C - Robustness Checks Tables

Table 6: Dynamic estimations including year dummies (Dependent variable: regional GDP growth rate, GMM-Diff estimator)

VARIABLES	1 GMM-DIFF	2 GMM-DIFF	3 GMM-DIFF	4 GMM-DIFF	5 GMM-DIFF	6 GMM-DIFF
L.GDP growth rate	-0.145278** (0.064)	-0.126346 (0.081)	-0.112430 (0.085)	-0.105747 (0.089)	-0.105996 (0.098)	-0.106859 (0.097)
L2.GDP growth rate	-0.076813 (0.068)	-0.114053 (0.070)	-0.106249 (0.071)	-0.082144 (0.100)	-0.082160 (0.092)	-0.087325 (0.090)
L.Government size	0.174665* (0.092)	0.494897 (0.572)	0.523287 (0.588)	6.297545** (2.858)	6.719843* (3.635)	6.977849* (3.760)
L.Squared government size		-0.316559 (0.522)	-0.334468 (0.520)	-5.974701** (2.574)	-6.521542* (3.488)	-6.828067* (3.618)
L.Government size*Dec. index				-19.262458* (9.956)	-19.813001* (10.717)	-20.056757* (11.171)
L.Squared gov. size*Dec. index				18.980244* (8.925)	19.720125* (9.935)	20.212856* (10.358)
L.Government size*VFI measure					-0.765332 (1.905)	-1.010041 (1.992)
L.Squared gov. size*VFI measure					0.904124 (1.997)	1.363415 (2.107)
L.Government size*VFI measure*Dec index						-0.881612** (0.327)
Decentralization index			0.030026 (0.087)	5.623980* (2.762)	5.698412* (2.888)	6.387297** (2.995)
Squared decentralization index				-1.399.977 (0.906)	-1.359.382 (0.961)	-2.196757** (0.960)
Vertical fiscal imbalance measure			0.013639 (0.010)	0.067502 (0.048)	0.204433 (0.435)	0.368073 (0.454)
Squared vertical fiscal imbalance measure				-0.048404 (0.047)	-0.032662 (0.056)	-0.069147* (0.038)
Population	0.037591 (0.137)	0.071910 (0.149)	0.074684 (0.145)	-0.077066 (0.172)	-0.045582 (0.151)	-0.022363 (0.138)
L.Centre-Left Government	-0.006141 (0.008)	-0.005885 (0.007)	-0.005552 (0.007)	-0.005215 (0.008)	-0.005084 (0.008)	-0.005816 (0.008)
L.Seats difference Maj.-Min.	0.000324 (0.001)	0.000386 (0.001)	0.000368 (0.001)	0.000315 (0.001)	0.000284 (0.001)	0.000353 (0.001)
L.Inflation rate	24.929821*** (3.415)	24.609583*** (3.153)	23.880310*** (3.486)	22.291257*** (4.059)	22.727495*** (4.100)	22.983780*** (3.935)
L.Openness	-0.008271 (0.067)	0.005671 (0.061)	0.019455 (0.056)	0.032424 (0.051)	0.027513 (0.055)	0.037459 (0.057)
Year = 2000	0.087931*** (0.012)	0.088894*** (0.010)	0.087984*** (0.013)	0.081156*** (0.013)	0.083625*** (0.011)	0.084690*** (0.011)
Year = 2001	-0.139864*** (0.024)	-0.137089*** (0.023)	-0.131955*** (0.025)	-0.125805*** (0.030)	-0.127189*** (0.031)	-0.128773*** (0.030)
Year = 2002	-0.225259*** (0.034)	-0.220482*** (0.033)	-0.213442*** (0.036)	-0.204563*** (0.042)	-0.207543*** (0.042)	-0.210697*** (0.041)
Year = 2003	-0.150185*** (0.023)	-0.147006*** (0.023)	-0.142266*** (0.025)	-0.137165*** (0.028)	-0.137659*** (0.029)	-0.138781*** (0.028)
Year = 2004	-0.163201*** (0.026)	-0.159376*** (0.025)	-0.153918*** (0.027)	-0.148927*** (0.031)	-0.151960*** (0.031)	-0.153889*** (0.030)
Year = 2005	-0.049572*** (0.011)	-0.048695*** (0.011)	-0.045339*** (0.012)	-0.044158*** (0.014)	-0.044461*** (0.014)	-0.045010*** (0.014)
Year = 2006	0.059901*** (0.006)	0.060295*** (0.005)	0.059201*** (0.005)	0.052435*** (0.008)	0.053674*** (0.008)	0.054730*** (0.007)
Observations	120	120	120	120	120	120
Number of regions	15	15	15	15	15	15
AR(1) test statistic	-3.034	-3.025	-2.963	-3.028	-2.993	-2.923
P-value of AR(1) statistic	0.00241	0.00249	0.00305	0.00247	0.00276	0.00346
AR(2) test statistic	-0.287	0.626	0.334	-0.347	-0.396	-0.397
P-value of AR(2) statistic	0.774	0.531	0.738	0.729	0.692	0.691
Sargan statistic	116.0	128.2	125.8	123.6	125.0	126.1
Degrees of freedom for Sargan statistic	84	101	102	98	96	95
P-value of Sargan statistic	0.0119	0.0351	0.0551	0.0410	0.0249	0.0182

Notes: Robust Standard Errors in parentheses  
\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 7: Dynamic estimations (Dependent variable: regional GDP growth rate, Fixed Effects estimator)

VARIABLES	1 FE	2 FE	3 FE	4 FE	5 FE	6 FE
L.GDP growth rate	-0.150983 (0.122)	-0.146151 (0.119)	-0.099570 (0.128)	-0.128080 (0.128)	-0.124228 (0.139)	-0.126168 (0.144)
L2.GDP growth rate	-0.309830*** (0.095)	-0.312409*** (0.098)	-0.299247*** (0.085)	-0.360811*** (0.095)	-0.357631*** (0.097)	-0.362502*** (0.101)
L.Government size	0.078290 (0.092)	0.804486 (0.644)	0.578050 (0.668)	9.754415*** (3.247)	10.080414** (3.883)	10.251553** (3.943)
L.Squared government size		-0.634482 (0.563)	-0.430574 (0.579)	-9.188171*** (2.910)	-9.637897** (3.616)	-9.835980** (3.696)
L.Government size*Dec. index				-31.825790** (11.320)	-32.051991** (12.155)	-32.244206** (12.292)
L.Squared gov. size*Dec. index				30.180719*** (10.110)	30.599502** (11.101)	30.941031** (11.285)
L.Government size*VFI measure					-0.721946 (1.840)	-0.859970 (1.902)
L.Squared gov. size*VFI measure					0.855238 (1.861)	1.129247 (1.980)
L.Government size*VFI measure*Dec index						-0.582088 (0.794)
Decentralization index			0.268133** (0.125)	9.970263*** (3.105)	9.985320*** (3.252)	10.462614*** (3.443)
Squared decentralization index				-2.609327** (0.994)	-2.614897** (0.990)	-3.182998** (1.131)
Vertical fiscal imbalance measure			0.047248** (0.017)	0.214338*** (0.064)	0.339617 (0.441)	0.444438 (0.470)
Squared vertical fiscal imbalance measure				-0.155442** (0.057)	-0.136940* (0.072)	-0.161835** (0.073)
Population	0.128261 (0.205)	0.128322 (0.215)	0.176645 (0.197)	-0.071841 (0.238)	-0.041688 (0.203)	-0.027708 (0.191)
L.Centre-Left Government	0.001377 (0.009)	0.001229 (0.008)	0.000410 (0.008)	0.000584 (0.008)	0.000885 (0.008)	0.000461 (0.008)
L.Difference Maj.-Min seats in reg. ass.	0.000099 (0.001)	0.000025 (0.001)	-0.000045 (0.001)	-0.000141 (0.001)	-0.000161 (0.001)	-0.000113 (0.001)
L.Inflation rate	-1.723128*** (0.332)	-1.656044*** (0.313)	-1.912440*** (0.319)	-1.713993*** (0.553)	-1.765948*** (0.501)	-1.838343*** (0.479)
L.Openness	0.033624 (0.064)	0.052771 (0.061)	0.079606 (0.067)	0.077666 (0.060)	0.078320 (0.062)	0.086245 (0.061)
Year	2.322124** (0.831)	2.058319* (1.038)	2.534307** (0.987)	0.420867 (1.714)	0.632165 (1.581)	0.723636 (1.594)
Squared year	-0.000580** (0.000)	-0.000514* (0.000)	-0.000633** (0.000)	-0.000106 (0.000)	-0.000159 (0.000)	-0.000181 (0.000)
Constant	-2325.301068** (831.295)	-2061.452635* (1,038.454)	-2538.203632** (987.123)	-420.058.086 (1,716.529)	-632.024.467 (1,583.171)	-723.968576 (1,595.554)
Observations	135	135	135	135	135	135
R <sup>2</sup>	0.248	0.256	0.332	0.410	0.412	0.414
Number of regions	15	15	15	15	15	15

Notes: Robust Standard Errors in parentheses  
\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 8: Dynamic estimations (Dependent variable: regional GDP growth rate, GMM-Diff estimator, region Lazio excluded)

VARIABLES	1	2	3	4	5	6
	GMM-DIFF	GMM-DIFF	GMM-DIFF	GMM-DIFF	GMM-DIFF	GMM-DIFF
L.GDP growth rate	-0.116790 (0.145)	-0.100190 (0.139)	-0.054366 (0.141)	-0.093306 (0.133)	-0.076436 (0.145)	-0.071928 (0.139)
L2.GDP growth rate	-0.347298** (0.131)	-0.357026** (0.128)	-0.335645*** (0.112)	-0.364301*** (0.112)	-0.352097*** (0.117)	-0.358449** (0.125)
L.Government size	0.051847 (0.156)	0.601815 (0.684)	0.440778 (0.714)	10.887804** (4.346)	11.623855** (4.823)	11.626997*** (3.754)
L.Squared government size		-0.459805 (0.592)	-0.302131 (0.614)	-10.473910** (4.119)	-11.163728** (4.705)	-10.779491*** (3.589)
L.Government size*Dec. index				-35.992127** (14.115)	-36.844888** (14.494)	-37.953465*** (11.752)
L.Squared gov. size*Dec. index				34.735803** (13.362)	35.646360** (13.986)	35.570224*** (11.084)
L.Government size*VFI measure					-0.989197 (2.027)	-1.100112 (1.775)
L.Squared gov. size*VFI measure					0.908135 (2.068)	-0.145620 (1.712)
L.Government size*VFI measure*Dec index						3.624341*** (1.197)
Decentralization index			0.217472 (0.132)	11.309597** (3.923)	11.453175** (4.044)	9.365806** (3.579)
Squared decentralization index				-3.274.542 (2.923)	-3.219.654 (3.125)	-0.054935 (3.188)
Vertical fiscal imbalance measure			0.043383** (0.018)	0.239711*** (0.080)	0.513813 (0.479)	0.254043 (0.424)
Squared vertical fiscal imbalance measure				-0.187771** (0.070)	-0.208321** (0.082)	-0.160117** (0.074)
Population	0.364336 (0.249)	0.384422 (0.229)	0.375221 (0.235)	0.212207 (0.231)	0.185383 (0.247)	0.241189 (0.240)
L.Centre-Left Government	0.003503 (0.010)	0.002358 (0.010)	0.001561 (0.009)	-0.000528 (0.009)	-0.000634 (0.010)	0.000697 (0.010)
L.Difference Maj.-Min seats in reg. ass.	-0.000240 (0.001)	-0.000091 (0.000)	-0.000180 (0.000)	0.000019 (0.001)	0.000025 (0.001)	-0.000059 (0.001)
L.Inflation rate	-1.863785*** (0.367)	-1.847355*** (0.345)	-2.019100*** (0.316)	-2.122672*** (0.493)	-2.112805*** (0.491)	-1.818844*** (0.450)
L.Openness	0.045945 (0.064)	0.057967 (0.060)	0.073655 (0.069)	0.100561* (0.055)	0.096730 (0.056)	0.081311 (0.057)
Year	2.678392*** (0.898)	2.431116** (1.129)	2.749446** (1.081)	1.432.615 (1.495)	1.402.555 (1.507)	0.573988 (1.432)
Squared year	-0.000669*** (0.000)	-0.000607** (0.000)	-0.000687** (0.000)	-0.000358 (0.000)	-0.000351 (0.000)	-0.000144 (0.000)
Observations	112	112	112	112	112	112
Number of regions	14	14	14	14	14	14
AR(1) test statistic	-3.064	-3.061	-3.044	-2.927	-2.943	-2.905
P-value of AR(1) statistic	0.00218	0.00221	0.00234	0.00343	0.00325	0.00367
AR(2) test statistic	-1.451	-1.383	-0.395	-0.263	-0.404	-0.818
P-value of AR(2) statistic	0.147	0.167	0.692	0.793	0.686	0.413
Sargan statistic	99.41	103.5	100.9	99.56	99.35	100.9
Degrees of freedom for Sargan statistic	86	101	99	95	93	92
P-value of Sargan statistic	0.153	0.413	0.429	0.354	0.307	0.246

Notes: Robust Standard Errors in parentheses  
\*\*\* p<0.01, \*\* p<0.05, \* p<0.1