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The impact of fiscal decentralization on the composition of public expenditure: panel data evidence from Italy

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ABSTRACT

This article is an original contribution to the understanding of the relationship between fiscal decentralization and public expenditure composition. It studies the effects of the ongoing decentralization process in Italy on the share of different categories of public spending in total expenditure of the Italian regional administrations over the period 1996-2008. The data used allow to go beyond the usual distinction between current and capital expenditures and to present both an "economic" and a functional classification of public expenditures. Through a panel data analysis, the paper shows that the level of decentralization influences the expenditure composition.

Keywords: Fiscal federalism, Composition of government expenditure, Panel data

JEL classification: H72, H77, C23

1. Introduction

Over the past decades institutional and fiscal decentralization has taken place in many developed and developing countries (RODRÍGUEZ-POSE and GILL, 2003). Many formerly centralized states have witnessed some form of devolution, and many states that were already decentralised have experienced even greater transfers of power to meso-levels of government. Moreover, in the European Union the introduction of the subsidiarity principle in the Maastricht Treaty has led to a renewed emphasis on the virtues of decentralization and a growing pressure to remodel the distribution of power both within the different European government levels and within the states.

Historically, the arguments in favour of devolution and decentralization relied heavily on issues of national or regional identity, such as ethnicity, language, religion, culture, or history, while the recent wave of redistribution of competences towards sub-central levels of government is increasingly based on economic arguments (RODRÍGUEZ-POSE and SANDALL, 2008). The literature analysing the so-called "economic dividend" of devolution in local government enumerates several advantages.[i]

Firstly, if preferences for the degree and form of the public sector service provision and for the taxes differ geographically then a decentralized system is more efficient than a centralized one, allowing a better matching of resources to preferences.[ii] As one may derive from Oates' decentralization theorem, the larger the variance in taste, the larger are the potential benefits of decentralization.

Secondly, decentralization may introduce interjurisdictional competition and thus push local governments to supply public goods efficiently (BRENNAN and BUCHANAN, 1980). Such competition should also motivate local governments to provide growth-promoting

infrastructure and not to offer socially inefficient services (QIAN and ROLAND, 1998). The efficiency-enhancing properties of the decentralization choice derive also from the mobility of consumers–citizens among the jurisdictions (TIEBOUT, 1956).

The third source of economic gains that devolution can engender operates from a political perspective. Decentralization of decision-making can increase transparency and accountability by reducing the distance between politicians and their electorates and can strengthen the local democratic process (AZFAR et al., 1999; EBEL and YILMAZ, 2002). In addition, it could reduce bureaucratic complexity and stimulate further efficiency gains as elected representatives should be obliged to be more sensitive to the preferences of their constituencies.

The increased interest in fiscal decentralization is, therefore, mainly fuelled by the widespread belief that decentralizing revenue raising and spending decisions is an effective tool for increasing the efficiency of public expenditures.[iii] Moreover, over time efficiency gains would lead to faster local as well as national economic growth. Numerous empirical studies, on individual countries (AKAI and SAKATA, 2002; XIE et al., 1999; ZHANG and ZOU, 2001, 1998) as well as cross-country (RODRÍGUEZ-POSE and EZCURRA 2010; RODRÍGUEZ-POSE et al., 2009; THORNTON, 2007; IIMI, 2005; THIESSEN, 2003; DAVOODI and ZOU, 1998), have analysed the direct impact of decentralization on economic growth, notwithstanding the results have so far been inconclusive.

This may be due in part to the lack of understanding of how fiscal decentralization relates to economic growth and to less attention devoted to the indirect channels through which it may affect economic growth (MARTINEZ-VAZQUEZ and MCNAB, 2003). For example, the problem has been rarely focused as an indirect relation from decentralization policy to the composition of public expenditure, and from the latter to economic growth.

Indeed, a key issue in the debate on the use of fiscal policy to promote economic growth relates to the effect of the composition of public expenditure on economic growth. The models of government expenditure and economic growth developed by BARRO (1990) and DEVARAJAN et al. (1996) point to the functional composition of government expenditure as a decisive factor.[iv] Several empirical studies support the notion that the composition of expenditure (as well as revenues) matter for long-term growth and that policies to improve the composition of both expenditure and revenue could have positive effects on long term growth (KOCHERLAKOTY and YI, 1997; KNELLER et al., 1999, 2001; ROMERO DE AVILA and STRAUCH, 2003). A distinction is made between capital expenditures and current expenditures. Conventional wisdom proposes that capital expenditures will have a positive effect on growth, while an increase in current expenditures is expected to have no or a negative effect on growth (ASCHAUER, 1989; BARRO, 1990). However, this distinction is not exempt from criticism as some categories of current spending are critical to ensure the profitability of investments. For this reason, other classifications of public expenditure have been proposed to analyze how the composition of the public budget affects economic growth. For example, AFONSO and GONZALEZ ALEGRE (2008) adopt a classification based both on "economic" categories (public investment, public consumption and social security) and on functional categories (according to the COFOG classification). BLEANY et al. (2001) present a classification of expenditures splits in two categories: "productive" and "unproductive", based on an *a priori* judgment regarding their expected impact on growth, in accordance to the endogenous growth theory.

The literature about fiscal decentralization has not traditionally looked at the impact that it may have on the composition of public expenditures, although this is an important channel through which fiscal decentralization can support economic growth as far it determines a better

allocative efficiency. To our knowledge, only some recent studies address this issue (GONZALEZ ALEGRE, 2010; RODRÍGUEZ-POSE et al., 2009; KAPPELER and VÄLILÄ, 2008; ARZE DEL GRANADO et al., 2005; FAGUET, 2004).

In the light of these considerations, this paper examines the impact of decentralization on the share of different type of public spending in total public expenditure of the Italian regional administrations over the period 1996-2008. Italy is a remarkable case since during the last decade the Italian system of intergovernmental fiscal relations has been involved in a radical process of reform that is still underway.[v] Therefore, there is scope for analyzing whether (and in which way) these reforms have affected the composition of public expenditure. The one-country focus allows us to avoid problems of data comparability and control for external shocks, political regime, institutions, and other exogenous factors and, therefore, to estimate the effects of decentralization more objectively than in cross-country analysis.

The dataset we use is taken from the Territorial public accounts (*Conti pubblici territoriali*) produced by the Italian Ministry of Economy. These data provide the allocation of revenues and expenditure flows collected/paid by each level of government included in the General government among 20 Italian Regions for the period 1996-2008.

The original contribution of this paper to the literature is threefold. First, it introduces new empirical evidence about the link between decentralization and composition of public expenditure: an important issue, to our knowledge, not well analyzed so far in the economic literature. The data used are of surprising scope and quality and allow to go beyond the usual distinction between current and capital expenditures, indeed this paper presents a functional classification of expenditures split in five categories with economically distinct roles and an expenditure decomposition based on “economic” categories (consumption, investment, personnel

expenditures, current transfer, capital transfer). The second innovation comes from the methodology used to study the effects of decentralization on expenditure composition: alongside to a static panel data approach, a system of dynamic panel regressions, with each expenditure category expressed relative to total regional government expenditure, is estimated in order to take into account both the short and the long run relationship. Third, studying the case of a developed country which has undergone radical reforms pursuing higher decentralization of revenue and expenditure responsibilities in the last decades, our results have policy implications that can be of interest for countries facing the same decentralization process.

The remainder of the paper is organised as follows. Section 2 provides a brief overview of some of the recent empirical literature on the causation line from decentralization to growth and on the impact that decentralization may have on the composition of public expenditures. In section 3, we briefly describe the Italian institutional framework and the ongoing decentralization process. Section 4 shows how the composition of public expenditure has changed in the period 1996-2008. In section 5, we present our econometric analysis and we discuss the main results. Finally, section 6 contains our concluding remarks.

2. Review of the literature

Traditionally, the theoretical and empirical analysis of fiscal decentralization has given little attention to the objective of economic growth. Only recently a substantial empirical literature on the causation line from decentralization to growth has emerged, but the results have so far been inconclusive.[vi]

ZHANG and ZOU (1998, 2001) find that fiscal decentralization is associated with slower growth for the case of China. DAVOODI and ZOU (1998) investigating the impacts of fiscal

decentralization on economic growth with cross-country data from 1970 to 1989, show that there is a significant negative relationship between fiscal decentralization and growth in developing countries, and none in developed countries. This negative relationship is also found by XIE et al. (1999) for the United States. Focusing on the economic impact of decentralization trends in three federal (Germany, India, and the USA) and three recently devolved countries (Italy, Mexico, and Spain), RODRIGUEZ-POSE and BWIRE (2004) find that a greater degree of autonomy seems to be at best irrelevant in determining a region's economic performance and, at worst, it is in some national contexts associated with lower levels of growth than under more centralized periods of government. AKAI and SAKATA (2002), in contrast, report a positive association between fiscal decentralization and economic performance in the USA, as do ZHANG and ZOU (2001) and LIN and LIU (2000), respectively, for the case of India and China. IIMI (2005), using the instrument variables technique with data on 51 countries for the period from 1997 to 2001, find that fiscal decentralization has a significant positive impact on *per capita* GDP growth. Others fail to find a statistically significant and robust relationship between fiscal decentralization and economic growth (RODRIGUEZ-POSE, 1996; WOLLER and PHILLIPS, 1998). THIESSEN (2003) suggests a hump-shaped relationship: it is positive when fiscal decentralization is increasing from low levels, but after reaching a peak the relationship becomes negative.

There is, therefore, a mixed picture of the decentralization effect on economic growth both in cross-country analyses and in studies within a single country.

The review of the empirical literature questions the existence of a direct linkage between decentralization and growth, but besides the direct impact there are potentially a multiplicity of indirect effects of decentralization on growth through consumer efficiency, producer efficiency,

the geographical distribution of resources, macroeconomic stability, corruption, and capture by elites (MARTINEZ-VAZQUEZ and MCNAB, 2003).

In our opinion, the effect of decentralization on allocative efficiency is particularly interesting. Indeed, devolution is regarded as a means of achieving greater efficiency: the greater the degree of autonomy, the stronger the scope for enhanced efficiency and for efficiency in public spending to be growth enhancing. An indirect measure of the allocative efficiency effects of decentralization is given by the impact of decentralization on the composition of public expenditures (ARZE DEL GRANADO et al., 2005).

To our knowledge only few papers addressed the impact that decentralization may have on the composition of public expenditures.

ARZE DEL GRANADO et al. (2005) and KAPPELER and VÄLILÄ (2008) analyse the relationship between decentralization and the composition of public investment from cross country panel data.[vii] Their results suggest that decentralization changes the composition of public investment in a way that should support an increase in allocative efficiency and therefore improving economic growth. Indeed, according to ARZE DEL GRANADO et al. (2005) decentralization leads to a higher share of education and health expenditures in total government expenditure, and according to KAPPELER and VÄLILÄ (2008) to an increase in the economically productive public investment and a reduction in the relative share of public investment in redistribution.

According to RODRÍGUEZ-POSE et al. (2009), who analyse the evolution of subnational expenditure categories in Germany, India, Mexico, Spain, and the USA, this positive effect of decentralization seems not to be materialised: decentralization has coincided in the sample countries with a relative increase in current expenditures at the expense of capital expenditures.

FAGUET (2004) and GONZALEZ ALEGRE (2010) look at the experience of a single country, respectively, Bolivia and Spain. In the first case, decentralization led to higher investment in human capital and social services and, therefore, since these shifts are positively related to local needs, to a more efficient allocation of public expenditure. In the second case, the results would suggest the opposite, since decentralized regions devote a higher share of their budget to current expenditure than centralized ones. Decentralization is expected to be growth-enhancing to the extent that it results in a shift of resources from current to capital expenditures (RODRIGUEZ-POSE et al., 2009).

3. The Italian institutional framework and the decentralization reform

Italy is a unitary country with strong attributes in terms of territorial and functional decentralization. The public sector is organized into three main layers of territorial government: central government, regional governments and local governments, which include provinces plus municipalities. In particular, sub-national governments include 15 ordinary statute regions (OSRs); 5 special statute regions (SSRs), one of which (Trentino Alto Adige) is in turn divided in two autonomous provinces (Provincia di Trento and Provincia di Bolzano); 110 provinces; and more than 8,000 municipalities ranging in size from small villages to large cities. SSRs enjoy a particular status, more autonomy, and a different (and often more generous) financing system than ordinary regions.

Italy is a country marked by severe structural and economic contrasts across different areas: regional territories greatly differ in terms of extension (a relevant feature for economies of scale in public productions), density and age structure of the population, and *per capita* GDP

(Table 1). Regional disparities are considerable and this obviously implies large disparities in fiscal capacity.

[*Here Table 1*]

The regional level of government has a wide set of legislative and administrative competences and it is the level of government that has been mainly affected by the reforms of the last two decades.

Since the early 1990s the Italian public sector has undergone radical reforms pursuing higher decentralization of revenue and expenditure responsibilities.[viii] With the Bassanini reform in 1997 a significant decentralization of administrative functions occurred. The regions received new competences and the transfer was combined with a profound restructuring of the sub-national government resources in order to increase their autonomy. As a result, in Italy decentralized governments tax autonomy has significantly increased since the early 1990s (ARACHI and ZANARDI, 2004). Regionalisation was pushed forward by the 2001 constitutional reform that changed the administrative architecture of the country by placing the state, regions, provinces, metropolitan cities and municipalities on the same level and implied new competences and more financial autonomy for sub-national governments. The so-called "federalist" constitutional reform changed the Title V of the Constitution, governing the distribution of powers across levels of government.[ix] Areas of exclusive central government and concurrent central and regional government competencies were specified in various spending and legislative areas – all areas not so specified were assigned to the exclusive competence of the regions by default. Clearly this reallocated much power to the regions, as not all potential areas

could be enumerated. Regions were for the first time also accorded legislative powers in areas of their exclusive competence in both spending and tax areas.

Considering this radical reform of the Italian system of intergovernmental fiscal relations, which is still underway, Italy seems to be a case of particular interest for analyzing whether these reforms have affected the composition of public expenditure.[x]

4. Composition of public expenditures in Italy: stylized facts

The extent of the decentralization process in Italy can be appreciated by examining the change of the share of public expenditure by sub-national levels of government (PROTA and GRISORIO, 2010). Figure 1 shows clearly that both the regional and local level have increased their share over total (and capital) expenditure in the last thirteen years.

[*Here Figure 1*]

Coming to the nexus between fiscal federalism and composition of public expenditure, Figure 2 shows the shares of central and sub-national (regional and local) government in five types of public investment.

For the scope of our analysis, we aggregate the sectoral classification underlying the consolidated Territorial public accounts, broken down into twenty-nine items that can be mapped to the Classification of the Functions of Government (COFOG), into five types of public investment with economically distinct roles.[xi] Public expenditure is by no means homogeneous, and different types of spending are likely to have different impacts on the economy.

As regards Pure public goods, the central government accounts, on average, for 69% of public expenditure. This high percentage is expected since public goods correspond to functions that are generally provided by the central administration. The same is true for the category "Social welfare" which includes pensions and wage supplementation. On the contrary, regional and local governments account for the bulk of public expenditure in infrastructure and for a relevant share in the categories "Public investment to enhance human capital" and "Expenditure for development". Considering the evolution over time of the share of sub-national government in the five types of public investment, it is clear the increasing role of the regional and local level, especially for "Infrastructure" and "Expenditure for development" (Figure 3). It is also interesting to note how the increase is particularly pronounced after 2002, following the 2001 constitutional reform.

[*Here Figure 2*]

[*Here Figure 3*]

Let us now summarise some key stylised facts of the composition of public expenditure in Italy from the perspective of fiscal federalism. First, the central government dominates public expenditure in pure public goods and in social welfare in all the Italian regions. On the contrary, regional and local governments account for the bulk of public expenditure in infrastructure and for a significant share in two other "productive" spending categories. Second, expenditure by sub-national levels of government has tended to increase relative to total public expenditure

during our sample period. Third, the process of expenditure decentralization is not homogeneous across the regions: it is more pronounced in special statute regions.

5. Empirical analysis

5.1. Econometric model specification

In this paper we test the hypothesis that decentralization affects the composition of public expenditure at the regional level. Public expenditures are grouped according to three main different criteria. Criterion (1) distinguishes between current and capital expenditures. This is the conventional distinction made in the growth literature to understand the effect that public expenditure has on economic outcomes (BARRO, 1990; DEVARAJAN et al., 1996; KNELLER et al., 1999). Criterion (2) presents a classification based on "economic" categories: consumption, investment, personnel expenditures, current transfer, capital transfer. Criterion (3) presents a functional classification of expenditures split in five categories with economically distinct roles.[xii] At this stage our analysis includes total public spending, capital and current, without specifically separating them. The rationale for this decision is based on the evidence that some categories of current spending items are indeed critical to ensure the profitability of investments. The classical example is the salary of teachers, classified under the current spending rubric, is closely connected to the quality of education provided.

We, therefore, proceed to the specification of three reduced-form models to be estimated, in order to test the hypothesis formulated above.

$$Cap\_exp_{r,t} = \alpha_r + \beta_1 Dec_{r,t} + \beta_2 X_{r,t} + \varepsilon_{r,t} \quad (1)$$

$$Exp\_econ\_cat_{r,t} = \alpha_r + \beta_1 Dec_{r,t} + \beta_2 X_{r,t} + \varepsilon_{r,t} \quad (2)$$

$$Exp\_func\_cat_{r,t} = \alpha_r + \beta_1 Dec_{r,t} + \beta_2 X_{r,t} + \varepsilon_{r,t} \quad (3)$$

The subscript r,t stands for region r at time t. The dependent variable $Cap\_exp_{r,t}$ represents the capital expenditure, while the dependent variables $Exp\_econ\_cat_{r,t}$ and $Exp\_func\_cat_{r,t}$ represent, respectively, each economic expenditure category and each functional category. They are expressed as a share of total regional public expenditure, assuming values in the interval [0, 1], in order to maximise the opportunity for finding significant compositional effects of decentralization.

Fiscal decentralization is measured by two indicators: the first measures the level of decentralization of tax revenue (*fis_dec*); while the second measures the vertical fiscal imbalance, that is the degree to which subnational governments rely on central government revenues to support their expenditures (*vfi*). $Dec_{r,t}$ is used as a generic notation to refer to either *fis_dec* or *vfi*.

[*Here Figure 4*]

$X_{r,t}$ is a vector of the control variables. The control variables, based on standard models of demand for government expenditure (BORCHERDING et al., 2004), seek to capture factors affecting public expenditure composition: income; demographics (population density and age distribution); social inequalities; institutional factors; public capital stock. Moreover, we consider central government expenditure, in order to control for the substitution effect that could be induced in regions and we calculate an interaction term between decentralization measures and a

dummy variable to capture the special statute regions status and, therefore, the potential difference in the impact of decentralization on expenditure composition in SSRs and in the other regions.

Considered that the dependent variable is a fraction constrained in the interval [0, 1], we need an appropriate estimation technique. Linear models may arise interpretation problems, since the predicted values from an OLS regression can never be guaranteed to lie in the unit interval, and the use of a logistic transformation, often suggested in the literature, is not a reliable solution as PAPKE and WOOLDRIDGE (1996) have demonstrated. In order to deal with the bounded nature of the dependent variable, we estimate a fractional response model for panel data by pooled QMLE, as proposed by PAPKE and WOOLDRIDGE (2008).[xiii]

We address the possible endogeneity of fiscal decentralization variables using a Hausman test. To this end the variable of fiscal decentralization is regressed on all the right hand side variables and lagged values of regional expenditure categories. We find that the inclusion in the model of the residuals from this first stage regression reveals not to have a significant effect. *Dec* is, therefore, treated as an exogenous variable.

The second step of our empirical analysis takes into account that the composition of public expenditure is likely to change slowly over time as a consequence of the decentralization process. We are interested both in the short run and the long run dynamics existing between decentralization and the composition of public expenditure. For this reason, we estimate an error correction model (ECM) which provides an explicit link between the short run and long run effects of decentralization. Interesting examples of the use of this methodology to analyse the composition of government expenditure can be found in GEMMEL et al. (2008) and SANZ and VELÁZQUEZ (2007). CASSETTE and PATY (2010) use a generalized one-step ECM to

examine the short run and long run dynamics of the relationship between decentralization and the size of the public sector.

The starting point is represented by the following autoregressive distributed lag model:

$$g_{f,r,t} = \varphi_1 g_{f,r,t-1} + \varphi_2 g_{f,r,t-2} + \alpha_0 Dec_{r,t} + \alpha_1 Dec_{r,t-1} + \alpha_2 Dec_{r,t-2} + \beta_0 X_{r,t} + \beta_1 X_{r,t-1} + \varepsilon_{r,t} \quad (4)$$

where g is used as a generic notation to refer to the share of each expenditure category on total spending at regional level and the subscript f indicates the expenditure category (capital expenditure, each "economic" and each functional category).

The error correction model is a linear transformation of the variables in the equation (4) needed to separate long term permanent effects from short term transitory effects.

$$\Delta g_{f,r,t} = (\varphi_1 - 1)\Delta g_{f,r,t-1} + \alpha_0 \Delta Dec_{r,t} + (\alpha_0 + \alpha_1)\Delta Dec_{r,t-1} + \gamma(g_{f,r,t-2} - Dec_{r,t-2}) + \theta Dec_{r,t-2} + \beta_0 \Delta X_{r,t} + (\beta_0 + \beta_1)X_{r,t-1} + \varepsilon_{r,t} \quad (5)$$

where $\theta = \alpha_0 + \alpha_1 + \alpha_2 + \varphi_1 + \varphi_2 - 1$, and $\gamma = \varphi_1 + \varphi_2 - 1$

In equation (5), the sum of the coefficients of contemporaneous and one period lagged degree of decentralization provides information about the short run effect of decentralization; while the coefficient of error correction term ($g_{f,r,,t-2} - Dec_{r,t-2}$) and the lagged level of decentralization explains the long run dynamics. Moreover, we include a set of control variables (X) both in difference and in levels.

5.2. The data

The data on public expenditure and those to measure the level of decentralization are taken from the Territorial public accounts (*Conti pubblici territoriali*) produced by the Italian Ministry of Economy. These data provide the allocation of revenues and expenditure (either on current and capital account) flows collected/paid by each level of government included in the General government among 20 Italian Regions for the period 1996-2008. The Territorial public accounts allow for analysis of various sub-aggregates covering different macro-areas and administrative regions, sector classifications, economic categories, definitions of government expenditure and final expenditure recipients.

In the Territorial public accounts, expenditure flows are regionalised according to what we can refer to as the *expenditure principle*: they are imputed to the territory where the means of production used for the production of public services and investments are located. This principle is suitable for the purpose of our work. Revenue flows are regionalised according to where the resources were collected.

Table A2 shows the descriptive statistics and sources of the variables used in the econometric analysis.

5.3. Estimation results

Table 2 shows the results of estimating equation (1) using a fractional probit pooled QMLE, as proposed by PAPKE and WOOLDRIDGE (2008). It reports also the results from a Sargan-Hansen test of overidentification in order to test the plausibility of instruments. In this formulation our dependent variable is the ratio of capital expenditure to total public expenditure of the regional government. We run the regressions using both our decentralization variables (on

the left side, *fis_dec*, and on the right side, *vfi*). Considering the results in Table 2, it is possible to conclude that capital expenditure depends on the level of decentralization. The coefficients estimated for both the decentralization measures are negative and statistically significant. The effect is more important when we use the level of decentralization of tax revenue as a measure of decentralization. The average partial effect (APE) implies that a ten percentage points increase in the level of decentralization leads to a reduction in the share of capital expenditure to total regional expenditure of 1.32% (0.52% when we use "vertical fiscal imbalance").

It is interesting to note that our results are similar to those shown in the paper of GONZALEZ ALEGRE (2010) where the effects of fiscal decentralization on the economic distribution of public expenditure in the Spanish regions are studied. In the case of Spain, decentralized regions spend a higher share of their budget on current expenditure in contrast to capital expenditure. In order to facilitate the comparison in terms of significance and sign as well as of magnitude of the coefficient of the variable capturing the decentralization process, we estimate a model analogous to that of GONZALEZ ALEGRE (2010), too. The results are reported in Table A3 in Appendix and they confirm that the effect of decentralization is the same in the two countries as well as its intensity, as measured by the value of the coefficient, is analogue.

We introduce among the regressors an interaction term in order to account for differences in the effect of fiscal decentralization between ordinary and special statute regions. For the subsample of special statute regions, we find a positive and statistically significant effect of decentralization on the share of regional capital expenditure.

Looking at the other control variables, we find the existence of a positive correlation with the share of capital expenditure by the central government (*cg_cap_exp*). The presence of a

positive coefficient indicates that both types of investment are complementary, that is regions with a high share of capital expenditure by central government tend to increase the amount of capital expenditure as a ratio to total expenditure. A positive coefficient is also associated with the level of capital stock per capita (*cap_pc*). We would expect that poorer regions invest a higher share on capital, in order to catch up the richer regions; nevertheless, we find that the coefficient on gdp_pc_{t-1} has a positive sign even if significant only in one of the two models estimated. Insofar as demographic variables are concerned, population density (pop_den_{t-1}) plays a highly important role and it seems to confirm the possibility to take advantages of economies of scale in providing public services.

As a robustness check, we also consider the ratio of capital to total expenditure for three of the functional categories which have mainly affected by the decentralization process in Italy: health, education, environment. Indeed, as a result of the 2001 constitutional reform, a group of public matters (and among them those we analyse) are assigned to a regime of concurrent competence of national and regional government: the legislative power of the former is restricted to the determination of basic principles, while the latter has full legislative powers within the framework determined by central government. The results of our estimates are again conclusive regarding the effect of the level of decentralization. In Table 3 we report the coefficient of both our decentralization variables: they are negative and statistically significant.

[*Here Table 2*]

[*Here Table 3*]

Our data allow us to go beyond the simple distinction between current and capital expenditures and to consider regional expenditure decompositions based on "economic" categories: consumption, investment, personnel expenditures, current transfer, capital transfer. Table 4 shows the results of estimating equation (2). They confirm the results obtained estimating equation (1): an increase in the level of decentralization induces a reduction in the share of capital transfer to total regional expenditure, while the opposite occurs in the share of consumption expenditure (an item of current expenditure). Even if the coefficient of the variable *fis_dec* is not statistically significant when we consider the categories "investment" (regression (5) in Table 4) and "current transfer" (regression (3) in Table 4), its sign is coherent: it is negative for the capital expenditure item (*inv*) and positive for the current expenditure one (*cur_tran*). Moreover, the decentralization process seems to be associated with a reduction in personnel expenditures, although this result is attributable to the more general process of reduction of public employees in Italy over the last decades.

For the subsample of special statute regions, we find that fiscal decentralization produces a shift from consumption expenditure mainly to investment, as shown by the value of average partial effect (regression 5 in Table 4), and, to a lesser extent, to capital and current transfers.

As regards the control variables, their behaviour is consistent with the previous model. Here, we focus only on long-term unemployment (*long_unem*), a variable included as a proxy in order to control for social inequality, since it plays a significant role in explaining the share of current transfer and capital transfer as well as investment and, therefore, confirms that not only the average level of income may affect public spending but also its distribution (MELTZER and RICHARD, 1981, 1983).

[*Here Table 4*]

Finally, considering the functional classification of regional expenditure (equation (3)), it is possible to conclude that a higher fiscal decentralization reduces the social welfare expenditure (*soc_welf*), while increases the other categories: investment to enhance human capital (*inv_hc*), infrastructure (*inf*) and development expenditure (*dev_exp*) (Table 5).[xiv] Our results suggest, therefore, that there is a change in the functional composition of public expenditure of the Italian regional governments as a result of the decentralization process under way.

Analysing the control variables, population density (pop_den_{t-1}) and its age structure (pop_15_{t-1} and pop_65_{t-1}) prove to be significant determinants in the composition of regional government expenditures, in accordance with the results of previous studies on the forces behind the composition of government spending (SANZ and VELÀZQUEZ, 2002, 2007; SHELTON, 2007). More in details, it is interesting to note that the coefficient of pop_den_{t-1} is statistically significant and negative for all the functions but one (social welfare); this seems to confirm the existence of economies of scale in the provision of many public services. Between investment in human capital and elderly share there is the expected negative sign (POTRAFKE, 2010) and the value of the average partial effect implies that public regional expenditures on education decreases by 2.8% when the elderly share increases by 10%. The central government expenditure for each function is statistically significant for all the categories. The negative sign of the coefficient means that a region with a higher expenditure by central government tend to decrease the amount of regional expenditure in education and training (regression (2) in Table 5); while the positive sign means that for the other categories the central and regional expenditure are complementary.

[*Here Table 5*]

5.3.1. Short run and long run effects of decentralization

Before estimating the error correction model we perform the panel unit root of Im-Shin-Pesaran for each variable (Table A4 in Appendix). As regards the dependent variables, with the only exception of capital expenditure which is I(1), all the variables are I(0). For the fiscal decentralization variable, the null hypothesis of the unit-root is rejected. The control variables are integrated in the order of I(1) and integrated by I(0).

In Table 6 we replicate the estimation for the capital expenditure variable using a GMM technique for the error correction version of the model. The validity of the instruments used in the regressions is evaluated using a Sargan-Hansen test of overidentification. The results for both the fiscal decentralization and vertical fiscal imbalance variables are coherent with the static model. An increase in the level of decentralization produces a reduction of the share of regional capital expenditure equally in the short and in the long run. Looking at the size of the coefficients, we find that the effect is larger in the short term than in the long term.

[*Here Table 6*]

Estimates in Tables 7 and 8 are made by a three-stages least seemingly unrelated regression, recognizing that there is interdependence across expenditure items considered that for a fixed budget any change in one category implies a matched change in some other expenditure categories (GEMMELL et al., 2008).

Focusing first on the "economic" classification of public regional expenditure, it emerges a divergence in the sign of the effect of decentralization across the short and the long term in all but one expenditure category (Table 7). In the short run the results are coherent with the static model: an increase in the level of fiscal decentralization causes a shift from personal expenditure and capital transfer to consumption and current transfer. In the long run, the opposite occurs: an increase in fiscal decentralization implies an increase in the share of personal expenditure and capital transfer. It seems, therefore, that the decentralization process in the first phase would certainly cause an increase in current expenditure items, but in the long term there is a recomposition of regional governments spending.

Table 8 confirms that with an increase in fiscal decentralization the share of social expenditure reduces both in the short and long run. At the same time, it is confirmed the positive effect on investment in human capital. For the development expenditure category there is a negative effect in the short term, even if the quantitative effect is negligible, while it is positive in the long run.

[*Here Table 7*]

[*Here Table 8*]

6. Conclusions

This paper analyzes whether decentralization has an impact on the composition of public expenditure of the Italian regional administrations over the period 1996-2008. The period under

analysis is particularly interesting since during the last two decades the Italian system of intergovernmental fiscal relations has been involved in a radical reform that is still underway.

The results demonstrate that the level of decentralization influence the expenditure composition and that the impact is both in the short and long run, as the dynamic panel data analysis adopted in this paper shows. First, an increase in the level of decentralization may induce a reduction in the share of capital expenditure to total regional expenditure. This result is robust to different empirical methodologies. Second, when we look at the "economic" classification of public expenditure, it seems that the decentralization process in the first phase would certainly cause an increase in current expenditure items (consumption and current transfer), but in the long term there would be a recomposition of regional governments spending. Third, considering a functional classification of regional expenditure, it emerges, both from the static and dynamic analysis, that a higher fiscal decentralization reduces the social welfare expenditure, while increases the level of investment to enhance human capital as well as the spending in infrastructure and development.

The policy implications of our findings may be quite interesting, in particular for countries undergoing a decentralization process as in Italy. Fiscal decentralization has undoubtedly an impact on the composition of public expenditures, but does the induced change determine a better allocative efficiency and thus lead to higher economic growth? Give a definitive answer to this question is beyond the scope of our paper, notwithstanding the reduction of capital expenditure of the Italian regional government could be harmful for the economic growth, as many theoretical models would suggest. Some recent empirical studies, focusing on OECD countries, support the significance of public capital expenditure for growth (COLOMBIER, 2009; WAHAB, 2004). The reduction of regional capital expenditure could be

particularly negative in countries with acute regional disparities such as Italy and Spain (RODRÍGUEZ-POSE and GILL, 2004). In this respect it is very interesting the analysis of the relationship between fiscal decentralization and regional income disparities in BONET (2006). In this paper, the author shows that the negative impact of the fiscal decentralization process implemented in Colombia during the 1990s on the regional income disparities was in part attributable to the allocation of a major portion of the new local resources to current spending instead of capital or infrastructure investments.[xv]

Whether the distinction between current and capital expenditure is abandoned and the functional composition is considered, then the picture seems to change, since an increase in the level of fiscal decentralization would cause a shift from "unproductive" expenditure (social welfare) to "productive" expenditure (investment to enhance human capital, infrastructure, and development expenditure) according to the classification presented by BLEANY et al. (2001).

Given the huge political and academic discourse about fiscal federalism across Europe, further research is needed to better understand the link between the change induced in the public expenditure composition by decentralization and economic growth mainly at regional level.

APPENDIX

[*Here Table A1*]

[*Here Table A2*]

[*Here Table A3*]

[*Here Table A4*]

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[i] The early contributions date back to the pioneering studies by TIEBOUT (1956) and OATES (1972).

[ii] The primary justification for this result stems from the existence of local public goods whose benefits and costs are restricted to a particular geographical area. The traditional view on decentralization suggests that where provision of the public goods provides benefits that are national, then the supply by the central level would be appropriate; where public goods provide localized benefits they should be supplied by local levels.

[iii] On the idea that devolution is associated with higher economic efficiency, however, there is no a unanimous consensus (RODRÍGUEZ-POSE and GILL, 2005; PRUD'HOMME, 1994). The choice between central and local provision and financing is thus often not clear-cut, and general conclusions about best practise are not easy to draw from a review of country experiences in this area.

[iv] Recently, AGÉNOR (2005, 2011) have examined various extensions of the Barro/Devarajan framework explicitly modelling different spending types (infrastructure, education and health) as inputs into private production and interactions between them.

[v] In Italy reforms occurred also on the electoral rules side (moving from a pure proportional-parliamentary system to a presidential-majoritarian one) both at the municipal (1993) and at regional level (1999). The direct election of Mayors of big cities and Presidents of regions strengthened their political importance and power and represented a push towards the devolution.

[vi] For a survey of the economics literature on the causal relationship between fiscal decentralization and economic growth see MARTINEZ-VAZQUEZ and MCNAB (2003).

[vii] The dataset used in ARZE DEL GRANADO et al. (2005) covers 45 developed and developing countries for the period 1973-2000. The sample used in KAPPELER, VÄLILÄ (2008) consists of a panel of EU10 countries (EU15 less the Cohesion countries less Luxembourg) during the period 1990–2005.

[viii] As stated in ARACHI and ZANARDI (2004) different driving forces can explain this radical process of reform: "the attempt to provide a response, through fiscal decentralisation, to the call for greater efficiency in public service provision and accountability of local governments; the pressures from regional groups for more participation

and control in the political process, in response to the increasing role of the European Union and the parallel weakening of national powers; the demand for constraining the size of government and consequently for a reduction in the tax burden; the emergence on the political stage of Lega Nord (Northern League), an autonomist party, and the attempt to avoid, through the decentralisation of fiscal responsibilities, the strengthening of separatist demands".

[ix] For a detailed discussion of the overall implications of the new Constitution see GIARDA (2004).

[x] The new constitutional provision requires organic implementation by the state legislator to allow effective entry into force of "fiscal federalism" in Italy. The entry into force of Law n° 42 on fiscal federalism on 5 May 2009 ("Delegation to the Government on the matter of fiscal federalism, in accordance with article 119 of the Constitution") undoubtedly represents a significant step in this direction. The law n° 42 contains several general principles which aim to draft the overall layout of the fiscal federalism model which the process of reform intends to accomplish.

[xi] The functional breakdown of public expenditure is presented in Table A1 in Appendix.

[xii] A similar functional classification is in KAPPELER and VÄLILÄ (2008)

[xiii] PAPKE and WOOLDRIDGE (2008) extend to panel data the results of PAPKE and WOOLDRIDGE (1996). In the earlier work the authors propose the use of a quasi-maximum likelihood estimation (QMLE) to guarantee that the predicted values of the dependent variable lay in the unit interval.

[xiv] The functional breakdown of public expenditure adopted in this paper consists of five categories, including "pure public goods". This category is not considered in econometric estimates since it contains sectors (defence, public order, justice) whose expenditure lies to the central government and it can be hardly influenced by decentralization process.

[xv] Considering the political dimension of decentralisation, EZCURRA and RODRÍGUEZ-POSE (2011) find that decentralization has a negative impact on within-country territorial inequalities.

Table 1. Regional indicators, 2008

	Surface (sq km)	Population (thousands)	Population density	Population < 15 years	Population > 65 years	GDP (millions of euro)	*Per capita* GDP (euro)	*Per capita* GDP (Italy = 1)
Piemonte	25,402.46	4,416.90	173.88	12.65%	22.69%	102,867.82	23,289.60	1.09
Valle d'Aosta	3,263.24	126.50	38.77	13.62%	20.66%	3,512.00	27,762.86	1.30
Lombardia	23,862.80	9,692.50	406.18	13.94%	19.90%	266,264.52	27,471.19	1.29
Veneto	18,398.85	4,858.90	264.09	14.08%	19.59%	121,014.95	24,905.83	1.17
Friuli Venezia Giulia	7,858.39	1,226.50	156.08	12.31%	23.12%	29,164.50	23,778.63	1.11
Liguria	5,421.55	1,612.40	297.41	11.28%	26.79%	34,956.45	21,679.76	1.02
Emilia Romagna	22,117.34	4,306.90	194.73	12.91%	22.56%	114,355.44	26,551.68	1.24
Toscana	22,993.51	3,692.40	160.58	12.43%	23.26%	85,847.94	23,249.90	1.09
Umbria	8,456.04	889.30	105.17	12.69%	23.18%	17,641.93	19,837.99	0.93
Marche	9,694.06	1,561.30	161.06	13.18%	22.47%	33,750.71	21,617.05	1.01
Lazio	17,235.97	5,593.90	324.55	13.92%	19.62%	139,711.82	24,975.74	1.17
Abruzzo	10,762.71	1,329.30	123.51	13.11%	21.26%	23,675.39	17,810.42	0.83
Molise	4,437.68	320.80	72.29	12.81%	21.88%	5,276.42	16,447.69	0.77
Campania	13,590.24	5,812.20	427.67	16.84%	15.77%	78,447.31	13,497.01	0.63
Puglia	19,357.90	4,078.10	210.67	15.18%	17.89%	57,595.01	14,123.00	0.66
Basilicata	9,994.61	590.80	59.11	13.80%	20.07%	8,971.96	15,186.12	0.71
Calabria	15,080.55	2,008.20	133.16	14.60%	18.59%	27,455.05	13,671.47	0.64
Sicilia	25,711.40	5,033.70	195.78	15.55%	18.28%	71,052.12	14,115.29	0.66
Sardegna	24,089.89	1,668.30	69.25	12.45%	18.54%	27,248.14	16,332.88	0.77
Provincia Autonoma di Trento	6,206.90	516.60	83.23	15.34%	19.10%	12,940.00	25,048.39	1.17
Provincia Autonoma di Bolzano	7,399.92	496.40	67.08	16.76%	17.37%	13,764.45	27,728.55	1.30

Source: authors' elaboration on ISTAT data

Table 2. Testing the effect of decentralization on public expenditure composition for Italian regions - Fractional probit Pooled QMLE (dependent variable: ratio of capital expenditure to total public regional expenditure)

	(1)			(2)	
	Coef.	*APE*		*Coef.*	*APE*
fis_dec	-0.5500***	-0.1316***	vfi	-0.2166***	-0.0518***
	(0.008)	(0.008)		(0.000)	(0.000)
inter _fis_dec	1.4368***	0.3437***	inter _vfi	0.4398***	0.1053***
	(0.000)	(0.000)		(0.000)	(0.000)
eff_reg	-0.0242	-0.0058	eff_reg	-0.1584**	-0.0379**
	(0.742)	(0.742)		(0.014)	(0.015)
pop_den_{t-1}	-0.0012***	-0.0003***	pop_den_{t-1}	-0.0012***	-0.0003***
	(0.000)	(0.000)		(0.000)	(0.000)
gdp_pc_{t-1}	7.4311	1.7778	gdp_pc_{t-1}	21.4015***	5.1222***
	(0.201)	(0.200)		(0.000)	(0.000)
cap_pc	15.2828***	3.6562***	cap_pc	11.2124***	2.6836***
	(0.000)	(0.000)		(0.001)	(0.001)
cg_cap_exp	2.1739***	0.5201***	cg_cap_exp	2.3106***	0.5530****
	(0.000)	(0.000)		(0.000)	(0.000)
cons	-1.3921***		cons	-1.4421***	
	(0.000)			(0.000)	
Pseudo Log-Likelihood	-82.5825		Pseudo Log-Likelihood	-82.5805	
Observations	273		Observations	273	

Notes: * significant at 10%; ** significant at 5%; *** significant at 1%

P-values are reported in parentheses

Table 3. Robustness check: testing the effect of decentralization on public expenditure in health, education and environment for Italian regions - Fractional probit Pooled QMLE (dependent variable: ratio of capital expenditure to total public regional expenditure by functional expenditure category)

	Health		Education		Environment	
	Coef.	*APE*	*Coef.*	*APE*	*Coef.*	*APE*
fis_dec	-0.0984	-0.0075	-2.8997***	-0.5972***	-3.0002***	-1.1210***
	(0.708)	(0.707)	(0.000)	(0.000)	(0.000)	(0.000)
inter_fis_dec	0.5490***	0.0419***	1.8529***	0.3816***	2.4237***	0.9056***
	(0.004)	(0.003)	(0.000)	(0.000)	(0.000)	(0.000)

	Health		Education		Environment	
	Coef.	*APE*	*Coef.*	*APE*	*Coef.*	*APE*
vfi	-0.1212***	-0.0093***	-0.4823***	-0.1003***	-0.6319***	-0.2373***
	(0.009)	(0.009)	(0.001)	(0.001)	(0.000)	(0.000)
inter_vfi	0.1397***	0.0107***	0.2927***	0.0609***	0.5251***	0.1972***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)

Notes: * significant at 10%; ** significant at 5%; *** significant at 1%

P-values are reported in parentheses

Table 4. Testing the effect of decentralization on "economic" expenditure composition for Italian regions - Fractional probit Pooled QMLE
(dependent variable: ratio of each economic expenditure category to total public regional expenditure)

	(1) per_exp		(2) con_exp		(3) cur_tran		(4) cap_tran		(5) inv	
	Coef.	*APE*	*Coef.*	*APE*	*Coef.*	*APE*	*Coef.*	*APE*	*Coef.*	*APE*
fis_dec	-0.3030***	-0.1021***	0.4587***	0.1774***	0.1786	0.0298	-0.7551***	-0.1213***	-0.1357	-0.0168
	(0.007)	(0.007)	(0.001)	(0.001)	(0.468)	(0.467)	(0.001)	(0.001)	(0.634)	(0.633)
inter_fis_dec	0.0384	0.0129	-1.3499***	-0.5222***	0.7079***	0.1180***	0.8901***	0.1430***	1.6378***	0.2029***
	(0.696)	(0.696)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
eff_reg	-0.0565	-0.0190	0.0583	0.0226	0.2071**	0.0345**	-0.2299***	-0.0369**	0.1168	0.0145
	(0.309)	(0.310)	(0.318)	(0.318)	(0.015)	(0.014)	(0.009)	(0.010)	(0.148)	(0.145)
pop_den_{t-1}	0.0001	0.0000	0.0004***	0.0002***	0.0004*	0.0001*	-0.0014***	-0.0002***	-0.0004**	-0.0001**
	(0.915)	(0.915)	(0.001)	(0.001)	(0.054)	(0.051)	(0.000)	(0.000)	(0.040)	(0.042)
gdp_pc_{t-1}	-1.9578	-0.6599	-0.7385	-0.2857	8.1629	1.3608	-33.3651***	-5.3620***	21.1454***	2.6203***
	(0.716)	(0.716)	(0.895)	(0.895)	(0.298)	(0.297)	(0.000)	(0.000)	(0.008)	(0.009)
cap_pc	0.2765	-0.0932	-10.0069***	-3.8711***	1.4206	0.2368	16.7328***	2.6891***	2.4553	0.3043
	(0.907)	(0.907)	(0.000)	(0.000)	(0.747)	(0.746)	(0.000)	(0.000)	(0.585)	(0.585)
long_unem	-0.0120**	-0.0040**	0.0009	0.0003	0.0411***	0.0068***	-0.0461***	-0.0074***	0.0271**	0.0034**
	(0.012)	(0.012)	(0.884)	(0.884)	(0.000)	(0.000)	(0.000)	(0.000)	(0.011)	(0.012)
cons	-0.3741***		-0.0684		-2.0616***		-0.1474		-2.3175***	
	(0.002)		(0.620)		(0.000)		(0.487)		(0.000)	
Pseudo Log-Likelihood	-108.9313		-62.0338		-62.0338		-59.5592		-47.3603	
Observations	273		273		273		273		273	

Notes: * significant at 10%; ** significant at 5%; *** significant at 1%

P-values are reported in parentheses

Table 5. Testing the effect of decentralization on functional expenditure composition for Italian regions - Fractional probit Pooled QMLE (dependent variable: ratio of each functional expenditure category to total public regional expenditure)

	(1) soc_welf		(2) inv_hc		(3) inf		(4) dev_exp	
	Coef.	*APE*	*Coef.*	*APE*	*Coef.*	*APE*	*Coef.*	*APE*
fis_dec	-1.8529***	-0.6118***	0.6576***	0.0587***	0.8050***	0.1514***	1.1977***	0.1875***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
eff_reg	0.6195***	0.2046***	-0.2414***	-0.0215***	-0.0621	-0.0117	0.0229	0.0036
	(0.000)	(0.000)	(0.000)	(0.000)	(0.379)	(0.379)	(0.788)	(0.788)
pop_den_{t-1}	0.0015***	0.0005***	-0.0009***	-0.0001***	0.0001	0.0001	-0.0025***	-0.0004***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.720)	(0.720)	(0.000)	(0.000)
pop_15t-1	3.6722***	1.2126***	0.5695	0.0508	-2.5653**	-0.4826**	-4.7765***	-0.7478***
	(0.008)	(0.008)	(0.601)	(0.602)	(0.041)	(0.041)	(0.000)	(0.000)
pop_65t-1	-0.1750	-0.0578	-3.1338***	-0.2798***	-3.2933***	-0.6196***	-5.1865***	-0.8120***
	(0.865)	(0.865)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
gdp_pc_{t-1}	-8.4596	-2.7934	-7.0882	-0.6329	8.8595	1.6667	-3.1734	-0.4968
	(0.180)	(0.180)	(0.298)	(0.296)	(0.109)	(0.108)	(0.595)	(0.596)
cap_pc	4.3738	1.4442	20.8428***	1.8612***	4.3271	0.8140	-9.3070*	-1.4571*
	(0.454)	(0.454)	(0.000)	(0.000)	(0.305)	(0.307)	(0.068)	(0.070)
cg_soc_welf_gdp	4.5858***	1.5143***						
	(0.000)	(0.000)						
cg_inv_hc_gdp			-18.3375***	-1.6374***				
			(0.000)	(0.000)				
cg_inf_gdp					7.6212***	1.4338***		
					(0.000)	(0.000)		
cg_dev_exp_gdp							3.5955***	0.5629***
							(0.008)	(0.009)
cons	-1.3322***		-0.5813*		-0.7132**		0.4684	
	(0.000)		(0.050)		(0.020)		(0.106)	
Pseudo Log-Likelihood	-108.0111		-35.2956		-68.3700		-57.9104	
Observations	273		273		273		273	

Notes: * significant at 10%; ** significant at 5%; *** significant at 1%

P-values are reported in parentheses

Table 6. Testing the effect of decentralization on expenditure composition for Italian regions - Error correction model (dependent variable: ratio of capital expenditure to total public regional expenditure)

	(1)		(2)
Δ cap_exp_{t-1}	-1.0595***	Δ cap_exp_{t-1}	-1.0269***
	(0.000)		(0.000)
Δ fis_dec_{t}	-0.2249***	Δ vfi_{t}	-0.0394***
	(0.000)		(0.000)
Δ fis_dec_{t-1}	-0.3289***	Δ vfi_{t-1}	-0.0504***
	(0.000)		(0.002)
ECT	-1.1899***	ECT	-1.1117***
	(0.000)		(0.000)
fis_dec_{t-2}	-1.6191***	vfi_{t-2}	-1.1736***
	(0.000)		(0.000)
short run coeff.	-0.5538***	short run coeff.	-0.0898***
	(0.000)		(0.000)
long run coeff.	-0.3607***	long run coeff.	-0.0557***
	(0.000)		(0.000)
Δ eff_reg	-0.0421	Δ eff_reg	-0.0490
	(0.250)		(0.177)
Δ pop_den	-0.0003	Δ pop_den	-0.0002
	(0.494)		(0.675)
Δ gdp_pc	-19.4773***	Δ gdp_pc	-21.0310***
	(0.006)		(0.003)
Δ cap_pc	5.8896	Δ cap_pc	4.2368
	(0.236)		(0.393)
eff_reg_{t-1}	0.0453	eff_reg_{t-1}	0.0281
	(0.320)		(0.533)
pop_den_{t-1}	-0.0011*	pop_den_{t-1}	-0.0008
	(0.089)		(0.221)
gdp_pc_{t-1}	-7.4217	gdp_pc_{t-1}	-13.5458**
	(0.284)		(0.046)
cap_pc_{t-1}	27.2892***	cap_pc_{t-1}	23.2422***
	(0.000)		(0.000)
cons	0.3097**	cons	0.3827**
	(0.036)		(0.012)
Sargan-Hansen test	0.231	Sargan-Hansen test	0.127
Observations	273	Observations	273

Notes: * significant at 10%; ** significant at 5%; *** significant at 1%

P-values are reported in parentheses

The instruments used include lagged values of right-hand variables

Table 7. Testing the effect of decentralization on economic expenditure composition for Italian regions - Error correction model (dependent variable: ratio of each economic expenditure category to total public regional expenditure)

	(1) per_exp	(2) con_exp	(3) cur_tran	(4) cap_tran	(5) inv
$\Delta g_{e,t-1}$	-0.2876***	-0.2757***	-0.2911***	-0.2853***	-0.2479***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Δ fis_dec$_t$	-0.0700	0.0441	0.0663	-0.0540	0.0146
	(0.150)	(0.465)	(0.140)	(0.215)	(0.537)
Δ fis_dec$_{t-1}$	-0.0690	0.0054	-0.0028	0.0525	0.0151
	(0.184)	(0.933)	(0.953)	(0.260)	(0.557)
ECT	-0.1588***	-0.1532***	-0.1734***	-0.1680***	-0.1397***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
fis_dec$_{t-2}$	-0.1337***	-0.2047***	-0.1794***	-0.1647***	-0.1110***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
short run coeff.	-0.1390*	0.0495*	0.0635*	-0.0015*	0.0297**
	(0.062)	(0.052)	(0.093)	(0.087)	(0.025)
long run coeff.	0.1581***	-0.3362**	-0.0346***	0.0196***	0.2054**
	(0.009)	(0.031)	(0.001)	(0.000)	(0.011)
Δ eff_reg	0.0014	-0.0040	-0.0302	0.0309	0.0016
	(0.971)	(0.934)	(0.404)	(0.378)	(0.932)
Δ pop_den	0.0003	0.0001	-0.0001	-0.0001	-0.0003
	(0.452)	(0.944)	(0.900)	(0.932)	(0.186)
Δ gdp_pc	-11.0817*	3.4498	7.4731	-0.9486	1.2945
	(0.073)	(0.653)	(0.189)	(0.863)	(0.663)
Δ cap_pc	-3.5833	-3.1039	-0.1544	3.6510	3.3451
	(0.417)	(0.571)	(0.970)	(0.354)	(0.116)
Δ long_unemp	-0.0016	-0.0062	0.0003	0.0039	0.0033**
	(0.619)	(0.115)	(0.904)	(0.159)	(0.030)
eff_reg$_{t-1}$	-0.0044	0.0125	-0.0047	-0.0031	-0.0002
	(0.749)	(0.465)	(0.711)	(0.802)	(0.980)
pop_den$_{t-1}$	0.0001	0.0001	-0.0001	-0.0001	0.0000
	(0.352)	(0.137)	(0.222)	(0.147)	(0.454)
gdp_pc$_{t-1}$	0.1164	-2.7338**	1.0660	0.3166	1.1491**
	(0.914)	(0.043)	(0.285)	(0.743)	(0.036)
cap_pc$_{t-1}$	0.2620	-0.7051	0.4115	0.0861	0.0038
	(0.692)	(0.390)	(0.498)	(0.885)	(0.990)
long_unemp$_{t-1}$	-0.0007	-0.0023	0.0012	0.0009	0.0010
	(0.593)	(0.166)	(0.358)	(0.457)	(0.150)
cons	0.0405	0.1369***	-0.0080	0.0114	-0.0225
	(0.153)	(0.000)	(0.748)	(0.643)	(0.101)
Oservation	273	273	273	273	273

Notes: * significant at 10%; ** significant at 5%; *** significant at 1%

P-values are reported in parentheses

Table 8. Testing the effect of decentralization on functional expenditure composition for Italian regions - Error correction model (dependent variable: ratio of each functional expenditure category to total public regional expenditure)

	(1) soc_welf	(2) inv_hc	(3) inf	(4) dev_exp
$\Delta g_{f,t-1}$	-0.3689***	-0.3810***	-0.4145***	-0.4364***
	(0.000)	(0.000)	(0.000)	(0.000)
Δ fis_dec$_t$	-0.0735	0.0434**	0.0004	-0.0076
	(0.150)	(0.013)	(0.991)	(0.864)
Δ fis_dec$_{t-1}$	-0.0566	0.0544***	-0.0053	-0.0092
	(0.324)	(0.004)	(0.898)	(0.849)
ECT	-0.1535***	-0.3851***	-0.2012***	-0.2131***
	(0.000)	(0.000)	(0.000)	(0.000)
fis_dec$_{t-2}$	-0.2681***	-0.3215***	-0.1749***	-0.1753***
	(0.000)	(0.000)	(0.000)	(0.000)
short run coeff.	-0.1301**	0.0978**	-0.0049	-0.0168***
	(0.012)	(0.031)	(0.113)	(0.001)
long run coeff.	-0.7466***	0.1652*	0.1307*	0.1774*
	(0.000)	(0.055)	(0.061)	(0.072)
Δ eff_reg	0.0528	0.0034	-0.0137	-0.0153
	(0.190)	(0.801)	(0.652)	(0.673)
Δ pop_den	-0.0001	-0.0001	-0.0002	0.0004
	(0.819)	(0.533)	(0.585)	(0.341)
Δ pop_15	-16.9789***	0.2182	9.0731**	7.0218*
	(0.000)	(0.899)	(0.012)	(0.096)
Δ pop_65	-6.6035**	0.4828	2.8514	3.3616
	(0.024)	(0.621)	(0.180)	(0.209)
Δ gdp_pc	-1.4746	3.0690	10.4013**	-16.7570***
	(0.816)	(0.165)	(0.028)	(0.003)
Δ cap_pc	0.8837	-1.2202	3.6042	-4.7179
	(0.847)	(0.447)	(0.293)	(0.249)
Δ cg$_f$	0.6791***	-0.6484***	0.1395	0.2253
	(0.000)	(0.000)	(0.640)	(0.105)
eff_reg$_{t-1}$	0.0322**	-0.0095*	-0.0127	-0.0070
	(0.032)	(0.064)	(0.257)	(0.607)
pop_den$_{t-1}$	0.0001***	-0.0001**	-0.0001	-0.0001***
	(0.001)	(0.017)	(0.530)	(0.006)
pop_15$_{t-1}$	-0.1268	0.3320***	0.0910	-0.2297
	(0.592)	(0.000)	(0.614)	(0.287)
pop_65$_{t-1}$	0.3067*	-0.0384	-0.1251	-0.3331**
	(0.090)	(0.530)	(0.367)	(0.041)
gdp_pc$_{t-1}$	1.4408	-0.0131	-1.1719	-1.1008
	(0.273)	(0.979)	(0.229)	(0.345)
cap_pc$_{t-1}$	-0.0672	0.8208***	0.3898	-0.0945
	(0.924)	(0.002)	(0.466)	(0.883)
cg$_{f,t-1}$	0.1316	-0.9832***	0.1611	0.1022
	(0.350)	(0.000)	(0.495)	(0.410)
cons	0.0083	-0.0038	0.0543	0.1476**
	(0.916)	(0.889)	(0.371)	(0.042)
Observation	273	273	273	273

Notes: * significant at 10%; ** significant at 5%; *** significant at 1%

P-values are reported in parentheses

cg$_f$ is used as a generic notation to refer to cg_soc_welf_gdp (in regression (1)), cg_inv_hc_gdp (in regression (2)), cg_inf_gdp (in regression (3)), cg_dev_exp_gdp (in regression (4))

Table A1. Functional breakdown of public expenditure

Aggregation	Territorial public accounts sectors
Pure public goods	General administration Defence Public Order Justice
Social welfare	Other social affairs (assistance and charity) Pensions and wage supplementation Health Other health and sanitation
Public investment to enhance human capital	Training Education
Infrastructure	Roads Other transport Telecomunications Energy Water Sewers and water treatment Environment Waste disposal Other public works Residential building and urban development
Expenditure for development	Research and development Labour Agriculture Marine fishing and aquaculture Tourism Wholesale and retail distribution Industry and artisan Other economic sectors Culture and recreational services

Table A2. Variables description and summary statistics

Variable	Description	Mean	Std. Dev.	Min	Max	Source
cap_exp	Ratio of capital to total public expenditures of the regional government	0.1704	0.1004	0.0248	0.5849	Territorial public accounts (*Conti pubblici territoriali*)
soc_welf	Ratio of social welfare to total public expenditures of the regional government	0.6746	0.1685	0.1693	0.8820	Territorial public accounts (*Conti pubblici territoriali*)
inv_hc	Ratio of investment to enhance human capital to total public expenditures of the regional government	0.0471	0.0515	0.0037	0.2184	Territorial public accounts (*Conti pubblici territoriali*)
inf	Ratio of infrastructure to total public expenditures of the regional government	0.1119	0.0459	0.0209	0.2598	Territorial public accounts (*Conti pubblici territoriali*)
dev_exp	Ratio of expenditure for development to total public expenditures of the regional government	0.0925	0.0682	0.0140	0.4655	Territorial public accounts (*Conti pubblici territoriali*)
per_exp	Ratio of personnel expenditure to total public expenditures of the regional government	0.2811	0.0437	0.0902	0.4493	Territorial public accounts (*Conti pubblici territoriali*)
con_exp	Ratio of consumption expenditure to total public expenditures of the regional government	0.4626	0.1062	0.2202	0.7337	Territorial public accounts (*Conti pubblici territoriali*)
cur_tran	Ratio of current transfer to total public expenditures of the regional government	0.0946	0.0467	0.0058	0.2340	Territorial public accounts (*Conti pubblici territoriali*)
cap_tran	Ratio of capital transfer to total public expenditures of the regional government	0.0929	0.0570	0.0046	0.3227	Territorial public accounts (*Conti pubblici territoriali*)
inv	Ratio of investment to total public expenditures of the regional government	0.0688	0.0590	0.0051	0.2731	Territorial public accounts (*Conti pubblici territoriali*)
vfi	Own tax revenues and intergovernmental transfers as a share of regional expenditures	0.7504	0.3726	0.0308	1.6827	Territorial public accounts (*Conti pubblici territoriali*)
fis_dec	Ratio of tax revenues and intergovernmental transfers of the regional government to total tax revenues and intergovernmental transfers	0.2098	0.1335	0.0137	0.5491	Territorial public accounts (*Conti pubblici territoriali*)
pop_den	Persons per km^2	170.7509	105.1668	34.5050	426.8360	ISTAT
pop_15	Population below 15 years / total population	0.1411	0.0226	0.1011	0.1998	ISTAT
pop_65	Population 65 years and over / total population	0.1912	0.0299	0.1240	0.2674	ISTAT
gdp_pc	GDP per capita (euro)	20316.56	5181.58	11330.00	28830.00	ISTAT
cap_pc	Public capital per capita	0.0105	0.0042	0.0052	0.0229	Di Giacinto *et al*. (2009)
eff_reg	Composite index of regional administration efficiency	0.9600	0.3529	0.4236	1.6885	Dipartimento per lo sviluppo e la coesione economica (www.dps.tesoro.it)
long_unemp	Long-term unemployed (12 months and more) as a percentage of the total active population	4.2814	3.5508	0.1757	15.0140	ISTAT
cap_exp_health	Ratio of health capital to total health public expenditures of the regional government	0.0353	0.0237	0.0042	0.1405	Territorial public accounts (*Conti pubblici territoriali*)
cap_exp_edu	Ratio of education capital to total education public expenditures of the regional government	0.1314	0.1405	0.0000	0.9300	Territorial public accounts (*Conti pubblici territoriali*)
cap_exp_env	Ratio of environment capital to total environment public expenditures of the regional government	0.4241	0.2672	0.0000	1.0000	Territorial public accounts (*Conti pubblici territoriali*)
cg_cap_exp	Ratio of capital to total public expenditures of the central government	0.1211	0.0436	0.0423	0.2505	Territorial public accounts (*Conti pubblici territoriali*)
cg_cap_exp_health	Ratio of health capital to total health public expenditures of the central government	0.0410	0.0333	0.0018	0.2692	Territorial public accounts (*Conti pubblici territoriali*)
cg_cap_exp_edu	Ratio of education capital to total education public expenditures of the central government	0.0048	0.0144	0.0000	0.1900	Territorial public accounts (*Conti pubblici territoriali*)
cg_cap_exp_env	Ratio of environment capital to total environment public expenditures of the central government	0.4943	0.2750	0.0144	0.9875	Territorial public accounts (*Conti pubblici territoriali*)
cg_soc_welf_gdp	Ratio of social welfare expenditures of the central government in each region to regional GDP	0.2177	0.0440	0.1094	0.3241	Territorial public accounts (*Conti pubblici territoriali*)
cg_inv_hc_gdp	Ratio of investment to enhance human capital of the central government in each region to regional GDP	0.0283	0.0173	0.0000	0.0687	Territorial public accounts (*Conti pubblici territoriali*)
cg_inf_gdp	Ratio of infrastructure expenditure of the central government in each region to regional GDP	0.0171	0.0091	0.0025	0.0529	Territorial public accounts (*Conti pubblici territoriali*)
cg_dev_exp_gdp	Ratio of expenditure for development of the central government in each region to regional GDP	0.0294	0.0196	0.0046	0.0973	Territorial public accounts (*Conti pubblici territoriali*)

Table A3. Testing the effect of decentralization on expenditure composition for Italian regions (dependent variable: ratio of capital expenditure to total public regional expenditure)

	(1) Fixed effects (AR1)	(2) Random effects (AR1)	(3) Dynamic GMM (A-Bond)
cap_exp_{t-1}			0.2119**
			(0.010)
fis_dec	-0.1337***	-0.0573	-0.1482***
	(0.004)	(0.150)	(0.006)
pop	0.0365	-0.0235***	0.0183
	(0.448)	(0.000)	(0.623)
gdp_pc_{t-1}	-10.5721*	3.0854*	-13.0306**
	(0.063)	(0.090)	(0.020)
cap_pc	3.2459	3.5883	8.2093*
	(0.497)	(0.150)	(0.076)
cg_cap_exp	0.2080**	0.2839***	0.2932***
	(0.024)	(0.002)	(0.003)
R^2	0.4037	0.4378	
Observation	273	273	273

Table A4. Panel unit root test (Im, Pesaran and Shin)

Variable	p-value	
	level	difference
cap_exp	0.157	0.000
soc_welf	0.006	-
inv_hc	0.001	-
inf	0.001	-
dev_exp	0.003	-
per_exp	0.058	-
con_exp	0.003	-
cur_tran	0.055	-
cap_tran	0.008	-
inv	0.014	-
fis_dec	0.081	-
pop_den	1.000	0.757
gdp_pc	0.156	0.000
cap_pc	0.278	0.000
eff_reg	0.991	0.000
pop_15	1.000	0.001
pop_65	0.000	-
long_unemp	0.851	0.000
cg_cap_exp	0.002	-
cg_soc_welf_gdp	1.000	0.000
cg_inv_hc_gdp	0.078	-
cg_inf_gdp	0.000	-
cg_dev_exp_gdp	0.685	0.000

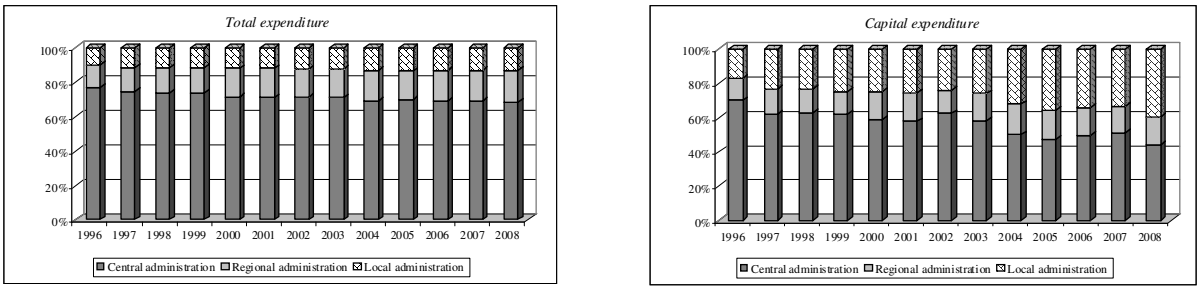


Fig. 1. Share of public expenditure by level of administration

Source: authors' elaboration on Territorial public accounts (Conti pubblici territoriali)

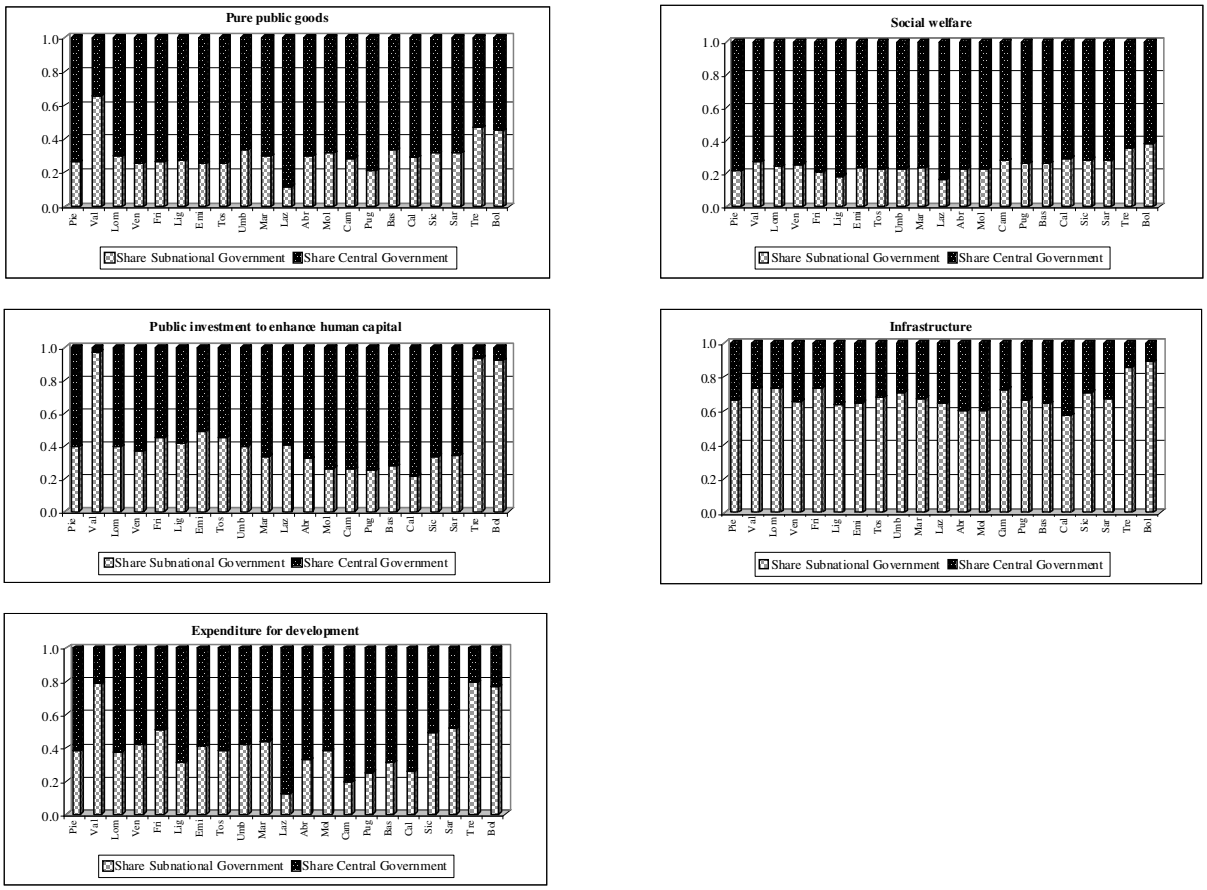


Fig. 2. Share of public expendture by function

Source: authors' elaboration on Territorial public accounts (Conti pubblici territoriali)

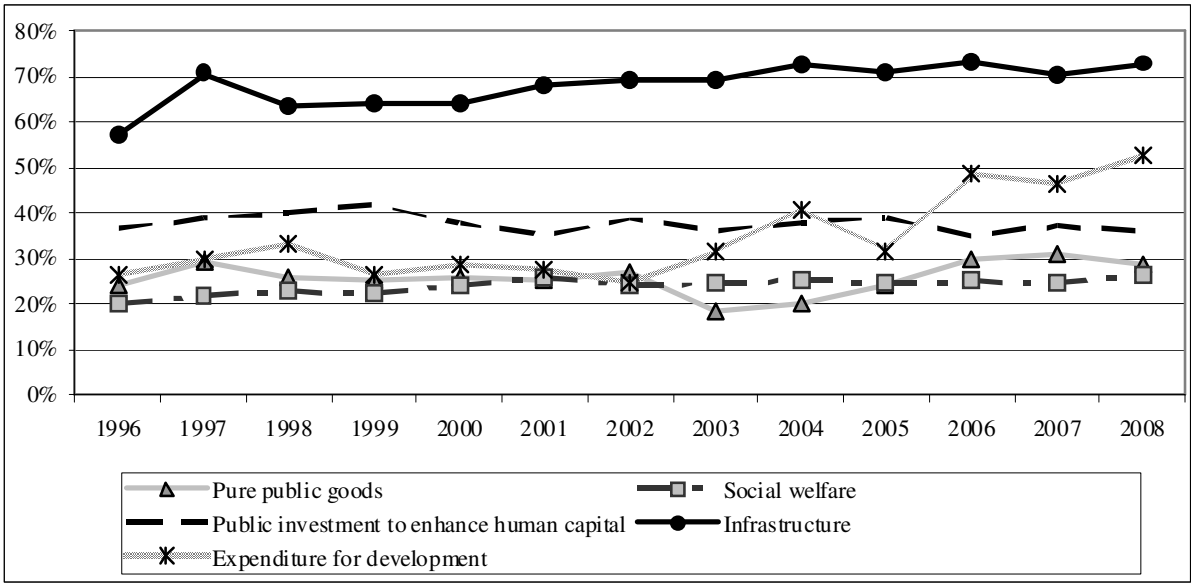
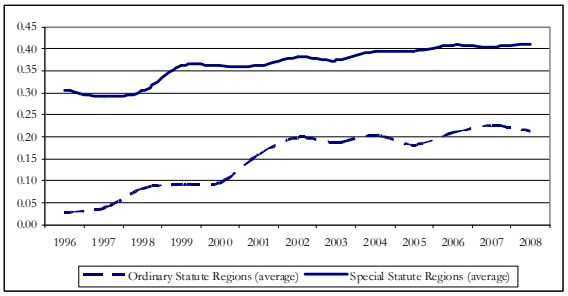
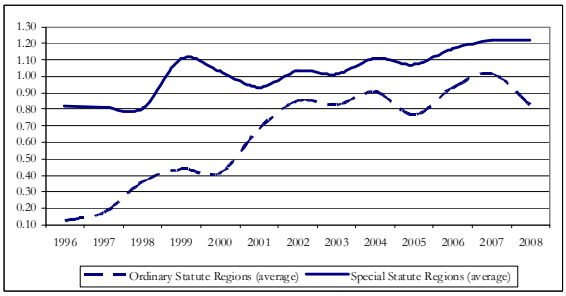


Fig. 3. Public expenditure: share of sub-national government by function

Source: authors' elaboration on Territorial public accounts (Conti pubblici territoriali)



Fiscal decentralization



Vertical fiscal imbalance

Fig. 4. Measures of decentralization in Italy

Source: authors' elaboration on Territorial public accounts (Conti pubblici territoriali