Decentralization, public spending and economic growth: a European perspective

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Abstract

The issue of decentralization of public spending - and its financing method through appropriate incentive schemes - is highly relevant in the literature of fiscal federalism in order to promote greater efficiency and greater responsibility of the policy maker. Nevertheless in the current debate it is somehow neglected the problem of coordination by levels of government in the provision of capital expenditure. Public capital expenditure may in the long run have an effect on growth and regional disparities, if it is well targeted for productive purposes. In the European case, it is widely recognized the important role that a massive public investment plan could have on economic growth. The issue is whether this European public investment plan in order to be effective in the highest degree is to be funded and conducted under a single director (i.e. a hypothetical European federal government) or instead left to the initiative of the each member state. It should be important then to analyze in a dynamic perspective the issue of public capital expenditure by level of government.

We develop therefore a theoretical model that analyzes public capital expenditure by levels of government and its potential effects on economic growth. This model allows us to evaluate the conditions of potential effects of a coordination among levels of government and to evaluate the possible effects of complementarity and / or substitution of capital expenditure among levels of government. This model will be tested through a comparative econometric analysis carried out for 25 European countries, in order to verify the presence (or the absence) of a significant relationship between decentralization and growth.

Keywords: Decentralization, Capital Expenditure, Economic Growth

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1 Introduction

The recent economic crisis has represented a huge challenge for the institutional structure of the EU countries, both at the European and at the national level. At the European level, the crisis has highlighted the weakness of current institutional arrangements. At the national level, the need to respect the financial measures "dictated by Europe" is leading many countries, including Italy, to substantially rethink the financial relationships between levels of government (State and sub-central entities) concerning the division of skills and responsibilities, and could lead to changes of major impact on the taxation system. Specifically all around Europe, there was a substantial re-centralization of decision-making on public resources (see Ahmad, Bordignon and Brosio 2016 Multi-level finance and the Euro crisis). In the current context, the debate on whether to grant a greater or lower autonomy to sub-central entities, however, is far from being solved. On the one hand there is, undoubtedly, the need to protect some primary objectives, such as control of public finances, macroeconomic stability and the rebalancing of unequal levels of development within a same country. And it is traditionally believed that these objectives are best pursued at a more centralized level of government. On the other it is, however, necessary to find new ways to make the territories more competitive and return to growth. In this respect, recently, in the literature on fiscal federalism, a new field of research, both theoretical and empirical, showed that decentralization could promote growth. However in the current research on the dynamic effects of fiscal federalism, a deep analysis of capital expenditure versus total expenditure has not been carried out so far, despite the fact that public capital expenditure (both at the local and at the national level) may have in the long run effects on growth and regional disparities. Moreover in the current debate it is somehow neglected the problem of coordination by levels of government in the provision of capital expenditure. For these purposes, an accurate reflection should be carried out at both national and European levels, in order to identify the most appropriate institutional framework to promote a long-term growth.

We believe that this issue is relevant. First, at the national level, to face the current crisis and promote growth, it may be the case that an adjustment on public expenditure may imply in some way a cut on improductive current expenditure and an increase on capital expenditure. But it must be investigated how to coordinate different levels of government in delivering capital expenditure. Secondly, in the EU, it is widely recognized the important role that a massive public investment plan could have on economic growth. The issue is whether this European public investment plan in order to be effective in the highest degree is to be funded and conducted under a single director (i.e. a hypothetical European federal government) or instead left to the initiative of the each member state.

In a nutshell, it should be important then to analyze in a dynamic perspective
the issue of public capital expenditure by level of government. This is the aim of the paper. We develop first a theoretical model that analyzes public capital expenditure by levels of government and its potential effects on economic growth. This model allows us to evaluate the conditions of potential effects of a coordination among levels of government and to evaluate the possible effects of complementarity and / or substitution of capital expenditure among levels of government. Finally we test the model through a comparative econometric analysis carried out for 25 European countries, in order to verify the presence (or the absence) of a significant relationship between decentralization and growth.

2 Decentralization and growth in the literature

Recently, in the literature on fiscal federalism, a new field of research, both theoretical and empirical, concerns the links between decentralization and growth (see Martinez-Vazquez, Lago-Penas and Sacchi (2015)). These studies build on the results of static efficiency, shown in the literature on fiscal federalism, and try to consider its effects dynamically in terms of economic growth. In particular, these studies note that the effects of increased efficiency related to the provision of certain types of expenditure (i.e. local public goods) which is achieved with decentralization could lead in the long run also to greater economic growth. This potential link between fiscal federalism and growth are deeply analyzed considering in turn three potential mechanisms: 1) federalism can affect the savings rate, 2) federalism can generate technological progress, and finally 3) federalism can generate increasing returns to scale (for an exhaustive survey see Cerniglia and Longaretti 2013b).

The pathbreaking study that considers the first mechanism is Brueckner (2006) in which the public good is financed by a uniform lump-sum tax and individuals (young and old) have heterogeneous preferences about the public good. In a federal system individuals are ordered in any jurisdiction depending on their own preference ("they vote with their feet") and the jurisdictions are homogeneous internally. His results show that young people receive a lower level of the public good than a unitary system, then paying a lower per-capita fee for its funding, thereby increasing the disposable income of young individuals and thus increases the incentive to save and in this way it promotes economic growth. Another proposed mechanism to explain the link between federalism and the savings rate is the tax competition. Under the assumption of perfect capital mobility between the regions, tax competition on the tax base lowers the tax burden. And then it increases savings, capital accumulation, and growth (see Lejour and Verbon, 1997; Hatfield, 2015; Koethenbuerger - Lockwood, 2010; and Chu and Yang, 2012).

The second mechanism considers the fact that fiscal federalism brings technological progress. In fact technological progress can be also declined as a result of greater public sector efficiency that is achieved with decentralization. But also, it can be interpreted as a result of the attempts of the "animal spirits" of the entrepreneurs who are looking for new and more efficient technologies
(Justman et al., 2002), that enhances efficiency of the private sector. In this perspective, the decentralization of certain powers to local governments can also have a greater impact on the agglomeration of economic activities and on the speed with which capital is accumulated and, especially, on the quality of capital that is accumulated. Hence, fiscal competition among local governments can also encourage these effects of agglomeration and each different region can attract different types of private capital. And yet, some local policies could produce catching-up phenomena in growth rates between the poorer regions and the richer ones (Brackman et al., 2002).

The third mechanism deals with the possibility that increasing returns are generated by decentralizing the provision of local public goods. This possibility is modeled in Cerniglia and Longaretti (2013a) where the public good is "education-related". Education is indeed a competence of local governments in many federal and unitary countries as documented in Sacchi and Salotti (2012). In Cerniglia and Longaretti (2013a), the local government provides a uniform level of the public good among the citizens of the territory. From a practical point of view, it is local public goods related to education are regional training programs and therefore, that in principle should be differentiated between regions on the basis of socioeconomic characteristics of territories and natural vocation of development. Cerniglia and Longaretti (2013a) consider a federal system in which individuals are heterogeneous in income level and therefore there is heterogeneity between and within jurisdictions. The study shows that such intra-jurisdictional heterogeneity may be a factor that stimulates the catching-up between regions and therefore a poor region, but with a very uneven distribution of income, can exhibit a higher growth rate compared to a richer region but less heterogeneous.

There is also a wide empirical literature between decentralization and growth that we review briefly in the following lines. First of all, the results of these studies are inconclusive in some way for many reasons: they are influenced by the variables used to measure the degree of decentralization; they are influenced by the dataset and by the level of spatial aggregation; and finally and very importantly, there is a lack of theoretical model of reference on the relationship between decentralization and growth, and therefore there is a lack of unambiguous hypotheses to be tested empirically, since, as mentioned above, many channels or mechanisms can be at work.

The results of cross-countries studies, on the one hand, (for example Davoodi and Zou (1998)) find no significant evidence of the relationship between decentralization and growth in developed economies, while the link is negative, although not significant, for developing economies. On the other hand, other papers (Thiessen 2003) showed a significant positive relationship in the rich economies. Studies applied to single countries instead get more tangible results in favor of a positive relationship between decentralization and growth in emerging economies, such as China (Lin and Liu, 2000; Qiao, Martinez-Vazquez and Yu 2002; Qian and Weingast 2005; and Feldenstein Iwata 2005) and Russia (Desai, Freinkman and Goldberg 2003). The evidence for developed economies (USA, Germany and Switzerland) is more ambiguous. For example, Xie, Zou

The theoretical and empirical literature briefly recalled in this section is the reference background to develop our analysis in the following section, with also the following novelty. We aim to contribute to the literature that explains the relationship between decentralization and growth. But as for decentralization, we focus on expenditure decentralization and notably we consider capital expenditure since, as shown in the endogenous growth theory, this is one of the main channels that drive growth in the long run. To the best of our knowledge, this is the first paper that tries to assess this channel at a decentralized level.

To do that, we need to firstly have to sketch a model that helps us to understand this potential link, and we need to describe and discuss the new measure of decentralization of capital expenditure that we use.

3 The theoretical model

We derive a simple theoretical model through which we aim to explore the relationship between growth and decentralization. The reference base is the neoclassical growth model, in which the aggregate production function of the $i-th$ country at time $t$ depends on the level of physical capital at that time, and a variable that represents the endowment of "efficient human capital" of each country at any time ($A_i H_i$). We consider therefore the following aggregate production function for the $i$-th country at time $t$:

$$Y_{it} = K_{it}^{\alpha} (A_i H_i)^{1-\alpha}$$

Let us define the variables per unit of efficient human capital $\tilde{y}_{it} = \frac{Y_{it}}{A_i H_i}$ and $\tilde{k}_{it} = \frac{K_{it}}{A_i H_i}$.

The production function per unit of "efficient human capital" becomes:

$$\tilde{y}_{it} = \tilde{k}_{it}^{\alpha}$$

Let us assume a constant rate of depreciation of capital, identical for both physical (K) and human (H) capital and equal across counties, $\partial$. The dynamics of capital per unit of efficient human capital becomes:

$$\Delta \tilde{k}_i = s_i \tilde{k}_{it}^{\alpha} - (\frac{\Delta A_i H_i}{A_i H_i} + \partial) \tilde{k}_{it}$$

where $s_i$ is the saving rate of country $i$. Therefore the rate of growth of capital per unit of efficient human capital is:

$$\frac{\Delta \tilde{k}_i}{\tilde{k}_i} = s_i \tilde{k}_{it}^{\alpha-1} - (\frac{\Delta A_i H_i}{A_i H_i} + \partial)$$
Assuming that aggregate human capital is the product of the individual human capital and the population \( H_i = h_i N_i \), the growth rate of the efficient human capital becomes:

\[
\frac{\Delta A_i H_i}{A_i H_i} = \frac{\Delta A_i}{A_i} + \frac{\Delta h_i}{h_i} + n_i
\]  

(5)

where \( n_i \) is the population growth rate.

In a balanced growth path (BGP) \( \frac{\Delta A_i H_i}{A_i H_i} \) is constant over time. Let us define \( \eta_i \) the BGP rate of growth of the efficient human capital:

\[
\frac{\Delta A_i H_i}{A_i H_i} = \eta_i
\]  

(6)

In a BGP, each country \( i \) converges to the following steady state of capital per unit of efficient human capital:

\[
\tilde{k}_i^* = \left( \frac{s_i}{\eta_i + \delta} \right)^{\frac{1}{1-\alpha}}
\]  

(7)

The long-run dynamics of per-capita variables \( \left( k_i = \frac{K_i}{N_i} \right) \) is therefore

\[
\frac{\Delta k_i}{k_i} = \frac{\Delta y_i}{y_i} = \frac{\Delta A_i}{A_i} + \frac{\Delta h_i}{h_i}
\]  

(8)

In this theoretical setting long-run growth will therefore depend on the rate of growth of \( A \) and on the investment in human capital.

Let us now analyze the dynamics of \( A \). It is reasonable to assume that the dynamics of \( A \), that is the labour augmenting technological change, is affected by public investment and by a bunch of factors that influence the institutional set-up of a country. The role of public capital (especially infrastructures) in the growth process, was analyzed and highlighted for the first time by Barro (1990). In recent years, under the impetus of the early work of Barro and Sala i Martin (1995) empirical evidence on the relationship between growth and public infrastructural facilities has expanded greatly by adopting ever more sophisticated technical tools (simple regression, instrumental variables, VAR), and increasingly large samples. More recently, Abiad, Furceri and Topalova (2015) in an interesting paper examine the macroeconomic impact of an increase in public investment. This study shows that these investments have a positive impact on output in both the short and long run, also stimulating private investment and reducing unemployment. These effects are particularly strong when conjugated with an accommodating monetary policy in a recession economy. Finally, the method of financing is relevant. Projects funded through the issuance of debt have more expansionary effects than investments financed by increasing taxes. Moreover the literature on the link between decentralization and growth, as reviewed above, suggests that decentralization may generate technological progress, leading to higher economic growth.
Therefore, we focus on capital expenditure disarticulated by levels of government as the factor that affects the labour augmenting technological change. Let us assume that public investment \((g_{it} in per capita terms)\) can be carried out and financed at different levels of government: central \((g_{c, it})\) or sub-national \((g_{sn, it})\). We assume, therefore the following equation of the dynamics of total factor productivity:

\[
\frac{\Delta A_i}{A_i} = \beta \left( \frac{g_{c, it}}{y_{it}} \right) + \gamma \left( \frac{g_{sn, it}}{y_{it}} \right) \quad (9)
\]

Therefore:

\[
\frac{\Delta k_i}{k_i} = \frac{\Delta y_i}{y_i} = \beta \left( \frac{g_{c, it}}{y_{it}} \right) + \gamma \left( \frac{g_{sn, it}}{y_{it}} \right) + \frac{\Delta h_i}{h_i} \quad (10)
\]

This equation is what we intend to test. In particular we want to estimate \(\beta\) and \(\gamma\): their size, their sign, and their interaction. In other words this equation enable us to disentangle the different effects of central and sub-central capital expenditure on growth.

4 Decentralization: how can it be measured? (to be completed)

For what has to do with the decentralization indicators, the main reference here is the index developed by Hooghe et al. (2016): the Regional Authority Index (RAI), a measure of the authority of sub-central governments in 81 countries. It is developed across ten dimensions: institutional depth, policy scope, fiscal autonomy, borrowing autonomy, representation, law making, executive control, fiscal control, borrowing control, constitutional reform. It covers, therefore, the many aspects that may be contained in a concept of decentralization. We will therefore refer to the aggregate index (RAI) to measure a “wide” concept of decentralization (not only fiscal, but also political, administrative, etc), and to the sub-index Fiscal Autonomy (FD) that instead refers to fiscal decentralization. In the wide literature on the decentralization, this phenomenon is usually described by means of rather poor proxies: the ratio of sub-central expenditures (or revenues) on the total general government expenditures (or revenues), that can only catch a part of a very complex phenomenon.

Moreover, in the empirical analysis, in order to detect the effect of capital expenditure on growth, we consider also another measure of decentralization.

For what has to do with the decentralization indicators, one of the main reference here is the index developed by Hooghe et al. (2016): the Regional Authority Index (RAI), a measure of the authority of sub-central governments in 81 countries. It is developed across ten dimensions: institutional depth, policy scope, fiscal autonomy, borrowing autonomy, representation, law making, executive control, fiscal control, borrowing control, constitutional reform. It covers,
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Then, in order to take into account the same variable traditionally used in the literature on the decentralization, we also refer to the ratio of total sub-central expenditures (or revenues) on the total general government expenditures (or revenues) as a proxy of decentralization. Lastly, in order to better investigate the specific research interests addressed in this work, we also take into account two measures of expenditure decentralization: the ratio of sub-central current expenditure on GDP, and the ratio of sub-central capital expenditure on GDP.

Results concerning decentralization of total expenditure are in Section 6. The breakdown of capital and current are in Section 7.

4.1 The dataset (to be completed)

We collected data on 25 European countries, for the years 1995-2014/2015. National accounts data, debt (or deficit) on GDP ratio, data on education and data related to expenditures/revenues of different level of government (variables SL_CUR_GDP, SL_CAP_GDP, CUR_EXP and CAP_EXP) come from Eurostat. We built the last data by consolidating across different levels of government the items of current/capital expenditure (or revenue) (Eurostat: gov_10a_main, Government expenditures, revenues and main aggregates). Other variables (DECR, DECELOC and TAX) come from the Fiscal Decentralization Database (OECD). Lastly, the Regional Authority Index (RAI) and the Fiscal Autonomy Index (FD) come from the dataset built from Hooghes’ et al.

5 The empirical model

In the empirical model we investigate the relationship between the growth rate of the real gross domestic product (GDP, at constant prices), and the economic variables suggested by the wide theory on the economic growth. We also introduce in the model, however, selected variables that can help to explain part of the difference observed in rate of growth of the European countries. In our regression analysis the dependent variable $\Delta \ln(y_t)$ is therefore the rate of growth of per capita GDP (written as the difference in the natural logs). Our explanatory variables are the following:

$Gfcf_{it}$, the ratio between gross fixed investment and the GDP (at constant prices), that we consider as a proxy of the amount of output invested in capital (OECD);

$School_{it}$, the school expectancy of students (ISCED 0-6), that we take as a proxy of the human capital accumulation (Eurostat);

$Dec_{it}$, an indicator of decentralization. We consider different a set of variables (each one taken individually in the regression, in order to avoid multi...
collinearity problems; 

RAI\(i_t\) (Regional Authority Index): this index, developed by Hooghe et al., allows us to measure the fiscal, administrative and political decentralization at each country level;

FD\(i_t\) (Fiscal Decentralization Index): it measures the level of fiscal decentralization (Hooghe et al.);

Deceloc\(i_t\): the ratio between sub-central total expenditures (State&Local) and total general government expenditures (OECD, Fiscal Decentralization Database);

Decr\(i_t\): the ratio between sub-central total revenues (State&Local) and total general government revenues (OECD, Fiscal Decentralization Database);

Tax\(i_t\): the ratio between the sub-central taxes (State&Local) and total general government taxes (OECD, Fiscal Decentralization Database);

Trade\(i_t\), the sum of export and import on the Gdp, that measures the level of openness of a country (OECD);

Inst\(i_t\), a proxy of macroeconomic instability. We consider, alternatively, the debt to Gdp ratio (Deb) and the deficit to Gdp (Def) ratio for both the general government and the sub-central (State&Local) level (Eurostat).\(^1\)

In order to take into account the dynamics of the process of growth, we also add to the right hand side variables also the \(ln(y_{it-1})\)

\(SL\_CUR\_GDP\): sub-central (State&Local) current expenditure on GDP ratio (built from Eurostat data);

\(SL\_CAP\_GDP\): subentral (State&Local) capital expenditure on GDP ratio (built from Eurostat data);

\(CUR\_EXP\): sub-central (State&Local) current expenditure on general government (GG) current expenditure (built from Eurostat data);

\(CAP\_EXP\): sub-central (State&Local) capital expenditure on general government (GG) capital expenditure (built from Eurostat data);

\(SL\_CAP\_GDP\): subcentral (State&Local) capital expenditure on GDP ratio (built from Eurostat data);

\(CUR\_EXP\): sub-central (State&Local) current expenditure on general government (GG) current expenditure (built from Eurostat data);

\(CAP\_EXP\): sub-central (State&Local) capital expenditure on general government (GG) capital expenditure (built from Eurostat data);

\[dln(y_{it}) = \alpha_{it} + \beta_{1it}ln(y_{it-1}) + \beta_{2it}Gfcf_{it} + \beta_{3it}School_{it} + \beta_{4it}Trade_{it} + \beta_{5it}Deceloc_{it} + \beta_{6it}Inst_{it} + \eta_i + \varepsilon_{it}\]  

(12)
have omitted variables related to country specific factors correlated to the other explanatory variables. Estimating model (12) is equivalent to estimating a dynamic model with a lagged dependent variables:

\[
y_{it} = \alpha_{it} + (1 + \beta_{1it})\ln(y_{it-1}) + \beta_{2it}Gf_{it} + \beta_{3it}School_{it} + \beta_{4it}Trade_{it}
\]

\[
+ \beta_{5it}Dec_{it} + \beta_{6it}Inst_{it} + \eta_{i} + \varepsilon_{it}
\]

where we know that \(|\gamma| = 1 + \beta_{1it}\) will be less than 1, as long as the convergence hypothesis will be satisfied \((-1 < \beta_{1it} < 0)\). Standard assumptions require residuals to be uncorrelated along time and across countries, and also uncorrelated with the fixed effects and strictly exogenous with respect to the explanatory variables. However, in our case the presence of a lagged dependent variable on the right hand side makes the fixed effect estimator (standard least squared dummy variable estimator, LSDV), biased. The bias goes to zero when the time dimension of the panel tends to infinity (Nickell, 1981), but since our \(T\) is not large \((T = 20)\), we need to be sure to correctly handling this bias. According to the literature, there is no unique, optimal way for estimating a panel model, being the optimal estimation technique dependent on the features of the datasets. Many estimators have been proposed instead of the standard LSDV estimator to solve the bias problem when \(T\) is not large. Anderson and Hsiao (AH, 1981) developed two instrumental variables (IV) procedures, while Arellano and Bond (AB, 1991) proposed estimation procedures based on generalized method of moments (GMM). However, GMM and IV estimators show nice properties when \(N\) is large, while become biased when the panel is based on a small number of cross-sectional units. Kiviet (1995) and Bun and Kiviet (2003) derived a formula for the bias in LSDV estimator for balanced panel dataset. The bias can be subtracted from the traditional LSDV estimations in order to correct them. The LSDV corrected (LSDVC) technique therefore involves a two steps procedures, that uses the residuals obtained from a first-stage consistent estimators (AH or AB, for example) for calculating the bias at a second stage. Bruno (2005) extended to unbalanced panel datasets the LSDVC procedure. Monte Carlo evidence (Judson and Owen, 1996; Bruno, 2005) run over traditional consistent estimators (among them, AH and AB) suggests to consider the LSDVC estimator as the less biased estimator when \(N\) is small. In our analysis we therefore refer to the code xtsdvc developed in Stata, that implements the LSDVC estimator described by Bruno (2005). We compare it with traditional fixed effect models (LSDV estimator), and with an IV estimator.
6 Decentralization of total expenditure: preliminary results

We estimate an unbalanced panel: 25 countries observed during the years between 1995 and 2014. We consider a “fixed effects” model (equivalent to a least square dummy variable estimation, LSDV) the more reasonable to analyze a sample of different countries during the time. However, from a theoretical point of view, the presence of a lagged variable on the right hand side makes the things harder, since we cannot assume no correlation between independent variables and disturbance, and therefore the estimates could be biased and inconsistent. We therefore compute a least squared dummy variable corrected estimator (LSDVC), that allows us to take into account the bias that emerges from a simple LSDV estimation and, how we explained before, we believe the more suitable estimator for these kind of macroeconomic panels. Lastly, in order to compare the results of the LSDVC model with standard dynamic panel data estimators, we also implement an instrumental variable analysis based on the Arellano-Bond system estimator.

The results are collected in Table 1, 2 and 3. The variables used to measure the concept of “decentralization” are the first two tables are the indices developed by Hooghe et al. (the Regional Authority Index, and the Fiscal Decentralization Index). Table 3 contains the estimate of the same models, but the decentralization variable is the ratio between total sub-national on total general government revenues, that is traditionally used in the literature as a proxy of the decentralization. Note that this is not significant. We omit to report the results obtained by estimating the same model with the other decentralization variable we mentioned before (Decr and Tax) since they appear to be equally not significant.

\(^2\)The countries considered are the following: Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Luxembourg, Netherlands, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, United Kingdom, Latvia, Lithuania. Switzerland is included even if it does not belong to the European Union, while we excluded Croatia, Romania, Malta and Cyprus because of the too many gaps in the data.

\(^3\)To this task we implemented the Stata routine xtlsdv.

\(^4\)Stata routine xtdpd.
Comparison across models (decentralization variable= RAI). Among the explanation variables we take into account the deficit/GDP ratio (DEF).

Fixed effect model (LSDV), LSDV corrected (LSDVC) and instrumental variable (IV) model. Years 1995-2014. LSDV and IV models with “robust” standard errors. LSDVC model with bootstrapped v-cov matrix, bias correction initialized by Anderson and Hsiao estimator up to order O(1/T). IV models: as instruments for lnGDP(-1) we use lnGDP(-2), while the other variables are used as instruments of themselves.

The dependent variable is the growth rate of real GDP (in log terms). The explanation variables are: the lag in the GDP (log), the gross fixed capital formation/GDP (Gfcf), (export+import)/GDP (Trade), the expectancy of years of schooling (school), the deficit/GDP (DEF) and, as a measure of decentralization, RAI (the Regional Authority Index).

Comparison across models (decentralization variable= FD). Among the explanation variables we take into account the deficit/GDP ratio (DEF).

Fixed effect model (LSDV), LSDV corrected (LSDVC) and instrumental
variable (IV) model. Years 1995-2014. LSDV and IV models with “robust” standard errors. LSDVC model with bootstrapped v-cov matrix, bias correction initialized by Anderson and Hsiao estimator up to order O(1/T). IV models: as instruments for lnGDP(-1) we use lnGDP(-2), while the other variables are used as instruments of themselves.

The dependent variable is the growth rate of real GDP (in log terms). The explanation variables are: the lag in the GDP (log), the gross fixed capital formation/GDP (GfC), (export+import)/GDP (Trade), the expectancy of years of schooling (school), the deficit/GDP (DEF) and, as a measure of decentralization, FD (the Fiscal Autonomy Index).

<table>
<thead>
<tr>
<th>fixed_LSDV</th>
<th>LSDV_corrected</th>
<th>IV_estimator</th>
</tr>
</thead>
<tbody>
<tr>
<td>lnGDP</td>
<td>-.2392109***</td>
<td>.78598032***</td>
</tr>
<tr>
<td>gfcf</td>
<td>.62215342***</td>
<td>.60360255***</td>
</tr>
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<td>trade</td>
<td>.07990852***</td>
<td>.0698663***</td>
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<tr>
<td>cons</td>
<td>2.1464378***</td>
<td>2.1464378***</td>
</tr>
</tbody>
</table>

| N   | 308          |
| r2  | .5485787     |
| r2_a| .50148799    |

* p<0.05, ** p<0.01, *** p<0.001

Tab 3

Fixed effect model (LSDV), LSDV corrected (LSDVC) and instrumental variable (IV) model. Years 1995-2014. LSDV and IV models with “robust” standard errors. LSDVC model with bootstrapped v-cov matrix, bias correction initialized by Anderson and Hsiao estimator up to order O(1/T). IV models: as instruments for lnGDP(-1) we use lnGDP(-2), while the other variables are used as instruments of themselves.

The dependent variable is the growth rate of real GDP (in log terms). The explanation variables are: the lag in the GDP (log), the gross fixed capital formation/GDP (GfC), (export+import)/GDP (Trade), the expectancy of years of schooling (school), the deficit/GDP (DEF) and, as a measure of decentralization, DECR (total sub-central revenues/total government revenues).

To sum up, according to our empirical model the economic growth seems to be significantly dependent on its past dynamics, on the amount of Gdp invested in fixed capital, and on the openness of a country to the international market.

Investment in human capital presents weakly significant coefficients, and only in the LSDV and in the LSDVC models, while it does not appear to be significant under the instrumental variables (Arellano-Bond) estimation. Unfortunately, it is not easy to measure this complex phenomenon, and the school expectancy of pupils in ISCED 0-6 could be quite inaccurate to the task. Our model could therefore be improved by using a better proxy for human capital. Also macroeconomic instability seems to be only weakly significant, in some
cases not significant at all. This could depend on the sample period that we consider and on the economic variables that we chose to measure macroeconomic instability (such are, the deficit and the debt to Gdp ratios). The perverse effects that arise from unbalanced public budgets increased dramatically during the last economic crisis, and our estimation sample could be still too short to properly catch this effect. Decentralization can matter or not, depending on which variable we use to measure it. We note that the Hooghes’ indicators result to be significant, while other variables, more commonly used in the literature, appear to be not significant. While these can be consider as simple proxies of a complex phenomenon, Hooghes’ indicators are more complex and built to take into account many different aspects of decentralization.

In some ways these results also confirm that it is not so straightforward to asses the direction of the link between decentralization and growth. As already stated above much depends on the variables used to measure the degree of decentralization, on the dataset and on the level of spatial aggregation. This is a further reason for the necessity to investigate decentralization distinguishing current and capital expenditure run by local governments.

7 Decentralization of capital expenditure: to be completed

8 Conclusions

The aim of this paper is to develop a theoretical model that analyzes public capital expenditure by levels of government and its potential effects on economic growth. Our reference background is the previous empirical literature that found not clear cut result on the nexus between decentralization of total expenditure and economic growth. We believe that this inconclusive evidence call for further research, both theoretical and empirical. From a theoretical side, the novelty of this paper could be to disentangle the effect of capital expenditure from other effects, and the possibility of coordination or subsidiarity with other factors. From the empirical side, the novelty comes from the fact that we also find different results according to different indicators used in the literature to measure decentralization. Moreover our further aim is to estimate the relationship between decentralization of only capital expenditure and growth.

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