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AND PUBLIC SPENDING PROGRAMS

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ABSTRACT

This paper extends the empirical literature about the effects of fiscal decentralization on the composition of growth of government by using a panel of 28 countries for the period 1975-2005. The paper examines the dynamic profiles of the impact of decentralization on three different programs: health care, education and social security. The cross section dimension of our sample includes countries characterized by different levels of development and government systems, so to include the largest variation in the degree of decentralization of the three spending programs. In order to make use of all the observations available, we begin by estimating an error correction model and then a panel cointegration analysis on a more restricted balanced sample, to verify the hypotheses made in the ECM estimates. Furthermore, the set of explanatory variables considered in the empirical models for each spending program is kept basically invariant, so to verify whether the process of decentralization affects each type of expenditure in a different way. Finally, we distinguish between the effects of the level of decentralization from the way (common pool vs. own resources) local governments finance their expenditures. Our results show that grants have a positive impact on the level of health care expenditures but not on those of education and social security. In addition, the greater is the proportion of own taxes that are raised at the subnational level, the lower the proportion that is spent on all items – health education and social security. Moreover, the greater the decentralisation, the higher becomes spending on education. Health care and social security expenditures instead reveal the opposite pattern. The results of the cointegration analysis by and large reflect those of the ECM. Finally, these results seem robust to changes in the empirical strategy and to changes of countries included in the sample and of periods.

JEL code: H11, H53, H77

Keywords: fiscal decentralization, Leviathan hypothesis, common pool, panel cointegration analysis

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1. Introduction

Recent developments in the literature on the “Leviathan hypothesis” have by and large confirmed the proposition that, when decentralization takes place both on the spending and on the taxing side of the budget, it does reduce the size of the public sector in the long run (Rodden, 2003; Ashworth, Galli and Padovano, 2008). Research is thus moving ahead to the analysis of the effects of decentralization on the composition of government spending (Stegarescu, 2005; Fiva, 2006; Keen and Marchand, 1996). This new research interest stems from the fact that different countries decentralize different spending programs, to the point that recent survey analyses register considerable cross country heterogeneity in the vertical organization of the spending competencies (OECD, 1999, 2005, 2007). This circumstance, as well as theoretical models that include decentralization or globalization as determinants of single spending programs (Rodrik, 1998; Oates, 1999 for a review), lead to the presupposition that decentralization has different restraining or expanding effects on alternative spending programs.

With respect to this growing literature, this paper innovates along several dimensions. First, as in our previous work on the decomposition of short and long run effects of decentralization on total government spending (Ashworth, Galli and Padovano, 2008), we examine the dynamic profiles of the impact of decentralization on three different programs: health care, education and social security. These programs have been selected according to two criteria: first, they must be characterized by different levels of decentralization across countries and time: spending items like defense, which the large majority of countries attributes to the central government, or garbage collection, usually run at the local level, lie outside the interests of our analysis. Second, the definition of the spending program must be as homogenous as possible between countries. To this end not only we resort to the COFOG classification, but we focus on spending programs that are

clearly identifiable, avoiding large conglomerates, such as redistributive spending or government consumption, like those used in Fiva (2005) or Persson and Tabellini (2003).

The cross section dimension of our sample includes countries characterized by different levels of development and government systems, so to include the largest variation in the degree of decentralization of the three spending programs; the time series includes the 1975-2005 period. In order to make use of all the observations available, we begin by estimating an error correction model, which does not require a balanced sample but makes assumptions on the stochastic properties of the series. We then proceed to a panel cointegration analysis on a more restricted balanced sample, to verify the hypotheses made in the ECM estimates. The panel cointegration conducted at the level of specific programs also highlights which countries are spending too much or too little relative to the long run equilibrium on a program by program basis. This allows to identify which countries are on a sustainable path for each spending program and which are not. Furthermore, the set of explanatory variables considered in the empirical models for each spending program is kept basically invariant, so to verify whether the process of decentralization affects each type of expenditure in a different way. A final innovation of the analysis is the introduction of explicit *coeteris paribus* condition for the level of decentralization of each government spending program in the empirical models. By that we can verify how alternative means of funding, namely a different mix of transfers and own resources, affects the dynamics of each spending program.

The rest of the paper is organized as follows. Section 2 briefly reviews the literature on the effects of decentralization on the composition of government spending, with regard to the theoretical contributions (section 2.1) and the empirical works (section 2.2). In section 3 we describe the data and the variables. Section 4 presents the results of the ECM (section 4.1), the robustness analysis (section 4.2) as well as the ECM estimates disaggregated between OECD and non OECD countries. Section 5 presents the panel cointegration analysis. Finally, in section 6 we draw the main conclusions of the study.

2. Literature review

2.1.Theory. The first theorizing about the effects of decentralization on the composition of government spending go back to Stigler (1957) and Musgrave (1959). These arguments warn against the consequences of decentralized responsibility for redistribution because of households mobility. The idea is that policies that are redistributive in nature give rise to a phenomenon that resembles adverse selection: net beneficiaries of redistributive policies are attracted to generous jurisdictions, while net contributors are repelled (Wildasin, 1991). This kind of reasoning led Stigler (1957) to the conclusion that redistribution is intrinsically a national policy. The key point is that decentralized responsibility for redistribution without any corrections induces each jurisdiction to choose its policy in isolation, ignoring the positive external benefits it creates for other jurisdictions. Generally this yields redistribution levels lower than socially desirable, possibly leading to a race to the bottom.

Keen and Marchand (1996) provide a more elaborate model to evaluate the effect of fiscal decentralization on the composition of government spending. They show that fiscal competition may not only lead to inefficient levels of aggregate public expenditures, but also to systematic inefficiencies in the composition of public expenditures. Their theoretical framework features a benevolent planner and focus on two parts of public spending: the first is a local public good, such as consumption of social services or redistributive payments from altruistic rich households to poor households; the second is a local public input in the economy's production function and corresponds, for example, to infrastructure spending. Assuming immobile workers and mobile firms, Keen and Marchand (1996) show that, holding the size of the public sector constant, welfare could be increased by a rebalancing of expenditures from publicly provided inputs towards provision of local public goods that benefit immobile residents. Under the assumption of immobile

households, Keen and Marchand provide one account of why fiscal competition may put downward pressure on welfare spending.

Moving from a political economy perspective whereby the mix of taxing and spending programs are the equilibrium outcomes of democratic decision making processes, Perotti (2001) and Padovano (2007) demonstrate that majority voting generates incentives to select taxes and expenditure programs that distort the efficient allocation of resources to appropriate redistributive gains. They show that such distortions are smaller the more these decisions are taken at a decentralized level, where the dimension of accessible the tax base is more limited than in the centralized case. These models thus predict that decentralization should affect both the size of government (as in the standard Leviathan hypothesis literature) as well as the composition of that tax instruments and spending programs; furthermore, like in Keen and Marchand (1996), factor relocation may affect the departure from Pareto efficiency.

2.2. Empirical contributions. The empirical literature on the effects of decentralization on government spending is fairly recent but growing. Fiva (2006) is one of the most representative contributions. Using panel data from 18 OECD countries he shows that fiscal decentralization matters for both the size and the composition of government spending. Tax revenue decentralization is associated with a smaller public sector, while expenditure decentralization is associated with a larger public sector. The results indicate that the former effect is driven by a reduction in social security transfers, while the latter effect is driven by increased government consumption. Stegarescu (2005) provides two contributions; first he assembles a data set of 150 countries that measures tax autonomy on a consistent and rigorous yearly basis, thereby providing an alternative source to those of IMF (various years) and OECD (1999, 2005). Second, he exploits this data set to verify whether country size, decentralization and openness are correlated with government size. He does find a correlation between these factors and the choice of the tax mix, but does not explore the spending side beyond the overall size.

A closely related literature verifies the correlation between political decentralization and corruption of public officials, in itself a proxy for government size and departure of spending programs from a first best, public goods-centered ideal. Fan, Lin and Treisman (2009) find that countries with a larger number of government or administrative tiers and (given local revenues) a larger number of local public employees are characterized by more rent-seeking expenditures and lower provision of public goods.

3. *Empirics*

3.1. Empirical strategy. To verify whether decentralization affects the health care, education and social security in the same way, we regress the same set of explanatory variables on the three explanatory variables. To sort out the long run from the short run effects of decentralization two models can be estimated: one is an error correction model, that requires assumptions about the stochastic properties of the series but allows exploiting the full size of the sample; the other is a panel cointegration model, that enables to verify the stochastic properties of the series, hence to rigorously specify the empirical model. Yet, the requirement of a balanced sample reduces the number of observations exploitable in this type of analysis, where data sets are often characterized by different time series lengths for different countries. This does not necessarily create a problem of degrees of freedom, rather it prevents from exploiting the maximum variety in the processes of decentralization by reducing the number of countries examined in the balanced panel. To strike a balance between institutional variety and analytical rigour, we first estimate an ECM on the whole sample, then we perform a panel cointegration analysis to the more limited balanced sample to verify the correctness of the ECM estimates.

The empirical analysis employs a unbalanced panel of 28 countries for the time period 1975-2005: Argentina, Australia, Austria, Belgium, Bolivia, Brazil, Canada, Chile, Denmark, Finland, France, Germany, Hungary, India, Ireland, Israel, Italy, Luxemburg, Mexico, Netherlands, New Zealand, Norway, Romania, South Africa Spain, Sweden, Switzerland, Thailand, United Kingdom

and United States. The countries are a range generally from amongst developed countries but also including a number of other nations. The panel is also characterized by a considerable variety of institutional systems and geographic location. The data are not directly comparable with previous works, though various sub-samples get close to those of Stegarescu (2005) and Fiva (2006).

3.2. Model specification. Following the literature (Rodden, 2003, 2005; Ashworth, Galli and Padovano, 2008) we estimate the following model, looking, in want of a theoretical specification of the dynamics of the relationship, for robust correlations.

$$\ln(\mathbf{EXP}_{kit}/\mathbf{GDP}_{it}) = a_0 + a_1\ln(\mathbf{GRANTS})_{it} + a_2\ln(\mathbf{OWNREV})_{it} + a_3(\mathbf{DECENTRALIZATION}) + a_4\ln(\mathbf{POP})_{it} + a_5\ln(\mathbf{POP15})_{it} + a_6\ln(\mathbf{POP65})_{it} + a_7(\mathbf{GDPPC}_{it}) + a_8\Delta(\mathbf{OPEN})_{it} + a_9\Delta(\mathbf{SURPLUS})_{it} + a_{10}\Delta(\mathbf{POLITICAL}) + a_{11} \text{ECM}_{it-1} + \theta_{kit} \quad (1)$$

1) **EXP** is the size of expenditure program *k* (health care, education and social security) at time *t* in country *i*, normalized by GDP. Both data come from International Monetary Fund's *Government Financial Statistics* (hereafter GFS, various years). The numerator in particular includes the total consolidated expenditures made by all government levels. According to GFS classification, the item "education" includes current and capital expenditures related to all levels of education, graduate level included; likewise, health care includes current and capital spending for the provision of health related services. Social security includes programs that fall within the categories of assistance to the poor, unemployment insurance and pensions.

2) **GRANTS** are revenues raised by the central government and transferred to sub-national governments (state-regional and local governments) over total revenues, where the denominator is the sum of central, regional and local government revenues. Data come from GFS (various years). According to the common pool theory, the expected sign on this variable is positive.

3) **OWNREV** is revenue raised and retained by state-regional and local level (local taxes, revenue-sharing, user fees, interest income and so on) over total revenues, from the GFS (various years). These data fail to distinguish between tax revenues that are legislated and collected locally and those that accrue to the sub-national governments through revenue-sharing schemes. As a

result, this variable may not be ideal for a cross-country test of the Leviathan hypothesis, because it does not fully capture the directness of the tax-benefit link or the likelihood of tax competition, both of which may be undermined by revenue-sharing programs or central regulation of local tax rates or bases. The existence of revenues raised and spent at the central level as well as transfers to and from supranational governments ensures that *GRANTS* and *OWNREV* neither sum to 1 nor to some homogenous fraction. They can therefore be used together in regression analysis without undue concerns of multicollinearity. A negative sign on *OWNREV* is consistent with the Leviathan hypothesis.

4) **DECENTRALIZATION** is a vector of dummy variables that capture the degree of decentralization of public expenditures. The percentage of total spending supplied by sub-central government levels is divided in quartiles, ranging from high decentralised spending (lowest quartile), to highly centralised spending (highest quartile), with two middle categories reflecting medium decentralised and medium centralised. The variable takes the value of 1 when the country falls within that quartile and 0 otherwise. The introduction of this variable is novel but important. The basic premise of our analysis has effectively two themes: to what extent the spending is localised and how any local spending is financed using grants or own taxes. However, having *GRANTS* and *OWNREV* alone does not completely test the Leviathan hypothesis without adjusting for the underlying preferences for the government level at which spending is carried out. Suppose that decentralisation of expenditure *per se* raises government spending, by increasing the monitoring costs for taxpayers (Franzese, 2001); failure to adjust for this phenomenon is liable to overstate the effects of grants and own taxes on overall expenditure. Similarly, if it lowers spending, there would be a downward effect. Furthermore, because there is no guarantee that *GRANTS* and *OWNREV* sum to unity, examining the type of expenditure preferences is a way of taking account of any missing revenues. To the extent that the data support the Leviathan hypothesis, we expect a negative sign on the highly decentralised dummy (lowest quartile).

5) *POP* is the country population, in millions of units, from the Penn World Tables. To the extent that this variable captures economies of scale in the provision of public goods and services, we expect a negative sign on it.

6) *POP15* and *POP65* is the proportion of the population younger than 15 years of age and older than 65. Taken together, these two variables approximate the size of the nonworking population. In most static model the predicted sign on this variable is positive because the larger the percentage of nonworking population, the greater the demand for redistribution. Moreover, the distinction between the two cohorts of population allows to distinguish age related preferences for education, more pressing for the youngsters, and health care, for which the elderly are the high demanders. It may, however, be the case that as the size of the working population shrinks, less tax revenues are available to finance redistribution towards welfare dependent individuals. If this effect prevails, we should observe a negative estimated coefficient.

7) *GDPPC* is per capita GDP in U.S. dollars measured at purchasing power parity and taken from Penn World Tables mark 6.2 (hereafter, PWT). The well-known “Wagner Law” foresees that government spending is income elastic, which predicts an estimated coefficient greater than 1.

8) *OPEN* is the sum of exports and imports over GDP in percentage terms, from PWT. This variable captures the prediction of the globalisation literature (Rodrik, 1998), which argues that increasing trade interdependence raises uncertainty, which, in turn, strengthens demands for public sector risk sharing. Given the construction of the variables, a positive sign would be expected on this variable. On the other hand, openness can lead to an increase in competitiveness and thereby a) restrict some areas of corporate taxation thus placing a restriction on government spending; b) stimulate output growth, which results in larger values of the denominator of our measure of public sector size. Both cases would result in a negative coefficient.

9) *SURPLUS* indicates the size of the central government surplus normalized by GDP. It captures the degree of stringency of the fiscal policies over the cycle; the expected sign is negative.

The vector **POLITICS** is composed of the following variables:

10) *DEMOCRACY* is a multivariate qualitative variable that ranges from -10 to +10. These values are the sum of the country scores for democracy and autocracy for every year; with data drawn from the Polity IV database. A positive sign is consistent with the Oates' (1985) view that if people trust the government – and presupposing that democratic governments are trustworthier than dictatorships - they allow the government to expand more. This might happen, for example, because people increase the elasticity of their labour supply, thereby pushing the revenue maximizing point of the Laffer curve further. Moreover, it can be the case that the effective median voter has a lower income in democracies than the ones of the crucial supporters in dictatorships (Wintrobe, 1998). Alternatively, a larger number of lobbies may capture the government in democracies than is the case in other regimes.

11) *SYSTEM* is a multivariate dummy that takes the value of 0 when the government is presidential, 1 when presidents or prime ministers are elected by the assembly and 2 when the system is parliamentary. The values are from the World Bank *Database of Political Institutions* (hereafter, DPI). The aim of this variable is to control for the effects of institutions on government spending; as suggested by Persson and Tabellini (2000) the expected sign should be positive, since presidential system spend relatively less, and parliamentary ones relatively more. As the number of semi-presidential systems in our sample was quite small, this variable has been redefined as a binary dummy, called *PARLIAMENTARY*, to reflect parliamentary (value equal to 1) as against presidential systems (value equal to 0). The sign on this variable is also expected to be positive.

12) *VETO* refers to the literature that links divided governments in presidential systems and fragmented governing coalitions in parliamentary systems to “wars of attrition” and budget deficits (Alesina and Drazen, 1991; Spolaore, 2004). The implications of such political fragmentation for fiscal scale are less clear, but it seems plausible that “wars of attrition” in systems with large debt levels create a status quo bias in expenditures (Padovano and Venturi, 2001). To capture the logic of the wars of attrition model, *VETO* mirrors the values of the variable “CHECKS2A” in the DPI (2004), which captures both the effects of the number of the institutional veto players in alternative

government and electoral systems. This variable is considered in a non-linear fashion to incorporate the possibility that a rise in the number of relevant players increases expenditure at relatively low values of *VEETO*, due to compromises between parties. When the value of *VEETO* becomes large, too many players inhibit the decision making process and so act as a constraint on spending (see Ashworth et al, 2005 and 2006 for examples).

13) *ELECTION* captures the effects of electoral years on spending decisions. It takes the value 1 in election years and 0 otherwise. A positive sign would detect the presence of political budget cycles. Considering the whole electoral cycle, as opposed to the election year, suggests an insignificant effect in both the long and the short run, probably because in many countries (Italy and the UK being two examples) elections do not take place at regular intervals.

14) *PARTISAN* is a dummy that captures government ideology; it equals -1 when the government is controlled by the left, 0 when by the centre, 1 by the right. According to the literature on partisan political cycles, right wing governments should be less inclined to spend, so we expect a negative sign on this variable.

4. Estimates.

4.1. Error correction model. To estimate this model using the variables listed above, one has to assume that the majority of our economic fiscal and demographic variables as I(1) in the initial estimation. The qualitative variables in *DECENTRALIZATION* and *POLITICAL* are instead assumed to be I(0). In its most general form, this generate the following structure:

$$\Delta \ln(\mathbf{EXP}_{kit}/\mathbf{GDP}_{it}) = b_0 + b_1 \Delta \ln(\mathbf{GRANTS})_{it} + b_2 \Delta \ln(\mathbf{OWNREV})_{it} + b_3 \Delta (\mathbf{DECENTRALIZATION}) + b_4 \Delta \ln(\mathbf{POP})_{it} + b_5 \Delta \ln(\mathbf{POP15})_{it} + b_6 \Delta \ln(\mathbf{POP65})_{it} + b_7 \Delta \ln(\mathbf{GDPPC}_{it}) + b_8 \Delta (\mathbf{OPEN})_{it} + b_9 \Delta (\mathbf{SURPLUS})_{it} + b_{10} \Delta (\mathbf{POLITICAL}) + b_{11} \mathbf{ECM}_{it-1} + b_{12} \ln(\mathbf{GRANTS})_{it} + b_{13} \ln(\mathbf{OWNREV})_{it} + b_{14} (\mathbf{DECENTRALIZATION}) + b_{15} \ln(\mathbf{POP})_{it} + b_{16} \ln(\mathbf{POP15})_{it} + b_{17} \ln(\mathbf{POP65})_{it} + b_{18} \ln(\mathbf{GDPPC}_{it}) + b_{19} (\mathbf{OPEN})_{it} + b_{20} (\mathbf{SURPLUS})_{it} + b_{21} (\mathbf{POLITICAL}) + \varepsilon_{kit}$$

The term ECM refers to the error-correction mechanism and represents deviations from any long-run relationship between the I(1) economic variables (*EXP/GDP*, *GRANTS*, *OWNREV*, *POP*,

POP15, POP65 GDPPC, OPEN, SURPLUS, and, possibly, the additional I(0) variables. Table 1 provides the results of the estimates.

Table 1: Estimation of Unrestricted Error-Correction Equation

Dependent Variable	$\Delta \text{Ln}(\text{EXP})$	$\Delta \text{Ln}(\text{EXP})$	$\Delta \text{Ln}(\text{EXP})$
Independent Variables	HEALTH	EDUCATION	SOCIAL SECURITY
$\Delta \text{Ln GRANTS}$	0.072 (0.114)	0.086 (0.097)	0.200^{***} (0.081)
$\Delta \text{Ln OWNREV}$	-0.051 (0.123)	-0.165 (0.105)	-0.113 (0.088)
$\Delta \text{Ln GDPPC}$	0.098 (0.077)	0.048 (0.102)	0.127 (0.086)
$\Delta \text{Ln POP}$	-0.058 (0.204)	0.108 (0.174)	-0.105 (0.147)
$\Delta \text{Ln POP15}$	1.945[*] (1.21)	2.354^{**} (1.048)	0.941 (8.733)
$\Delta \text{Ln POP65}$	3.041[*] (1.69)	-2.211[*] (1.45)	-0.740 (1.220)
ΔOPEN	-0.153^{***} (0.054)	-0.601 (0.464)	0.545 (0.392)
$\Delta \text{DEMOCRACY}$	0.016 (0.023)	0.001 (0.02)	-0.014 (0.017)
$\Delta \text{SURPLUS}$	0.998 (0.89)	-0.627 (0.759)	-0.936 (0.638)
$\Delta \text{PARTISAN}$	-0.171^{**} (0.054)	-0.083[*] (0.046)	-0.035 (0.039)
ECM_{t-1}	-0.554^{***} (0.024)	-0.408^{***} (0.023)	-0.723^{***} (0.021)
Ln GRANTS_{t-1}	0.105^{***} (0.035)	-0.0005 (0.029)	-0.019 (0.025)
Ln OWNREV_{t-1}	-0.163^{***} (0.163)	-0.335^{***} (0.05)	-0.172^{***} (0.041)
LOWCENT_{t-1}	-0.288^{**} (0.109)	0.296^{***} (0.093)	0.092 (0.078)
LOWMIDCENT_{t-1}	-0.102 (0.099)	0.195[*] (0.084)	0.124^{**} (0.07)
HIMIDCENT_{t-1}	-0.077 (0.091)	0.067 (0.078)	0.331^{***} (0.060)
Ln GDPPC_{t-1}	0.33^{***} (0.054)	0.205^{***} (0.046)	0.182 (0.065)
Ln POP_{t-1}	-0.059[*] (0.03)	-0.199^{***} (0.026)	-0.157^{***} (0.021)
POP15_{t-1}	0.295[*]	0.362	-0.326

	(0.119)	(1.007)	(0.851)
POP65 _{t-1}	0.617***	-4.294**	1.032***
	(0.222)	(1.871)	(0.161)
SURPLUS _{t-1}	0.771	-0.743**	-0.825*
	(0.790)	(0.374)	(0.527)
OPEN _{t-1}	-0.302***	-0.169	0.428
	(0.132)	(0.111)	(0.29)
DEMOCRACY _{t-1}	0.043***	0.021***	0.013***
	(0.013)	(0.008)	(0.006)
PARTISAN _{t-1}	-0.068*	-0.001	-0.032**
	(0.037)	(0.032)	(0.016)
SYSTEM _{t-1}	0.179***	0.081*	0.048
	(0.055)	(0.046)	(0.039)
VETO _{t-1}	0.122*	0.035*	0.038**
	(0.067)	(0.019)	(0.016)
VETO _{t-1} ²	-0.013*		
	(0.008)		
ELECTION YEAR _{t-1}	0.032	0.101**	0.003
	(0.129)	(0.052)	(0.092)
Intercept	-2.833**	-0.126	-0.202***
	(0.947)	(0.081)	(0.068)
R ²	0.49	0.61	0.62
Fixed Effects	1.523	0.969	1.324
Hausman Test	60.225***	45.77***	39.55***
RESET	2.971	1.587	3.117
Normality	5.114	4.307	5.662

Notes: estimated standard errors are in parentheses. ***, **, * indicate a 1%, 5% and 10% significance level, respectively. The fixed effects and Hausman tests are the standard panel tests for a different fixed effect for each country and whether this can be modelled as a random effect; period effects when estimated also proved to be insignificant.

There are number of factors that become immediately apparent from the estimates. Grants have a positive impact on the level of health care expenditures but not on those of education and social security, where the coefficients are not statistically significant. That possibly because health care is a program spent locally and funded by the central government, more often than the other two. In the short run, an increase in grants does increase social security, while the other two programs, though always with a positive coefficient, are not significant. The combination of the results on social security suggests that a onetime increase in grants has a positive immediate impact on social security expenditure but the increase is offset later. The coefficients on OWNREV indicate that the greater the size (and the proportion therefore) of own taxes that are raised at the subcentral government level, the lower the proportion that is spent on all items – health education

and social security. This in line with previous work by the authors (Ashworth, Galli and Padovano, 2008), that is raising own taxes lowers expenditures overall. Education appears to be the most affected program. Short run changes in own revenues do not produce changes in health care, education or social security; the signs are correct but the coefficient are not significant. A higher level of GDP per capita increases health care expenditures the most, then education and less social security. This reflects the items where new resources are spent first; furthermore the relative size of the coefficients makes sense, given the higher elasticity of demand for health care relative to education (which is not compulsory beyond a certain age) and the risk sharing nature of most programs included in social security. Short run changes have the correct sign, but are not significant (some are borderline to significance). The greater the surplus of the general government, the lower expenditures shows up in social security, both in the short-term and in the long-term. In the long run this relationship holds true for education but not for health, which is never significant, neither in the short run, nor in the long run. The negative sign on population captures long run economies of scale (more pronounced in the supply of education), while changes are, predictably, never significant. POP15 and POP65 are always important drivers. A change in POP15 increases education and health care, with the former with a larger coefficient, and has no impact on social security. Conversely, a change in POP65 increases spending for health care and reduces that on education; this suggests that, in relative terms, resources are taken away from the needs of the young to finance those of the elderly. No effect of a change of POP65 on social security spending is recorded; this result may seem odd, but it is possibly due to a lagged effect. Levels of POP15 raise health care spending and education (though only borderline significant) and reduce social security spending. Levels of POP65, instead, raise health care and social security spending, and reduce education, much in the same way as for the short run effects. Also the size of the coefficients on health care (smaller) and social security (larger) make sense: all elderly are on social security, but not all of them demand health care. Taken together, all these results reveal that the ageing of population produce a switching effect from education spending to

health care and social security. Education, however, turns out to be the spending program most sensitive to electoral issues, as it is the only one with a significant positive effect of an election year. Whilst health may be a political bargaining tool, it may not be seen as having the immediate effect on the electoral outcomes as much as education, possibly because the political “returns” to spending on education are seen to be more immediate than other sectors. Several explanations could be put forward: lobbying is one, as the ageing of population reduces the number of teachers which raises in turn their efficiency as an interest group relative to doctors (who increase in numbers) and welfare dependent individuals. Another is that teachers being more educated are more likely to be swing voters. To verify the robustness of this result we have also lagged the electoral dummy twice, to check whether a political budget cycle phenomenon occurred with one year advance, and forwarded it by one year, to see if we could get evidence of post election political budget cycle behaviour, but results never significant. Continuing with the political variables, a higher number of veto players increase spending on all government programs especially health care, whose coefficient is four times larger than those of the other two. Furthermore this relationship is linear for education and social security, for which a squared term was tried, but never turn out significant, and non linear for health care, where the square *VETO* term is negative and significant. The optimum value is reached between 4 and 5 veto players, suggesting that, above a certain point, political coalitions quit the war of attrition and begin paying a rent to agents in the health care sector. Changes in political ideology, as captured by the variable *PARTISAN* (which captures moves towards the right) are correlated with reductions in spending on health care and education, while there is no evident effect on social security. Conversely, precisely this program and health care tend to be cut down by right wing governments, an effect not observed in education spending. Overall, right wing governments seem to have a long run interest in investment in human capital, but do cut waste in the short run. In line with theory (Persson and Tabellini, 1994) parliamentary systems spend more, especially for health care, a correlation less evident in the case of education and social security.

Democracies, instead, do spend more on all the three items. Changes in the degree of democracy have a positive, but not statistically significant, impact on health care and education, while the effect on social security is negative. This result might reflect the disruptive effects of the welfare state observed in the transition from dictatorial to democratic regimes, such as in the case of former communist countries (Rodden, 2003). Looking at the degree of openness of the country to international trade, more open economies are characterized by lower spending on health care and education, though this effect is not quite significant. The negative coefficient is possibly a result of the reduction of the taxbase due to globalization, thus reflecting the holding down of the size of government overall (Ashworth, Galli and Padovano, 2008). Social security spending instead increases with *OPEN*, and is borderline to significant, a result more or less in line with Rodrik (1998). The low levels of significance are likely due to the mingling of highly developed and less developed countries in the sample. Looking at the dummies that control for the level of **DECENTRALIZATION** in expenditures, the estimated coefficients suggest that the greater the decentralisation, the higher becomes spending on education, possibly because education is a local public good. This effect is however tempered if this greater expenditure has to be financed via local taxes. Health care expenditures instead reveal the opposite pattern, as the higher the share of expenditure on health care made at the local level, the less it is spent generally. Health therefore seem to be a national problem, where individual adjustment prevails on local adjustment. The imposition of minimum standards in the provision of health care services in many countries may also explain the pattern of the coefficients of the decentralization dummies on health care expenditures. Finally, the greater the expenditure on social security devolved at the local level, the lower is spending, a clear evidence of a race to the bottom in social security spending. Finally, the error correction term has always the expected negative sign. The correction process is strongest in social security, then in health care and is less pronounced in education. This pattern of result is highly plausible, because of the cyclical nature of social security spending, whereas health care and education are more conditioned by long run, demographic factors.

4.2. Sensitivity analysis. In order to verify the robustness of the results, in Table 2 we report the results of the sensitivity analysis.

Table 2. Sensitivity analysis, values of F tests

n.	Country removed	OECD sample member ¹	Health	Education	Social Security
1	Argentina	No	0,250	0,430	0,572
2	Australia	Yes	0,195	0,224	0,063
3	Austria	Yes	0,244	0,266	0,022
4	Belgium	Yes	0,271	1,112	0,174
5	Bolivia	No	1,390	0,848	1,750
6	Brazil	No	1,532	1,552^{**}	1,797^{**}
7	Canada	Yes	1,267	0,406	0,078
8	Chile	No	0,185	0,181	1,326
9	Denmark	Yes	0,572	0,304	0,045
10	Finland	Yes	0,312	0,230	0,292
11	France	Yes	0,257	0,623	0,258
12	Germany	Yes	0,703	1,264	0,087
13	Hungary	No	1,203	1,819^{**}	0,225
14	India	No	0,200	0,396	1,292
15	Ireland	Yes	0,209	0,174	0,104
16	Israel	No	0,390	0,670	0,415
17	Italy	Yes	0,992	0,018	0,134
18	Luxemburg	Yes	0,118	0,474	0,147
19	Mexico	No	0,644	1,197	0,969
20	Norway	Yes	0,555	0,164	0,214
21	The Netherlands	Yes	0,136	0,455	0,074
22	Romania	No	1,719^{**}	1,638^{**}	1,525
23	Spain	Yes	1,565^{**}	0,758	0,175
24	Sweden	Yes	0,845	1,173	0,150
25	Switzerland	Yes	0,077	0,161	0,046
26	Thailand	No	0,200	0,754	1,332
27	UK	Yes	0,278	0,122	0,210
28	US	Yes	1,542^{**}	1,829^{***}	1,789^{**}
	critical values			1,83 ^{***}	1,54 ^{**}

The sensitivity analysis was carried out by removing one country at a time from the overall sample and then performing an F test on the null hypothesis that two sets of regressions are equal. The results are highly satisfactory. There are just a few cases where the test failed to reject the null hypothesis, limited to Latin American countries (like Bolivia and Brazil) or transition economies (such as Romania and Hungary). Otherwise, the most notable exception are the case of Spain for

¹ Only countries that were OECD members throughout the sample were introduced in the sample. Hungary and Mexico, that joined respectively in 1997 and 1995, were therefore considered non-OECD countries in the analysis.

health care expenditure, possibly because it is a country that emerged from a dictatorship and invested considerably in the health sector, and the U.S., which is a somewhat peculiar country in our sample, both because of its size and of the important role played by the private and the third sector in all three expenditure programs.

5. Cointegration analysis

Two countries, Hungary and South Africa, and 5 years (2001-2005) had to be removed from the sample of the ECM estimates in order to meet the balanced sample requirements for the cointegration analysis. The purpose of the analysis is to verify the correctness of the specification of the unrestricted ECM, as well as a further robustness test of the estimates. The estimates are reported in Table 3.

The results of the cointegration analysis by and large reflect those of the ECM. There size of the coefficients is generally smaller than in the ECM estimates, suggesting an upward bias in the unrestricted model. The variable GRANTS shows the same pattern of signs as in the ECM model, only the coefficient are smaller. The same holds true for the other key regressor, OWNREV, where the reduction of coefficient size is especially noticeable for education. The dummies controlling for the degree of expenditure decentralization are characterized by results in general, but not always, similar to those of the ECM estimates. LOWCENT shows a change in sign for health care, while the other dependent variables remain more or less unchanged. LOWMIDCENT present the same pattern of signs, although the coefficients are here too smaller. HIMIDCENT has significant results for health care and education only, whereas also social security was significant in the ECM. POP is never significant in the cointegration analysis, whereas it was in the ECM, possibly the greatest difference between the two models. POP15 and POP65 instead confirm the results. SURPLUS presents larger (negative) coefficients in the panel cointegration estimates for education and social security.

Table 3. Panel cointegration results

	Ln (HEALTHEXP)	Ln (EDUCATIONEXP)	Ln (SSEXP)
Ln (GRANTS)	0.157 (0.027)	-0.031 (0.342)	-0.011 (0.449)
Ln (OWNREV)	-0.017 (0.065)	-0.152 (0.018)	-0.013 (0.004)
LOWCENT	0.221 (0.046)	0.201 (0.048)	0.007 (0.480)
LOWMIDCENT	-0.078 (0.329)	0.219 (0.08)	0.118 (0.248)
HIMIDCENT	-0.275 (0.079)	0.255 (0.088)	0.065 (0.369)
Ln (POP)	-0.049 (0.441)	-0.227 (0.228)	-0.182 (0.289)
Ln (GDPPC)	0.179 (0.086)	0.086 (0.000)	0.121 (0.102)
POP15	11.510 (0.004)	2.4757 (0.071)	7.205 (0.103)
POP65	15.992 (0.012)	-4.414 (0.069)	10.509 (0.067)
SURPLUS	0.444 (0.303)	-1.743 (0.015)	-2.247 (0.004)
OPEN	0.194 (0.015)	0.002 (0.492)	0.333 (0.001)
DEMOCRACY	-0.045 (0.033)	0.022 (0.072)	0.008 (0.303)
SYSTEM	0.098 (0.089)	0.058 (0.326)	0.279 (0.022)
VETO	0.030 (0.055)	0.072 (0.026)	0.189 (0.031)
VETO SQUARED	-0.003 (0.102)		
ELECTION	-0.021 (0.434)	0.128 (0.05)	0.081 (0.263)
PARTISAN	-0.108 (0.004)	-0.070 (0.047)	-0.015 (0.118)
Adjusted R ²	0.4545	0.3924	0.3502
DF	-6.158	-9.664	3.719
DFt	-4.068	-6.229	-2.908
DFp*	-15.196	-20.357	11.854
DFt*	-5.029	-6.672	-4.143
ADF(1)	-4.420	-4.861	-2.307
Panel v	2.079	3.096	3.617
Panel ρ	-10.722	-12.441	-9.332
Panel t (non-parametric)	-9.863	-10.834	-7.956
Panel t (parametric)	-9.664.	-10.002	-7.442
McCoskey and Kao	-1.368	-1.498	-1.215

Notes: t-statistics are in parentheses. The DOLS estimations are broadly in line with the results presented above; all inferences are as reported. The results are available from the authors on request. For the Pedroni tests a deterministic intercept is included; including a deterministic trend or omitting both the intercept and the trend give the same inference with respect to cointegration. All results were computed using NPT 3.1 with necessary corrections and the Pedroni tests were checked using the RATS procedure where there are only minor differences and not with respect to inference. The inference of cointegration is implied whichever residuals are used.

The Rodrik hypothesis is generally confirmed in the panel cointegration model, as all coefficients on OPEN are positive and significant, which was not the case for the ECM. The results for the degree of democracy are virtually the same, whereas SYSTEM is characterized by smaller coefficients in health care and education. It is not statistically significant for social security, contrary to the ECM estimates. Importantly, the estimates for veto players repeat the specification of the ECM, i.e., non linear in the case of health care, linear for the other two spending programs. Finally, also in the cointegration analysis, education is the only program characterized by a political budget cycle, again the coefficients are smaller throughout.

This paper has re-considered the effects of fiscal federalism on the growth of government, both in the short and long run, using recent panel data estimation techniques. It has shown that there is indeed a long-run relationship between the size of government and a number of economic and political factors; notably, the amount of revenue raised by sub-national governments leads to a long-term fall in the size of government but grants between the different levels of government lead to a growth of government. In addition, a greater decentralisation of expenditure leads to greater overall spending, though the tempering effect of raising the revenue at a local level is clearly pertinent. Having a parliamentary, as opposed to a presidential system of government, leads to a rise in the size of government; the role of veto players is crucial and dependent on the system of government within which they are working. When the short-term is considered, however, these influences do not work immediately, as the speed of adjustment towards the desired size of government is relatively slow and in the case of the OECD very slow. There is also a clear effect from the role of local revenue raising powers that stimulates the growth of government in the short term. These results seem robust to changes in the composition of the variables, countries and periods included in the sample.

6. Concluding remarks

In this paper we extend the empirical literature about the effects of fiscal decentralization on the composition of growth of government and innovate along several dimensions. First, we examine the dynamic profiles of the impact of decentralization on three different programs (health care, education and social security), selected according to two criteria: the homogeneity of the definition of the spending across countries and the difference in the degree of decentralization across countries and time. The cross section dimension of our sample includes countries characterized by different levels of development and government systems, so to include the largest variation in the degree of decentralization of the three spending programs; the time series includes the 1975-2005 period. In order to make use of all the observations available, we begin by estimating an error correction model, which does not require a balanced sample and then we proceed to a panel cointegration analysis on a more restricted balanced sample, to verify the hypotheses made in the ECM estimates. Furthermore, the set of explanatory variables considered in the empirical models for each spending program is kept basically invariant, so to verify whether the process of decentralization affects each type of expenditure in a different way. We also verify how alternative means of funding, namely a different mix of transfers and own resources, affects the dynamics of each spending program. Our results show that grants have a positive impact on the level of health care expenditures but not on those of education and social security. In addition, the greater is the proportion of own taxes that are raised at the subnational level, the lower the proportion that is spent on all items – health education and social security. Moreover, the greater the decentralisation, the higher becomes spending on education. Health care and social security expenditures instead reveal the opposite pattern. The results of the cointegration analysis by and large reflect those of the ECM. Finally, these results seem robust to changes in the empirical strategy and to changes of countries included in the sample and of periods.

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