Fiscal Federalism and the Leviathan:
The Evil Beast or the Lesser Evil?

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Abstract

This paper analyses the relation between fiscal decentralization and the size of government in the tradition of the Leviathan Hypothesis. We construct and include more comprehensive indicators of fiscal federalism than the classical sub-national revenue and expenditure shares by using structural aspects of decentralization. The cross-sectional regression analysis for 21 high-income OECD countries shows that our indicators are of higher explanatory power and that, contrary to the Leviathan Hypothesis, a low degree of fiscal decentralization is related to lower public expenditures than a medium degree. The results underline the need to examine further in what ways federalism in countries with medium decentralization is misdesigned to cause higher public expenditures.

Key words: Fiscal federalism; Public expenditures; Leviathan hypothesis
JEL Classification: H77, E62, C31

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I. INTRODUCTION

Since the publication of the Leviathan Hypothesis by Brennan/Buchanan (1980) there has been a considerable amount of research in the area of fiscal decentralization[1] and its influence on state performance variables, especially public expenditures. All empirical studies face the same problem, which is to construct a measure of fiscal decentralization across countries against which the hypothesis can be tested. Typical indicators of such studies are the share of sub-national public expenditures as part of national public expenditure, as well as the revenue generated on a sub-national level as a share of national revenue. Their simplicity is of advantage, but obviously 'fiscal reality' can hardly be grasped in full by these two ratios.

In order to improve existing studies on the Leviathan Hypothesis, in our view it is useful to create a more comprehensive indicator of fiscal federalism, generated out of qualitative information of the structure and degree of fiscal relations within countries. This indicator could provide a considerably better measure of fiscal decentralization and thus help to improve the significance of empirical results. Also, such measure should not only be applied to simply test for a linear relationship as it is usually done. A non-linear, polynomial relationship between decentralization and public expenditures might also be a predictable outcome of the theory of fiscal federalism.

The paper is organized as follows: Section II contains a brief introduction on the Leviathan Hypothesis and the Theory of fiscal decentralization. Section III reviews existing empirical findings on the effect of fiscal decentralization on public expenditures. Section IV lays out the foundations of our empirical work in detail, i.e., the data used, the methodology of the analysis and finally our results along with an interpretation and implications for future work. Section V contains concluding remarks.

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[1] We use the terms federalism and decentralization synonymously in this paper. Also, when speaking of federalism and decentralization, the fiscal aspects involved are our main concern as opposed to the political or any other aspects.

II. THE LEVIATHAN HYPOTHESIS AND THE THEORY OF FISCAL FEDERALISM

The relation between fiscal decentralization and the size of government (or equivalently: public expenditures) is based on the theory of the Leviathan State by Brennan and Buchanan (1980). They assume that "total government intrusion into the economy should be smaller, ceteris paribus, the greater the extent to which taxes and expenditures are decentralized".[2] The theory states that tax competition is a constraint on the growth of government spending in decentralized countries. The central government is seen as a hungry beast, a revenue-maximizing monolithic entity, the Leviathan. This Leviathan can be tamed by destroying its monopoly on taxation and bringing government spending closer to the preferences of the people. The Theory of Fiscal Federalism implies that by shifting power from sub-national to central government levels the preferences of individuals are neglected. Public spending by the central government is always a compromise between the preferences of different regions and citizens. The loss of welfare increases as the regional preferences diverge, the so-called "Oates effect"[3]. Avoiding such a compromise is possible through fiscal decentralization under the (rather strong) assumption of mobile individuals and firms which force local governments to take part in tax competition.

The interest in fiscal decentralization has been increasing over the last decade. As Martinez-Vazquez and McNab (2003) state, one reason is the belief that through fiscal decentralization the efficiency of public expenditures can be enhanced. Another interpretation is that fiscal decentralization can be a way to loosen the central government's influence on the economy by reallocating fiscal authority to sub-national government.

Thießen (2003) summarizes other positive characteristics of fiscal decentralization. Out of these, one of the most important ones is the "diversification hypothesis" or Oates´

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[2] Brennan/Buchanan (1980), p. 15.
[3] Stehn (2002), p. 302.

"decentralization theorem" which articulates that a central or uniform supply of public goods and services will be generally inefficient. Considering these arguments, the size of government should constantly decrease with increasing fiscal decentralization.

Nevertheless, there are arguments against full fiscal decentralization such as the view that it intensifies regional inequalities. Also, lower quality of government decisions, more corruption and greater influence of interest groups might be the outcome.[4] With regard to the level of public expenditures, decentralization might also lead to some increase due to foregone economies of scale at the central level.[5] Such reasoning extends the theory to a point where one might expect an optimal influence of federalism on the size of government at some medium degree of, and not absolute, decentralization.

III. BRIEF REVIEW OF EMPIRICAL LITERATURE ON FISCAL DECENTRALIZATION AND STATE PERFORMANCE

The Leviathan hypothesis has been subject of many empirical studies. But as Feld, Kirchgässner and Schaltegger (2003) review, cross-national studies have largely failed to prove the Leviathan Hypothesis. For Wallace Oates the Leviathan is a "mythical beast"[6]. As an indicator of fiscal decentralization most authors used either the ratio of sub-national expenditures to total expenditures or the ratio of sub-national revenue to total revenue.

Ehdaie (1994) extends all previous studies by using a cross-indicator (ratio of sub-national governments own-source revenues over total national-sub-national government expenditures) to treat the revenue and the spending side simultaneously, as he considers them indivisible. His findings show a negative influence of decentralization on public sector size.

Rodden (2003) uses an error correction model with lagged variables to explain the growth of government. His indicators for fiscal decentralization are the share of grants to total revenue and the share of "own-source" sub-national revenue to total national revenue. His data set

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[4] Cp. Thießen (2003), p. 241.
[5] Cp. OECD (2002b), p. 14.
[6] Oates (1985), p. 756.

contains observations of 44 countries over the period 1978-97. The results also associate decentralization with smaller government.

IV. METHODOLOGY, DATA AND EMPIRICAL ANALYSIS

IV.1. Classical and Revised Methodology

Traditionally, empirical studies on the Leviathan hypothesis follow a certain methodology. There is a set of classical indicators of fiscal decentralization which are subsequently used to test for a linear relationship between these indicators and the level of public expenditures (measured as a share of GDP). Most often ratios of sub-national revenues as part of total national revenues or sub-national expenditures as part of total national public expenditures are used to capture the level of decentralization. Yet, it is often argued in the literature that these indicators do not mirror the actual degree of sub-national responsibility over revenues and expenditures, as the shares do not automatically correspond to autonomy and discretionary power. Contrarily, often the central government decides on sub-national tax regulations (i.e., their tax bases and rates) and sets expenditure schemes and obligations.[7] This implies that such indicators cannot picture the reality of fiscal decentralization and its consequences adequately.

In addition to the use of such indicators, a purely linear relation between decentralization and the size of the government may not be the only possibility. The theory of fiscal federalism predicts increasing constraints on the revenue-maximizing Leviathan with an increasing degree of decentralization; yet its above-mentioned disadvantages may at some degree dominate the advantages and actually result in an increase in public expenditures, e.g. due to duplication of effort, corruption at the local level, etc.

This paper seeks to improve existing studies by using an advanced methodology. Firstly, a wider range of decentralization indicators will be considered. Among the traditional above-

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[7] Cp. OECD (2003), p. 147.

mentioned indicators we aim to create additional, more comprehensive indicators: A more detailed picture of fiscal decentralization can be drawn by help of a set of structural decentralization indicators which are combined to form a more qualitative decentralization ranking. We create these out of a recently published OECD survey on national budgetary practices and procedures in 2002. By extending traditional decentralization indicators with these additional data, it is possible to test if there are national structural factors which may influence the amount of overall public expenditures. By transforming these indicators into different indicators across our country sample, we can not only test for a linear relationship but also for a non-linear, hump-shaped relationship.[8] The logic behind such an estimation is to incorporate the possibility of an optimal (or suboptimal) degree of fiscal decentralization somewhere in the middle. Overall, this approach serves to provide a better understanding of the issue at hand, namely the influence of fiscal decentralization on public expenditures.

IV.2. Estimation Method and Country Sample

The econometric estimation of this paper is based on a cross-country analysis of 21 high-income OECD countries, as listed in table 1. Excluded from the sample is Luxembourg because of its small size, as well as the middle-income OECD countries.[9] In order to smooth out very short-term fluctuations in the amount of public expenditures and the sub-national revenue and expenditure shares, the estimation is carried out with data averages over the period 1998-2000.[10] Such a cross-country comparison implicitly assumes that long-term equilibria in the respective variables have been reached. Looking at changes in the last three decades such a conclusion may be premature. Yet, this assumption is more realistic for the group of high-income OECD countries than for any other country group. Thus the group is chosen for reasons of homogeneity, comparability, stability and data reliability. Also, Thießen

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[8] Such an approach was used by Thießen (2003) for high-income OECD countries with growth of GDP as the endogenous variable.
[9] Czech Republic, Hungary, Iceland, Korea, Mexico, Poland, Slovak Republic and Turkey.
[10] In some cases shorter periods or single-year figures apply due to data constraints.

(2003) concludes that most high-income OECD countries have converged to a medium degree of fiscal federalism over the last three decades, which underlines the assumption that no major changes may be expected in the near future.

IV.3. Indicators of Fiscal Decentralization

IV.3.a. Classical Indicators: Governmental System and Sub-national Expenditure/ Revenue Shares

The use of sub-national expenditure and revenue shares as explanatory variables for the level of public expenditures is suggested by both the Theory of Fiscal Federalism and the Leviathan Hypothesis. We applied three year averages over the years 1998-2000 in order to smoothen out short-term variations in the shares.[11] These indicators (*exp_share* and *rev_share*) are listed in table 1 for our country sample of 21 high-income OECD countries.

Table 1: Classical Indicators of Fiscal Decentralisation

	gov_sys Governmental System	*rev_share* Sub-national Revenue Share	*exp_share* Sub-national Expenditure Share	*avg_share* Avg. of rev_share and exp_share
AUSTRALIA	federal	32.0	42.5	37.3
AUSTRIA	federal	24.9	31.6	28.2
BELGIUM	federal	10.1	24.1	17.1
CANADA	federal	52.2	58.7	55.4
DENMARK	unitary	33.4	46.1	39.7
FINLAND	unitary	27.7	33.5	30.6
FRANCE	unitary	12.5	16.3	14.4
GERMANY	federal	32.7	38.5	35.6
GREECE	unitary	3.4	3.9	3.6
IRELAND	unitary	6.9	25.1	16.0
ITALY	unitary	16.7	24.1	20.4
JAPAN	unitary	26.0	40.7	33.4
NETHERLANDS	unitary	10.9	27.7	19.3
NEW ZEALAND	unitary	10.8	10.7	10.7
NORWAY	unitary	21.1	34.0	27.5
PORTUGAL	unitary	8.4	10.4	9.4
SPAIN	unitary	18.9	27.6	23.3
SWEDEN	unitary	31.8	36.9	34.4
SWITZERLAND	federal	42.9	47.4	45.2
UNITED KINGDOM	unitary	8.1	22.1	15.1
UNITED STATES	federal	41.4	49.5	45.5

Note: Three-year averages 1998-2000 where no data restrictions apply. Exceptions: France (2000), Germany (1998 and 2000), Ireland (1997), Japan (2000), Netherlands (2000), Norway (1998 and 1999).
Source: IMF Government Finance Statistics Yearbook (GFSY) 2002 and 2003; Japan: OECD Economic Outlook 2003; authors' calculations.

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[11] For some countries, only one or two year data is applied due to data constraints.

Additionally, a dummy variable was created indicating if a country's governmental system is formally federal or unitary.[12] Interestingly, this classification seems to be in no obvious relation to the degree of decentralization as measured in any of the other indicators, an observation that was made before (cp. Thießen (2003), p. 259, OECD (2003), p. 144) and was confirmed through persistent insignificance of this dummy variable in the forthcoming estimation.

IV.3b. Structural Indicators: Expenditure and Revenue Decentralization Index

The structural decentralization indicators were formed out of the OECD/World Bank Budget Practices and Procedures Database, providing comparable data on nearly 300 aspects of the budget formulation, approval, implementation and audit phases in each OECD member country except Switzerland and many non-member countries. Aspects of fiscal interrelations between government levels are contained in section 6 of the database. Out of this section, we chose the most important aspects which indicate higher or lower degrees of decentralization with regard to revenue and expenditure autonomy. For every of the chosen aspects a dummy variable was created where 1 indicates a high degree of decentralization or sub-national autonomy and 0 a low degree of decentralization with respect to the survey question.[13] In a limited number of cases 0.5 was given in case of answers which were ambiguous or not given. In order to facilitate reference to the original survey questions for the reader, the components of our decentralization ranking contain the number of the original survey question.

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[12] Cp. Thießen (2003), p. 245.
[13] For Switzerland no survey data was existing, so the data was investigated with help of additional literature, as well as for the completion of data sets for some other countries where survey data was missing.

Table 2: Structural Decentralization Indicators

	Revenue Dezentralization						Expenditure Decentralization						Aggregated
	6.2.a	6.2.b	6.2.d	6.2.e	6.2.h	*rev_aut*	6.3.c	6.4.a	6.4.b	6.4.c	6.4.d	*exp_aut*	*agg_aut*
AUSTRALIA	1	1	0	0	0	2	1	0	1	1	0	3	5
AUSTRIA	0	1	1	1	0	3	0	0	1	1	0	2	5
BELGIUM	1	1	1	1	0	4	1	1	1	1	0	4	8
CANADA	1	0	1	1	0	3	1	1	1	1	1	5	8
DENMARK	1	0	1	1	0	3	0	0	1	0	0	1	4
FINLAND	1	0	1	1	0	3	1	1	1	0	0	3	6
FRANCE	1	0	0.5	1	0	2.5	0	1	1	1	0	3	5.5
GERMANY	1	0	1	1	0	3	1	0	1	0	0	2	5
GREECE	0	0	0	1	1	2	0	1	0	0	0	1	3
IRELAND	1	1	0.5	0	0	2.5	1	0	0	0	0	1	3.5
ITALY	1	0	1	1	0	3	0	0	0.5	0	0	0.5	3.5
JAPAN	1	0	1	0	0	2	0	0	0	1	1	2	4
NETHERLANDS	1	0	0	1	0	2	1	1	0	1	1	4	6
NEW ZEALAND	1	1	0.5	0.5	1	4	1	1	1	0	1	4	8
NORWAY	0	0	1	1	0	2	0	1	1	0	1	3	5
PORTUGAL	0	0	1	1	0	2	1	0	1	0	0	2	4
SPAIN	1	1	0.5	1	0	3.5	1	0	1	0	0	2	5.5
SWEDEN	1	0	1	1	0	3	1	1	1	1	0	4	7
SWITZERLAND	1	1	0	1	0	3	1	0	1	0	0	2	5
UNITED KINGDOM	1	1	1	0	0	3	1	0	0.5	0	0	1.5	4.5
UNITED STATES	1	1	1	0	1	4	1	0	1	1	1	4	8

Sources: OECD/World Bank Budget Practices and Procedures Database; Spahn (2004); OECD (2003); OECD (2002a); OECD (2002b); OECD (1997); Ma (1997); authors' calculations.

Indicators of sub-national revenue autonomy

- 6.2.a indicates the existence of own revenue sources for sub-national government levels, i.e., no sole dependence on downward revenue sharing.

- 6.2.b indicates high sub-national tax autonomy, i.e., that there is mainly exclusivity of tax bases and/or autonomy in setting tax rates for sub-national governments.

- 6.2.d indicates that fiscal gaps are addressed mainly with non-specific grants or revenue sharing so that the money can be spent at the discretion of sub-national levels.

- 6.2.e indicates that sub-national levels have an influence in the determination of intergovernmental transfers.

- 6.2.h. indicates that there is no equalization system in case of a horizontal revenue imbalance.

Indicators of sub-national expenditure autonomy

- 6.3.a indicates the existence of clear and separate competences for national and sub-national governments for most of the expenditure.

- 6.4.a indicates the absence of borrowing limits for lower levels of government.

- 6.4.b indicates that the national government does not explicitly or implicitly guarantee the borrowing activity of lower levels of government.

- 6.4.c indicates that the national government is not involved in setting the overall expenditure level of lower layers of government.

- 6.4.d indicates that national government does not co-ordinate general government expenditure aggregates.

Out of these dummy variables the following structural indicators were created: sub-national revenue autonomy (*rev_aut*), sub-national expenditure autonomy (*exp_aut*) and aggregated sub-national fiscal autonomy (*agg_aut*)[14].

The next step to enable the analysis of a non-linear, hump-shaped relationship is to transform the structural indicators *rev_aut*, *exp_aut* and *agg_aut* into a parabola-shaped ranking, as done in table 3. First, countries are ranked from 1 to 21 according to their autonomy indicators where a low ranking number corresponds to a high degree of sub-national fiscal autonomy. Where countries score the same, the respective share of sub-national fiscal revenues or expenditures is taken as a second criterion to create an unambiguous ranking. In the case of the aggregated ranking both shares are regarded and if they contradict the ranking position is shared. This procedure leads to the indicators named *rev_rank_q*, *exp_rank_q* and *agg_rank_q*.[15] Subsequently, they are transformed into an indicator which is able to measure the hump-shaped relationship: low and high values of the rankings become low values, while median ranking values become high hump values.[16]

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[14] Variable names in bold print are the ones used in the forthcoming estimations.
[15] They are not used in the subsequent estimation, as the autonomy indicators are informationally superior.
[16] Tables 7-9 in the Appendix contain country rankings by the different indicators for easier comparison.

<div align="center">**Table 3: Structural Decentralization Indicators, Ranks and Humps**</div>

	Revenue Autonomy				Expenditure Autonomy				Aggregated Autonomy		
	rev_ aut	*rev_ share*	*rev_ rank_q*	*rev_ hump_q*	*exp_ aut*	*exp_ share*	*exp_ rank_q*	*exp_ hump_q*	*agg_ aut*	*agg_ rank_q*	*agg_ hump_q*
AUSTRALIA	2	32.0	16	6	3	42.5	7	7	5	11	11
AUSTRIA	3	24.9	11	11	2	31.6	14	8	5	12	10
BELGIUM	4	10.1	3	3	4	24.1	5	5	8	4.5	4.5
CANADA	3	52.2	5	5	5	58.7	1	1	8	2	2
DENMARK	3	33.4	7	7	1	46.1	18	4	4	14	8
FINLAND	3	27.7	10	10	3	33.5	9	9	6	8	8
FRANCE	2.5	12.5	14	8	3	16.3	10	10	5.5	13	9
GERMANY	3	32.7	8	8	2	38.5	13	9	5	9	9
GREECE	2	3.4	21	1	1	3.9	20	2	3	21	1
IRELAND	2.5	6.9	15	7	1	25.1	19	3	3.5	18.5	3.5
ITALY	3	16.7	12	10	0.5	24.1	21	1	3.5	17	5
JAPAN	2	26.0	17	5	2	40.7	12	10	4	20	2
NETHERLANDS	2	10.9	19	3	4	27.7	4	4	6	10	10
NEW ZEALAND	4	10.8	2	2	4	10.7	6	6	8	4.5	4.5
NORWAY	2	21.1	18	4	3	34.0	8	8	5	15	7
PORTUGAL	2	8.4	20	2	2	10.4	16	6	4	18.5	3.5
SPAIN	3.5	18.9	4	4	2	27.6	15	7	5.5	7	7
SWEDEN	3	31.8	9	9	4	36.9	3	3	7	3	3
SWITZERLAND	3	42.9	6	6	2	47.4	11	11	5	6	6
UNITED KINGDOM	3	8.1	13	9	1.5	22.1	17	5	4.5	16	6
UNITED STATES	4	41.4	1	1	4	49.5	2	2	8	1	1

Source: authors' calculations.

IV.3c. Advanced Indicators: Combined Classical and Structural Indicators

Given our reasoning for the use of structural indicators to describe fiscal decentralization more appropriately, it may be an even more promising approach to combine the classical quantitative indicators with our new structural indicators, as done in table 4.

Our approach is to give equal weights to the structural and quantitative aspects of fiscal decentralization. In order to create such a measure, revenue and expenditure shares are transformed into an indicator which is also scaled between 0 and 5, as the autonomy indicators. The shares are grouped in categories between 1 and 10, according to intervals of ten per cent.[17] This measure (*rev_sh_ind* and *exp_sh_ind*) is added to the indicators of revenue/expenditure decentralization (*rev_aut* and *exp_aut*), leading to combined sums (***rev_sum***, ***exp_sum*** and ***agg_sum*** for the aggregated combined indicator). As done before,

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[17] A 0.1-10% revenue or expenditure share is assigned a 1 in *rev_sh_ind*; 10.1-20% a 2 etc.. A zero point revenue or expenditure share would be assigned a 0, even though this is never the case.

these values are transformed into rankings (*rev_rank*, *exp_rank* and *agg_rank*) and subsequently into a hump-shaped indicator (**rev_hump**, **exp_hump** and **agg_hump**).

Table 4: Combined Decentralization Indicators, Ranks and Humps

|	Combined Revenue Autonomy					Combined Expenditure Autonomy					Combined Agg. Autonomy		
	rev_ share	*rev_ sh_ind*	*rev_ sum*	*rev_ rank*	*rev_ hump*	*exp_ share*	*exp_ sh_ind*	*exp_ sum*	*exp_ rank*	*exp_ hump*	*agg_ sum*	*agg_ rank*	*agg_ hump*
AUSTRALIA	32.0	2	4	12	10	42.5	2.5	5.5	4	4	11.5	6.5	6.5
AUSTRIA	24.9	1.5	4.5	10	10	31.6	2	4	13	9	11.5	12	10
BELGIUM	10.1	1	5	8	8	24.1	1.5	5.5	6	6	14.5	5	5
CANADA	52.2	3	6	2	2	58.7	3	8	1	1	17.0	1	1
DENMARK	33.4	2	5	4	4	46.1	2.5	3.5	15	7	11.5	10	10
FINLAND	27.7	1.5	4.5	9	9	33.5	2	5	8	8	12.5	9	9
FRANCE	12.5	1	3.5	16	6	16.3	1	4	14	8	10.0	15	7
GERMANY	32.7	2	5	5	5	38.5	2	4	12	10	12.0	6.5	6.5
GREECE	3.4	0.5	2.5	21	1	3.9	0.5	1.5	21	1	6.0	20	2
IRELAND	6.9	0.5	3	19	3	25.1	1.5	2.5	19	3	8.0	18.5	3.5
ITALY	16.7	1	4	13	9	24.1	1.5	2	20	2	9.0	16	6
JAPAN	26.0	1.5	3.5	14	8	40.7	2.5	4.5	11	11	10.0	21	1
NETHERLANDS	10.9	1	3	18	4	27.7	1.5	5.5	5	5	10.5	13	9
NEW ZEALAND	10.8	1	5	7	7	10.7	1	5	9	9	14.0	8	8
NORWAY	21.1	1.5	3.5	15	7	34.0	2	5	7	7	10.5	11	11
PORTUGAL	8.4	0.5	2.5	20	2	10.4	1	3	18	4	7.5	18.5	3.5
SPAIN	18.9	1	4.5	11	11	27.6	1.5	3.5	16	6	11.5	14	8
SWEDEN	31.8	2	5	6	6	36.9	2	6	3	3	14.0	3	3
SWITZERLAND	42.9	2.5	5.5	3	3	47.4	2.5	4.5	10	10	13.0	4	4
UNITED KINGDOM	8.1	0.5	3.5	17	5	22.1	1.5	3	17	5	9.5	17	5
UNITED STATES	41.4	2.5	6.5	1	1	49.5	2.5	6.5	2	2	17.0	2	2

Source: authors.

In order to complete the number of non-linear decentralization indicators, table 6 in the appendix reports hump-shaped indicators of the three classical decentralization shares (table 1) which are created along the same procedure (**rev_sh_hump, exp_sh_hump** and **avg_sh_hump**).

A first impression of possible relations between such an indicator and national public expenditures as part of GDP may be observed from figure 1. In the cloud of data points it is hard to spot a clear linear relationship at first sight. A type of hump-shaped relationship may be suspected, even though not the way it would have been expected according to the theory outlined above. The suspected polynomial curve indicates the possibility of a positive

relationship between the level of public expenditures and a medium level of decentralization.[18]

Also, it can be clearly seen that there are some outlier countries which in no case follow a common trend, most notably Japan and New Zealand.

Graph 1: Public Expenditure/GDP and Fiscal Decentralization in 21 High-Income OECD Countries
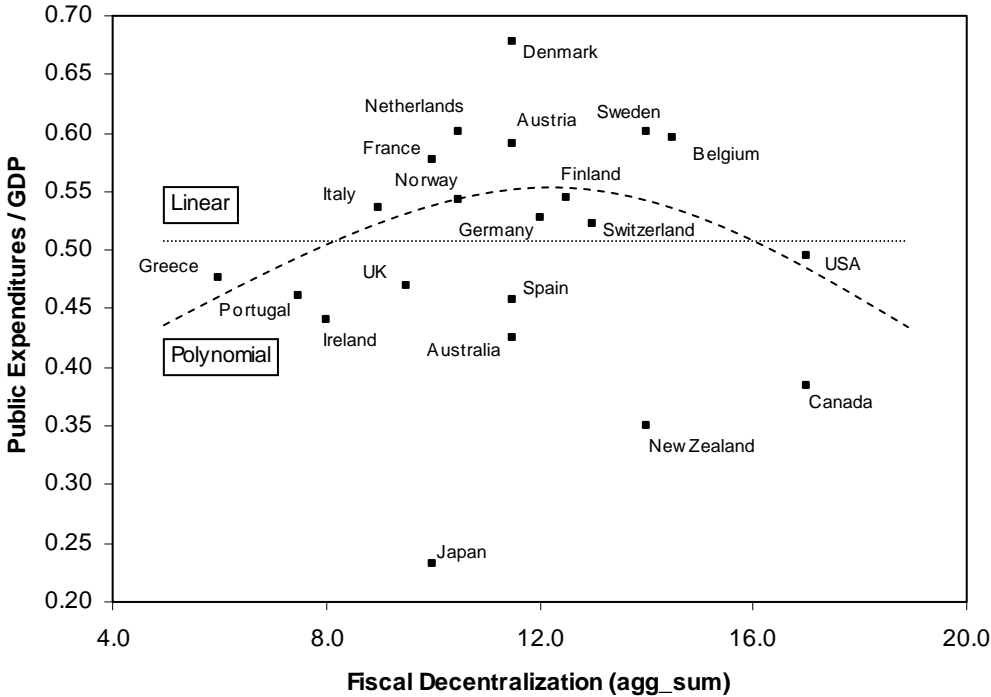
Note: Public expenditures and GDP are measured as three-year averages over the period 1998-2000.
Source: GFSY 2002/2003, IMF International Financial Statistics (IFS) CD-ROM 2004.

IV.4. Variables and Estimation of Results

The dependent variable as suggested by the greater part of the Leviathan literature is the size of government measured by the level of general government (i.e., including all levels of government) public expenditures as a share of GDP (***exp_gdp***). The data were extracted from

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[18] Actually, there is a difference between a generally medium degree of decentralization and a medium degree of decentralization with regard to the respective country sample. However, it is clear that the total extremes do not exist, i.e., full centralization or full decentralization. In that sense we assume our sample to be one in which the range of actually feasible degrees of decentralization is covered at the extremes so that here both expressions express the same.

the IMF Government Financial Statistics and represent three-year averages over the years 1998-2000.[19]

A whole range of estimations will be carried out with the above introduced indicators of fiscal decentralization, our independent variables. By doing so we pursue several goals: First, we aim to find out which indicators provide us with best results: the classical quantitative decentralization measures, structural decentralization measures or, as we suspect, combined indicators. Second, we aim to explain if public expenditures can best be explained by considering either the revenue aspects or the expenditure aspects of fiscal federalism, or if an aggregation of both sides is needed to offer a meaningful explanation. These findings may also provide a more profound clarification of the reasons for higher or lower public expenditures, which may be rooted in very few main aspects of fiscal federalism design. Our hypothesis is that either the expenditure side or the aggregated indicators should perform best to explain public expenditures. Third, we aim to verify whether the size of government follows a linear or a non-linear trend. The Leviathan hypothesis predicts a (strictly) linear and negative relation between the degree of fiscal decentralization and the level of public expenditures. The theory of fiscal federalism combined with the explanations above predicts a non-linear relation where public expenditures should be lowest at a medium degree of fiscal decentralization.

To test these hypotheses, the size of the public sector is regressed on one of the indicators of fiscal decentralization and a matrix of control variables suggested by the literature on public sector size or growth. For the basic estimation procedure we use a limited set of control variables in order to be left with sufficient degrees of freedom and to produce meaningful results. Subsequently, the results can be tested for robustness by including more control variables.[20]

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[19] Due to data constraints: France (2000), Germany (1998 and 2000), Ireland (1997), Japan (1993), Netherlands (2000), Norway (1998 and 1999).

[20] The set of control variables was mainly adapted to our problem from the set of Rodden (2003).

Our basic matrix of control variables with a three-year average (1998-2000) includes: i) GDP per capita[21] (***gdp_pc***) in current US dollars where data are calculated from the World Bank Development Indicators; ii) Trade openness (***open***) as measured by exports plus imports as a share of GDP in current prices where data are from Penn World Tables for the years 1998-2000; iii) A dummy for the national executive being controlled by the left taken from the World Bank's Database of Political Institutions (DPI) for the year 2000 (***ex_left***); iv) Fixed country dummies[22] (***jpnwz***[23]).

The extended set of control variables additionally contains: v) the size of the population (***popu***) as taken from IFS; vi) the national dependency ratio[24] (***dep***) as reported by World Bank Development Indicators; vii) a dummy variable for parliamentary regimes (***ex_parl***, as opposed to a directly elected executive power) also taken from DPI.

The basic regression (1) and the robust regression (2) look as follows, where log variables are taken whenever possible to improve the fit of the estimation:

(1) $\ln exp\_gdp_i = \alpha + \beta_1 \ln gdp\_pc_i + \beta_2 \ln open_i + \beta_3 ex\_left_i + \beta_4 jpnwz$

$$+ \beta_5 \ln decentralization\ indicator_i$$

(2) $\ln exp\_gdp_i = \alpha + \beta_1 \ln gdp\_pc_i + \beta_2 \ln open_i + \beta_3 ex\_left_i + \beta_4 \ln popu_i + \beta_5 \ln dep_i$

$$+ \beta_6 ex\_parl_i + \beta_7 jpnwz + \beta_8 \ln decentralization\ indicator_i$$

Table 5 contains the estimation results of the basic estimation. Table 10 in the appendix contains the robust estimations with the extended set of control variables.

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[21] According to Wagner's Law.

[22] Country dummies control for the existence of omitted variables in terms of fixed country effects which may help determine country differences in the long-term. The obvious fixed country dummy for different governmental systems gov_sys was universally estimated insignificant and is thus not reported.

[23] Best results are achieved by controlling for the extreme outlier countries of Japan and New Zealand, which show abnormally low public expenditures. This may be explained by low levels of social security and social service expenditures in both countries. (Ministry of Finance Japan (2001), Atkinson and Noord (2001))

[24] The share of society above or below working age.

Table 5: Results of Basic Estimation

Dependent Variable: log General Government Public Expenditures / GDP [ln *exp_gdp*], 1998-2000

Eq.	Decentralization measure	α	ln *gdp_pc*	ln *open*	*ex_left*	*jpnwz*	dec. indicator	Adj. R²	Akaike	F-stat.
	Rev. Autonomy									
a1	ln *rev_share*	1.300	0.068	0.207	0.102	-0.439	0.030	0.713	-1.079	10.935
		(2.385)	(0.104)	(0.063)***	(0.057)*	(0.104)***	(0.051)			
a2	ln *rev_aut*	0.668	0.098	0.191	0.098	-0.454	0.060	0.711	-1.074	10.860
		(2.049)	(0.084)	(0.061)***	(0.057)	(0.103)***	(0.119)			
a3	ln *rev_sum*	1.108	0.077	0.197	0.098	-0.450	0.078	0.715	-1.087	11.038
		(2.177)	(0.092)	(0.060)***	(0.057)	(0.102)***	(0.116)			
a4	ln *rev_sh_hump*	1.120	0.074	0.202	0.120	-0.483	0.080	0.779	-1.340	15.081
		(1.804)	(0.074)	(0.053)***	(0.051)**	(0.091)***	(0.036)**			
a5	ln *rev_hump_q*	1.620	0.059	0.182	0.109	-0.436	0.052	0.732	-1.147	11.915
		(2.154)	(0.089)	(0.060)***	(0.055)*	(0.100)***	(0.044)			
a6	ln *rev_hump*	1.045	0.082	0.172	0.145	-0.507	0.088	0.782	-1.357	15.388
		(1.784)	(0.073)	(0.054)***	(0.053)**	(0.093)***	(0.039)**			
	Exp. Autonomy									
a7	ln *exp_share*	-0.672	0.163	0.193	0.095	-0.462	-0.043	0.713	-1.081	10.954
		(2.906)	(0.129)	(0.061)***	(0.058)	(0.105)***	(0.072)			
a8	ln *exp_aut*	0.250	0.117	0.202	0.114	-0.434	-0.033	0.714	-1.084	10.998
		(2.093)	(0.086)	(0.061)***	(0.060)*	(0.105)***	(0.051)			
a9	ln *exp_sum*	0.037	0.128	0.200	0.108	-0.438	-0.040	0.711	-1.072	10.831
		(2.335)	(0.098)	(0.061)***	(0.059)*	(0.105)***	(0.083)			
a10	ln *exp_sh_hump*	1.366	0.071	0.175	0.119	-0.457	0.044	0.723	-1.114	11.431
		(2.170)	(0.089)	(0.063)**	(0.059)*	(0.101)***	(0.047)			
a11	ln *exp_hump_q*	0.788	0.093	0.194	0.108	-0.464	0.026	0.714	-1.083	10.989
		(2.059)	(0.085)	(0.060)***	(0.058)*	(0.105)***	(0.042)			
a12	ln *exp_hump*	1.898	0.047	0.175	0.115	-0.523	0.072	0.751	-1.220	13.044
		(2.063)	(0.085)	(0.058)***	(0.054)**	(0.106)***	(0.044)			
	Agg. Autonomy									
a13	ln *avg_share*	0.330	0.116	0.195	0.101	-0.451	-0.009	0.707	-1.058	10.643
		(2.729)	(0.120)	(0.062)***	(0.058)	(0.105)***	(0.066)			
a14	ln *agg_aut*	0.547	0.105	0.197	0.103	-0.447	-0.006	0.707	-1.057	10.630
		(2.109)	(0.088)	(0.063)***	(0.060)	(0.106)***	(0.106)			
a15	ln *agg_sum*	0.727	0.095	0.195	0.100	-0.451	0.023	0.707	-1.059	10.656
		(2.219)	(0.096)	(0.061)***	(0.058)	(0.104)***	(0.126)			
a16	ln *avg_sh_hump*	1.553	0.061	0.178	0.133	-0.462	0.060	0.737	-1.168	12.234
		(2.081)	(0.086)	(0.059)***	(0.059)**	(0.098)***	(0.045)			
a17	ln *agg_hump_q*	1.299	0.074	0.156	0.121	-0.432	0.087	0.783	-1.359	15.425
		(1.798)	(0.074)	(0.055)**	(0.050)**	(0.089)***	(0.038)**			
a18	ln *agg_hump*	0.791	0.096	0.150	0.107	-0.424	0.099	0.811	-1.495	18.127
		(1.655)	(0.068)	(0.052)**	(0.046)**	(0.084)***	(0.034)**			

Source: authors' calculations
Note: Standard errors in brackets. ***p < .01, **p < .05, *p < .1.

IV.5. Interpretation of Results

Table 5 provides us with first answers to the questions posed above. Overall, all regressions are of good explanatory power, with adjusted R^2's between 70 and 82 per cent.[25] While the constant α and *gdp_pc* are never significant, the other control variables perform well, with openness *open* being always significant at the 5 or 10 per cent level, *ex_left* being mostly significant at the 5 or 10 per cent level and the country dummy for Japan and New Zealand *jpnwz* being universally significant at the 1 per cent level. According to the parameter values higher GDP per capita, a governing left-wing party and more trade openness have a positive influence on the level of public expenditures.

The performance of the decentralization indicators is very varying but it can instantly be noticed that only non-linear indicators are statistically significant.[26] Surprisingly, the observation of graph 1 is confirmed through the positive parameter value of all hump indicators: according to the way this indicator was constructed a medium degree of decentralization goes along with a higher value and thus a stronger influence on public expenditures. We estimate this relationship to be positive. Additionally, public expenditures at the "centralized end" of the country spectrum are on average lower than on the "decentralized end".[27] These findings cannot be supported by any of the above stated theories.

The next observation which can be made is that two out of three non-linear indicators become significant at the 5 per cent level for the aggregated autonomy as well as the revenue autonomy consideration, however not for the expenditure autonomy consideration. In total, aggregated indicators are more significant than revenue indicators only. But as the aggregated

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[25] For all estimations the hypothesis of homoscedasticity cannot be rejected at a one per cent significance level (White Test).

[26] Without the fixed country dummy, the adjusted R^2 falls below 40 per cent in the least explanatory equations and hardly overcomes the 50 per cent mark in the best cases. When excluding the country dummy for Japan and New Zealand, the decentralization indicator in equation a18 remains significant at 5%. In a17 it is barely above 10%, whereas it becomes highly insignificant in a4 and a6. Such distortion in the results confirms the necessity for such a dummy variable, especially in such a small country sample.

[27] Using *agg_sum* to rank the country sample it can be divided into three equally strong groups. Without Japan and New Zealand, the six most centralized countries have average public expenditures / GDP of 49.4 per cent while the most decentralized countries average around 52.4 per cent. With medium decentralization the average is 54.6 per cent.

indicators are per definition half driven by the outcome of the revenue indicators, the reasons for excessive public expenditures may rather be found in the design of a nation's revenue decentralization than its expenditure decentralization. Again, this finding contradicts our hypothesis and lacks an obvious explanation.

Regarding our last question another interesting result is achieved: in every category the non-linear indicator which is constructed by combining both the structural aspects as well as the quantitative aspects outperforms all other indicators. The most successful out of these measures is the one regarding aggregated autonomy (*agg_hump*) which is highly significant (almost at the 1 per cent level). When looking at all three categories it is not obvious if the quantitative or the purely structural indicator has more explanatory power. However, it becomes clear that there is a significant added value when combining quantitative and structural aspects of fiscal decentralization. This finding is consistent with the expectations of the authors and the motivation of this paper.

For the robust estimation results (table 10) much more variables become insignificant, as expected with such a small number of observations. Most R^2's deteriorate only slightly, as well as the Akaike information criteria, whereas F-statistics of these equations worsen considerably. Yet, our favourite decentralization regressor of the basic estimation set, *agg_hump*, remains significant at the 5 per cent level.[28] In general, our above stated findings are confirmed in the robust estimation as much as this may be possible with such a considerable degree of uncertainty due to reduced degrees of freedom.

IV.6. Implications

The findings of the estimation above have several implications for future research. It was shown that fiscal decentralization indicators consisting of a combination of quantitative and structural aspects seem to mirror the reality of federalism better than any of these facets in an

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[28] Apart from that, only *rev_sh_hump* remains a considerable explanatory variable, only barely missing the 10 per cent significance level.

isolated consideration. Clearly such combined indicators may be challengeable as to their composition. Different weighing of the composing survey aspects or the composing indicators could lead to different results. Indicator fine-tuning might still be possible and should go along with detailed investigation of the reasons for the surprising results of this study.[29]

This leads to the second finding and unanswered question – why do characteristics of revenue decentralization explain public expenditure patterns more accurately than features of expenditure decentralization? The answer may be found with help of the OECD/World Bank Budget Practices and Procedures Database which is much more comprehensive than the data used in this study. Apart from fiscal relations between different levels of government, more detailed information is contained on various issues of national budgeting which may also be of high influence on the level of public expenditures. In our view this data might also be used to construct one overall or several sub-indicators on budgeting practices which would then shed more light onto possible influences on the size of government.

In a practical sense, this approach may also yield answers to the second puzzle brought up in this paper, the relation between comparatively higher public expenditures and a medium degree of decentralization. For example, it seems plausible that an administration which is decentralized "half-way" neither profits from economies of scale at the central level nor from the improved matching of the preferences of local citizens. Instead, shared competences may result in increased decision and coordination costs with bureaucratic efforts and state employment at the national and sub-national level without the expenditure-minimizing consequences of decentralization. Such thoughts may have far-reaching consequences for the Theory of Fiscal Federalism which is likely to use overly simplistic assumptions and thus

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[29] For example, the actual amount of taxes over which sub-national governments have full discretion might be included as an indicator of federalism (Cp. Meloche, Vaillancourt and Yilmaz (2004)). This aspect was only coded as "mainly" or "not mainly" in our indicator. Also, the budgeting survey seems not to be filled out diligently at times. For example, Germany's answer to 6.4.b indicates no bailing out of lower levels of government while the Federal Constitutional Court has made it clear that bankrupt sub-national governments cannot default but have to be supported vertically or horizontally. In general, a big obstacle for fine tuning is the lack of data availability and reliability which would have to be satisfied through extensive case studies of every country involved in the sample.

need to be extended. It seems reasonable to expect answers with regard to the institutional set-up of fiscal federalism in practice and/or political incentives, i.e., in the domains of the NIE (new institutional economics) or the NPE (new political economy). For example, it may be interesting to examine if existing structures of fiscal federalism are designed along the lines of Weingast's (1995) "market-preserving federalism" and if deviations from this structure may be responsible for excessive public expenditures. For example, while our indicator regards the absence of borrowing limits for lower level governments as higher expenditure autonomy, Weingast argues that soft budget constraints are one of the characteristics of federalism which destroy market signals and thus lead to increased inefficiency.

It is an essential question to ask if the implementation of theoretically superior federalism structures is inherently flawed or if they can be improved and thus lead to actually quantifiable superiority, such as lower public expenditures. Before such additional analysis is not carried out, it is probably too early to come up with detailed policy advice on how to improve those structures.[30]

Also it should be taken in mind that the level of public expenditures is only one among several key policy goals. Economic growth might be regarded an equally important goal fostered through adequate fiscal structures. In that sense, our results differ from Thießen (2003) who examines the impact of fiscal federalism on growth with a similar methodology for the same country sample (but over 1974 to 1998 averages). His results imply higher growth rates for countries of medium decentralization. Thus, a policy recommendation based on our analysis to establish extreme centralization or decentralization would of course be mistaken. However, at least with regard to public expenditures the Leviathan state is today not an evil beast but rather the lesser evil in a world of imperfect federalism.

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[30] A further issue to be examined which was not dealt with in this paper is the following: it occurs to us that it may be necessary to analyze the composition of public expenditures more closely, especially concerning their division into state consumption or investment. These parts are likely to be unequally influenced by the design of fiscal federalism.

V. CONCLUDING REMARKS

When fiscal competencies are assigned among different levels of government, many different structural aspects are concerned and may be dealt with differently in different countries. This paper has made a first attempt at quantifying structural data on fiscal relations in order to determine the relation between fiscal structures and public expenditures.

As was shown in this study, information regarding the structural aspects of fiscal decentralization can have considerable power in explaining the level of general government public expenditures. Since classical indicators of fiscal decentralization do not implement all important facets of actual fiscal federalism the information content of both should be paired to achieve more significant estimation results. Accordingly, the combined indicators presented in this paper help to substantially improve the description of reality for our sample.

What we found is that the more centralized Leviathan state is apparently not the evil revenue- and expenditure-maximizing beast but actually the lesser evil in a world of imperfect federalism. Against all theory we find medium degrees of federalism to cause higher public expenditures. Our suspicion is that this is not an immanent characteristic of federalism but that in fact misdesigned fiscal structures lead to increased costs to the extent that the advantages of federalism are forfeited. Possible explanations are coordination problems between different levels of government at a medium degree of decentralization, leading to higher public employment, coordination and decision costs. Such misdesign may stem from the destruction of market incentives in the process of decentralizing, e.g., the lack of hard budget constraints for lower levels of government. Yet, it remains to explain these results in detail on a coherent theoretical basis. The exact reasons for the "stuck in the middle" problem need to be examined and empirically confirmed in order to come up with well-founded policy advice in the long run.

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APPENDIX

Table 6: Quantitative Decentralization Indicators, Ranks and Humps

	Quantitative Revenue Autonomy			Quantitative Expenditure Autonomy			Quantitative Aggregated Autonomy		
	rev_ share	rank	*rev_sh_ hump*	*exp_ share*	rank	*exp_sh_ hump*	*avg_ share*	rank	*avg_sh_ hump*
AUSTRALIA	32.0	6	6	42.5	5	5	37.3	5	5
AUSTRIA	24.9	10	10	31.6	11	11	28.2	10	10
BELGIUM	10.1	17	5	24.1	15	7	17.1	15	7
CANADA	52.2	1	1	58.7	1	1	55.4	1	1
DENMARK	33.4	4	4	46.1	4	4	39.7	4	4
FINLAND	27.7	8	8	33.5	10	10	30.6	9	9
FRANCE	12.5	14	8	16.3	18	4	14.4	18	4
GERMANY	32.7	5	5	38.5	7	7	35.6	6	6
GREECE	3.4	21	1	3.9	21	1	3.6	21	1
IRELAND	6.9	20	2	25.1	14	8	16.0	16	6
ITALY	16.7	13	9	24.1	16	6	20.4	13	9
JAPAN	26.0	9	9	40.7	6	6	33.4	8	8
NETHERLANDS	10.9	15	7	27.7	12	10	19.3	14	8
NEW ZEALAND	10.8	16	6	10.7	19	3	10.7	19	3
NORWAY	21.1	11	11	34.0	9	9	27.5	11	11
PORTUGAL	8.4	18	4	10.4	20	2	9.4	20	2
SPAIN	18.9	12	10	27.6	13	9	23.3	12	10
SWEDEN	31.8	7	7	36.9	8	8	34.4	7	7
SWITZERLAND	42.9	2	2	47.4	3	3	45.2	3	3
UNITED KINGDOM	8.1	19	3	22.1	17	5	15.1	17	5
UNITED STATES	41.4	3	3	49.5	2	2	45.5	2	2

Source: authors' calculations.

Table 7: Revenue Ranking Comparison

	Sub-national Revenue Share	Ranking according to rev_share	Ranking according to rev_aut	Ranking according to rev_sum
	rev_share		*rev_rank_q*	*rev_rank*
CANADA	52.2	1	5	2
SWITZERLAND	42.9	2	6	3
UNITED STATES	41.4	3	1	1
DENMARK	33.4	4	7	4
GERMANY	32.7	5	8	5
AUSTRALIA	32.0	6	16	12
SWEDEN	31.8	7	9	6
FINLAND	27.7	8	10	9
JAPAN	26.0	9	17	14
AUSTRIA	24.9	10	11	10
NORWAY	21.1	11	18	15
SPAIN	18.9	12	4	11
ITALY	16.7	13	12	13
FRANCE	12.5	14	14	16
NETHERLANDS	10.9	15	19	18
NEW ZEALAND	10.8	16	2	7
BELGIUM	10.1	17	3	8
PORTUGAL	8.4	18	20	20
UNITED KINGDOM	8.1	19	13	17
IRELAND	6.9	20	15	19
GREECE	3.4	21	21	21

Source: authors' calculations.

Table 8: Expenditure Ranking Comparison

	Sub-national Expenditure Share	Ranking according to exp_share	Ranking according to exp_aut	Ranking according to exp_sum
	exp_share		*exp_rank_q*	*exp_rank*
CANADA	58.7	1	1	1
UNITED STATES	49.5	2	2	2
SWITZERLAND	47.4	3	11	10
DENMARK	46.1	4	18	15
AUSTRALIA	42.5	5	7	4
JAPAN	40.7	6	12	11
GERMANY	38.5	7	13	12
SWEDEN	36.9	8	3	3
NORWAY	34.0	9	8	7
FINLAND	33.5	10	9	8
AUSTRIA	31.6	11	14	13
NETHERLANDS	27.7	12	4	5
SPAIN	27.6	13	15	16
IRELAND	25.1	14	19	19
BELGIUM	24.1	15	5	6
ITALY	24.1	16	21	20
UNITED KINGDOM	22.1	17	17	17
FRANCE	16.3	18	10	14
NEW ZEALAND	10.7	19	6	9
PORTUGAL	10.4	20	16	18
GREECE	3.9	21	20	21

Source: authors' calculations.

Table 9: Aggregated Ranking Comparison

	Average of Sub-national Shares	Ranking according to avg_share	Ranking according to agg_aut	Ranking according to agg_sum
	avg_share		*agg_rank_q*	*agg_rank*
CANADA	55.4	1	2	1
UNITED STATES	45.5	2	1	2
SWITZERLAND	45.2	3	6	4
DENMARK	39.7	4	14	10
AUSTRALIA	37.3	5	11	6.5
GERMANY	35.6	6	9	6.5
SWEDEN	34.4	7	3	3
JAPAN	33.4	8	20	21
FINLAND	30.6	9	8	9
AUSTRIA	28.2	10	12	12
NORWAY	27.5	11	15	11
SPAIN	23.3	12	7	14
ITALY	20.4	13	17	16
NETHERLANDS	19.3	14	10	13
BELGIUM	17.1	15	4.5	5
IRELAND	16.0	16	18.5	18.5
UNITED KINGDOM	15.1	17	16	17
FRANCE	14.4	18	13	15
NEW ZEALAND	10.7	19	4.5	8
PORTUGAL	9.4	20	18.5	18.5
GREECE	3.6	21	21	20

Source: authors' calculations.

Table 10: Results of Robust Estimation

Basic Estimation Results

Dependent Variable: log General Government Public Expenditures / GDP [ln *exp_gdp*], 1998-2000

Eq.	Decentralization measure	α	ln *gdp_pc*	ln *open*	*ex_left*	ln *popu*	ln *dep*	*ex_parl*	*jpnwz*	dec. indicator	Adj. R²	Akaike	F-stat.
Rev. Autonomy													
b4	ln *rev_sh_hump*	1,277 (2,436)	0,113 (0,079)	0,123 (0,086)	0,136 (0,054) **	-0,014 (0,032)	-0,223 (0,369)	0,203 (0,150)	-0,544 (0,103) ***	0,066 (0,038)	0,775	-1,259	9,600
b5	ln *rev_hump_q*	1,127 (3,614)	0,135 (0,118)	0,102 (0,095)	0,125 (0,061) *	-0,017 (0,038)	-0,281 (0,422)	0,233 (0,243)	-0,526 (0,120) ***	0,008 (0,067)	0,716	-1,028	7,310
b6	ln *rev_hump*	1,519 (2,564)	0,112 (0,083)	0,108 (0,088)	0,146 (0,057) **	-0,018 (0,034)	-0,246 (0,383)	0,136 (0,174)	-0,552 (0,108) ***	0,066 (0,047)	0,757	-1,182	8,776
Exp. Autonomy													
b10	ln *exp_sh_hump*	1,339 (2,839)	0,122 (0,094)	0,093 (0,096)	0,134 (0,061) **	-0,017 (0,036)	-0,257 (0,408)	0,235 (0,167)	-0,532 (0,114) ***	0,027 (0,048)	0,723	-1,052	7,523
b11	ln *exp_hump_q*	0,849 (2,762)	0,144 (0,090)	0,103 (0,098)	0,126 (0,060) *	-0,016 (0,037)	-0,270 (0,413)	0,254 (0,171)	-0,531 (0,115) ***	0,001 (0,045)	0,716	-1,027	7,300
b12	ln *exp_hump*	1,769 (2,764)	0,099 (0,094)	0,105 (0,092)	0,131 (0,058) **	-0,013 (0,035)	-0,243 (0,397)	0,208 (0,164)	-0,567 (0,116) ***	0,049 (0,048)	0,739	-1,111	8,071
Agg. Autonomy													
b16	ln *avg_sh_hump*	1,567 (2,778)	0,111 (0,092)	0,097 (0,093)	0,143 (0,061) **	-0,017 (0,035)	-0,253 (0,401)	0,218 (0,166)	-0,532 (0,112) ***	0,041 (0,048)	0,732	-1,086	7,836
b17	ln *agg_hump_q*	1,020 (2,567)	0,106 (0,087)	0,109 (0,090)	0,128 (0,056) **	-0,012 (0,034)	-0,092 (0,415)	0,147 (0,178)	-0,484 (0,115) ***	0,062 (0,050)	0,748	-1,147	8,424
b18	ln *agg_hump*	0,090 (2,265)	0,127 (0,071) *	0,121 (0,079)	0,131 (0,049) **	0,009 (0,032)	-0,040 (0,354)	0,222 (0,136)	-0,461 (0,099) ***	0,090 (0,038) **	0,807	-1,413	11,442

Source: authors' calculations
Note: Standard errors in brackets. ***p < .01, **p < .05, *p < .1.