

**ECONOMICS DEPARTMENT**

**DO GOVERNMENTS RE-PRIORITISE SPENDING? FIRST INSIGHTS FROM COFOG DATA  
ON PUBLIC SPENDING REALLOCATION IN OECD COUNTRIES**

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## ABSTRACT/RÉSUMÉ

### **Do Governments Re-Prioritise Spending? First insights from COFOG Data on Public Spending Reallocation in OECD Countries**

This study investigates the capacity of governments to reallocate spending across different functions of the government. It mobilises the COFOG dataset for the period 1996 - 2017, which allows comparing public spending mixes at detailed levels in ways that are consistent across countries and over time.

Three main empirical findings are established. Firstly, countries differ in their propensity to reallocate public spending across functions and countries that reallocate more are also countries with sounder governance and tighter fiscal rules in place. Secondly, obstacles to reallocation are identified, with governments avoiding nominal cuts, especially in health and social expenditures. Thirdly, while the analysis underlines some degree of convergence among OECD countries in terms of public spending allocation, this convergence is not universal. A cluster of Nordic countries persists, and Greece is identified as diverging from the rest of countries included in the sample.

Keywords: public finances, government spending, COFOG, fiscal frameworks

JEL codes: H5 National Government Expenditures and Related Policies, H6 National Budget, Deficit, and Debt

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### **Les gouvernements priorisent-ils les dépenses publiques ? Premiers enseignements des données COFOG sur la réorientation des dépenses publiques dans les pays de l'OCDE**

Cette étude examine la capacité des gouvernements à réaffecter les dépenses entre les différentes fonctions de l'État. Elle mobilise l'ensemble de données COFOG (Classification des fonctions des administrations publiques) pour la période 1996 - 2017, qui permet de comparer les combinaisons de dépenses publiques à des niveaux précis et de manière cohérente entre les pays et dans le temps.

Trois résultats principaux sont établis de façon empirique. Premièrement, les pays diffèrent dans leur propension à réaffecter les dépenses publiques entre les différentes administrations et les pays qui réaffectent davantage sont également ceux qui ont une gouvernance plus saine, ainsi que des règles fiscales plus strictes. Deuxièmement, les obstacles à la réaffectation traduisent souvent la réticence des pouvoirs publics à réduire les montants nominaux en particulier dans les dépenses de santé et les dépenses sociales. Troisièmement, si l'analyse souligne un certain degré de convergence entre les pays de l'OCDE en termes d'allocation des dépenses publiques, cette convergence n'est pas universelle. Un groupe de pays nordiques se maintient, et la Grèce est identifiée comme divergeant du reste des pays inclus dans l'échantillon.

Mots clés : finances publiques, dépenses publiques, COFOG, gouvernance budgétaire

Codes JEL : H5 Dépenses budgétaires nationales ; H6 Dette et déficit publique

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# Do Governments Re-Prioritise Spending? First insights from COFOG Data on Public Spending Reallocation in OECD Countries

By Sebastian Barnes, Boris Cournède, Julien Pascal<sup>1</sup>

## 1. Introduction

Governments in the OECD spend on average about 40% of GDP on the provision of public goods, services and transfers. While the size of public spending relative to GDP is a central economic variable, the allocation of public spending between different uses is essential: the spending mix determines what public services and social transfers are provided. Empirical research (Cournède, Fournier and Hoeller, 2018<sup>[1]</sup>; Devarajan, Swaroop and Zou, 1996<sup>[2]</sup>; Ormaechea and Morozumi, 2013<sup>[3]</sup>; Fournier and Johansson, 2016<sup>[4]</sup>) has shown that the public spending mix can have large, lasting effects on the level of economic activity and the distribution of incomes.

This raises two questions: (i) Is reallocation of public expenditures a common phenomenon among OECD countries? (ii) What are the frictions to reallocation? This paper aims at providing new empirical insights related to these two questions. Specifically, this paper investigates national public spending mixes and their adjustment using a detailed dataset on government expenditure by function (COFOG) from the OECD for the period 1996 – 2017 that became available in 2019.

The paper constructs a measure of the degree to which governments reallocate spending based on the variation in nominal growth rates across spending categories, measured as the difference for each category from the median growth rate of other spending categories. This can be viewed as a measure of how far governments make targeted rather than “across the board” changes in spending. The study also investigates to what extent intensity of reallocation at the national level correlate with governance and fiscal rule indicators.

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The existence of frictions in the allocation of spending implies that actual allocation across different categories may differ from optimal or desired choices. These frictions could arise from a number of sources. First, political economy frictions may make it difficult to reallocate spending across uses given the winners/losers this may create. Second, bureaucratic frictions could arise from the dynamics of decision-making within government that make it difficult to make decisions about spending and tend to default to existing allocations. Third, obstacles to reallocation may arise because spending occurs through programmes such as multi-year contracts.

The paper also looks at two potential drivers of reallocation. First, following existing literature (Durlauf and Johnson, 1995<sup>[5]</sup>; Hobijn and Franses, 2000<sup>[6]</sup>; Sanz and Velázquez, 2004<sup>[7]</sup>), it looks at patterns of cross-country convergence in the allocation of spending over time. Combining insights from a principal components analysis and a cluster analysis, it is shown that while countries converge overall, convergence is not towards a unique mix common to all countries. Clusters of countries exist and persist across time. Second, it examines the role of nominal rigidities in determining the allocation of spending using a bunching/discontinuity analysis: imposing nominal cuts may be much more visible than allowing inflation to erode the real value of spending in some areas or slowing the nominal growth rate relative to other categories.

The main results of the paper are:

- Countries differ in their propensity to reallocate public spending across functions. Econometric analysis covering 1997-2017 shows that countries where indicators point to sounder governance have reallocated more than the rest. More active reallocation is positively correlated with having a fiscal council and following an expenditure rule.
- There are obstacles to reallocation: econometric analysis identifies a discontinuity indicating that governments often avoid nominal cuts in many spending areas, in particular in health and social services.

Section 2 describes the dataset on government expenditure by function (COFOG) and presents some key descriptive statistics. Section 3 constructs a measure of the degree to which governments reallocate and investigates how reallocation correlates with governance and fiscal rules indicators. Section 4 identifies frictions to reallocation using bunching techniques, especially in some specific areas. Section 5 looks at convergence of public spending mix. Section 6 concludes.

## 2. Data and descriptive statistics

To measure reallocation of public expenditures across different spending categories, this paper relies on a new dataset that has become available in recent years. Specifically, the study uses the COFOG dataset from the OECD National Accounts.<sup>2</sup> This section describes key features of the COFOG dataset and provides descriptive statistics of public expenditures by function and by country.

A first key feature of the COFOG dataset is that government spending categories are computed in ways that are comparable across countries as their definition follows the Systems of National Accounts (EC, IMF, OECD, UN, World Bank, 2008<sup>[8]</sup>). This property distinguishes this dataset from the expenditure items as reported in national budget documents, which are often defined using different national definitions.

A second important feature of the dataset is that it relates to the general government sector, which covers all parts of government. By contrast, national budgetary documents are often split between the central government, subnational authorities, agencies and other entities.

A third key feature of the COFOG dataset is that a breakdown of government expenditures is available at two levels of granularity. The COFOG level I dataset contains observations along ten broad divisions

<sup>2</sup> [https://stats.oecd.org/Index.aspx?DataSetCode=SNA\\_TABLE11#](https://stats.oecd.org/Index.aspx?DataSetCode=SNA_TABLE11#)

(General public services, Defence, Public order and safety, Economic affairs, Environment protection, Housing and community amenities, Health, Recreation, culture and religion, Education, Social protection). The COFOG level II dataset provides information about how expenditure is split across groups within divisions. For instance, groups within the public order and safety division relate to police, fire protection, courts, prisons, R&D related to public order and public-order expenditure that cannot be classified.

The robustness and plausibility of the COFOG dataset are gauged with descriptive statistics for the distribution of annual log differences of government expenditures<sup>3</sup>. More specifically, Table.1 and Table 2 show descriptive statistics for the distribution of  $\Delta \log(y_{i,j,t}) \equiv \log(y_{i,j,t}) - \log(y_{i,j,t-1})$ , where  $y_{i,j,t}$  denotes government  $i$ 's spending in function  $j$  at time  $t$ . Table.1 reports descriptive statistics for log differences in nominal terms, while Table 2 uses log differences in real terms.

Table.1 indicates that nominal log differences are centred around values ranging between 2.2% (for expenditures in housing and community amenities) and 6.1% (for health expenditures). When considering the sum of all government expenditures (called "Total function" in the COFOG terminology), the average annual log change is 4.7%. Table 2 indicates that the mean growth rate in total real expenditures, where nominal values are deflated by the economy-wide price level, is approximately equal to 2.2%. Density plots for the nominal and real log differences in total expenditures are depicted on Figure 1 .

Rather than looking at descriptive statistics by expenditure function, one may be interested in country-specific statistics. Figure 2 displays country-specific median values for  $\Delta \log(y_{i,j,t})$  and the median volatility of  $\Delta \log(y_{i,j,t})$  across spending categories within a country. According to this measurement of volatility, Poland and Greece are more volatile than the rest of countries included in the sample.<sup>4</sup>

A finer level of granularity is achieved by focusing on the COFOG level II dataset, which breaks down level I functions into sub-categories. At this level of granularity, observations are available for the period 1996 - 2017, with the number of observations being even more limited before 2002 (see Figure 14). If all countries theoretically available in the COFOG dataset were included, the panel would be strongly unbalanced. For that reason, when the subsequent analysis involves level II data, the following countries fall outside the scope of the analysis because their series involve too many missing observations: Australia, Chile Colombia, Israel, Japan, Korea, Latvia, Lithuania and the United States (see Figure 15). Figure 3 underlines that observations of  $\Delta \log(y_{i,j,t})$  at the COFOG II level are very volatile in Hungary and Lithuania.

**Table.1. COFOG level I: Descriptive statistics for the distribution of  $\Delta \log(y_{i,j,t})$  in nominal terms**

Function	Mean	Sd	Skewness	Kurtosis	N
Defense	0.0376	0.1149	-0.0706	9.2071	646
Economic affairs	0.0383	0.1974	-0.5849	18.5888	646
Education	0.0479	0.0582	0.7581	6.4204	646
Environment protection	0.0510	0.1816	-1.2318	29.5215	621
General Public services	0.0360	0.1086	0.1108	55.5598	646
Health	0.0614	0.0704	1.8197	13.9916	646
Housing & comm. Amen.	0.0221	0.3194	-0.1765	35.3391	643
Public order and safety	0.0508	0.0692	0.2734	10.5595	646
Recreation, cult. & religion	0.0541	0.0919	0.4381	7.2417	646
Social protection	0.0532	0.0528	0.8840	6.6679	646
Total function	0.0472	0.0591	0.9633	13.2030	646

Notes.: The sample includes 32 OECD countries for the period 1995-2017.

Source: OECD COFOG database and authors' calculations.

<sup>3</sup> Which are approximately equal to the growth rates for small changes.

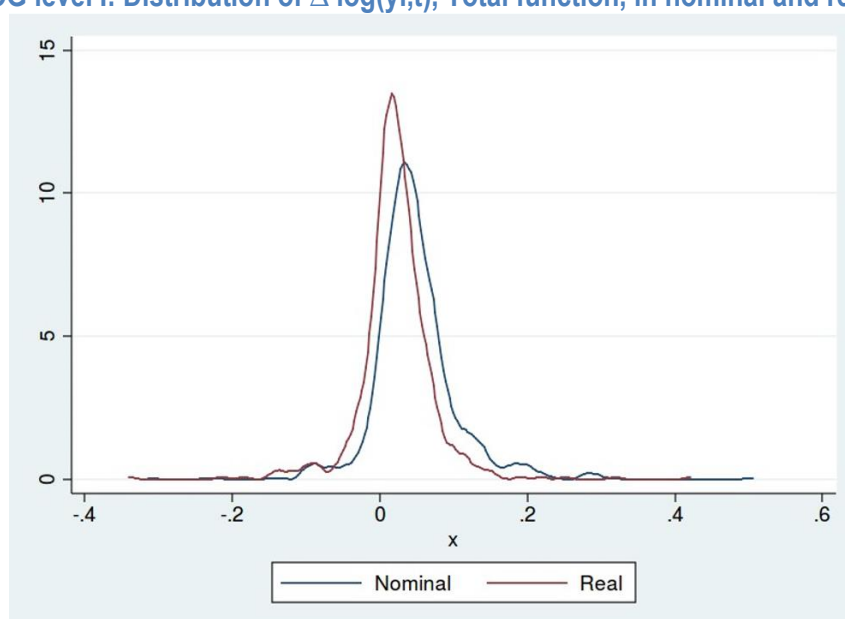
<sup>4</sup> The underlying values used to generate Figure 2 are represented in Table 28.

**Table 2. COFOG level I: Descriptive statistics for the distribution of  $\Delta \log(y_{i,t})$  in real terms**

Function	Mean	Sd	Skewness	Kurtosis	N
Defense	0.0120	0.1115	-0.2978	9.9584	641
Economic affairs	0.0132	0.1960	-0.5860	18.9974	641
Education	0.0226	0.0495	0.0352	6.7728	641
Environment protection	0.0267	0.1775	-1.4837	32.5083	616
General Public services	0.0107	0.1030	-0.7037	65.0324	641
Health	0.0363	0.0621	1.3642	13.9702	641
Housing & comm. Amen.	-0.0029	0.3169	-0.2273	35.6892	638
Public order and safety	0.0256	0.0628	-0.7495	13.7612	641
Recreation, cult. & religion	0.0288	0.0865	0.1138	7.8953	641
Social protection	0.0280	0.0444	0.2065	7.9135	641
Total function	0.0220	0.0513	0.2641	16.1080	641

Note: Authors' calculations and data from the OECD. The sample includes 32 OECD countries for the period 1995-2017. Government expenses were divided by country-specific CPI indexes (equal to 100 in 2015).

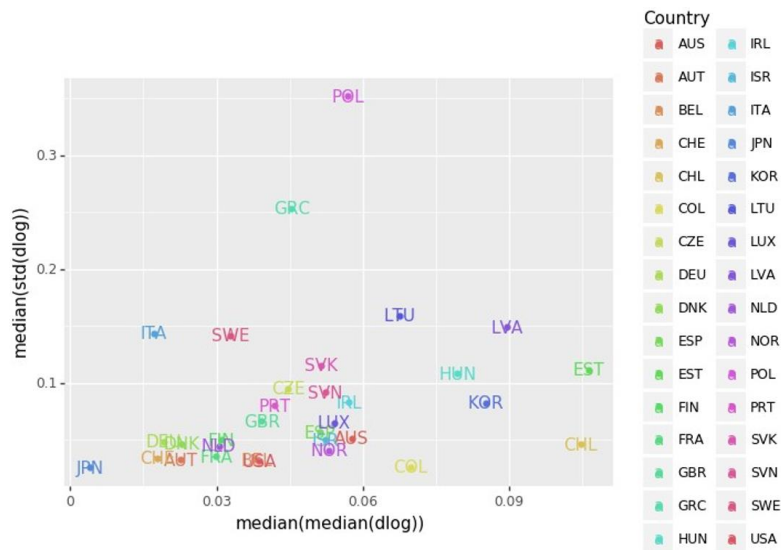
Source: OECD COFOG database and authors' calculations.

**Figure 1. COFOG level I: Distribution of  $\Delta \log(y_{i,t})$ , Total function, in nominal and real terms**

Note: Authors' calculations based on data from the OECD. The dataset is composed of 32 countries for 1995-2017. Total government expenses were divided by country-specific CPI indexes (equal to 100 in 2015)

Source: OECD COFOG database and authors' calculations.

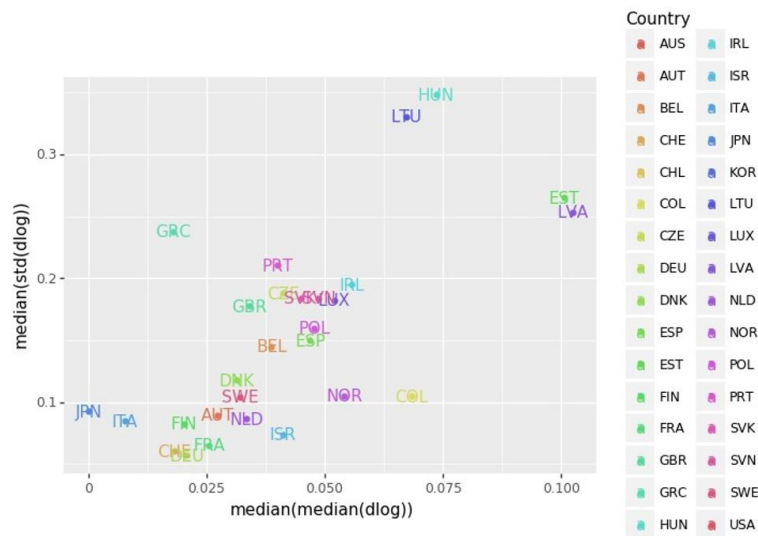
Figure 2. COFOG level I: Dispersion and mean of  $\Delta \log(y_{i,j,t})$ , in nominal terms



Note: Authors' calculations based on data from the OECD. The x-axis display the median (across level I categories) of the median log change across time by category. The y-axis shows the median (across categories) of the standard deviation of log change across time by category. In a nutshell, the x-axis displays a measure of centrality for log changes, while the y-axis measures its volatility.

Source: OECD COFOG database and authors' calculations.

Figure 3. COFOG level II: Dispersion and mean of  $\Delta \log(y_{i,j,t})$ , in nominal terms



Note: Authors' calculations based on data from the OECD. The x-axis display the median (across level II categories) of the median log change across time by category. The y-axis shows the median (across categories) of the standard deviation of log change across time by category. In a nutshell, the x-axis displays a measure of centrality for log changes, while the y-axis measures its volatility.

Source: OECD COFOG database and authors' calculations.

### 3. Estimating public spending reallocation

This section builds a measure of the degree to which governments reallocate spending based on the variation in nominal growth rates across spending categories. This metric of government expenditure reallocation can be viewed as a metric of how far governments are able to grow some categories of

spending relative to others and avoid “across the board” changes in spending. A second step investigates how expenditure reallocation correlates with indices measuring the quality of governance and fiscal rules at the national level.

### 3.1. An econometric framework for net public spending reallocation

Spending reallocation is measured using deviations from the median:

$$\Delta \log(y_{i,t,j}) = \beta_{i,j} \times z_{i,t} \quad (1)$$

where  $z_{i,t} \equiv \text{Med}(\Delta \log(y_{i,t,j}))$  is the median growth rate of public spending in country  $i$ , for year  $t$ . The median is taken across functions  $j$ , within the same country  $i$  and year  $t$ .

Intuition for equation (1) comes from considering the situation in which a government never reallocates spending across functions. In the extreme case of no-reallocation,  $\text{Med}(\Delta \log(y_{i,t,j}))$  would be equal to the growth rate of total public spending and each function would grow at exactly this rate. Hence, all the  $\beta_{i,j}$  would be equal to 1. However, if a country does reallocate spending across functions, some functions would grow at a rate that differs from  $\text{Med}(\Delta \log(y_{i,t,j}))$  and some  $\beta_{i,j}$  would not be equal to unity. Hence, the spread in the distribution of  $\beta_{i,j}$  captures the degree to which countries reallocated public spending across functions.

One point of concern with Equation (1) is that governments may be forced to reallocate across functions by exogenous factors, such as an ageing population (e.g. pensions) or the macroeconomic conjecture (e.g. social protection). A potential avenue for further work, which would complement the present approach measuring reallocation net of the effect of these exogenous drivers, would be to focus on the strength of these drivers by spending category. A measure of reallocation net of exogenous factors is obtained by controlling for key drivers of spending:

$$\Delta \log(y_{i,t,j}) = \beta_{i,j} \times z_{i,t} + \gamma_i \times X_{i,t} + \varepsilon_{i,j,t} \quad (2)$$

The set of control variables  $X_{i,t}$  captures structural factors that are driving public spending in certain areas. In particular, the structure of the population is included to control for its effects on pension and health spending. GDP per capita and unemployment rates are included to control for macroeconomic conditions having a direct impact on public spending (automatic stabilisers). The model (2) is estimated through median regression to limit the impact of outliers.

The model is estimated separately for each country and each category. Results are presented in Table 4. Countries that reallocated the most for the period, as measured by the difference between the 90th and 10th percentile of the distribution of  $\beta_{i,j}$  are Belgium, Denmark, Greece and Sweden. Countries that reallocated the least are Estonia, Slovakia and Slovenia. Similar results can be seen using alternative metrics. One caveat about reallocation is that it may not always bring benefits: in an extreme case, a country may already be at its optimal public spending mix, in which case there would be no advantage to reallocating. Control variables are reported in section C of the Appendix.

**Table 3. Selected control variables**

Stats	Working age (15-64) per pension age (+65)	GDP per capita PPP	Harmonized unemployment rate (%)
count	693	689	654
mean	4.6	84.2	8.1
std	1.4	14.9	4.2
min	2.1	25.8	1.9
25%	3.8	73.7	5.1
50%	4.3	86.3	7.3
75%	5.0	98.0	9.7
max	13.5	112.2	27.5

Source: OECD data and authors' calculations.

**Table 4. Summary statistics for the distribution of  $\beta_{i,j}$  per country ranked by reallocation from lowest to highest**

Country	P10	P25	P50	P75	P90	P75 – P25	P90 – P10
SVK	0.049	0.449	0.919	1.716	2.644	1.267	2.595
EST	-0.644	0.359	0.969	1.446	2.108	1.087	2.752
SVN	-0.514	0.596	1.044	1.707	2.351	1.112	2.865
IRL	-0.478	0.236	0.924	1.614	2.648	1.378	3.126
CZE	-0.350	0.494	1.166	1.843	3.020	1.348	3.370
PRT	-0.887	0.288	0.814	1.738	2.641	1.450	3.528
FRA	-0.456	0.220	1.076	2.333	3.291	2.113	3.747
DEU	-0.335	0.305	0.824	1.836	3.504	1.531	3.839
ESP	-0.272	0.355	1.014	2.154	3.601	1.799	3.872
ITA	-0.735	0.395	1.028	1.898	3.311	1.503	4.046
GBR	-0.015	0.472	1.010	3.093	4.107	2.621	4.121
FIN	-1.206	0.007	0.858	1.521	3.011	1.515	4.217
LUX	-1.150	-0.079	0.829	1.608	3.275	1.687	4.425
NLD	-1.326	-0.310	0.922	1.617	3.444	1.927	4.770
HUN	-0.407	0.572	1.001	2.201	4.376	1.630	4.783
NOR	-0.877	0.086	0.641	2.273	3.957	2.187	4.834
POL	-0.574	0.168	1.104	2.606	4.295	2.438	4.869
AUT	-0.564	0.378	0.969	2.366	4.584	1.988	5.148
GRC	-0.139	0.405	1.045	1.803	5.138	1.398	5.276
BEL	-1.822	-0.203	1.245	2.561	4.578	2.763	6.400
DNK	-1.475	0.296	1.036	2.934	5.761	2.638	7.236
SWE	-4.083	-0.098	0.807	2.216	5.320	2.314	9.403

Note This table shows statistics for country-specific distribution of  $\beta_{i,j}$  estimated with Equation (2).

Source: OECD COFOG database and authors' calculations.

### 3.2. Public spending reallocation: governance and fiscal rules

The second step of the analysis for this section investigates how intensity of reallocation correlates with quality of governance and fiscal rules indicators. Correlations are calculated between the baseline measurement of intensity of reallocation, defined as the P90 – P10 for  $\beta_{i,j}$ , and governance quality indicators from the World Bank. Table 5 shows that variables measuring "voice and accountability", "rule of law", "control of corruption" and "perceived government effectiveness" are significantly and positively correlated with the baseline measurement of intensity of reallocation.

Table 6 reports the correlations between baseline measurement of intensity of reallocation with fiscal rules indicators from the OECD. Table 6 underlines that intensity of reallocation is positively and significantly correlated with the fact of having a fiscal council. The data also points towards a positive correlation between having an expenditure rule and the likelihood to reallocate public spending.

A series of checks provide indications of robustness. The positive correlations between governance (fiscal rules) indicators and the P90 – P10 index remain when omitting control variables in the right-hand side of (2) (see section D.1 of the Appendix). If the P75 – P25 index is used to measure reallocation, potentially more robust to outliers, the overall findings are not altered. It is not surprising given the strong and positive correlation between the two measures of dispersion (see section D.2 of the Appendix).

One additional source of concern is that the control variables are country-specific. Given the limited time dimension of the panel, they may not be precisely estimated. To address this issue, a two-step approach first estimates a "factor model" measuring the impact of the business cycle and other structural factors on public spending. The factor model is common to all the countries in the sample. A second step runs the baseline regression on the residual from the first step, which is by construction orthogonal to structural

factors. Results are presented in section D.3 of the Appendix. This methodology shows that the higher scores for voice and accountability, rule of law, government effectiveness and control of corruption are positively correlated with more redistribution across COFOG II categories. Having an expenditure rule and a fiscal council are positively correlated with reallocation, even though the latter is no longer statistically significant at the 10% significance level.

The results presented in this section are correlations, which may or may not reflect causality relationships. A third (omitted) variable may be driving both propensity to reallocate and the quality of governance. Or it could be that because some countries are more keen to reallocate in the first place, they establish sound fiscal rules. To establish causality (sound governance leads to more reallocation; stricter fiscal rules generate more reallocation), additional indicators would be needed. Such an analysis is beyond the scope of the present study.

**Table 5. Correlation dispersion  $\beta_{i,j}$  and quality of governance indicators**

Indicator	Coeff	Pvalue
Voice and accountability	0.075	0.023
Regulatory Quality	0.074	0.160
Rule of Law	0.135	0.057
Political Stability	0.047	0.367
Government Effectiveness	0.146	0.042
Control of corruption	0.208	0.038

Note: This table displays the slope coefficient and the p-value for the regression of P90 –p10 on selected governance indicators. Source: OECD COFOG database, World Bank Worldwide Governance Indicators and authors' calculations.

**Table 6. Correlation dispersion  $\beta_{i,j}$  and fiscal rules indicators**

Indicator	Coeff	Pvalue
Expenditure rule	0.117	0.030
Revenue rule	0.034	0.340
Budget balance rule	0.029	0.253
Debt rule	0.033	0.364
Fiscal council	0.089	0.068

Note: This table displays the slope coefficient and the p-value for the regression of P90 –p10 on selected fiscal rules indicators. Source: OECD COFOG and International Budget Practices and Procedures databases and authors' calculations.

#### 4. Obstacles to reallocation: a bunching estimate

The results so far establish that countries differ in their propensity to reallocate public spending and that countries in which reallocation is more common tend to have better governance indicators and stricter fiscal rules. This section investigates a separate but related question: is there evidence of obstacles to the reallocation of public spending?

The study implements a regression discontinuity design (RDD), a methodology initially developed by McCrary (2008<sup>[9]</sup>) to test whether a running variable has been manipulated by participants,. In the present setting, governments may have an incentive to freeze spending in nominal terms to generate cuts in real terms. If some citizens suffer from the "price illusion", defined as the tendency to think in nominal terms rather than in real terms, freezing nominal spending generates real savings while reducing the political cost of doing so.

This tendency to freeze spending would provide a lower bound on the ability of government to cut spending in some categories (which is determined by the inflation rate), and could explain why the public spending

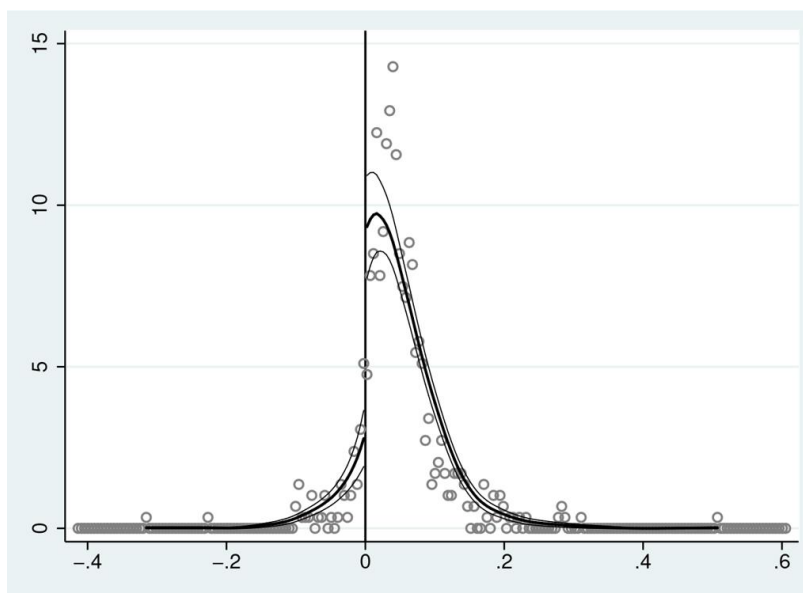
mix is rather stable over time in a period when inflation has often been fairly low. If the "freezing" strategy is used by governments, the distribution of log changes  $\Delta \log(y_{i,j,t})$  should display a discontinuity point at 0.

The methodology of McCrary (2008<sup>[9]</sup>) first builds a histogram with bins excluding the potential discontinuity point (0 in the present context). Then, two polynomials are estimated separately for each side of the potential discontinuity, using the previously built histogram. The statistics of interest,  $\theta \equiv \log(f^+) - \log(f^-)$ , which measures the density gap at the potential discontinuity point, is calculated using the two estimated polynomials. If a non-discontinuity exists for the variable of interest,  $\theta$  is equal to 0 (modulo the noise generated by random sampling); otherwise  $\theta$  is different from 0. One key advantage of the methodology of McCrary (2008) is that standard errors and p-values for the  $\theta$  coefficient can be computed.

Figure 4 displays McCrary's (2008<sup>[9]</sup>) applied to log differences of total government expenditures, including all the countries of the sample. Dotted points represent the height within each bin. The solid dark line represents the two fitted polynomials. A discontinuity point is clearly visible at 0 on Figure 4. The interpretation is that governments tend to "bunch" changes in spending to the right hand side of 0. That is, governments tend avoid nominal cut in public expenditures.

Table 7 and Table 8 show the estimated discontinuity gap for each COFOG level II categories, pooling all countries and years together. Only coefficients statistically significant at the 10% significance level (and less) were retained. A first stylized fact is that many functions are prone to bunching at 0. A second fact is that bunching at 0 seems to be particularly important for functions related to health and social programs spending, as indicated by the magnitude of the  $\theta$  coefficient for these categories. One hypothesis, is that because citizens can easily monitor these types of spending and the political penalty for reducing spending in these categories (in nominal terms) is likely to be large, leading to a "freeze-and-wait" strategy.

**Figure 4. Bunching at 0 for total public spending  $\Delta \log(y_{i,t})$  in nominal terms**



Note: Author's calculations based on data from the OECD. Public spending in nominal terms. The methodology of McCrary (2008) is used to construct two polynomials from each side of the potential discontinuity point at 0. Dotted points represent the height within each bin. The solid dark line represents the two estimated polynomials, fitted on the histogram excluding the potential discontinuity point.

Source: OECD COFOG database and authors' calculations.

Table 7. Density gap at 0 by function

Category	$\theta$	Std. Err	t	P-value
Outpatient services	1.505	0.184	8.186	3E-16
Medical products	1.317	0.119	11.049	2E-28
Hospital service	1.281	0.175	7.324	2E-13
Old age	1.080	0.366	2.950	3E-03
Pre-primary & primary educ.	1.047	0.165	6.341	2E-10
R&D Public order	1.039	0.170	6.094	1E-09
Education not def. by level	1.023	0.116	8.799	1E-18
Survivors	1.003	0.112	8.938	4E-19
Post secondary educ.	0.993	0.159	6.225	5E-10
Social exclusion	0.989	0.152	6.525	7E-11
Police services	0.963	0.192	5.011	5E-07
Family and child	0.900	0.152	5.916	3E-09
R&D health	0.832	0.139	5.988	2E-09
Foreign economic aid	0.816	0.115	7.124	1E-12
R&D Education	0.800	0.122	6.560	5E-11
R&D Housing and comm. amen.	0.797	0.183	4.364	1E-05
Public health services	0.796	0.130	6.128	9E-10
Religious and other comm. serv.	0.795	0.130	6.098	1E-09
R&D Economic affairs	0.791	0.117	6.781	1E-11
Tertiary education	0.756	0.189	3.999	6E-05
Subsidiary services to educ.	0.751	0.152	4.925	8E-07
Sickness and disability	0.750	0.189	3.963	7E-05
Prisons	0.749	0.151	4.944	8E-07
General public n.e.c	0.743	0.158	4.690	3E-06
R&D Social Protection	0.728	0.141	5.151	3E-07
Health n.e.c	0.723	0.139	5.183	2E-07
Broadcasting and publ. services	0.703	0.111	6.358	2E-10
R&D recreation	0.703	0.144	4.863	1E-06
Recreation cult. & rel. n.e.c	0.690	0.155	4.462	8E-06
Basic research	0.685	0.157	4.353	1E-05
Law courts	0.669	0.185	3.615	3E-04
R&D Environment	0.666	0.135	4.949	7E-07

Note:  $\theta$  is the estimated density gap at the discontinuity point (0) for the distribution of log changes in public expenditure  $\log(Y_t) - \log(Y_{t-1})$  in nominal terms.

Source: OECD COFOG database and authors' calculations.

Table 8. Density gap at 0 by function (continued)

Category	$\theta$	Std. Err	t	P-value
Housing and comm. amen. n.e.c	0.6559	0.1508	4.3495	0.0000
Public health services	0.6551	0.1572	4.1681	0.0000
R&D defence	0.6295	0.1461	4.3089	0.0000
R&D General public serv.	0.6018	0.1500	4.0110	0.0001
Street lighting	0.5906	0.1475	4.0042	0.0001
Transport	0.5716	0.1603	3.5662	0.0004
Secondary education	0.5676	0.1761	3.2225	0.0013
Community develop.	0.5464	0.1124	4.8634	0.0000
Fire-protection services	0.5438	0.1854	2.9331	0.0034
Housing	0.5363	0.1295	4.1430	0.0000
Social protection n.e.c	0.5347	0.1137	4.7031	0.0000
Education n.e.c	0.5204	0.1357	3.8340	0.0001

Foreign military aid	0.4944	0.1360	3.6348	0.0003
General services	0.4818	0.1256	3.8361	0.0001
Civil defence	0.4587	0.1406	3.2619	0.0011
Pollution abatement	0.4491	0.1263	3.5568	0.0004
Economic affairs n.e.c	0.4398	0.1429	3.0785	0.0021
Protect. of biodiversity and landscape	0.4231	0.1324	3.1958	0.0014
Executive & legislative organs	0.4231	0.1795	2.3570	0.0184
Cultural service	0.4148	0.1680	2.4689	0.0136
Fuel & energy	0.4125	0.1782	2.3153	0.0206
Waste management	0.3855	0.1302	2.9599	0.0031
Water supply	0.3645	0.1286	2.8332	0.0046
Defence n.e.c	0.3589	0.1160	3.0941	0.0020
Recreational and sporting serv.	0.3496	0.1705	2.0501	0.0404
General econ., comm. & lab. affairs.	0.3463	0.1234	2.8066	0.0050
Environmental protection	0.3462	0.1477	2.3444	0.0191
Communication	0.3248	0.1438	2.2593	0.0239
Waste water management	0.3231	0.1331	2.4277	0.0152
Agriculture forestry fishing	0.2551	0.1426	1.7883	0.0737
Public debt transactions	-0.3786	0.1707	-2.2184	0.0265

Note:  $\theta$  is the estimated density gap at the discontinuity point (0) for the distribution of log changes in public expenditure  $\log(Y_t) - \log(Y_{t-1})$  in nominal terms.

Source: OECD COFOG database and authors' calculations.

## 5. Public spending reallocation: convergence of public spending mix?

This section explores whether reallocation occurs in ways that correspond to convergence processes. Previous results indicate that (i) reallocation of public spending across functions happens with an intensity that differs across countries, and (ii) some categories are more preserved from reallocation than others in terms of nominal reductions. This section investigates two related questions: to the extent that public expenditure reallocation does happen, is there evidence of a convergence of public spending mix across countries included in the sample? If yes, does convergence occur towards a unique mix?

### 5.1. Measuring overall convergence

The answer to these two questions is complicated by the fact that series on public expenditure by function is both high-dimensional (there are 69 level II functions) and noisy (due to measurement errors and cyclical fluctuations). The methodology used to measure convergence aims at reducing both the noise and dimensionality of the data.

To reduce noise, the sample is split into two sub-periods (1997 - 2002 and 2012 - 2017) and country-period specific five-year average values are computed for each function. This split is chosen to compare changes over a long period, while using 5-year averages to yield more stable results and avoiding the period of the Global Financial Crisis.

Given the high dimensional nature of different public spending functions, principal Component Analysis (PCA) is used to summarise differences in the share of spending on different items as a share of GDP across countries using a more limited number of dimensions. Specifically, the PCA identifies dimensions (which by construction are linear combinations of the initial dimensions) along which countries differ the most. The PCA is performed on 5-year averages for both sub-periods.

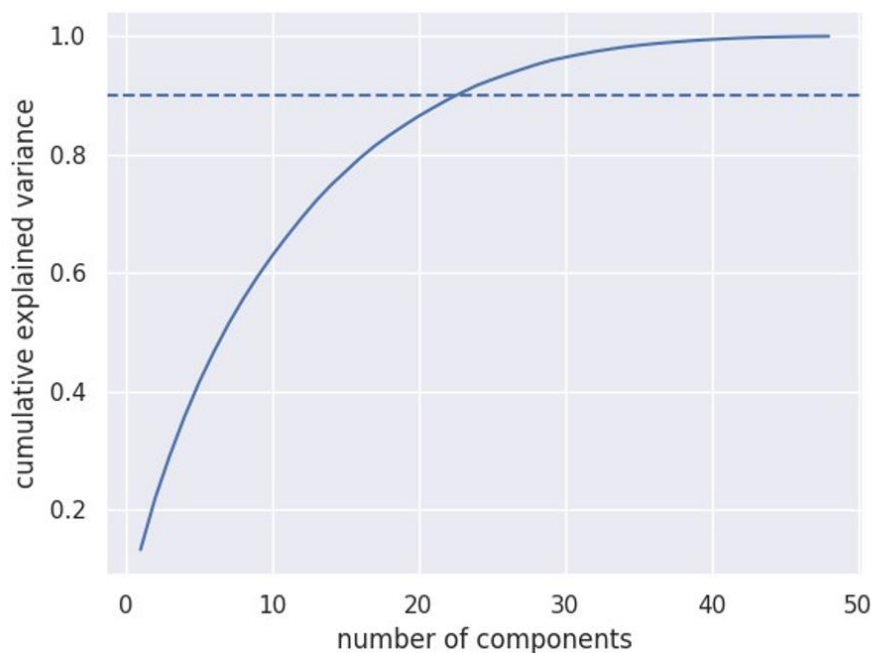
Figure 5 illustrates the dimension reduction achieved by the PCA. It shows that the first 22 principal components explain 90% of the variance across countries in spending allocations. The first 30 principal

components explain 96% of the variance. A saturation point in terms of explained variance is reached at around 40 principal components. Once the principal components have been extracted, countries can be mapped on the resulting orthogonal basis for the first and second periods. Figure 6 and Figure 7 show such a projection along the first and second principal components. A certain degree of convergence appears when looking at the spread of countries as the projection on the components has become more similar over time comparing the two periods. In particular, Estonia, Hungary, Latvia, and Slovakia experienced a decrease in their coordinate on the second principal component, bringing them to levels more in line with other countries.

To formalise this idea of convergence, taking into consideration the several meaningful dimensions extracted by the PCA, one may calculate the cross-country standard deviation of countries' projections on the principal components in the first and second periods. If the ratio of the second to the first period is less than 1, it suggests that countries have become more similar in terms of their public spending mix. This notion of convergence, relying on a cross-sectional dispersion, is called  $\sigma$ -convergence in the literature (Apergis, Christou and Hassapis, 2013<sup>[10]</sup>). Figure 8 shows the mean, the median and the weighted mean standard deviation ratios. In the latter case, weights are proportional to share of explained variance that each principal component has (hence, the first principal components have more weights

As a robustness check, section B of the Appendix uses the same methodology, normalizing each expenditure by total government expenditure instead of GDP. Convergence holds when using this alternative measurement, suggesting that it is a robust feature of the data.

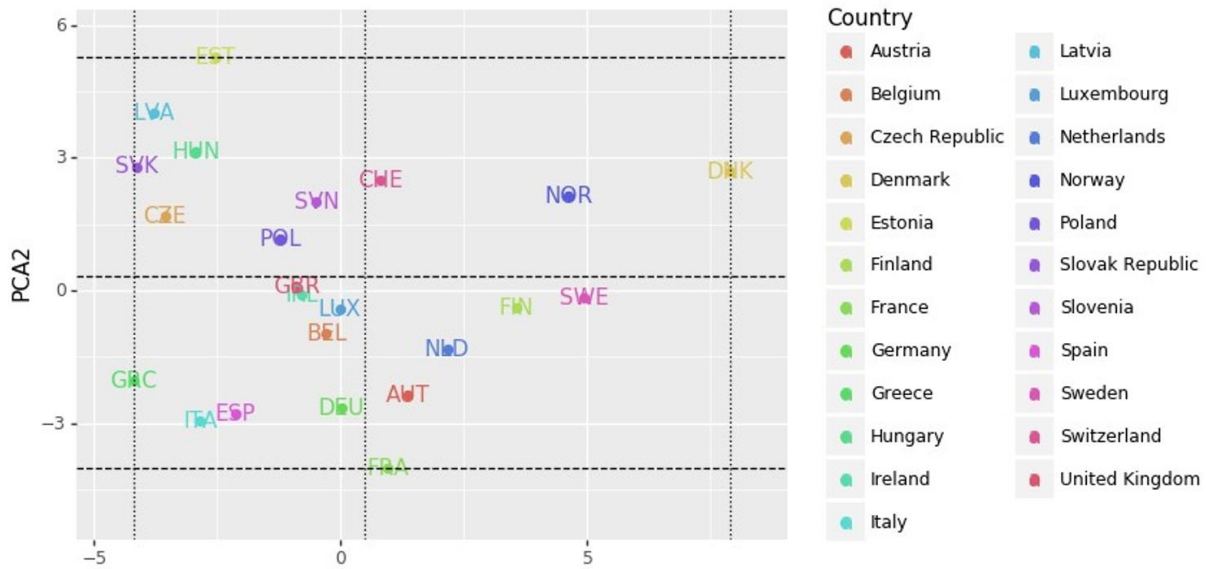
**Figure 5. Explained variance and number of components**



Note: Notes: Authors' calculations based on data from the OECD. The horizontal dashed line intersects the y-axis at the value 0.9. This plot shows that the first 22 principal components explain approximately 90 % of the variance in the sample.

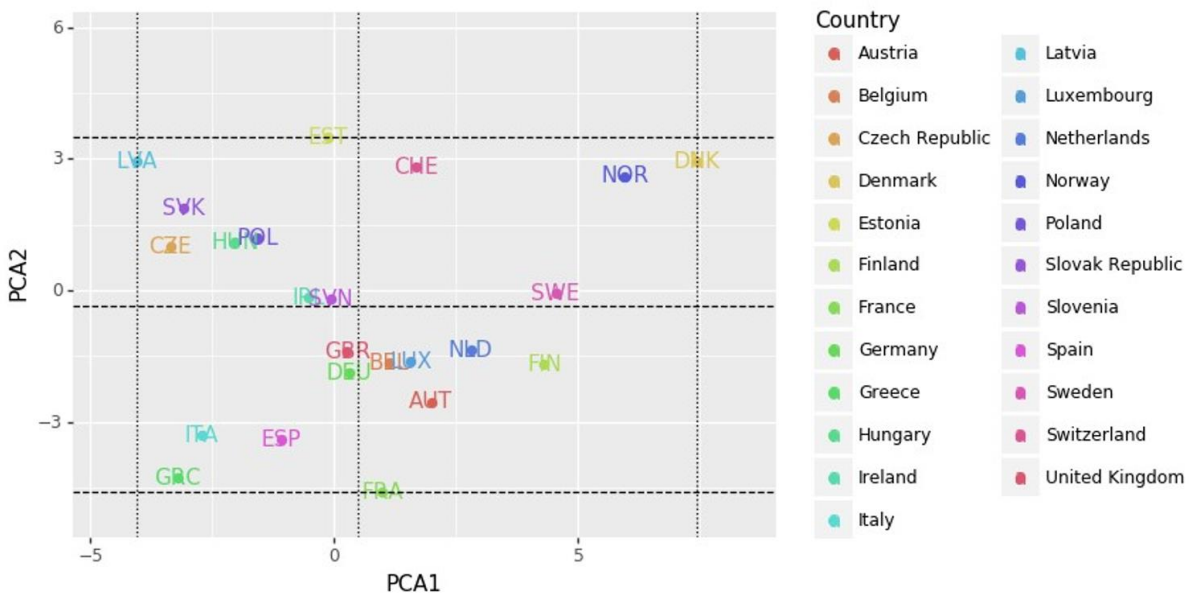
Source: OECD COFOG database and authors' calculations.

Figure 6. Countries in the PCA1-PCA2 space for 1997-2003



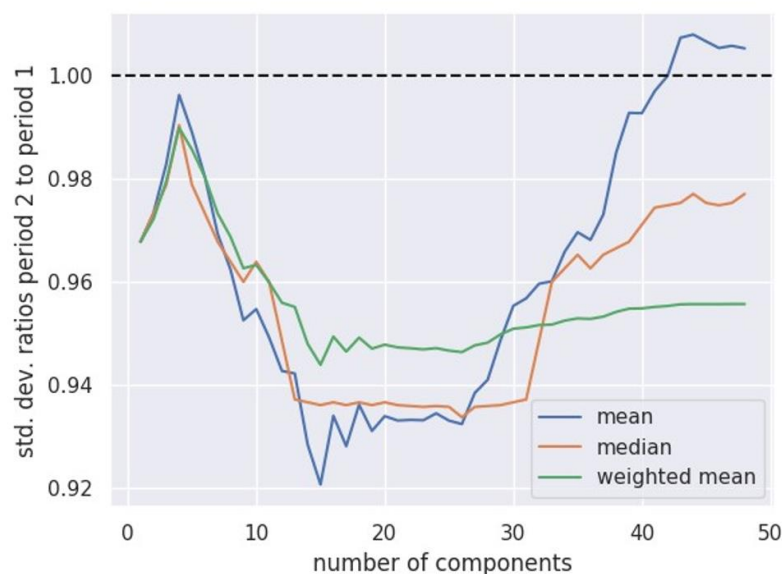
Note: . The vertical (horizontal) lines represent the minimum, the maximum and the mean for the first (second) components.  
 Source: OECD COFOG database and authors' calculations.

Figure 7. Countries in the PCA1-PCA2 space for 2012-2017



Note: The vertical (horizontal) lines represent the minimum, the maximum and the mean for the first (second) components.  
 Source: : OECD COFOG database and authors' calculations.

Figure 8. Convergence of principal components across time



Note: Public spending by function as a share of GDP. Period 1:1997 - 2003, Period 2: 2012 - 2017.

Source: : OECD COFOG database and authors' calculations.

## 5.2. A non-universal convergence

The previous subsection indicates that an overall convergence in terms of public spending mix has taken place for countries included in the sample. This subsection analyses whether or not the convergence is towards a unique "steady-state", common to all countries in the sample.

A way to examine the type of convergence is to combine the results from PCA analysis with a clustering analysis. The k-means algorithm is run for the first and second periods taken separately, using the first 30 principal components to summarise each country's public spending mix. Using the first 30 principal components offers a good trade-off between exhaustivity (96% of the variance is explained) and noise reduction (additional principal components have limited explanatory power). The silhouette width is used to determine the optimal number of clusters to consider. The silhouette width measures the distance of elements within a cluster. Formally, the silhouette width of cluster  $i$  is defined as:

$$s_i \equiv b_i - a_i \quad (3) \max\{a_i, b_i\}$$

where  $a_i$  is the average distance of observation  $i$  to other elements within the same cluster and  $b_i$  is the smallest average distance to other clusters. The silhouette width ranges between -1 and 1, with a high value indicating that points are well sorted. The parameter  $k$  is set to maximise the average silhouette width. Table 9 indicates that, while countries could be grouped optimally within two clusters for the period 1997 - 2002, this number rises to three for 2012-2017.

For the period 1997 - 2003, the Nordic countries are assigned to the same cluster (Denmark, Finland, Norway, Sweden), while another one regroups the other countries. For the period 2012 - 2017, the clustering analysis suggests that Sweden changed groups, while Greece became a group on its own. These observations suggest that the spending adjustments that Sweden undertook in the 2000s made its expenditure mix become similar to that of non-Scandinavian OECD countries. The clustering analysis suggests that the deep changes implemented in Greece in response to the sovereign debt crisis have resulted in a highly specific spending mix.

To summarise, the combination of a PCA and clustering analysis suggests that countries in the sample have become more similar over time regarding their public spending mixes. But the convergence is not achieved towards a single public spending mix, as indicated by the clustering analysis.

**Table 9. Silhouette analysis**

Nb. clusters	Av. Silhouette coef.	
	1997 – 2002	2012-2017
<b>2</b>	<b>0.0918</b>	0.0980
<b>3</b>	0.0538	<b>0.1068</b>
4	0.0632	0.0626
5	0.0586	0.0422
6	0.0483	0.0244

Note: The table shows the average silhouette coefficient as a function of the number of clusters.

Source: : OECD COFOG database and authors' calculations.

**Table 10. Clusters for the periods 1997 - 2003 and 2013 - 2017**

Country	Group Nb. 1997 - 2003	Group Nb. 2013 - 2017
AUT	0	0
BEL	0	0
CHE	0	0
CZE	0	0
DEU	0	0
DNK	1	1
ESP	0	0
EST	0	1
FIN	1	0
FRA	0	0
GBR	0	0
GRC	0	2
HUN	0	0
IRL	0	0
ITA	0	0
LUX	0	0
LVA	0	0
NLD	0	0
NOR	1	1
POL	0	0
SVK	0	0
SVN	0	0
SWE	1	0

Note: The table shows the group index assigned to each country for the periods 1997-2003 and 2013 - 2017.

Source: : OECD COFOG database and authors' calculations.

## 6. Conclusion

This paper uses the COFOG dataset at a fine level (level II) to establish new empirical facts regarding the public spending mix in major OECD countries. Three main results emerge:

- First, an econometric analysis covering 1997-2017 underlines that countries differ in their propensity to reallocate public expenditure across functions. More active reallocation is positively

correlated with having a fiscal council and following an expenditure rule. More active reallocation is also positively correlated with sounder governance indices.

- While the empirical literature generally indicates that countries have much to gain by reallocating public spending across functions (without necessarily altering the level of public spending), few countries seem to undertake large reallocation programs. The present paper sheds new light on why this is the case. An econometric analysis using a "bunching" approach identifies a discontinuity indicating that governments often avoid nominal cuts in many functions (in particular in health and social services). As nominal cuts are often avoided, the inflation rate becomes key in determining the ability of government to reallocate across functions.
- Finally, a principal component analysis combined with a clustering analysis finds signs pointing to convergence in public spending mixes over time. However, this convergence is far from universal, with the persistence of a cluster of Nordic countries and Greece diverging from the rest of the sample.

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## Appendix

### A. Data sources

The main dataset used in the present analysis is the sample of government expenditure by function (COFOG), from the OECD National Accounts Statistics.<sup>5</sup>

Data on the population structure, including the ratio of working-age (15-64) on pension-age (+65), is taken from the OECD.<sup>6</sup>

Data on governance quality are from the World Bank<sup>7</sup>.

Data on fiscal rules are from the OECD Survey of Budget Practices and Procedures.<sup>8</sup>

Data on GDP per capita PPP, and inflation rate (CPI) are also from OECD datasets.<sup>9</sup>

### B. Robustness checks: convergence of public spending mix

Instead of measuring government expenditure as share of GDP, the convergence analysis can be conducted using ratios of expenditure on each item over total government spending. This section replicates the analysis of section 5 using the latter instead of the former.

Figure 9 shows that the relationship between the cumulative explained variance of principal components and the number of principal components to use is very similar to the one observed in Figure 5: slightly more than 20 principal components are necessary to explain 90 % of the variance. Figure 10 and Figure 11 show that the same clusters of countries appear in the (PCA1-PCA2) space, with the Nordic countries in the top corner of the image and a group of Mediterranean countries appearing in the top right corner. Figure 12 confirms the findings observable in Figure 8: the dispersion of public spending mix across countries has experienced a decrease when comparing the periods 1997 - 2003 and 2012 - 2017. When considering a reasonable range for the number of principal components (in between 10 and 30), Figure 12 suggests a decrease of about 8 to 10 %.

In terms of clustering analysis, the silhouette analysis suggests that while countries could be optimally assigned to 2 clusters in the late nineties, this number rose to 4 for the period 2013-2017 (see Table 12). For the period 1997 - 2003, a first cluster is composed of the Baltic states plus Hungary, while the remaining countries are grouped together. For the period 2013 - 2017, a cluster of mainly-Nordic countries and a group of mixed EMU countries are formed, while Greece and the United Kingdom appear to form their own cluster. This analysis confirms the findings that while some degree of convergence in public spending mix can be observed, as measured by the cross-sectional dispersion in principal components, a cluster analysis suggests that this convergence is not uniform. Convergence may occur towards different steady-state values.

<sup>5</sup> [https://stats.oecd.org/Index.aspx?DataSetCode=SNA\\_TABLE11](https://stats.oecd.org/Index.aspx?DataSetCode=SNA_TABLE11)

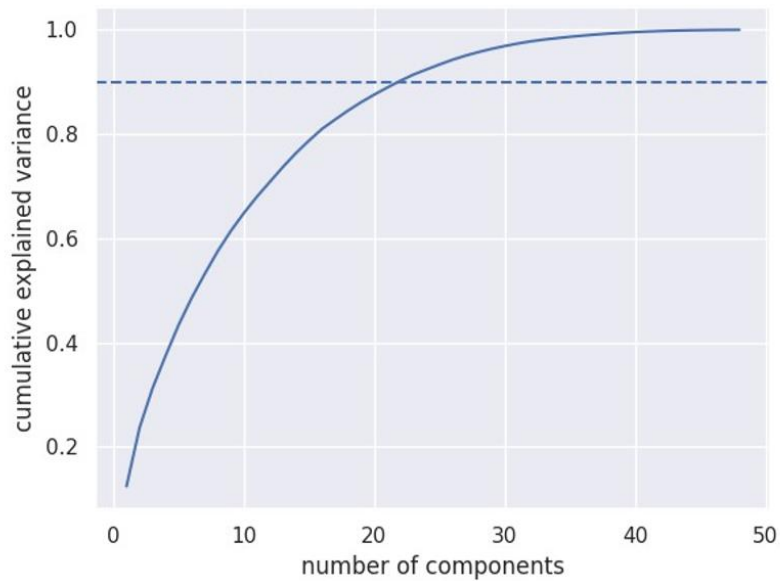
<sup>6</sup> [https://stats.oecd.org/Index.aspx?DataSetCode=POP\\_PROJ](https://stats.oecd.org/Index.aspx?DataSetCode=POP_PROJ)

<sup>7</sup> <https://datacatalog.worldbank.org/dataset/worldwide-governance-indicators>

<sup>8</sup> [https://qdd.oecd.org/subject.aspx?Subject=BPP\\_2018](https://qdd.oecd.org/subject.aspx?Subject=BPP_2018)

<sup>9</sup> [https://stats.oecd.org/index.aspx?DataSetCode=PDB\\_LV](https://stats.oecd.org/index.aspx?DataSetCode=PDB_LV) [https://www.oecd-ilibrary.org/employment/harmonised-unemployment-rate-hur/indicator/english\\_52570002-en](https://www.oecd-ilibrary.org/employment/harmonised-unemployment-rate-hur/indicator/english_52570002-en) <https://data.oecd.org/price/inflation-cpi.htm>

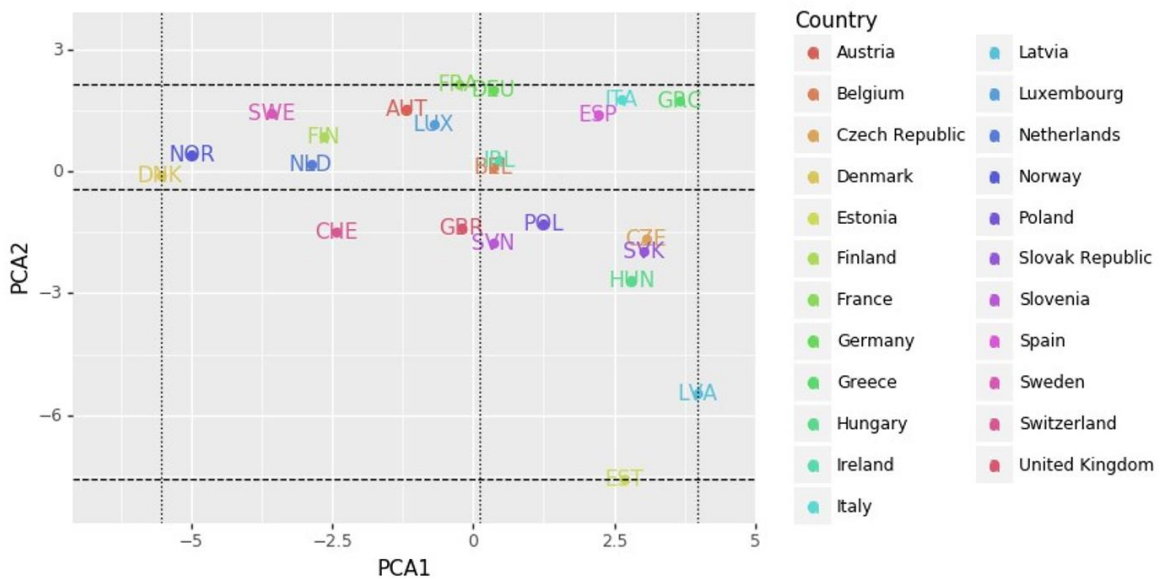
Figure 9. Explained variance and number of components



Note: The horizontal dashed line intersects the y-axis at the value 0.9. Government expenses by category are divided by total government spending.

Source: : OECD COFOG database and authors' calculations.

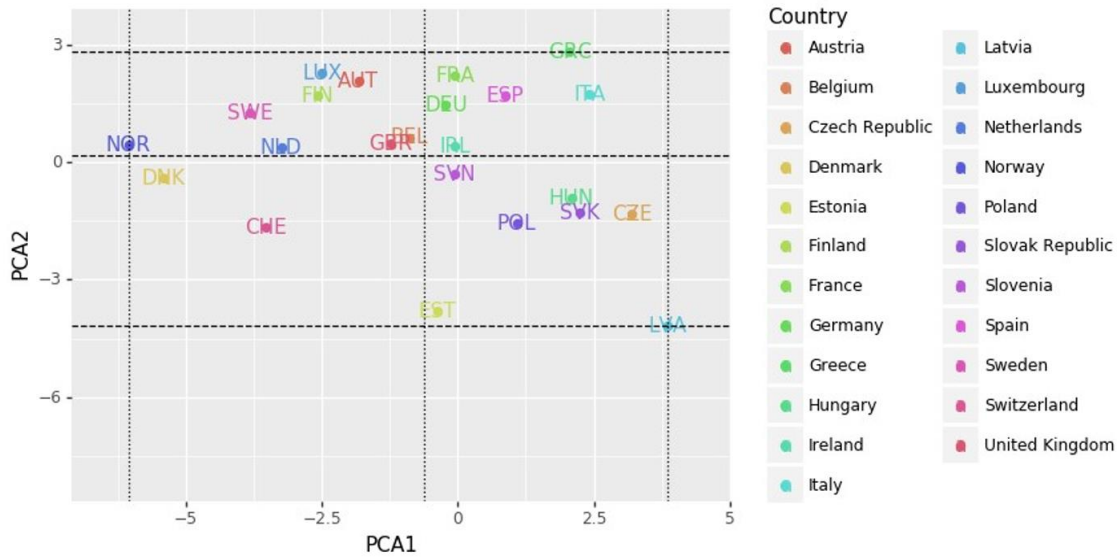
Figure 10. Countries in the PCA1-PCA2 space for 1997-2003



Note: The vertical (horizontal) lines represent the minimum, the maximum and the mean for the first (second) components. Government expenses by category are divided by total government spending.

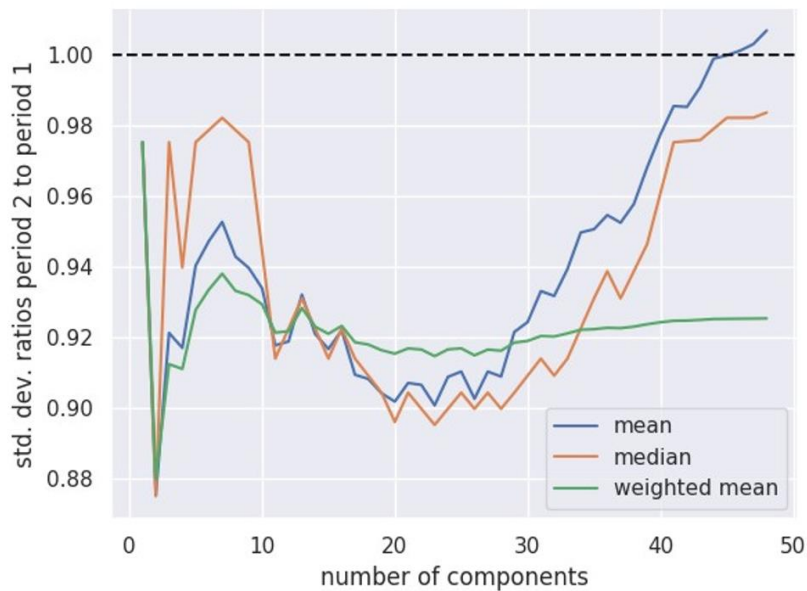
Source: OECD COFOG database and authors' calculations.

Figure 11. Countries in the PCA1-PCA2 space for 2012-2017



Note: The vertical (horizontal) lines represent the minimum, the maximum and the mean for the first (second) components. Government expenses by category are divided by total government spending.  
 Source: OECD COFOG database and authors' calculations.

Figure 12. Convergence of principal components across time



Note: Public spending by function as a share of GDP. Period 1: 1997 - 2003, Period 2: 2012 - 2017. Government expenses by category are divided by total government spending.  
 Source : OECD COFOG database and authors' calculations.

**Table 11. Silhouette analysis**

Nb. clusters	Av. Silhouette coef.	
	1997 – 2002	2012-2017
<b>2</b>	<b>0.1210</b>	0.0868
3	0.0563	0.0772
<b>4</b>	0.0767	<b>0.0966</b>
5	0.0442	0.0599
6	0.0500	0.0628

Notes: The table shows the average silhouette coefficient as a function of the number of clusters. Government expenses by category are divided by total government spending.

Source: OECD COFOG database and authors' calculations.

**Table 12. Clusters for the periods 1997 - 2003 and 2013 - 2017**

Country	Group Nb. 1997 - 2003	Group Nb. 2013 - 2017
AUT	1	1
BEL	1	2
CHE	1	1
CZE	1	2
DEU	1	2
DNK	1	1
ESP	1	2
EST	0	2
FIN	1	1
FRA	1	2
GBR	1	0
GRC	1	3
HUN	0	2
IRL	1	2
ITA	1	2
LUX	1	1
LVA	0	2
NLD	1	1
NOR	1	1
POL	1	2
SVK	0	2
SVN	1	2
SWE	1	1

Note: The table shows the group index assigned to each country for the periods 1997-2003 and 2013 - 2017. Government expenses by category are divided by total government spending.

Source: OECD COFOG database and authors' calculations

### **C. Control variables**

The baseline specification (2) estimates several J equations per country, with J the number of COFOG II categories. This procedure creates J different values for control variables. Statistics on country-specific distributions of control variables are presented in Table 13, Table 14, Table 15.

**Table 13. Summary statistics for the distribution of  $\gamma_{1,j}$  per country: working age (15-64) per pension age (+65)**

Country	P10	P25	P50	P75	P90
AUT	-2.471	-0.966	-0.01	0.836	2.176
BEL	-7.863	-2.874	-0.07	2.793	6.812
CZE	-3.796	-1.828	0.336	1.453	3.841
DEU	-3.452	-1.638	-0.146	0.807	2.137
DNK	-2.717	-1.315	0.189	1.842	6.304
ESP	-5.526	-2.228	0.135	1.807	4.012
EST	-11.935	-5.214	-0.384	6.44	12.944
FIN	-2.922	-0.953	0.284	1.403	2.423
FRA	-3.755	-1.275	-0.026	0.972	2.364
GBR	-4.102	-1.593	0.169	1.631	4.075
GRC	-5.87	-3.267	0.296	5.49	14.111
HUN	-23.873	-11.678	-0.191	6.094	10.732
IRL	-3.241	-1.333	0.135	2.041	5.809
ITA	-5.085	-2.722	-0.431	3.264	6.349
LUX	-4.95	-2.833	0.204	1.475	5.539
NLD	-5.516	-2.437	0.173	3.076	10.311
NOR	-1.969	-0.614	0.034	0.537	2.108
POL	-6.063	-2.295	-0.066	1.552	3.397
PRT	-16.323	-5.312	1.211	6.61	16.984
SVK	-1.993	-0.485	0.366	2.017	3.805
SVN	-7.646	-3.332	0.388	3.93	9.46
SWE	-2.192	-0.855	-0.056	0.559	2.979

Note: This table shows statistics for country-specific distribution of  $\gamma_{1,j}$  estimated with equation

Source: OECD COFOG database and authors' calculations

**Table 14. Summary statistics for the distribution of  $\gamma_{2,j}$  per country: GDP per capita PPP**

Country	P10	P25	P50	P75	P90
AUT	-2.402	-0.996	-0.094	0.857	2.554
BEL	-5.961	-2.631	-0.074	2.092	10.038
CZE	-3.151	-1.039	-0.093	0.786	2.103
DEU	-1.476	-0.648	-0.016	0.673	1.021
DNK	-4.001	-1.713	-0.271	0.558	3.66
ESP	-4.601	-0.868	0.477	1.707	5.2
EST	-2.109	-0.771	-0.007	0.767	2.71
FIN	-1.624	-0.501	-0.006	0.643	2.531
FRA	-2.114	-0.597	0.228	0.698	1.519
GBR	-6.665	-1.467	0.092	1.707	5.076
GRC	-2.431	-0.837	0.126	1.474	4.75
HUN	-3.315	-1.027	0.045	2.134	4.629
IRL	-0.431	-0.144	-0.001	0.161	0.977
ITA	-5.078	-2.244	0.212	1.612	4.149
LUX	-1.065	-0.416	0.028	0.326	0.809
NLD	-4.795	-1.658	-0.048	1.056	2.332
NOR	-3.461	-1.022	-0.321	0.385	1.163
POL	-6.489	-2.011	-0.246	2.769	6.6
PRT	-5.446	-2.217	0.407	3.587	7.265
SVK	-1.164	-0.249	0.052	0.539	1.399
SVN	-2.631	-0.977	-0.115	0.717	3.477
SWE	-1.429	-0.664	-0.074	0.511	2.195

Note: This table shows statistics for country-specific distribution of  $\gamma_{2,j}$  estimated with equation (2)

Source: OECD COFOG database and authors' calculations

**Table 15. Summary statistics for the distribution of  $\gamma_{i,j}$  harmonised unemployment rate**

Country	P10	P25	P50	P75	P90
AUT	-0.246	-0.075	-0.002	0.166	0.464
BEL	-1.012	-0.358	-0.022	0.183	0.56
CZE	-0.323	-0.095	-0.002	0.133	0.315
DEU	-0.331	-0.194	-0.012	0.169	0.398
DNK	-0.457	-0.097	0.004	0.185	0.542
ESP	-0.616	-0.2	0.073	0.361	0.692
EST	-0.53	-0.319	-0.038	0.307	0.562
FIN	-0.628	-0.265	0.092	0.231	1.129
FRA	-0.333	-0.172	-0.022	0.127	0.368
GBR	-0.793	-0.386	-0.028	0.34	0.927
GRC	-0.785	-0.225	0.106	0.731	2.006
HUN	-0.725	-0.326	0.006	0.568	1.173
IRL	-0.401	-0.125	0.027	0.175	0.367
ITA	-0.997	-0.326	0.063	0.312	0.748
LUX	-0.393	-0.136	0.018	0.134	0.288
NLD	-0.475	-0.222	-0.029	0.089	0.302
NOR	-0.228	-0.126	-0.026	0.085	0.171
POL	-0.511	-0.233	-0.002	0.377	0.708
PRT	-1.173	-0.317	0.085	0.478	1.682
SVK	-0.241	-0.109	0.004	0.104	0.401
SVN	-0.915	-0.39	-0.021	0.356	0.846
SWE	-0.506	-0.245	-0.013	0.239	0.644

Note: This table shows statistics for country-specific distribution of  $\gamma_{i,j}$  estimated with equation (2)

Source: OECD COFOG database and authors' calculations

#### ***D. Additional econometric specifications***

##### **Robustness checks: no control variables**

This section replicates the methodology in section 3, when no control variables are included.

**Table 16. Summary statistics for the distribution of  $\beta_{i,j}$  per country with no control variables**

Country	P10	P25	P50	P75	P90	P75 – P25	P90 – P10
IRL	0.505	0.692	0.991	1.511	2.117	0.820	1.612
FIN	-0.219	0.241	1.034	1.442	1.854	1.201	2.074
LUX	0.044	0.592	0.951	1.682	2.291	1.090	2.247
EST	-0.377	0.640	1.021	1.378	1.877	0.737	2.255
FRA	0.178	0.566	0.950	1.924	2.477	1.357	2.299
PRT	0.186	0.691	1.062	1.491	2.500	0.800	2.314
NLD	0.173	0.588	1.025	1.791	2.500	1.203	2.328
SVK	-0.014	0.628	0.994	1.605	2.339	0.977	2.353
ESP	0.155	0.810	1.153	1.623	2.656	0.813	2.501
SVN	-0.350	0.595	1.067	1.442	2.156	0.846	2.506
GRC	0.370	0.545	0.871	1.471	2.896	0.926	2.526
ITA	0.063	0.528	1.089	1.737	2.594	1.210	2.531
DEU	0.051	0.472	0.906	1.641	2.813	1.169	2.761
CZE	-0.370	0.539	1.058	1.764	2.555	1.225	2.925
HUN	-0.273	0.611	1.029	1.521	2.762	0.911	3.034
POL	-0.043	0.509	1.017	1.925	3.290	1.416	3.332
BEL	-0.014	0.354	1.099	2.213	3.430	1.859	3.444

NOR	-0.718	0.119	0.832	1.962	2.840	1.843	3.557
DNK	-0.292	0.245	1.068	1.785	3.375	1.540	3.667
AUT	-0.572	0.268	0.879	1.713	3.628	1.446	4.201
GBR	0.014	0.369	0.907	2.039	4.378	1.669	4.364
SWE	-2.868	0.054	1.212	2.826	7.007	2.772	9.875

Note: This table shows statistics for country-specific distribution of  $\beta_{i,j}$  estimated with equation (2) when no control variables are included.  
Source: OECD COFOG database and authors' calculations

**Table 17. Correlation dispersion  $\beta_{i,j}$  and quality of governance indicators with no control variables**

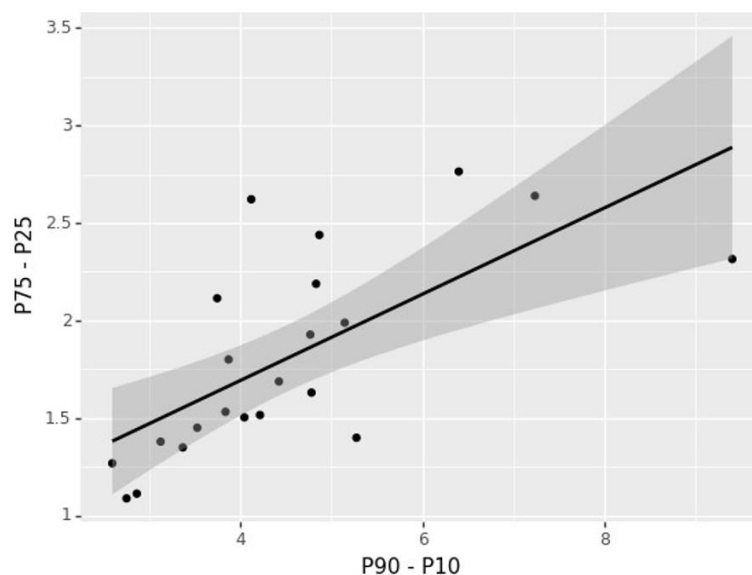
Indicator	Coeff	Pvalue
Voice and accountability	0.047	0.152
Regulatory Quality	0.053	0.291
Rule of Law	0.097	0.157
Political Stability	0.036	0.469
Government Effectiveness	0.098	0.158
Control of corruption	0.144	0.140

Note: This table displays the slope coefficient and the p-value for the regression of  $P90 - p10$  on selected governance indicators.  
Source: OECD COFOG database, World Bank Worldwide Governance Indicators and authors' calculations

**Table 18. Correlation dispersion  $\beta_{i,j}$  and fiscal rules indicators with no control variables**

Indicator	Coeff	Pvalue
Expenditure rule	0.052	0.327
Revenue rule	-0.014	0.677
Budget balance rule	0.011	0.656
Debt rule	0.010	0.769
Fiscal council	0.037	0.439

Note: This table displays the slope coefficient and the p-value for the regression of  $P90 - p10$  on selected fiscal rules indicators.  
Source: OECD COFOG database, OECD International Budget Practices and Procedures database and authors' calculations.

Robustness checks: *P75 – P25*Figure 13. Correlation between *P90 – P10* and *P75 – P25*

Note: This figure shows the correlation between *P90 – P10* and *P75 – P25* when control variables are included in (2).  
Source: OECD COFOG database and authors' calculations

Table 19: Correlation dispersion  $\beta_{i,j}$  and quality of governance indicators with no control variables

Indicator	Coeff	Pvalue
Voice and accountability	0.075	0.023
Regulatory Quality	0.074	0.160
Rule of Law	0.135	0.057
Political Stability	0.047	0.367
Government Effectiveness	0.146	0.042
Control of corruption	0.208	0.038

Note: This table displays the slope coefficient and the p-value for the regression of *P75 – P25* on selected governance indicators.  
Source: OECD COFOG database, World Bank governance indicators and authors' calculations

Table 20. Correlation dispersion  $\beta_{i,j}$  and fiscal rules indicators

Indicator	Coeff	Pvalue
Expenditure rule	0.229	0.182
Revenue rule	0.170	0.115
Budget balance rule	0.069	0.374
Debt rule	0.073	0.515
Fiscal council	0.320	0.041

Note: Authors' calculations based on data from the OECD. This table displays the slope coefficient and the p-value for the regression of *P75 – P25* on selected fiscal rules indicators.

Source: OECD COFOG database, OECD International Budget Practices and Procedures database and authors' calculations

### A two-step approach

Instead of the baseline regression model (2), one could use a two-step approach. The first step consists in estimating a factor model, which measures the impact of structural changes on spending. While governments have some room to manoeuvre when setting the public spending mix, part of the mix is determined by latent factors. For instance, when the unemployment rate increases, government expenditures related to unemployment increase because of automatic stabilizers. The factor model is estimated as follows:

$$\Delta \log(y_{i,t,j}) = \alpha_i + \gamma_t + \gamma X_{i,t} + \Delta \log(\tilde{y}_{i,t,j}) \quad (4)$$

where  $\alpha_i$  is a country fixed-effect,  $\gamma_t$  is a time fixed-effect and  $y_{i,t,j}$  is the log change in public spending in country  $i$ , for year  $t$  in category  $j$ . The set of factor variables is denoted by  $X_{i,t}$ . The residual from regression (4), denoted by  $\Delta \log(\tilde{y}_{i,t,j})$ , is the part of log changes that cannot be explained by the structural factors in  $X_{i,t}$ . It can be interpreted as the part of log changes which can be directly controlled by the government. We estimate equation (4) by pooling all countries together. The second step consists in estimating a regression similar to (2), but using residuals from the first step as explained variables:

$$\Delta \log(\tilde{y}_{i,t,j}) = \beta_{i,j} \times z_{i,t} + \varepsilon_{i,j,t} \quad (5)$$

where  $z_{i,t} \equiv \text{Med}(\Delta \log(\tilde{y}_{i,t,j}))$ . The differences between specifications (2) and (5) is that control variables are country-specific in the former, while they are common to all countries in the latter.

In the first step,  $X_{i,t}$  includes the log difference for ratio of the population above 65 to the population between 15 and 64 to the, the GDP per capita and the unemployment rate. Point estimates are presented in Table 22 and Table 21. For instance, a 1% increase in the unemployment rate is associated with a 0.37% increase in expenditures for the COFOG II category "Unemployment". Statistical significance of point estimates can be assessed using Table 23 and Table 24, which report p-values. The spread in the distribution of  $\beta_{i,j}$ , estimated in the second step, which measures the degree to which countries reallocated public spending across functions, are presented in Table 25. The correlations between the spread in the distribution of  $\beta_{i,j}$  and institutional factors are presented in Table 26 and Table 27.

**Table 21. Point estimates for regression (4)**

Category	$\Delta \log(\text{GDP})$	$\Delta \log(\text{15-64/65+})$	$\Delta \log(U)$
Foreign military aid	-4.50	-4.21	-0.60
Defence n.e.c.	2.83	1.43	0.06
Military defense	0.24	0.39	-0.15
Mining, manufacturing and construction	-1.29	-0.38	-0.41
RandD Economic affairs	0.94	-0.78	0.03
Economic affairs n.e.c.	0.50	-3.11	0.31
General economic, commercial and labour affairs	0.94	0.39	0.49
Agriculture, forestry, fishing and hunting	0.21	-0.53	-0.21
Transport	0.86	-1.73	-0.08
Other industries	0.45	-0.27	-0.22
Fuel and energy	0.93	1.30	0.22
Communication	3.44	-2.88	-0.22
Education not definable by level	0.58	-1.52	-0.27
Secondary education	0.35	0.03	-0.03
Subsidiary services to education	0.73	-2.39	0.05
Pre-primary and primary education	0.17	0.01	-0.14
Tertiary education	0.74	-0.72	0.01
RandD Education	-1.38	-0.84	-0.31
Education n.e.c.	-0.75	-0.25	-0.11
Environmental protection n.e.c.	0.30	1.33	-0.18

Waste water management	1.79	-2.35	0.01
Protection of biodiversity and landscape	-1.24	1.00	-0.32
Pollution abatement	-1.02	-1.83	-0.18
RandD Environmental protection	0.64	-0.28	-0.01
Waste management	1.24	-2.20	-0.08
Foreign economic aid	-0.83	-0.58	-0.37
General services	0.96	0.83	-0.10
Executive and legislative organs, financial, fiscal and external affairs	0.42	-0.64	-0.06
Public debt transactions	-0.59	1.01	-0.05
Basic research	0.65	-1.01	-0.02
General public services n.e.c.	-1.03	-4.18	0.04

Note: This table shows the coefficients estimated from regression (4). GDP is GDP per capita in PPP; 15-64/65+ is the ratio of the population in between 16 and 64 to the population of 65 and more; U is the harmonized unemployment rate.

Source: OECD COFOG database and authors' calculations

**Table 22. Point estimates for regression (4) (continued)**

Category	$\Delta \log(\text{GDP})$	$\Delta \log(15-64/65+)$	$\Delta \log(U)$
RandD General public services	0.43	7.32	-0.42
Medical products, appliances and equipment	0.76	9.38	0.11
Hospital services	0.24	-2.04	-0.10
RandD Health	0.45	-1.39	-0.06
Health n.e.c.	0.21	0.29	0.09
Outpatient services	0.13	-3.27	-0.15
Public health services	-0.86	-1.00	-0.38
Housing and community amenities n.e.c.	2.32	-4.02	0.62
Housing development	0.71	-1.36	-0.02
Community development	4.38	-3.39	0.22
Street lighting	0.86	1.15	0.21
Water supply	1.07	-1.67	-0.05
Prisons	0.17	-0.32	-0.19
Law courts	0.33	-0.61	-0.10
Police services	0.61	-0.30	-0.04
Fire-protection services	0.19	-0.86	-0.09
Public order and safety n.e.c.	3.38	5.40	0.28
Recreation, culture and religion n.e.c.	1.00	-1.26	-0.16
Cultural services	0.12	-0.03	-0.09
Religious and other community services	0.44	-2.74	-0.22
Broadcasting and publishing services	-0.20	0.90	0.11
Recreational and sporting services	0.28	-1.65	-0.19
RandD Recreation, culture and religion	2.72	0.75	0.62
RandD Social protection	-1.74	-1.91	-0.49
Survivors	-0.11	2.29	0.02
Social exclusion n.e.c.	0.99	-1.86	0.14
Unemployment	-0.67	-1.04	0.37
Family and children	-0.04	-0.28	0.01
Housing	0.75	-3.77	0.02
Old age	0.18	0.16	0.03
Sickness and disability	0.11	0.07	-0.08
Social protection n.e.c.	0.57	-0.46	-0.07

Note: This table shows the coefficients estimated from regression (4). GDP is GDP per capita in PPP; 15-64/65+ is the ratio of the population in between 16 and 64 to the population of 65 and more; U is the harmonized unemployment rate.

Source: OECD COFOG database and authors' calculations

Table 23. p – values for regression (4)

Category	$\Delta \log(GDP)$	$\Delta \log(15-64/65+)$	$\Delta \log(U)$
Foreign military aid	0.303	0.067	0.138
Defence n.e.c.	0.205	0.675	0.834
Military defence	0.564	0.460	0.053
Mining, manufacturing and construction	0.504	0.787	0.013
RandD Economic affairs	0.052	0.254	0.750
Economic affairs n.e.c.	0.781	0.119	0.184
General economic, commercial and labour affairs	0.721	0.740	0.171
Agriculture, forestry, fishing and hunting	0.819	0.407	0.002
Transport	0.163	0.019	0.315
Other industries	0.626	0.819	0.083
Fuel and energy	0.570	0.486	0.413
Communication	0.171	0.220	0.380
Education not definable by level	0.493	0.053	0.293
Secondary education	0.377	0.924	0.529
Subsidiary services to education	0.259	0.014	0.764
Pre-primary and primary education	0.425	0.977	0.013
Tertiary education	0.002	0.255	0.914
RandD Education	0.562	0.769	0.555
Education n.e.c.	0.395	0.805	0.296
Environmental protection n.e.c.	0.699	0.170	0.090
Waste water management	0.022	0.042	0.970
Protection of biodiversity and landscape	0.424	0.512	0.085
Pollution abatement	0.657	0.379	0.492
RandD Environmental protection	0.273	0.816	0.918
Waste management	0.071	0.000	0.387
Foreign economic aid	0.400	0.644	0.120
General services	0.126	0.112	0.483
Executive and legislative organs, financial, fiscal and external affairs	0.241	0.207	0.382
Public debt transactions	0.138	0.169	0.611
Basic research	0.156	0.340	0.820
General public services n.e.c.	0.233	0.048	0.807

Note: This table shows the p-values for the coefficients estimated in regression (4). GDP is GDP per capita in PPP; 15-64/65+ is the ratio of the population in between 16 and 64 to the population of 65 and more; U is the harmonized unemployment rate.

Source: OECD COFOG database and authors' calculations.

Table 24. p – values for regression (4) (continued)

Category	$\Delta \log(GDP)$	$\Delta \log(15-64/65+)$	$\Delta \log(U)$
RandD General public services	0.689	0.002	0.146
Medical products, appliances and equipment	0.325	0.222	0.368
Hospital services	0.261	0.246	0.026
RandD Health	0.309	0.224	0.713
Health n.e.c.	0.810	0.707	0.543
Outpatient services	0.583	0.046	0.000
Public health services	0.427	0.234	0.190
Housing and community amenities n.e.c.	0.113	0.002	0.102
Housing development	0.358	0.400	0.892
Community development	0.041	0.092	0.510
Street lighting	0.207	0.447	0.493
Water supply	0.204	0.017	0.760
Prisons	0.725	0.672	0.031
Law courts	0.211	0.023	0.157

Police services	0.054	0.356	0.228
Fire-protection services	0.540	0.103	0.033
Public order and safety n.e.c.	0.034	0.241	0.451
Recreation, culture and religion n.e.c.	0.293	0.564	0.177
Cultural services	0.639	0.940	0.154
Religious and other community services	0.241	0.158	0.068
Broadcasting and publishing services	0.859	0.751	0.589
Recreational and sporting services	0.360	0.072	0.027
RandD Recreation, culture and religion	0.205	0.769	0.162
RandD Social protection	0.418	0.452	0.121
Survivors	0.796	0.316	0.756
Social exclusion n.e.c.	0.226	0.058	0.046
Unemployment	0.411	0.255	0.000
Family and children	0.926	0.542	0.832
Housing	0.633	0.179	0.919
Old age	0.253	0.654	0.259
Sickness and disability	0.723	0.923	0.057
Social protection n.e.c.	0.449	0.425	0.524

Note: This table shows the p-values for the coefficients estimated in regression (4). GDP is GDP per capita in PPP; 15-64/65+ is the ratio of the population in between 16 and 64 to the population of 65 and more; U is the harmonized unemployment rate.

Source: OECD COFOG database and authors' calculations.

**Table 25. Summary statistics for the distribution of  $\beta_{i,j}$  per country using the the 2-step approach**

Country	P10	P25	P50	P75	P90	P75 – P25	P90 – P10
ESP	-0.385	0.137	0.780	1.203	1.967	1.065	2.352
SVK	-0.403	0.058	0.742	1.661	2.008	1.602	2.411
IRL	-0.095	0.237	0.529	1.061	1.894	0.824	1.989
EST	-0.524	0.299	0.599	1.079	1.785	0.781	2.309
LUX	-1.309	-0.717	0.088	0.742	2.078	1.459	3.388
HUN	-0.280	0.317	0.787	1.440	2.404	1.123	2.684
PRT	-0.373	0.228	0.702	1.280	2.099	1.052	2.472
NLD	-0.827	-0.289	0.251	0.569	2.251	0.858	3.078
CZE	-1.786	-0.567	0.312	1.038	2.173	1.605	3.959
GBR	-0.319	-0.007	0.701	1.775	2.871	1.781	3.190
FRA	-2.196	-0.807	-0.095	1.073	1.939	1.879	4.135
ITA	-1.210	-0.437	0.388	1.366	2.727	1.803	3.936
POL	-1.213	-0.426	0.247	1.207	1.954	1.633	3.168
SVN	-0.888	-0.181	0.440	0.904	1.818	1.085	2.707
FIN	-2.329	-1.052	-0.105	0.537	1.485	1.590	3.813
GRC	-0.153	0.213	0.536	1.397	2.566	1.184	2.719
DNK	-1.958	-0.604	-0.088	0.977	2.292	1.581	4.250
AUT	-2.203	-1.230	-0.077	1.323	4.389	2.554	6.593
DEU	-2.202	-0.652	0.928	1.937	5.199	2.589	7.402
NOR	-3.147	-1.508	-0.623	0.719	1.594	2.227	4.742
BEL	-1.801	-0.638	0.630	1.758	4.302	2.396	6.103
SWE	-6.332	-2.704	-0.073	2.064	7.284	4.768	13.616

Note: This table shows statistics for country-specific distribution of  $\beta_{i,j}$  estimated with equation (5).

Source: OECD COFOG database and authors' calculations.

**Table 26. Correlation dispersion  $\beta_{i,j}$  and quality of governance indicators using the the 2-step approach**

Indicator	Coeff	Pvalue
Voice and accountability	0.043	0.034
Regulatory Quality	0.045	0.162
Rule of Law	0.087	0.043
Political Stability	0.042	0.181
Government Effectiveness	0.090	0.039
Control of corruption	0.125	0.042

Note: Authors' calculations based on data from the OECD and the World Bank. This table displays the slope coefficient and the p-value for the regression of P90 –p10 from Table 25 on selected governance indicators.

Source: OECD COFOG database, World Bank Worldwide Governance Indicators and authors' calculations.

**Table 27. Correlation dispersion  $\beta_{i,j}$  and fiscal rules indicators using the the 2-step approach**

Indicator	Coeff	Pvalue
Expenditure rule	0.0637	0.059
Revenue rule	-0.003	0.861
Budget balance rule	0.015	0.325
Debt rule	0.013	0.542
Fiscal council	0.044	0.133

Note: Authors' calculations based on data from the OECD. This table displays the slope coefficient and the p-value for the regression of P90 –p10 from Table 25 on selected fiscal rules indicators.

Source: OECD COFOG database, OECD International Budget Practices and Procedures database and authors' calculations

## E. Data

**Table 28. COFOG I by country**

Country	Function	Median	Std	Mean	Max	Min	N
AUT	Defence	0.011	0.084	0.013	0.205	-0.256	22
AUT	Economic affairs	0.018	0.149	0.031	0.547	-0.230	22
AUT	Education	0.028	0.016	0.028	0.068	-0.023	22
AUT	Environment protection	0.026	0.261	-0.020	0.155	-1.166	22
AUT	General public services	0.015	0.033	0.014	0.074	-0.040	22
AUT	Health	0.038	0.016	0.043	0.071	0.019	22
AUT	Housing and community amenities	0.011	0.177	-0.035	0.141	-0.752	22
AUT	Public order and safety	0.034	0.018	0.029	0.057	-0.008	22
AUT	Recreation, culture and religion	0.020	0.033	0.026	0.118	-0.048	22
AUT	Social protection	0.032	0.012	0.031	0.061	0.005	22
BEL	Defence	0.010	0.030	0.006	0.073	-0.074	22
BEL	Economic affairs	0.045	0.138	0.047	0.546	-0.277	22
BEL	Education	0.038	0.015	0.037	0.064	0.009	22
BEL	Environment protection	0.038	0.080	0.043	0.192	-0.143	22
BEL	General public services	0.000	0.028	0.004	0.071	-0.065	22
BEL	Health	0.047	0.030	0.045	0.109	-0.013	22
BEL	Housing and community amenities	0.038	0.119	0.036	0.271	-0.148	22
BEL	Public order and safety	0.040	0.035	0.042	0.142	-0.033	22
BEL	Recreation, culture and religion	0.051	0.062	0.055	0.294	-0.051	22
BEL	Social protection	0.035	0.016	0.038	0.078	0.012	22
CZE	Defence	0.008	0.153	0.019	0.337	-0.347	22
CZE	Economic affairs	0.012	0.235	-0.002	0.361	-0.819	22
CZE	Education	0.046	0.046	0.047	0.124	-0.061	22
CZE	Environment protection	0.065	0.173	0.037	0.377	-0.345	22
CZE	General public services	0.054	0.120	0.053	0.372	-0.284	22

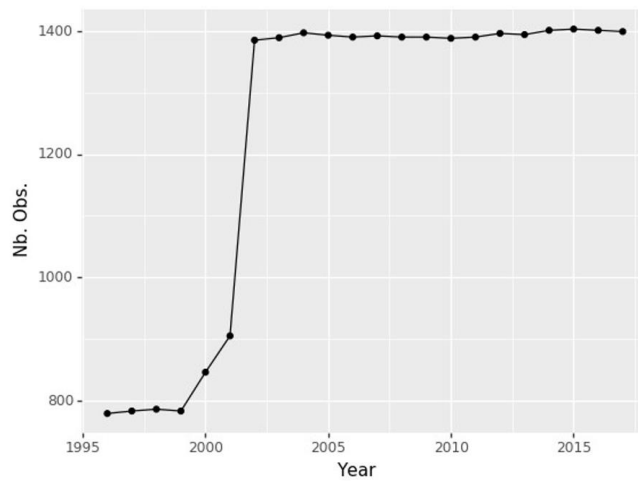
CZE	Health	0.060	0.046	0.057	0.192	-0.024	22
CZE	Housing and community amenities	0.018	0.196	0.024	0.508	-0.484	22
CZE	Public order and safety	0.040	0.063	0.050	0.170	-0.081	22
CZE	Recreation, culture and religion	0.057	0.070	0.051	0.223	-0.057	22
CZE	Social protection	0.043	0.043	0.056	0.173	-0.001	22
DEU	Defence	0.017	0.072	0.010	0.084	-0.269	22
DEU	Economic affairs	-0.016	0.306	-0.033	0.806	-0.877	22
DEU	Education	0.022	0.022	0.022	0.059	-0.049	22
DEU	Environment protection	-0.002	0.089	0.008	0.303	-0.136	22
DEU	General public services	0.011	0.026	0.014	0.077	-0.026	22
DEU	Health	0.033	0.022	0.032	0.085	-0.033	22
DEU	Housing and community amenities	-0.018	0.073	-0.009	0.113	-0.158	22
DEU	Public order and safety	0.026	0.016	0.022	0.045	-0.027	22
DEU	Recreation, culture and religion	0.021	0.075	0.037	0.339	-0.041	22
DEU	Social protection	0.023	0.020	0.023	0.058	-0.011	22
DNK	Defence	0.022	0.055	0.017	0.161	-0.115	22
DNK	Economic affairs	0.024	0.049	0.026	0.132	-0.067	22
DNK	Education	0.042	0.031	0.035	0.082	-0.025	22
DNK	Environment protection	-0.003	0.092	0.023	0.218	-0.095	22
DNK	General public services	0.003	0.061	0.008	0.140	-0.180	22
DNK	Health	0.041	0.023	0.043	0.087	0.002	22
DNK	Housing and community amenities	0.011	0.262	-0.021	0.604	-0.628	22
DNK	Public order and safety	0.037	0.024	0.034	0.094	-0.014	22
DNK	Recreation, culture and religion	0.032	0.044	0.037	0.139	-0.060	22
DNK	Social protection	0.021	0.020	0.028	0.073	0.005	22
ESP	Defence	0.029	0.062	0.023	0.151	-0.140	22
ESP	Economic affairs	0.021	0.157	0.023	0.307	-0.559	22
ESP	Education	0.052	0.044	0.039	0.085	-0.085	22
ESP	Environment protection	0.062	0.091	0.047	0.265	-0.116	22
ESP	General public services	0.025	0.043	0.025	0.101	-0.047	22
ESP	Health	0.070	0.049	0.048	0.122	-0.068	22
ESP	Housing and community amenities	0.069	0.187	0.003	0.237	-0.613	22
ESP	Public order and safety	0.050	0.052	0.039	0.159	-0.092	22
ESP	Recreation, culture and religion	0.055	0.086	0.034	0.151	-0.248	22
ESP	Social protection	0.045	0.033	0.049	0.117	-0.005	22
EST	Defence	0.126	0.141	0.115	0.313	-0.208	22
EST	Economic affairs	0.107	0.114	0.095	0.309	-0.256	22
EST	Education	0.094	0.072	0.083	0.194	-0.079	22
EST	Environment protection	0.105	0.194	0.119	0.466	-0.239	19
EST	General public services	0.068	0.112	0.090	0.289	-0.084	22
EST	Health	0.093	0.081	0.099	0.282	-0.081	22
EST	Housing and community amenities	0.118	0.985	0.073	3.044	-2.287	22
EST	Public order and safety	0.086	0.113	0.076	0.246	-0.288	22
EST	Recreation, culture and religion	0.118	0.106	0.098	0.347	-0.150	22
EST	Social protection	0.108	0.071	0.104	0.262	-0.040	22
FIN	Defence	0.014	0.053	0.026	0.126	-0.049	27
FIN	Economic affairs	0.029	0.074	0.019	0.129	-0.241	27
FIN	Education	0.027	0.026	0.030	0.094	-0.034	27
FIN	Environment protection	0.033	0.075	0.027	0.160	-0.174	27
FIN	General public services	0.038	0.048	0.046	0.188	-0.030	27
FIN	Health	0.054	0.041	0.040	0.090	-0.106	27
FIN	Housing and community amenities	0.005	0.130	0.006	0.277	-0.237	27
FIN	Public order and safety	0.033	0.040	0.030	0.116	-0.047	27
FIN	Recreation, culture and religion	0.028	0.065	0.034	0.218	-0.166	27
FIN	Social protection	0.040	0.034	0.044	0.157	-0.003	27
FRA	Defence	0.017	0.040	0.014	0.075	-0.075	22
FRA	Economic affairs	0.033	0.046	0.030	0.097	-0.069	22
FRA	Education	0.023	0.014	0.026	0.060	0.002	22
FRA	Environment protection	0.047	0.040	0.050	0.142	-0.042	22
FRA	General public services	0.014	0.031	0.013	0.081	-0.028	22
FRA	Health	0.032	0.016	0.034	0.069	0.009	22
FRA	Housing and community amenities	0.028	0.064	0.037	0.159	-0.046	22
FRA	Public order and safety	0.024	0.026	0.033	0.103	0.004	22

FRA	Recreation, culture and religion	0.040	0.041	0.044	0.130	-0.049	22
FRA	Social protection	0.034	0.012	0.035	0.058	0.016	22
GBR	Defence	0.004	0.045	0.024	0.107	-0.037	22
GBR	Economic affairs	0.042	0.200	0.054	0.567	-0.276	22
GBR	Education	0.041	0.048	0.042	0.155	-0.041	22
GBR	Environment protection	0.037	0.187	0.057	0.726	-0.413	22
GBR	General public services	0.044	0.085	0.035	0.272	-0.118	22
GBR	Health	0.059	0.030	0.058	0.110	0.006	22
GBR	Housing and community amenities	0.037	0.152	0.030	0.304	-0.206	22
GBR	Public order and safety	0.043	0.045	0.039	0.124	-0.042	22
GBR	Recreation, culture and religion	0.025	0.105	0.028	0.363	-0.204	22
GBR	Social protection	0.035	0.024	0.042	0.093	0.004	22
GRC	Defence	0.046	0.346	-0.007	0.488	-1.258	22
GRC	Economic affairs	0.077	0.444	0.006	0.774	-1.466	22
GRC	Education	0.028	0.175	-0.002	0.181	-0.726	22
GRC	Environment protection	0.094	0.440	-0.005	0.380	-1.913	22
GRC	General public services	0.004	0.100	-0.001	0.213	-0.238	22
GRC	Health	0.045	0.180	-0.009	0.148	-0.705	22
GRC	Housing and community amenities	0.008	0.208	-0.005	0.352	-0.684	22
GRC	Public order and safety	0.069	0.326	-0.019	0.167	-1.478	22
GRC	Recreation, culture and religion	0.030	0.251	-0.014	0.195	-1.084	22
GRC	Social protection	0.077	0.257	-0.003	0.130	-1.137	22
HUN	Defence	0.084	0.187	0.085	0.498	-0.356	22
HUN	Economic affairs	0.083	0.189	0.083	0.533	-0.244	22
HUN	Education	0.076	0.084	0.081	0.222	-0.063	22
HUN	Environment protection	0.061	0.311	0.061	0.758	-0.842	22
HUN	General public services	0.054	0.082	0.065	0.235	-0.065	22
HUN	Health	0.065	0.078	0.078	0.252	-0.081	22
HUN	Housing and community amenities	0.123	0.314	0.099	1.180	-0.595	22
HUN	Public order and safety	0.086	0.088	0.100	0.255	-0.054	22
HUN	Recreation, culture and religion	0.108	0.129	0.114	0.478	-0.067	22
HUN	Social protection	0.070	0.059	0.075	0.183	-0.011	22
IRL	Defence	0.031	0.087	0.026	0.165	-0.170	22
IRL	Economic affairs	0.066	0.442	0.053	1.341	-1.180	22
IRL	Education	0.066	0.069	0.051	0.155	-0.106	22
IRL	Environment protection	0.079	0.135	0.060	0.315	-0.250	22
IRL	General public services	0.051	0.059	0.041	0.136	-0.070	22
IRL	Health	0.059	0.068	0.074	0.224	-0.065	22
IRL	Housing and community amenities	0.054	0.188	0.047	0.358	-0.353	22
IRL	Public order and safety	0.053	0.066	0.051	0.164	-0.102	22
IRL	Recreation, culture and religion	0.076	0.088	0.074	0.239	-0.099	22
IRL	Social protection	0.056	0.080	0.060	0.195	-0.072	22
ITA	Defence	0.020	0.138	-0.002	0.122	-0.582	22
ITA	Economic affairs	0.004	0.099	-0.010	0.227	-0.268	22
ITA	Education	0.014	0.094	-0.003	0.092	-0.410	22
ITA	Environment protection	0.044	0.197	0.000	0.103	-0.880	22
ITA	General public services	-0.003	0.046	-0.003	0.078	-0.089	22
ITA	Health	0.029	0.180	-0.004	0.101	-0.816	22
ITA	Housing and community amenities	-0.001	0.552	0.000	1.780	-1.833	22
ITA	Public order and safety	0.014	0.117	0.000	0.104	-0.515	22
ITA	Recreation, culture and religion	0.025	0.150	-0.002	0.179	-0.624	22
ITA	Social protection	0.029	0.160	-0.002	0.068	-0.733	22
LTU	Defence	0.107	0.170	0.090	0.360	-0.301	22
LTU	Economic affairs	0.068	0.272	0.039	0.646	-0.790	22
LTU	Education	0.058	0.092	0.074	0.263	-0.080	22
LTU	Environment protection	0.153	0.401	0.127	1.441	-0.643	22
LTU	General public services	0.063	0.409	0.067	1.241	-1.232	22
LTU	Health	0.067	0.122	0.092	0.323	-0.123	22
LTU	Housing and community amenities	0.096	0.241	0.059	0.361	-0.717	22
LTU	Public order and safety	0.064	0.132	0.067	0.389	-0.196	22
LTU	Recreation, culture and religion	0.089	0.149	0.085	0.431	-0.204	22
LTU	Social protection	0.062	0.105	0.083	0.281	-0.109	22
LVA	Defence	0.103	0.197	0.109	0.498	-0.470	22

LVA	Economic affairs	0.143	0.150	0.096	0.377	-0.202	22
LVA	Education	0.065	0.123	0.086	0.294	-0.196	22
LVA	Environment protection	0.139	0.489	0.115	0.951	-1.753	22
LVA	General public services	0.085	0.097	0.084	0.308	-0.122	22
LVA	Health	0.074	0.149	0.092	0.400	-0.200	22
LVA	Housing and community amenities	0.065	0.187	0.102	0.514	-0.384	22
LVA	Public order and safety	0.094	0.129	0.080	0.382	-0.311	22
LVA	Recreation, culture and religion	0.125	0.157	0.105	0.440	-0.291	22
LVA	Social protection	0.065	0.081	0.084	0.210	-0.061	22
NLD	Defence	0.009	0.050	0.015	0.104	-0.081	22
NLD	Economic affairs	0.026	0.061	0.028	0.159	-0.073	22
NLD	Education	0.036	0.026	0.037	0.094	-0.008	22

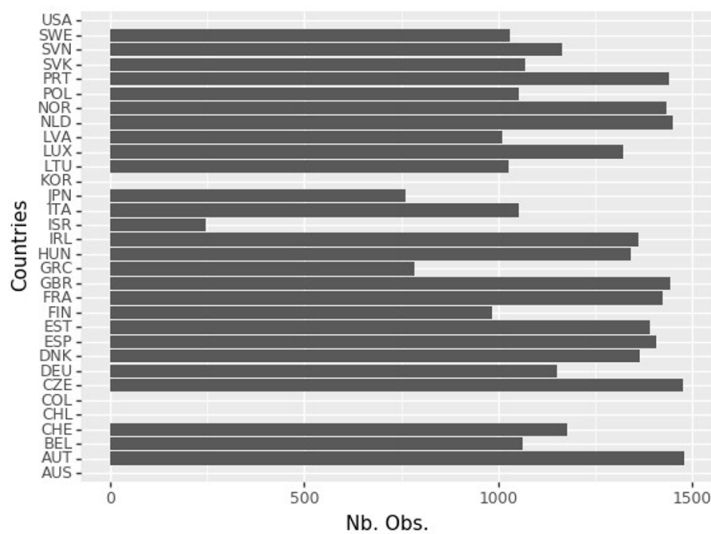
Note: This table shows country-specific statistics for log changes in government expenditures in COFOG I categories.  
 Source: OECD COFOG database and authors' calculations.

Figure 14. COFOG level II: Number of observations per year



Note: The dataset covers 32 countries and 69 COFOG-2 categories. If there were no missing values, there would be 2208 observations per year.  
 Source: OECD COFOG database and authors' calculations

Figure 15. COFOG level II: Number of observations per country



Source: OECD COFOG database and authors' calculations.

Table 29. Number of observations per function

Function	N	Function	N
Agriculture, forestry, fishing and hunting	507	Public health services	490
Cultural services	507	Subsidiary services to education	490
Education n.e.c.	507	Fuel and energy	489
Executive and legislative organs, financial, fiscal and external aff.	507	Housing	486
Family and children	507	Medical products, appliances and equipment	485
Fire-protection services	507	Mining, manufacturing and construction	485
General services	507	Economic affairs n.e.c.	484
Health n.e.c.	507	Water supply	483
Law courts	507	Hospital services	482
Military defence	507	RandD Economic affairs	482
Old age	507	RandD Education	480
Police services	507	Waste water management	474
Pre-primary and primary education	507	RandD Environmental protection	473
Prisons	507	Communication	472
Recreational and sporting services	507	Pollution abatement	468
Sickness and disability	507	Foreign economic aid	466
Social protection n.e.c.	507	Housing development	464
Tertiary education	507	Basic research	460
Transport	507	General public services n.e.c.	458
Broadcasting and publishing services	505	Community development	450
Outpatient services	504	Recreation, culture and religion n.e.c.	437
Public debt transactions	504	RandD General public services	433
Secondary education	504	Defence n.e.c.	416
Survivors	504	RandD Recreation, culture and religion	401
Unemployment	504	RandD Social protection	397
Social exclusion n.e.c.	503	Housing and community amenities n.e.c.	396
Waste management	503	Street lighting	378
General economic, commercial and labour affairs	501	RandD Defence	375
Public order and safety n.e.c.	499	Foreign military aid	352
Education not definable by level	497	Civil defence	343
Other industries	497	Post-secondary non-tertiary education	327
Religious and other community services	496	RandD Public order and safety	306
Environmental protection n.e.c.	495	RandD Housing and community amenities	297
RandD Health	494	Transfers of a general character between dif. Levels of gvt.	60
Protection of biodiversity and landscape	492		

Note: The table shows the number of observations available per function. The sample includes Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Luxembourg, Netherlands, Norway, Poland, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, United Kingdom.

Source: OECD COFOG database and authors' calculations