EVOLUTION OF FISCAL DECENTRALISATION IN OECD COUNTRIES: A CLUB CONVERGENCE ANALYSIS

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Abstract

We study the fiscal decentralisation patterns in OECD countries through a club convergence approach. Our analysis covers 30 countries spanning 1995 to 2018 and considers the noncentral expenditure and revenue sides with two perspectives, as percentage of GDP and as percentage of the total government expenditure and revenue. The results show differences between the expenditure and revenue sides, but with five and six clubs on both sides for the GDP and total government perspectives, respectively. These results allow one to establish a typology based on the four dimensions analysed. In addition, our results suggest a divergent impact of the Great Recession at the overall level of countries and under the expenditure and revenue perspectives; however, simultaneously, that economic downturn seems to have reinforced the process of convergence within clubs under the expenditure perspective. We also study the dynamics of convergence over time using a rolling window estimation, for all countries and the clubs.

Keywords: Decentralisation, club convergence, OECD, Great Recession.

JEL Classification: H77, H10, C01

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Introduction

Fiscal decentralisation is a major issue in public economics literature, especially since the seminal work by Musgrave (1959), who considered that, while central government should focus on economic stability and fair distribution of income, the provision of some (local) public goods could be carried out more efficiently by the subcentral levels of government. In another seminal contribution, Oates (1972) and his "Decentralisation Theorem" explained the potential welfare and efficiency gains of local provision of some public goods. (See Oates (2005) for a relevant and interesting update of fiscal federalism theory.) Brueckner (2004) analysed the positive effects of fiscal decentralisation following the postulates of Tiebout (1956), also studied by Zodrow et al. (2006), but also the negative impacts from the tax competition approach. Furthermore, the extensive literature within fiscal decentralisation has analysed the impact on economic growth (Brueckner, 2006; Chu and Yang, 2012), income inequality and regional disparities (Kyriacou et al., 2017), and other interesting variables, such as public sector efficiency (Adam et al., 2104) and public sector employment (Martínez-Vázquez and Yao, 2009). (Another interesting field refers to the effects of resource discovery on fiscal decentralisation. For example, Bhattacharyya et al. (2017), using a dataset of 77 countries for 1970-2012, concluded that resource discovery has little impact on revenue decentralisation, but leads to expenditure centralisation.) Moreover, some studies have been devoted to the determinants of fiscal decentralisation (Panizza, 1999; Letelier, 2005; Delgado, 2021). See Martínez-Vázquez et al. (2017) for an exhaustive review of the impact of fiscal decentralisation in several dimensions.

The evolution of fiscal decentralisation in recent decades has been analysed in some studies. Dziobek et al. (2011) studied 80 countries, concluding that fiscal decentralisation appeared to be stable during 1990-2008. For OECD countries, Blöchliger and Kim (2016) determined that the decentralisation process was recently intense in a few countries, such as Spain and Italy, while others, namely Norway and the Netherlands, had precisely recentralised.

Although many public sector issues have been analysed from the convergence perspective, namely taxation (Esteve et al., 2000; Delgado, 2009; Delgado and Presno, 2010, 2011, 2017; Regis et al., 2015; Delgado et al., 2019), expenditure (Apergis et al., 2013; Ferreiro et al., 2014), deficit and debt (Kocenda et al., 2008; Apergis and Cooray, 2014), and total revenue (Bertarelli et al., 2014), the convergence of the fiscal decentralisation processes has scarcely been studied. Specifically, to the best of our knowledge, only Blanco et al. (2020), for the European Union, analysed this issue and concluded that European countries were quite heterogeneous in terms of fiscal federalism and decentralisation, with greater convergence in fiscal responsibility than in other magnitudes.

This study contributes by filling this gap in the literature, examining the case of OECD countries, a more heterogeneous group in economic and fiscal issues. In addition, we analyse whether the Great Recession has affected the convergence dynamics of the decentralisation process in recent decades. The rest of the paper is structured as follows. Section 1 describes the methodology based on the club convergence approach proposed by Phillips and Sul (2007, 2009). Section 2 includes the data, and Section 3 the main results. Finally, we present the conclusions.

1. Methodology: the club convergence approach

We analyse convergence in the panel of 30 OECD states applying the club convergence methodology of Phillips and Sul (2007, 2009), who use the following dynamic factor formulation of the variable y_{it}, for $i = 1, \ldots, N$ (number of states, considering in this case 30) and $t = 1, \ldots, T$ (sample size, covering here between 1995 and 2018): $y_{it} = \delta_{it}\mu_t$, representing μ_t the common component and δ_{it} the time-varying idiosyncratic component that measures how individual states relate to the common component. In the context of fiscal convergence, this framework is reasonable, as countries have a common part (e.g. policies, institutions) and an idiosyncratic and country-specific one.

Convergence is tested by studying whether δ_{it} converges toward δ. For that, Phillips and Sul (2007) proposed the construction of the "relative transition paths":

$$h_{it} = y_{it} / (N^{-1} \Sigma_{i=1}^N y_{it}) = \delta_{it} / (N^{-1} \Sigma_{i=1}^N \delta_{it}) \tag{1}$$

which can be directly computed from the data and remove μ_t, tracing over time an individual trajectory for economy i in relation to the cross-section average.

In the presence of convergence, h_{it} converge to unity ($h_{it} \to 1$, for all i as $t \to \infty$), and the cross-sectional variance of h_{it}, H_t, converge to zero:

$$H_t = N^{-1} \Sigma_{i=1}^N (h_{it} - 1)^2 \Rightarrow 0 \text{ as } t \Rightarrow \infty \tag{2}$$

From these properties, Phillips and Sul (2007) derive the "log t" convergence test, which is based on the estimate of the following equation with robust methodology:

$$log (H_1/H_t) - 2 \, log(log(t)) = a + \gamma \, log(t) + u_t, \text{ for } t = [rT], [rT]+1, \ldots, T \tag{3}$$

where $[rT]$ represents the integer part of rT. Phillips and Sul (2007, 2009) concluded that for small sample sizes (below T=50), $r=0.3$ is a good candidate, so the initial 30% of observations is discarded. Also, -2log(log(t)) is a penalty function that improves the test performance. The null of convergence is tested through a one-sided t test of $\gamma \geq 0$, and is rejected at the 5% significance level when $t_{\hat{\gamma}} < -1.65$.

The procedure allows us to determine not only the presence of convergence but also the type. For that, the magnitude of γ is of interest (under the null of convergence, the point estimate of γ converges to the scaled speed of convergence parameter 2α.) and allows us to detect conditional convergence or convergence in growth rates ($0 \leq \hat{\gamma} < 2$) and absolute convergence or convergence in levels ($\hat{\gamma} \geq 2$).

One of the most important features of the approach is that if the null of convergence for the full set of states is rejected (concluding no convergence to a common steady state), it allows the detection of groups of countries converging (clubs of convergence) and economies that diverge from them. For that, Phillips and Sul (2007, 2009) propose a four-step clustering algorithm whose main steps can be summarised as follows:

- Sort the states into descending order on the basis of the last observation.
- Form a core club.
- Sieve the data for new club members and run the log t test to check if a convergence club is attained.

• Run the log t test on the states that were not selected in the previous step; if the t statistic is greater than the critical value (-1.65 at the 5% significance level), conclude that there are two convergence clubs. In another case, repeat step 1 to step 3 to detect other convergence groups. When no other clubs are estimated, conclude that the remaining countries display divergent behaviour.

Finally, and importantly, to correct for the tendency of the algorithm to overestimate the number of clubs, the log t test can also be used to merge the initial clubs into larger groups.

2. Data

We use data from the OECD -the OECD Fiscal Decentralisation Database-, concretely for 30 countries (Australia (AU), Austria (AT), Belgium (BE), Canada (CA), Czech Republic (CZ), Denmark (DK), Estonia (EE), Finland (FI), France (FR), Germany (DE), Greece (EL), Hungary (HU), Ireland (IE), Israel (IL), Italy (IT), Latvia (LV), Lithuania (LT), Luxembourg (LU), Netherlands (NL), New Zealand (NZ), Norway (NW), Poland (PL), Portugal (PT), Slovak Republic (SK), Slovenia (SI), Spain (ES), Sweden (SE), Switzerland (CH), United Kingdom (UK), United States (US)) and the period 1995-2018. It should be mentioned that the OECD comprises 34 countries currently, but four have been excluded from our study due to the unavailability of data for a long period, a requirement commonly demanded for the club convergence analysis.

Our decentralisation measures, based on non-central -local, and regional or state in some cases- expenditure and revenue, include two complementary perspectives: as percentage of GDP and as percentage of the total expenditure or revenue. It should also be mentioned in our context that the sample contains federal and unitary countries. Our seven federal countries are Australia, Austria, Belgium, Canada, Germany, Switzerland and the United States. In addition, other highly decentralised states, but not strictly federal in political terms, are Spain, France and Italy, revealing the potential differences between the political organisation and the fiscal decentralisation.

Table 1 contains the descriptive statistics from which several considerations can be made. First, is the asymmetric process between expenditures and revenues. In 2018, non-central expenditure represented a weighted average of 13.46% of GDP, while revenue reached only 8.17%. In terms of the total expenditure or revenue, the non-central expenditure was 30.96%, whereas the revenue stood at just 19.20%.

Second, in contrast to the ascending evolution of the coefficient of variation (CV), a measure of the sigma convergence approach, for the expenditure case, denoting a sigma divergence path, the opposite is found for the revenue side. We will recover this sigma convergence approach in the following for the analysis of the effects of the Great Recession in this process.

And third, there are notable differences across countries: in 2018, with ranges of 29.89 and 60.21 percentage points in the expenditure side, and 22.10 and 52.37 in the revenue case, for % GDP and % total, respectively.

Table no. 1. Descriptive statistics
1a. Expenditure

	% GDP			% Total		
	1995	2008	2018	1995	2008	2018
Mean	13.45	13.61	13.46	28.12	31.49	30.96
St. Dev.	7.12	6.80	7.66	13.98	15.68	16.67
CV	0.5293	0.4994	0.5692	0.4970	0.4978	0.5384
Min.	2.75	3.53	2.41	5.84	6.91	7.56
Max.	31.29	31.64	32.30	60.28	67.58	67.77
Range	28.54	28.11	29.89	54.44	60.67	60.21

1.b. Revenue

	% GDP			% Total		
	1995	2008	2018	1995	2008	2018
Mean	7.82	7.87	8.17	18.26	18.99	19.20
St. Dev.	5.96	5.62	5.97	14.44	14.55	14.78
CV	0.7620	0.7142	0.7305	0.7905	0.7661	0.7698
Min.	0.97	0.97	1.11	2.60	2.67	3.01
Max.	23.29	21.97	23.22	54.31	55.23	55.38
Range	22.32	20.00	22.10	51.71	52.56	52.37

Source: OECD and the authors' elaboration.

3. Results

The main results from the club convergence analysis are summarised in Tables 2 and 3 for the expenditure and Tables 4 and 5 for the revenue, with the double perspective noted above: % GDP and % total. In all cases, the results include the sequential analysis performed: first, the null hypothesis of convergence of the full sample is tested and rejected (see note under the tables); second, the club convergence procedure leads to the initial clubs; third, the merge procedure is carried out; and fourth, the final clubs are achieved. For the sake of brevity, we will comment only on the final results of the process.

As general results, we identify a rather large number of clubs for the 30 countries considered in the analysis, evidencing the heterogeneity between OECD countries. In addition, Canada diverges, at the top of the distribution, in most cases. In the GDP perspective, if we compare expenditure and revenue, countries as Denmark and New Zealand are located in the extreme clubs under the expenditure side, but in the central clubs under the revenue size. In the other perspective, and depending on whether the expenditure or the revenue side is considered, there are more differences in the position of the club to which the country belongs: e.g., Denmark or the Netherlands (located at upper clubs in expenditure), or Portugal and New Zealand (above in revenue). Finally, we observe conditional convergence in general. Just two clubs -Club I for expenditure, from the total viewpoint, and Club II for revenue, from the GDP perspective- form weak convergence clubs with diverging behaviour (negative γ). In these cases, the detected clusters of countries would converge to different steady states.

Expenditure

From the % GDP perspective, we identify five clubs and one divergent country, namely Denmark, clearly above the rest of the countries. In the first club, other Nordic countries, Finland and Sweden, appear along with Canada and Belgium. Thus, federal and unitary countries share prominence in this first cluster.

Table no. 2. Club convergence results – Expenditure % GDP, 1995-2018

Initial classification				Club merging			
Club	Countries	$t_{\hat{\gamma}}$	$\hat{\gamma}$		$t_{\hat{\gamma}}$	$\hat{\gamma}$	$\hat{\alpha}$
Divergent	DK, DE, AT, CZ, IE						
1	CA, SE, BE, FI	1.974	0.401		1.974	0.401	0.200
2	CH, US, ES, AU, NW	1.073	0.904	Club 2+ DE +AT	0.444	0.269	0.135
3	PL, IT, NL, LV, FR	3.256	0.434	Club 3+CZ	1.908	0.257	0.128
4	UK, EE, SI, SK	1.849	0.605	Club 4	1.849	0.605	0.302
5	LT, HU, PT, IL, LU, NZ, EL	2.399	0.684	Club 5+IE	3.101	0.240	0.120

Table no. 2. Club convergence results – Expenditure % GDP, 1995-2018 (cont.)

Final classification			
Club	Countries	Type	Aver.
Divergent	DK	High+	33.32
I	CA, SE, BE, FI	High	24.46
II	CH, US, ES, AU, NW, DE, AT	Medium-High	17.67
III	PL, IT, NL, LV, FR, CZ	Medium	12.21
IV	UK, EE, SI, SK	Medium-Low	8.71
V	LT, HU, PT, IL, LU, NZ, EL, IE	Low	5.06

Source: authors' elaboration.

Note: Aver.: average of last five years. Type: this is merely an illustrative way to distinguish clubs and considering also the transition paths (comment valid for Tables 3-5).

Full sample: $t_{\hat{\gamma}}$=-27.627, -rejection of the null hypothesis at the 5% level-; $\hat{\gamma} = -1.033$

Regarding the % total approach, the procedure recognises six clusters. However, the divergent country, also at the top, is now Canada, whereas the first club is composed of two countries: Denmark and Switzerland. Again, federal and unitary nations lead this fiscal decentralisation at the expenditure side.

In both cases, the following countries are grouped into the last (low) cluster: Hungary, Portugal, New Zealand, Luxembourg, Ireland and Greece. All these countries are unitaries in the political configuration.

Revenue

From the GDP point of view, again five clubs are identified in the analysis. Canada is also now divergent at the top of the distribution. However, the first club now comprises more countries, denoting a different pattern of decentralisation between expenditure and revenue in most countries, although more intense in some countries. This large high-revenue-decentralisation club includes Germany, Austria, Sweden, Switzerland, Finland, Denmark, the United States, Belgium and Spain, combining again both federal and unitary nations. In the other extreme, the low-revenue-decentralisation cluster includes Luxembourg, Slovakia, Estonia, Greece, Ireland and Italy, with three countries -Luxembourg, Greece and Ireland- also categorised in the low-expenditure-decentralisation club.

With regard to the % total viewpoint, six clubs are arranged. With Canada again standing out above the rest of the countries, the first club consists of two countries: Switzerland and Australia. By contrast, the last cluster includes Luxembourg, Ireland, Slovakia, Estonia, Lithuania and Greece, the same countries as the last club in the other perspective.

Table no. 3. Club convergence results – Expenditure % total, 1995-2018

Club	Countries	$t_{\hat{\gamma}}$	$\hat{\gamma}$		$t_{\hat{\gamma}}$	$\hat{\gamma}$	$\hat{\alpha}$
	Initial classification				**Club merging**		
Divergent	CA, AT						
1	DK, CH	-0.934	-0.430		-0.934	-0.430	-0.215
2	SE, US, AU, BE, ES, DE, FI	2.473	0.213		2.473	0.213	0.106
3	PL, NW, NL	0.657	0.372	Club 3+AT	0.788	0.323	0.161
4	CZ, LV, IT	4.734	1.544		4.734	1.544	0.772
5	EE, LT, UK, FR, SI, SK, IL	2.892	0.365		2.892	0.365	0.182
6	HU, PT, NZ, LU, IE, EL	6.032	1.455		6.032	1.455	0.727

Table no. 3. Club convergence results – Expenditure % total, 1995-2018 (cont.)

Club	Countries	Type	Aver.
	Final classification		
Divergent	CA	High+	68.27
I	DK, CH	High	60.33
II	SE, US, AU, BE, ES, DE, FI	Medium-High	44.62
III	PL, NW, NL, AT	Medium	31.81
IV	CZ, LV, IT	Medium-Low	27.53
V	EE, LT, UK, FR, SI, SK, IL	Low+	19.67
VI	HU, PT, NZ, LU, IE, EL	Low	10.64

Source: authors' elaboration

Note: Aver.: average of last five years.

Full sample: $t_{\hat{\gamma}}$=-30.827, -rejection of the null hypothesis at the 5% level-; $\hat{\gamma} = $ -0.993

Expenditure and revenue view

To achieve a common view of the results, Table 6 contains the summary of the results from both perspectives, with the following considerations. First, Denmark and Canada clearly lead the fiscal decentralisation process in the OECD. Second, a large group also exhibits high degrees of fiscal decentralisation, comprising Sweden, Belgium, Finland, Switzerland, the United States, Spain, Australia and Germany. And third, Luxembourg, Greece, and Ireland are grouped into the low-decentralisation clubs in all cases.

Table no. 4. Club convergence results – Revenue % GDP, 1995-2018

Club	Countries	$t_{\hat{\gamma}}$	$\hat{\gamma}$		$t_{\hat{\gamma}}$	$\hat{\gamma}$	$\hat{\alpha}$
	Initial classification				**Club merging**		
Divergent	CA, ES						
1	DE, AU, SE, CH, FI, DK, US, BE	3.528	0.609	Club 1+ES	5.007	0.352	0.176
2	NW, FR, CZ	0.941	1.001	Club 2+Club 3	-0.855	-0.850	-0.425
3	LV, PL	-1.135	-3.084				
4	IT, AT, SI, NZ	0.743	0.192	Club 4	0.743	0.192	0.096
5	PT, NL, HU	1.191	1.057	Club 5+ Club 6	2.856	0.732	0.366
6	IL, UK	-0.701	-0.620				
7	LU, SK, EE, EL	5.964	1.019	Club 7+ Club 8	3.074	0.530	0.265
8	IE, IT	2.751	2.230				

Table no. 4. Club convergence results – Revenue % GDP, 1995-2018 (cont.)

Final classification			
Club	Countries	Type	Aver.
Divergent	CA	High+	22.85
I	DE, AU, SE, CH, FI, DK, US, BE, ES	High	14.62
II	NW, FR, CZ, LV, PL	Medium	7.84
III	IT, AT, SI, NZ	Medium-Low	5.39
IV	PT, NL, HU, IL, UK	Low+	4.21
V	LU, SK, EE, EL, IE, LT	Low-	1.69

Source: authors' elaboration.

Note: Aver.: average of last five years.

Full sample: $t_{\hat{\gamma}}$= -24.082, -rejection of the null hypothesis at the 5% level-; $\hat{\gamma}$= -0.684

Table no. 5. Club convergence results – Revenue % total, 1995-2018

Initial classification				Club merging			
Club	Countries	$t_{\hat{\gamma}}$	$\hat{\gamma}$		$t_{\hat{\gamma}}$	$\hat{\gamma}$	$\hat{\alpha}$
Divergent	CA, SE						
1	CH, AU	2.904	3.498		2.904	3.498	1.749
2	US, DE, FI, ES, BE	0.590	0.096	Club 2+SE	0.626	0.099	0.049
3	DK, CZ, LV, PL, FR, NW	2.752	0.417		2.752	0.417	0.208
4	IT, SI, NZ, AT, PT, IL	2.348	0.430		2.348	0.430	0.215
5	UK, NL, HU	3.121	2.650		3.121	2.650	1.325
6	LU, IE, SK, EE, LT, EL	4.314	0.759		4.314	0.759	0.379

Table no. 5. Club convergence results – Revenue % total, 1995-2018 (cont.)

Final classification			
Club	Countries	Type	Aver.
Divergent	CA	High+	55.92
I	CH, AU	High	47.69
II	US, DE, FI, ES, BE, SE	High-Medium	31.66
III	DK, CZ, LV, PL, FR, NW	Medium	19.05
IV	IT, SI, NZ, AT, PT, IL	Medium-Low	11.17
V	UK, NL, HU	Low+	8.66
VI	LU, IE, SK, EE, LT, EL	Low	4.36

Source: authors' elaboration.

Note: Aver.: average of last five years.

Full sample: $t_{\hat{\gamma}}$=-46.776, -rejection of the null hypothesis at the 5% level-; $\hat{\gamma}$= -0.731.

Dynamics of convergence over time

The analysis of the dynamics of convergence among the countries of the OECD over time is of interest. For this objective, we follow Arcabic et al. (2021) and use a rolling window estimation of the log t regression. Concretely, we carry out this analysis at two levels: overall and clubs (i.e., for all the countries, and for the clubs previously estimated).

At the overall level, the robustness and sensitivity of the conclusions are studied for some window sizes: 10, 15 and 20 years (the initial year is 1995, so, for a window size of 10 years, the sample is rolling for the 1995-2004; 1996-2005… periods). Figure 1 shows the time-varying coefficients of the log t regression for the expenditure and revenue perspectives.

All estimated coefficients are negative and statistically significant for all periods under consideration, indicating a clear divergence. Additionally, coefficients decrease for a long period, which could mean a worsening in the divergence process, although in the case of expenditure they exhibit a modest improvement in the final period.

To analyse the dynamics of convergence within the group of convergent countries, we replicated the rolling-window estimation for the clubs but now focussed on a window size of 15 years. The time-varying coefficients are plotted in Figure 2 and show that about half of the clubs experienced an improvement in the convergence process. For instance, a striking case is that of Club II in expenditure (% GDP), which experienced a continuous increase in the process of convergence. In contrast, cases like Club III in expenditure (% total), Club II in revenue (% GDP), and Club V in revenue (% total) are notable for their strong drops in the estimation of the log t coefficients over time.

Table no. 6. Typology of countries. Expenditure and revenue

| Country	F/U	Non-central expenditure % GDP	Non-central expenditure % Expenditure	Non-central revenue % GDP	Non-central revenue % Revenue
DK	U	High+	High	High	Med
CA	F	High	High+	High+	High+
SE	U	High	High-Med	High	High-Med
BE	F	High	High-Med	High	High-Med
FI	U	High	High-Med	High	High-Med
CH	F	High-Med	High	High	High
US	F	High-Med	High-Med	High	High-Med
ES	U*	High-Med	High-Med	High	High-Med
AU	F	High-Med	High-Med	High	High
NW	U	High-Med	Med	High-Med	Med
DE	F	High-Med	High-Med	High	High-Med
AT	F	High-Med	Med	Med-Low	Med-Low
PL	U	Med	Med	High-Med	Med
IT	U	Med	Med-Low	Med-Low	Med-Low
NL	U	Med	Med	Low+	Low+
LV	U	Med	Med-Low	High-Med	Med
FR	U	Med	Low+	High-Med	Med
CZ	U	Med	Med-Low	High-Med	Med
UK	U	Med-Low	Low+	Low+	Low+
EE	U	Med-Low	Low+	Low-	Low
SI	U	Med-Low	Low+	Med-Low	Med-Low
SK	U	Med-Low	Low+	Low-	Low
LT	U	Low	Low+	Low	Low
HU	U	Low	Low	Low+	Low+
PT	U	Low	Low	Low+	Med-Low
IL	U	Low	Low+	Low+	Med-Low
LU	U	Low	Low	Low-	Low
NZ	U	Low	Low	Med-Low	Med-Low
EL	U	Low	Low	Low-	Low
IE	U	Low	Low	Low-	Low

Source: authors' elaboration

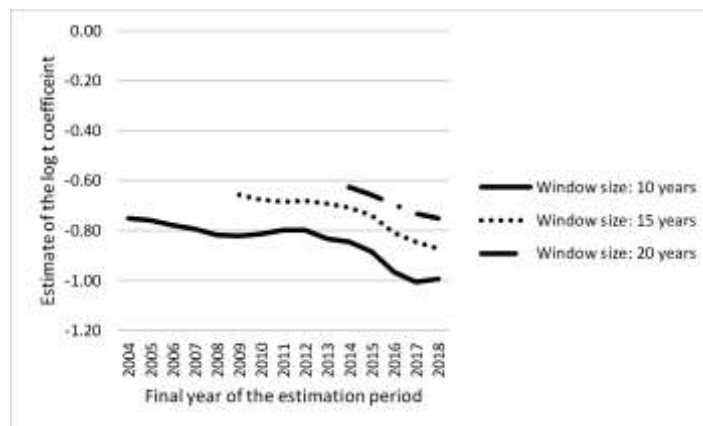*Note:* F: federal. U: unitary. U*: unitary but with three levels of government

1a. Expenditure. % GDP
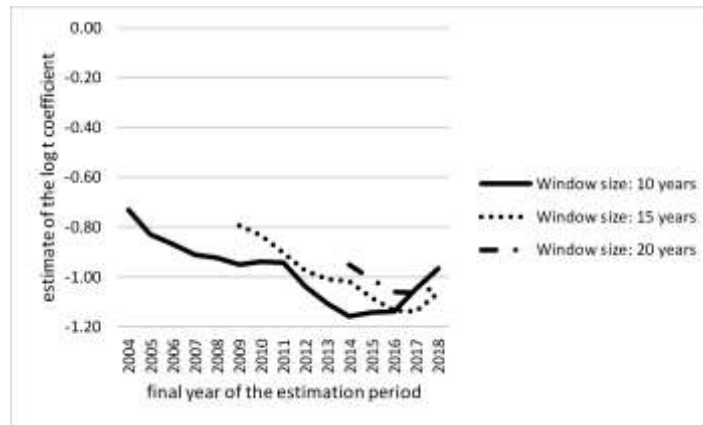
1b. Expenditure. % total
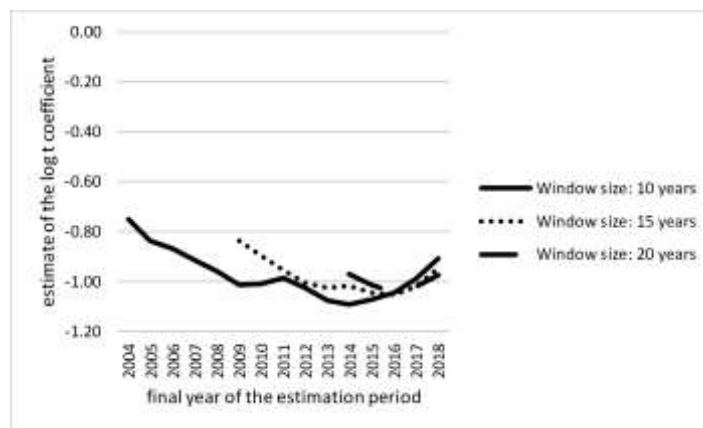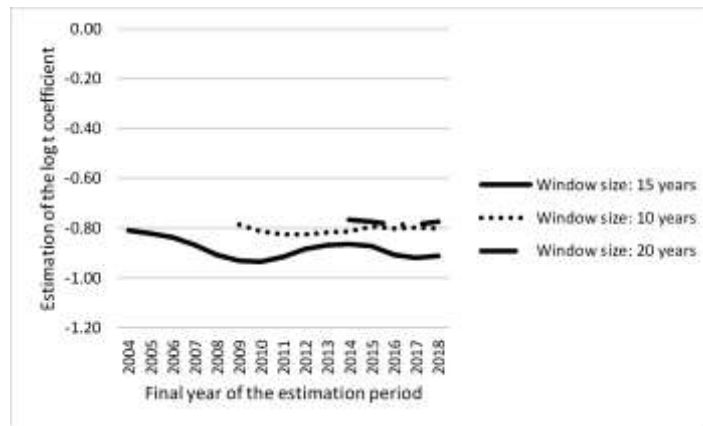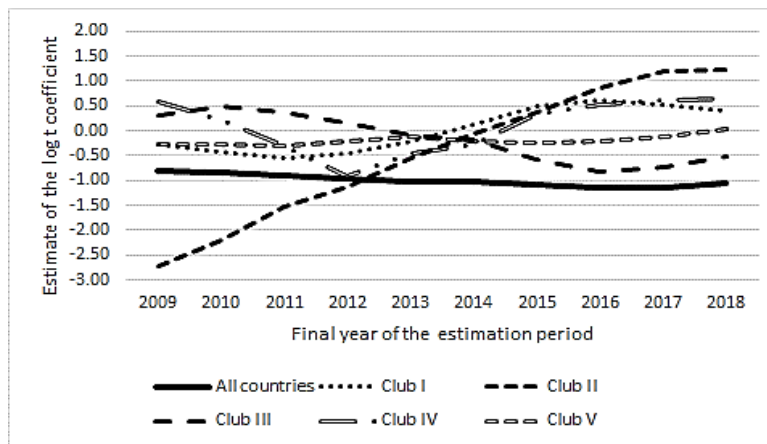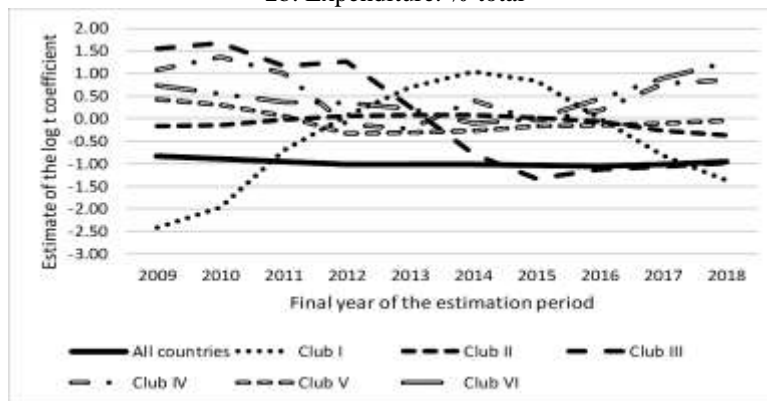

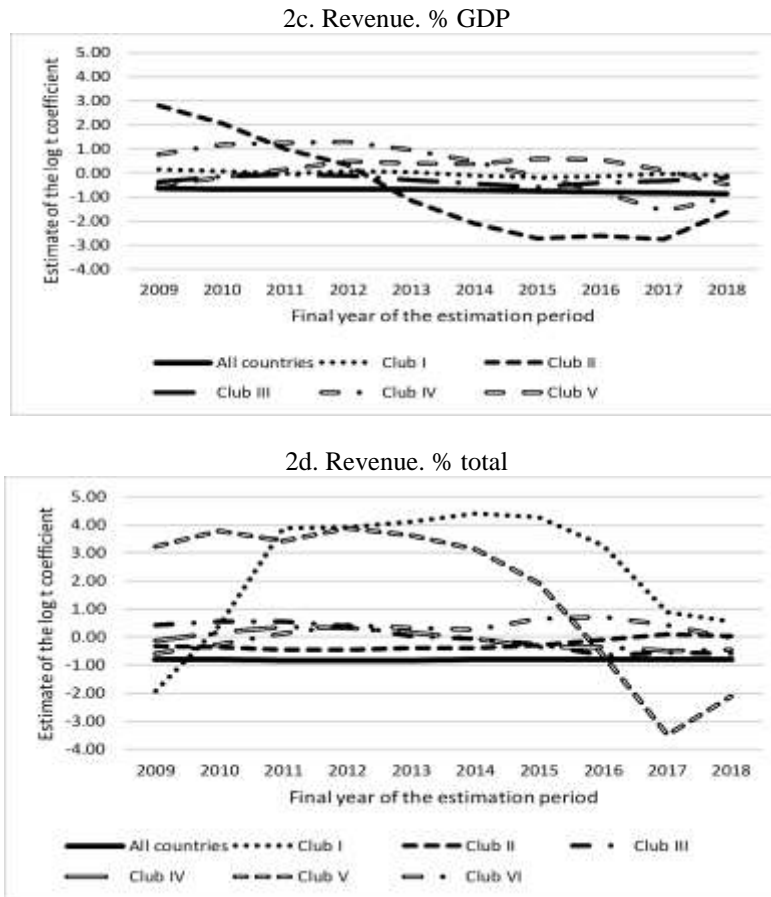1c. Revenue. % GDP

1d. Revenue. % total

Figure no. 1. Rolling window estimate of the log t coefficient. All countries
Source: authors' elaboration

2a. Expenditure. % GDP

2b. Expenditure. % total

2c. Revenue. % GDP

2d. Revenue. % total

Figure no. 2. Rolling window estimate of the log t coefficient (window size: 15 years).
All countries and clubs
Source: authors' elaboration

The effect of the Great Recession

An extension of the log *t* procedure enables the research of how the Great Recession could have modified the convergence process within each club. For this aim, we follow the proposal by Mazzola and Pizzuto (2020) and estimate an augmented version of the log *t* regression model in order to compare the speed of convergence before and after the crisis in 2008:

$$log\ (H_i/H_t) - 2\ log(log(t)) = a_1 D_1 + a_2 D_2 + \gamma_1 D_1\ log(t) + \gamma_2 D_2\ log(t) + u_t \qquad (4)$$

where:

$D_1 = 1$ *if* $t \leq 2008$, *otherwise* $D_1 = 0$

$D_2 = 1$ *if* $t > 2008$, *otherwise* $D_2 = 0$

Tables 7 and 8 report the results of the analysis for expenditure and revenue, respectively.

Table no. 7. The effect of the Great Recession within clubs – Expenditure

7a. % GDP

	$\hat{\gamma}_1$ (pre-crisis)	$t_{\hat{\gamma}_1}$	$\hat{\gamma}_2$ (post-crisis)	$t_{\hat{\gamma}_2}$
Overall	-0.838*	-18.145	-1.195*	-10.667
Club I	-0.425*	-3.014	1.576	2.646
Club II	-2.311*	-17.763	3.284	9.717
Club III	0.938	4.278	-0.111	-0.274
Club IV	-0.359	-0.453	1.785	5.747
Club V	0.302	1.555	0.887	3.606

7b. % total

	$\hat{\gamma}_1$ (pre-crisis)	$t_{\hat{\gamma}_1}$	$\hat{\gamma}_2$ (post-crisis)	$t_{\hat{\gamma}_2}$
Overall	-0.899*	-20.431	-0.969*	-9.351
Club I	-1.673*	-3.522	-2.003	-1.342
Club II	-0.093	-0.816	0.094	0.287
Club III	1.836	1.708	-0.997	-1.246
Club IV	1.680	2.378	2.625	2.268
Club V	0.381	1.119	0.809	4.962
Club VI	1.786	5.441	3.319	5.708

Source: authors' elaboration

Note: *indicates rejection of the null hypothesis at the 5% level.

At the overall level, results suggest the absence of convergence in the pre- and post-crisis periods. Additionally, and except for revenue as percentage of total aggregate, results show a deterioration in the evolution of the speed of convergence when the pre- and post-Great Recession periods are considered.

At the level of clubs, when expenditure is considered (as % GDP and % total), the temporal evolution of the speed of convergence improves in all the clubs, with the sole exception of Club III. However, from the revenue perspective, we observe a greater number of impairments in the speed of convergence of clubs.

Most of these conclusions emerge too from the dynamic analysis of convergence plotted in Figures 1 and 2 and commented on in the previous subsection.

As a conclusion, and at the overall level, the Great Recession increased the disparities, both under the expenditure and revenue approach, but at the same time it seems to have reinforced the process of convergence within clubs under the expenditure perspective.

Table no. 8. The effect of the Great Recession within clubs – Revenue

8a. % GDP

	$\hat{\gamma}_1$ (pre-crisis)	$t_{\hat{\gamma}_1}$	$\hat{\gamma}_2$ (post-crisis)	$t_{\hat{\gamma}_2}$
Overall	-0.665*	-32.861	-0.839*	-12.079
Club I	0.126	1.218	0.640	5.525
Club II	4.993	6.500	-2.349*	-2.385
Club III	-0.347*	-2.222	0.587	0.747
Club IV	1.269	1.117	-1.086	-1.470
Club V	-0.632*	-2.276	-0.137	-0.362

<div align="center">8b. % total</div>

	$\widehat{\gamma}_1$ (pre-crisis)	$t_{\widehat{\gamma}_1}$	$\widehat{\gamma}_2$ (post-crisis)	$t_{\widehat{\gamma}_2}$
Overall	-0.816*	-37.712	-0.704*	-28.669
Club I	2.721	0.830	1.525	0.367
Club II	-0.407*	-8.390	0.914	3.827
Club III	1.206	4.595	-0.291	-1.352
Club IV	0.015	0.053	0.074	0.108
Club V	3.384	1.211	-2.999	-1.103
Club VI	-0.640*	-1.923	0.766	3.268

<div align="center">*Source: authors' elaboration*</div>

Note: *indicates rejection of the null hypothesis at the 5% level.

Conclusions

Fiscal decentralisation, at the expenditure and revenue sides, is a major issue within public economics. In this paper, we focus on the fiscal decentralisation patterns among the OECD countries during the last decades, specifically between 1995 and 2018, including growth phases and the Great Recession. We use a club convergence approach to explore the dynamics of decentralisation of 30 OECD countries, considering expenditure and revenue from non-central -local, and regional or state in some cases- government levels and with two references: the percentage of GDP and the proportion over the total government aggregates.

The results from the club convergence analysis for expenditure and revenue reveal five clubs when the reference is GDP and six clusters when the analysis is done in relation to the total government aggregate, with a divergent country in all cases. These results allow us to establish a typology following the four dimensions analysed. In summary, Denmark and Canada clearly lead the fiscal decentralisation process in the OECD context. Then, a large group also exhibits high degrees of fiscal decentralisation, including Sweden, Belgium, Finland, Switzerland, the United States, Spain, Australia and Germany. Finally, Luxembourg, Greece and Ireland are grouped into the low-decentralisation clubs in all cases. The results evidence some common patterns of federal and unitary countries and the asymmetry of the fiscal decentralisation process between expenditure and revenue (more intense in the first case) with several directions adopted by the countries in the dilemma of decentralisation vs. centralisation (and recentralisation in some cases) across OECD countries.

In addition, the analysis of the dynamics of the convergence among countries of the OECD over time seems to reinforce the conclusion that the Great Recession could cause a divergent impact on expenditure and revenue at the overall level of countries, but, at the same time, the process of convergence within clubs, under the expenditure perspective, has been strengthened.

As an extension of this paper, it would be interesting to analyse the potential effects of COVID-19 on decentralisation processes when data are available, due to the challenge of the pandemic for countries and their responses from different levels of government. In another direction, although partially related, the current global energy crisis, since end-2021, reinforced by the Russian invasion of Ukraine in March 2022, may also have effects on the dynamics of fiscal decentralisation, taking also into account the interactions between decentralisation and green transition (Liu et al., 2022) promoted by the new Next Generation Funds (2021-2027).

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