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Local taxation in the EU: A convergence study

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ABSTRACT:

In this note we study the convergence of local taxation in the EU-15 for 1975-2015 and two sub-periods, 1975-1994 and 1995-2015. Through a sigma convergence analysis, we find evidence of convergence for 1975-2015 and 1995-2015 but divergence for 1975-1994. In a club convergence approach, the countries are clustered into two clubs in the overall sample, while in the sub-periods we identify two and three clubs and divergent countries.

KEYWORDS: local taxation; European Union; sigma convergence; club convergence.

JEL CLASSIFICATION: E62; H20.

Imposición local en la UE: un estudio de convergencia

RESUMEN

En esta nota estudiamos la convergencia de la imposición local en la UE-15 en 1975-2015 y dos subperiodos, 1975-1994 y 1995-2015. Mediante un análisis de sigma convergencia, encontramos evidencia de convergencia para 1975-2015 y 1995-2015 pero divergencia para 1975-1994. En una aproximación de clubs de convergencia, los países son agrupados en dos clubs en el periodo completo, mientras que en los subperiodos identificamos dos y tres clubs respectivamente junto a países divergentes.

PALABRAS CLAVE: Imposición local; Unión Europea; convergencia sigma; club de convergencia.

CLASIFICACIÓN JEL : E62; H20.

1. INTRODUCTION

The analysis of fiscal convergence has received increasing attention in the literature in recent decades, especially in the context of the European Union integration process. We focus on local taxation¹ due to the relevance of the non-central levels of government in most EU countries, where non-central revenue represented an (unweighted) average of 17.45% of total tax revenue for the EU-15 in 2015. And specifically for the local level, this average was 4.70% in 2015, with a minimum of 0.60% in Ireland and

¹ The local taxation in the EU relies both on income & profits and property, with two models clearly differentiated. For example, in 2015, the taxes on income & profits represented the 97.6% of total local tax revenues in Sweden, concretely on individuals, whereas in Luxembourg the 90.3% of the income & profits taxation relies on corporates. The cases of Finland and Denmark are similar to Sweden, with shares of 92.6% and 88.7% respectively. On the other extreme, the property tax represented the 100% of total local taxation in the United Kingdom. Ireland, with 91.4%, and Greece, with 93.8%, have also property-based local tax systems.

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a maximum of 15.80% in Sweden. In addition, the local taxation represented the 11.21% of the total tax revenue, again with great differences across countries, between the 2.40% of Ireland and the 36.40% of Sweden.

Due to data availability and the length required for time series analysis, we study local taxation in the EU-15 for the period 1975-2015. To the best of our knowledge, this is the first attempt to study tax convergence at the local level of government, with previous studies on tax convergence in the EU having focused on the central government tax burden or its components² (Table 1).

The paper is organized as follows. Section 2 describes the methodology and data. The main results are presented in Section 3. Section 4 contains the conclusions.

TABLE 1.
Papers on tax convergence in EU

Paper	Data	Approach	Results
Esteve, Sosvilla-Rivero and Tamarit (2000)	EU-15 1967-1994	Sigma and time series	Catch-up to Germany for several countries
Delgado (2009)	Tax burden (total and three main components) EU-15 1965-2005	Beta, sigma and gamma	Convergence due to taxation on goods and services
Delgado and Presno (2011)	Tax burden EU-15 1965-2004	Time series	United Kingdom and Germany long-run convergence; few countries converge
Regis, Cuestas and Chen (2015)	Corporate tax (statutory rates) EU-19 (1980-2014) and 25 (1993-2014)	Club	Four clubs
Delgado and Presno (2017)	Tax burden, tax mix (total and five components) EU-15 1975-2011	Club	Sigma convergence Several clubs in each component

Source: Own elaboration.

² Bertarelli, Censolo and Colombo (2014) study convergence of total revenue.

2. METHODOLOGY AND DATA

Sigma convergence

This is based on the evolution of the dispersion of the tax indicator, using the coefficient of variation (CV):

$$CV_t = \frac{\left(\frac{1}{N} \sum_{i=1}^N (y_{it} - \bar{y}_t)^2\right)^{1/2}}{\bar{y}_t} \quad (1)$$

where y_{it} is the tax value in the country i ($i=1, \dots, N$) in year t ($t=1, \dots, T$); and \bar{y}_t is average tax in year t .

In addition, we compute the annual rate of sigma convergence and we test the (unconditional) sigma convergence hypothesis by estimating:

$$CV_t = \alpha' + \beta' t + \varepsilon_t \quad (2)$$

where $\beta < 0$ denotes σ -convergence and $\beta > 0$ σ -divergence.

Club convergence

Phillips and Sul (2007) propose the *logt* test in order to analyze convergence in panel data.

Panel data are traditionally decomposed as:

$$y_{it} = g_{it} + a_{it} \quad (3)$$

where g_{it} and a_{it} represent systematic components (such as permanent common components) and transitory components respectively. In order to separate common components from idiosyncratic components, (3) can be transformed in the following dynamic model:

$$y_{it} = \left(\frac{g_{it} + a_{it}}{\mu_t}\right) \mu_t = \delta_{it} \mu_t \quad (4)$$

where μ_t (or *common growth component*) is a common component which captures some deterministic or stochastically trending behavior. δ_{it} (or *transition parameter*) is a time varying factor-loading coefficient which measures the idiosyncratic distance between μ_t and y_{it} .

In estimating δ_{it} , Phillips and Sul (2007) focus on the relative transition path:

$$h_{it} = \frac{y_{it}}{N^{-1} \sum_{i=1}^N y_{it}} = \frac{\delta_{it}}{N^{-1} \sum_{i=1}^N \delta_{it}} \quad (5)$$

which traces out an individual transition path over time for economy i in relation to the panel average, where the common growth path is removed.

The *logt* test is based on the time series regression model:

$$\log\left(\frac{H_1}{H_t}\right) - 2 \log(\log(t)) = c + b \log(t) + \varepsilon_t \quad (6)$$

where $t = [rT], [rT]+1, \dots, T$, for some fraction $r > 0$ normally in the range $[0.2, 0.3]$, and $[rT]$ is the integer part of rT . Specifically, it is suggested to set $r=0.3$ for small/moderate sample size ($T \leq 50$). On the other hand, H_t is the variance of the relative transition coefficients in period t :

$$H_t = N^{-1} \sum_{i=1}^N (h_{it} - 1)^2 \quad (7)$$

Under convergence, $h_{it} \xrightarrow{p} 1$ for all i as $t \rightarrow \infty$, and H_t converges to zero asymptotically. Also, b converges in probability to the scaled speed of the convergence parameter 2α . Thus, the null hypothesis of convergence is tested by a one-sided t test of $\alpha \geq 0$ (using the estimate \hat{b} and HAC standard errors), and is rejected at the 5% significance level if $t_{\hat{b}} < 1.65$.

When the null is rejected, Phillips and Sul (2007) propose a four-step clustering algorithm (based on the iterative application of the *logt* test) which allows the endogenous identification of all possible subgroups or clubs which converge in the panel. Phillips and Sul (2009) state that their initial algorithm tends to over-estimate the number of clubs, and propose merging them into larger clubs using the *logt* convergence test.

Not only is the sign of b of interest, but also its magnitude since this measures the speed of convergence. $0 \leq \hat{b} < 2$ ($0 \leq \hat{\alpha} < 1$) implies convergence in a relative sense, indicating that differentials tend to decrease over time within each club (convergence in growth rates), and $\hat{b} \geq 2$ ($\hat{\alpha} \geq 1$) indicates absolute convergence within the panel to a club-specific tax burden level over the period (convergence in levels).

Data

We study local taxation in EU-15 from two perspectives: the percentages of GDP (%GDP) and of total tax revenue (%Revenue). The data are from the OECD³ and for the period 1975-2015. Table 2 contains the descriptive statistics and the Annex incorporates the data for all countries in 1975, 1995 and 2015.

TABLE 2.
Descriptive statistics

	%GDP			%Revenue		
	1975	1995	2015	1975	1995	2015
Mean	3.53	4.11	4.70	10.06	9.87	11.21
St. Dev.	3.63	4.58	4.55	9.50	9.64	9.95
Min.	0.0	0.3	0.6	0.0	0.9	2.4
Max.	11.4	14.6	15.8	30.0	31.3	36.4

Source: OECD and own elaboration.

3. RESULTS

Sigma convergence

The results for σ -convergence are summarized in Table 3 and represented in Figure 1 (including the test). For local taxation both as a percentage of GDP and of total revenue, the results confirm the existence of σ -convergence in the overall period. However, we can differentiate two sub-periods, with 1995 as the turning point. Note that in 1993 the euro convergence (Maastricht) criteria were approved with the consequent effects on taxes and public expenditures, with 1996 as the target to satisfy the criteria. The annual rate of convergence for 1975-2015 is -0.17% for %GDP and -0.15% for %Revenue. However, if we look at 1975-1994, the conclusion is σ -divergence, with annual rates of 0.36% and 0.17% respectively. σ -convergence occurs in 1995-2015, with annual rates of -0.66% and -0.45% respectively⁴. These

³ Concretely, data have been extracted at the OECD Fiscal Decentralization Database, available at: <http://www.oecd.org/tax/fiscal-decentralisation-database.htm>

⁴ Local tax convergence in the EU may be the result of several forces: i) the decision on the role of the local public sector in the economy –see Lago-Peñas, Martínez-Vázquez and Sacchi (2016) for a recent survey on decentralization and Blanco, Delgado and Presno (2019) for a study on convergence of fiscal decentralization in the EU-; ii) tax competition and tax mimicry among local

relatively high annual rates of sigma convergence in the second period support the conclusion of a strong approximation of the burden derived from the local taxation in the EU.

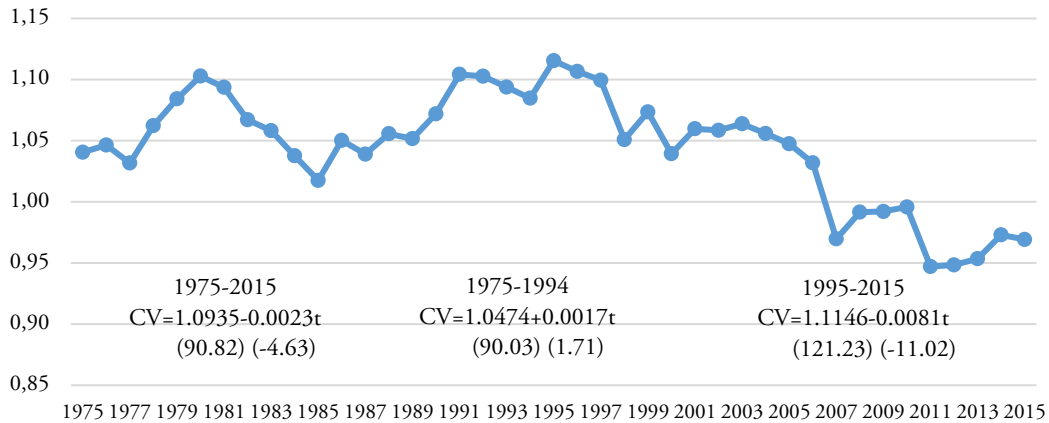
TABLE 3.
 σ -convergence

	%GDP	%Revenue
CV1975	1.0406	0.9438
CV2015	0.9692	0.8876
Annual rate (%) of convergence(-)/divergence(+)		
1975-2015	-0.17	-0.15
1975-1994	0.36	0.17
1995-2015	-0.66	-0.45

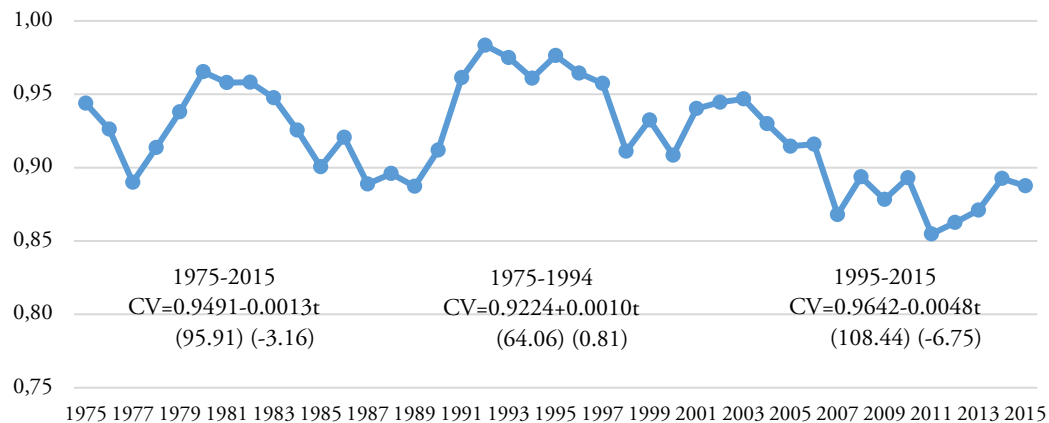
Source: Own elaboration.

FIGURE 1.
 σ -convergence

a) %GDP



b) % Revenue



Source: Own elaboration.

governments; iii) the integration process in general. The outcome is almost certainly due to a combination of at least these three factors.

Club convergence

The results of the club convergence analysis are reported in Table 4 (initial, merged and transition). We analyze convergence for the 1975-2015 period and two sub-periods considering 1995 as a turning year based on the σ -convergence results. In all cases the *logt* test leads to rejection of the hypothesis of overall convergence at the 5% significance level: countries did not converge to the same steady state equilibrium in terms of local taxation.

For 1975-2015, two clubs are identified for %GDP and two plus a divergent country (Sweden) for %Revenue. Club 1 includes high local taxation countries. Meanwhile, Sweden presents an increasing share of local taxation, 36.4% in 2015, far from Denmark with 26.9%. In all the cases the convergence is relative, with high speed of convergence (0.628) in club 2 of low taxation. As stated above, this relative convergence implies that the differentials tend to decrease over time within each club, but countries are not converging to the same tax burden level. The clubs cannot be merged in this period.

In 1975-1994, with the %GDP approach, three clubs are formed, plus two divergent countries, and the merging process only move one of these countries (Greece) to a club. It should be noted the absolute convergence in club 1, formed by Sweden and Denmark, with the highest local taxation, and a speed of convergence of 1.016. This result implies that Sweden and Denmark are converging in levels of local taxation. The analysis of %Revenue also reveals two clubs –with relative convergence derived from low speeds of convergence- plus five divergent countries, reduced to three with the merging step.

In the period 1995-2015, in both cases the initial four clubs are merged into two, characterized by high and low local taxation, with two divergent countries which are then reduced to one, Sweden. The clubs are similar to the achieved for the overall period.

The average relative transition curve for each club is represented in Figure 2.

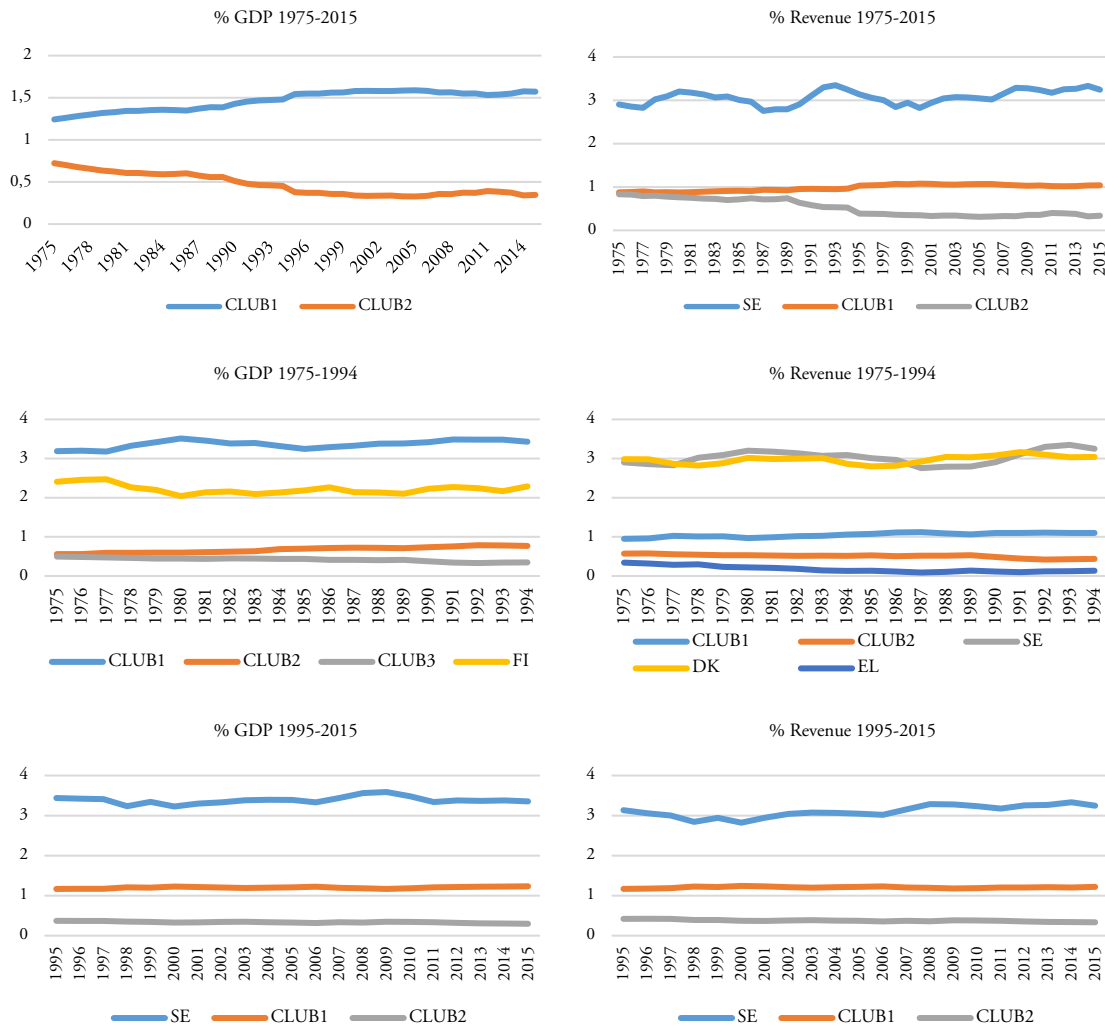
In addition, the clustering procedure allows us to study evidence of convergence between neighboring members of different clubs (Table 4, last columns). Following Phillips and Sul (2009), we performed this test by running the *logt* test including 50% of the lowest local taxation members (in terms of %GDP or %Revenue) in the upper club together with 50% of the highest local taxation members of the lower local taxation club. Except for %GDP in 1975-2015, in all cases the findings indicate strong evidence of transitioning across clusters (in particular, conditional convergence). These groups can be understood as being in a state of transition, with some countries showing a tendency towards a higher or lower club, joining the new club in the future.

TABLE 4.
Club convergence

Club	Countries-Initial	$t_{\hat{\beta}}$	$\hat{\beta}$	$\hat{\alpha}$	Club	Countries-Merged	$t_{\hat{\beta}}$	$\hat{\beta}$	$\hat{\alpha}$	Transition-between-clubs	$t_{\hat{\beta}}$	$\hat{\beta}$
1975-2015												
%GDP	Full sample	-4.521*	-0.381	-0.190	(Same)					Club 1_(FR-ES-PT-NL) + Club 2_(DE-BE-UK)	-6.397*	-0.775
Club_1	SE-DK-FI-IT-FR-ES-PT-NL	2.739	0.119	0.058								
Club_2	AT-BE-DE-IE-EL-LU-UK	1.235	0.288	0.144						Club 1_(DE-PT-BE-NL-IE) + Club 2_(UK-EL)	1.728	0.410
%Rev	Full sample	-5.524*	-0.490	-0.245								
Club_1	DK-FI-IT-FR-ES-DE-PT-BE-NL-IE	1.803	0.137	0.068								
Club_2	UK-EL-LU-AT	2.498	1.357	0.628	Divergence	SE						
Divergence	SE											
1975-1994												
%GDP	Full sample	-17.351*	-0.775	-0.387	Club_1	SE-DK	1.779	2.033	1.016	Club 1_(DK) + Club 2_(AT-FR)	-13.010*	-0.626
Club_1	SE-DK	1.779	2.033	1.016								
Club_2	AT-FR-ES-PT	2.213	0.173	0.086								
Club_3	LU-BE-IT-DE-UK-NL-IE	0.889	0.211	0.105	Club_3	LU-BE-IT-DE-UK-NL-IE-EL	-0.188	-0.039	-	Club 2_(ES-PT) + Club 3_(DE-LU-BE-IT)	1.764	0.756
Divergence	FI-EL			0.019								
%Rev	Full sample	-10.648*	-0.740	-0.370	Club_1	AT-FR-ES-PT-FI	0.138	0.005	0.002	Club 1_(ES-PT) + Club 2_(DE-LU-IT-BE)	0.627	0.250
Club_1	AT-FR-ES-PT	3.604	0.386	0.193								
Club_2	LU-IT-DE-BE-UK-IE	0.774	0.258	0.129	Club_2	LU-IT-DE-BE-UK-IE-NL	0.614	0.181	0.090			
Divergence	SE-DK-FI-NL-EL											
1995-2015												
%GDP	Full sample	-12.976*	-0.485	-0.242	Club_1	DK-FI-IT-FR-ES-DE-EL-PT	-0.957	-0.072	-	Club 1_(ES-DE-PT-EL) + Club 2_(BE-UK-NL)	0.894	0.202
Club_1	DK-FI-IT-FR	3.390	0.368	0.184								
Club_2	ES-DE-EL	2.234	1.200	0.600	Club_2	NL-AT-LU-IE-BE-UK	-0.793	-0.158	-			
Club_3	NL-AT-LU-IE	2.676	0.791	0.395								
Club_4	BE-UK	-0.931	-0.142	-0.071	Divergence	SE						
Divergence	SE-PT											
%Rev	Full sample	-18.742*	-0.539	-0.269	Club_1	DK-FI-IT-FR-ES-DE-EL-PT	-0.176	-0.014	-	Club 1_(ES-DE-PT-EL) + Club 2_(BE-UK-NL)	0.111	0.019
Club_1	DK-FI-IT-FR	2.839	0.247	0.123								
Club_2	ES-DE-EL	2.177	1.024	0.512	Club_2	UK-BE-IE-NL-LU-AT	0.761	0.190	0.095			
Club_3	UK-BE-IE	0.544	0.213	0.106								
Club_4	NL-LU-AT	6.163	1.704	0.852	Divergence	SE						
Divergence	SE-PT											

Source: Own elaboration. * Indicates rejection of the null hypothesis of convergence at the 5% level. Note: Abbreviations: AT:Austria, BE:Belgium, DK:Denmark, DE:Germany, IE:Ireland, EL:Greece, ES:Spain, FR:France, IT:Italy, LU:Luxembourg, NL:Netherlands, PT:Portugal, FI:Finland, SE:Sweden, UK:United Kingdom.

FIGURE 2.
Average relative transition curves. Merged



Source: Own elaboration.

4. CONCLUDING REMARKS

We have studied convergence of local taxation as a percentage of GDP and total tax revenue in the EU-15 for the period 1975-2015. We find evidence of σ -convergence for the period as a whole, with an annual rate of convergence of 0.17% for local taxation as a percentage of GDP and 0.15% as a percentage of total revenue. However, we can distinguish two differentiated patterns: σ -divergence in 1975-1994, with annual rates of 0.36% and 0.17%, and σ -convergence in 1995-2015, with annual rates of 0.66% and 0.45%. Regarding club convergence, we find two clubs in 1975-2015, but the analysis of the two sub-periods reveals different results. After the merging procedure of the initial clubs, for local taxation as a percentage of GDP three and two clubs (plus divergent countries) are formed in each sub-period respectively. For local taxation as a percentage of total tax revenue, the results indicate two clubs with several divergent countries.

In terms of fiscal federalism and concretely fiscal decentralization, these results support the assumption of different views of the role of the public sector, and specifically the local level, in the economy. In addition, the data exhibit the resistance of the central (and regional) levels of government to move tax capacity to the local level, shifting the local taxes from 10.06% to 11.21% of total tax revenue between 1975 and 2015, and with two differentiated models of local taxation, based on taxes on income and profits (the Nordic case) or on property (UK, Ireland and Greece).

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ANNEX – DATA

TABLE A.1.
Local taxation as %GDP and %Total Tax Revenue in EU 1975, 1995 and 2015

	%GDP			%Revenue		
	1975	1995	2015	1975	1995	2015
Austria	4.5	1.7	1.3	12.4	4.1	3.1
Belgium	1.7	2.0	2.2	4.4	4.8	4.8
Denmark	11.1	14.6	12.5	30.0	31.3	26.9
Finland	8.5	9.9	10.5	23.5	22.3	23.8
France	2.6	4.6	6.0	7.6	11.0	13.3
Germany	3.1	2.7	3.1	9.0	7.4	8.3
Greece	0.6	0.3	1.4	3.4	0.9	3.8
Ireland	2.0	0.8	0.6	7.3	2.7	2.4
Italy	0.2	2.1	7.0	0.9	5.4	16.2
Luxembourg	2.1	2.3	1.3	6.7	6.5	3.5
Netherlands	0.4	1.2	1.4	1.2	3.1	3.7
Portugal	0.0	1.6	2.5	0.0	5.4	7.3
Spain	0.8	2.7	3.3	4.3	8.5	9.8
Sweden	11.4	14.1	15.8	29.2	30.9	36.4
United Kingdom	3.8	1.1	1.6	11.1	3.7	4.9

Source: OECD.

