CONVERGENCE IN SOCIAL PROTECTION ACROSS EU COUNTRIES, 1970-1999

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ABSTRACT

This paper examines the degree of convergence in social protection registered in the European Union during the 1970-99 period. To that end, we use Eurostat data and study the long-run properties of the data set using time series analysis. Our results indicate that there is no evidence of long-run convergence in Social Protection expenditure to GDP ratios. However, we do find evidence of catching-up with respect both to Germany and the EU average for all countries belonging to EU12, except for Greece.

JEL Codes: F42, H53, O52.
Key words: Social Protection Expenditure, Convergence, European Union.

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I   Introduction

The issue of social policy coordination has regularly been present in the agenda of the European Union (EU), although it has never been granted the high profile that economic policy coordination has enjoyed. One powerful reason for such interest has been to ease higher labour mobility across countries, since the safety net system is considered to be an important disincentive to job mobility (see e.g. OECD, 1990). Also the idea of a social Europe has been present since the founding Treaties were signed. On the other hand, member states have always claimed that social policies that involve enormous economic resources are not to be harmonised given the present real economic differences among countries, leaving aside other arguments about the proper jurisdictional level from which to conduct social policy altogether.

Yet, beyond actual moves towards social policy coordination at a EU scale, every country looks, more or less informally, at each other as a reference. One could thus wonder whether, given global resources (for instance GDP), converging population structures, lifestyles or welfare programmes would progressively lead towards similar standards in benefits relative to those resources (i.e. the benefits-to-GDP ratio).

This paper examines the degree of convergence in social protection across the EU countries. To that end, we apply time-series unit root-based tests to Eurostat social protection data covering the 1970-99 period. The rest of the paper is organised as follows. In Section II we present the basic data and trends on social protection ratios and in Section III we outline the econometric methodology. Section IV reports the empirical results, while some concluding remarks are offered in Section V.

II   Trends in social protection ratios across the EU

Data on social protection for EU countries have been available from 1970 onwards through the ESSPROS system for most of the current EU-15 member states since the mid-1980s.[1] In this study we use data concerning the ratio of social protection expenditure to GDP for the EU-12 countries through the period 1970-99. Data for the period 1970-79 for Spain, Greece, Portugal and Italy were lacking in the ESSPROS data base and had to be derived from national figures on social transfers projecting backwards regression results between social transfers and social protection figures computed for the period 1980-99. This procedure allowed us to complete our data set for EU-12.

It can be seen in Figures 1.a and 1.b that social protection expenditures have followed similar patterns in every country with certain exceptions however. For most of the countries social expenditure has been growing even as a percentage of their GDP despite general stabilisation in the period from 1983 to 1989

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[1] In the ESSPROS classification system, up to 8 different expenditure functions are included: Sickness/healthcare, Disability, Old age, Survivors, Family/children, Unemployment, Housing and Social exclusion. See Eurostat (1996) for further detail as for the precise definitions and Eurosat (2001) for complete data on expenditure and receipts.

and a marked decrease in many countries since around 1995. For the six member states out of EU-12 that had the highest expenditure ratios in 1999, there has been a narrowing of expenditure ratios around 28% of GDP in 1999 up from around 20% 30 years ago (Figure 1.a). In what concerns the six other countries with the lowest expenditure ratios, there has been some more variability across time but ratios in 1999 varied around 22% while, in 1970, they where located around 12% with a larger variation (Figure 1.b).

Figure 1.a. Social protection expenditure over GDP in EU-12 (in %) 1970-99
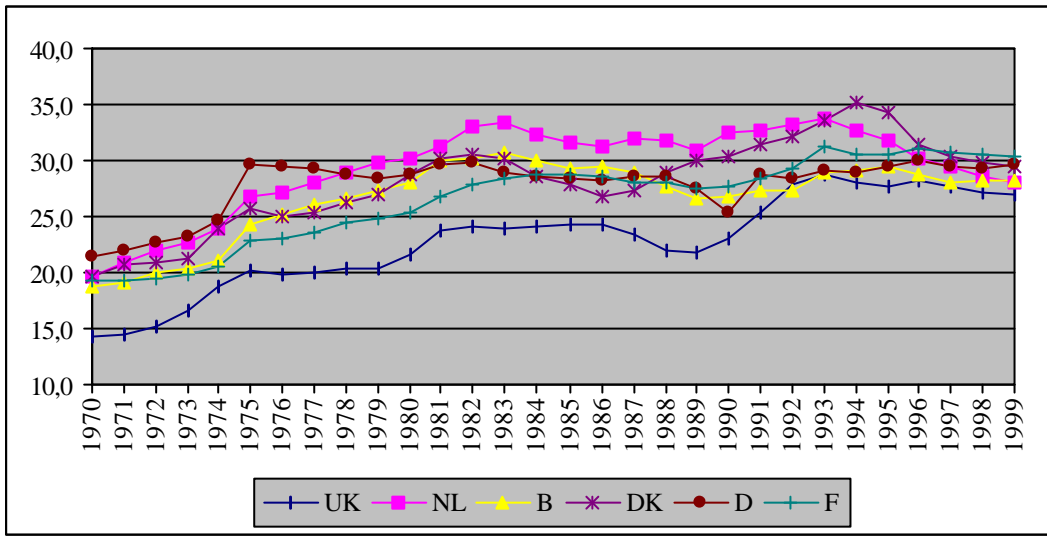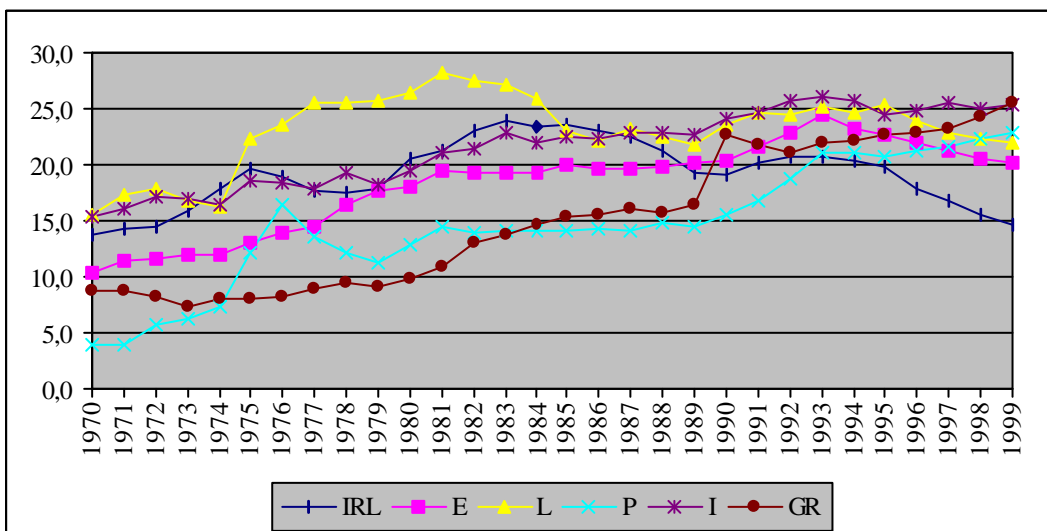   *Countries with high social protection ratios (as of 1999)*

Figure 1.b Social protection expenditure over GDP in EU-12 (in %) 1970-99
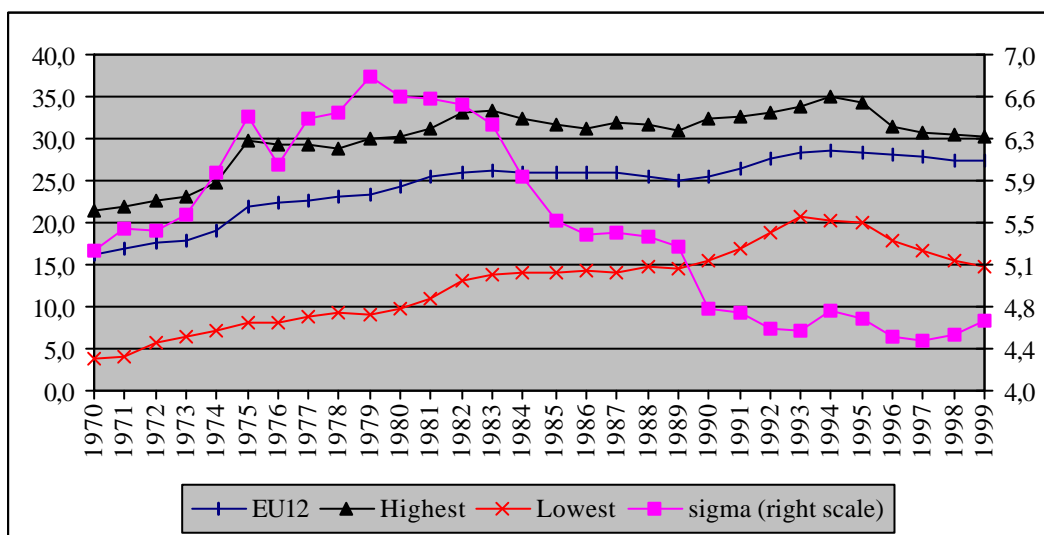   *Countries with low social protection ratios (as of 1999)*

On average (EU-12, Figure 1.c), social protection expenditure rose from 16.3% of GDP in 1970 to 27.5% in 1999 although, as already mentioned, the ratio decreased in the second half of the 1980s and 1990s when GDP was growing rather fast.

Simply computing the standard deviation of the distribution of social protection ratios for the different countries year by year (renamed *sigma* in Figure 1.c) one observes that, in general, dispersion was increasing though the 1970s, dramatically diminishing though the 1980s and oscillating downwards in the 1990s. As a raw measure of general convergence in social protection expenditure, thus, the standard deviation tells us a mixed story.

Shown also in Figure 1.c are the highest and lowest ratios for every year in the period. As one could expect, the series depicted do not correspond to any single country all through the years, as can be seen in Figures 1.a and 1.b. These patterns however tell us clearly that the EU-12 (weighted) average has been dominated by the evolution of social protection expenditure in the countries with higher ratios all though the period due to their larger size.

Figure 1.c Social protection expenditure over GDP in EU-12 (in %) 1970-99
      Summary indicators

III   Time-series convergence

Consider two countries *A* and *B*, and denote their Social Protection Benefits (SPB) to GDP ratios as respectively sp^A and sp^B. How are these series evolving along time with respect to each other? Following Bernard and Durlauf (1995 and 1996) and Oxley and Greasley (1995), we can distinguish between *catching-up* and *long-run convergence*.

Catching-up implies that the difference between the two series $\left(sp^A - sp^B \right)$ is a stochastic variable with a non zero mean, suggesting that the deviation between the series, even if expected to decrease, would not disappear. Formally, assuming two dates, *t* and *t+T*, and that $sp_t^A > sp_t^B$ the definition of catching-up implies that

(1) $E\left\{ sp_{t+T}^A - sp_{t+t}^B \mid I_t \right\} < sp_t^A - sp_t^B$

where I_t denotes all the information available at t. Therefore, a stochastic trend in the difference between the two time series would violate the definition (1), although the presence of a deterministic trend, in itself, would not. A sufficient condition for catching-up would be the existence of stochastic cointegration between both variables. Note that this concept of "weak convergence" or "catching-up" could be appropriate in our context, since convergence in SPB/GDP ratios could be an ongoing process.

Conversely, long-run convergence is a more demanding level of convergence, since it implies both the absence of a unit root in the difference between the series sp^A and sp^B and a time trend in the deterministic process (i. e., the absence of both stochastic and deterministic trend). Long-run convergence can be formally defined as follows:

$$(2) \qquad \lim_{t \to \infty} E\left\{ sp^A_{t+T} - sp^B_{t+T} \mid I_t \right\} = 0$$

In this case, a sufficient condition for convergence would imply both stochastic and deterministic cointegration between the two series.

As can be seen, statistical tests of catching-up and long-run convergence hinge on the time-series properties of $\left(sp^A_t - sp^B_t \right)$. These properties are characterised by the order of integration of the deviation from their deterministic paths (Nelson and Plosser, 1982). To that end, we make use of the widely used Augmented Dickey Fuller tests (see Said and Dickey, 1984):

$$(3) \qquad \Delta(sp^A_t - sp^B_t) = \boldsymbol{m} + \boldsymbol{a} \quad (sp^A_{t-1} - sp^B_{t-1}) + \boldsymbol{b}t + \sum_{i=1}^{k} c_i \Delta(sp^A_{t-i} - sp^B_{t-i}) + \boldsymbol{e}_t$$

Three cases may arise:

i)   if the difference $\left(sp^A_t - sp^B_t \right)$ is not stationary, that would mean that there is no convergence and the SPB/GDP ratios in the two countries will diverge,

ii)   if the difference is stationary, there would be long-run convergence, and

iii) if the difference is stationary around a trend, it would imply catching-up.

In addition, we consider the existence of a structural break over the period when testing for a unit root.

Following Perron (1989, 1997), we allow for the possibility of a one-time structural change in the trend function occurring at time T_b. Three situations are considered: a change in the intercept, a change in both the intercept and the slope, and a change in the slope. Regarding the transition to the new trend path, and following Perron (1989), two models are evaluated: the "additive outlier model" (AOM) and the "innovational outlier model" (IOM). While the AOM specifies that the change to the new trend function occurs instantaneously (with no further effect on future observations), in the IOM that change takes place gradually (feeding back into the process dynamics).

In the case of the IOM, the unit-root test is performed using the *t*-statistic for testing $\boldsymbol{a} = 1$ in the following regressions:

$$(4) \qquad \text{IOM-1:} \ sp^A_t - sp^B_t = \boldsymbol{m} + \boldsymbol{b}t + \boldsymbol{q}\, DU_t + \boldsymbol{d}\, D(T_b)_t + \boldsymbol{a}(sp^A_{t-1} - sp^B_{t-1}) + \sum_{i=1}^{k} c_i \Delta(sp^A_{t-i} - sp^B_{t-i}) + \boldsymbol{e}_t$$

$$sp_t^A - sp_t^B = \boldsymbol{m} + \boldsymbol{b}\,t + \boldsymbol{q}\quad DU_t + \boldsymbol{g}\quad DT_t + \boldsymbol{d}\,D\;(T_b) +$$

(5)   IOM-2:

$$+\boldsymbol{a}(sp_{t-1}^A - sp_{t-1}^B) + \sum_{i=1}^{k} c_i\,\Delta(sp_{t-i}^A - sp_{t-i}^B) + \boldsymbol{e}_t$$

(6)   IOM-3: $sp_t^A - sp_t^B = \boldsymbol{m} + \boldsymbol{b}\,t + \boldsymbol{g}DT_t + \boldsymbol{a}(sp_{t-1}^A - sp_{t-1}^B) + \sum_{i=1}^{k} c_i\Delta(sp_{t-i}^A - sp_{t-i}^B) + \boldsymbol{e}_t$

where $D(T_b)_t = 1$ if $t = T_b + 1$ (0 otherwise); $DU_t = 1$ if $t > T_b$ (0 otherwise); and $DT_t = (t - T_b)$ if $t > T_b$ (0 otherwise). In equation (4) we allow for a one-time change in the intercept of the trend function, while in equation (5) we allow for both a change in the intercept and in the slope of the trend function, whereas in equation (6) there is a change in the slope of the trend function.

Regarding the AOM, the following two-step procedure is used. First, the series is detrended using the following regressions:

(7)   AOM-1: $sp_t^A - sp_t^B = \boldsymbol{m} + \boldsymbol{b}t + \boldsymbol{q}DU_t + (s\tilde{p}_t^A - s\tilde{p}_t^B)$

(8)   AOM-2: $sp_t^A - sp_t^B = \boldsymbol{m} + \boldsymbol{b}\,t + \boldsymbol{q}\,DU_t + \boldsymbol{g}\,DT_t + (s\tilde{p}_t^A - s\tilde{p}_t^B)$

(9)   AOM-3: $sp_t^A - sp_t^B = \boldsymbol{m} + \boldsymbol{b}\,t + \boldsymbol{g}DT_t + (s\tilde{p}_t^A - s\tilde{p}_t^B)$

where $(s\tilde{p}_t^A - s\tilde{p}_t^B)$ is accordingly defined as the detrended series. As can be seen, in equation (7) we allow for a one-time change in the intercept of the trend function, in equation (8) we allow for both the change in the intercept and the slope of the trend function to take place simultaneously, and in equation (9) we allow for a change only in the slope of the trend function.

For models IOM-1 and IOM-2, the test is then performed using the t-statistic for testing $\boldsymbol{a} = 1$ in the regression:

(10) $s\tilde{p}_t^A - s\tilde{p}_t^B = \boldsymbol{a}\left(s\tilde{p}_{t-1}^A - s\tilde{p}_t^B\right) + \sum_{j=0}^{k} d_j D(T_b)_{t-j} + \sum_{i=1}^{k} c_i\left(s\tilde{p}_t^A - s\tilde{p}_t^B\right) + \boldsymbol{e}_t$

while for model IOM-3, the second step is of the form:

(11) $s\tilde{p}_t^A - s\tilde{p}_t^B = \boldsymbol{a}\left(s\tilde{p}_{t-1}^A - s\tilde{p}_t^B\right) + \sum_{i=1}^{k} c_i\Delta\left(s\tilde{p}_{t-i}^A - s\tilde{p}_{t-i}^B\right) + \boldsymbol{e}_t$

Note that in regressions (4) to (11), the break date (T_b) and the truncation lag (k) are treated as unknown. Therefore, to carry out the test procedure, we need to consider a method to choose T_b and k. In order to select the break date endogenously, we consider the procedure whereby T_b is selected as the value, for all possible break points, which minimises the test statistic for testing $\alpha = 1$ in the appropriate autocorrelation specification (see Zivot and Andrews, 1992). Regarding the truncation lag parameter (k), we use a general-to-specific recursive approach based on the value of the t-statistic on the coefficient associated with the last lag in the estimated autocorrelation (see Perron, 1989).[2]

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[2] That is, start with a large k_{max} and then estimate the model with k_{max} lags. If the coefficient of the last included lag is significant at the 10% level, select $k = k_{max}$. Otherwise, reduce the order of lags by one until the coefficient on the last included lag is significant.

IV   Has there been time series convergence in social protection expenditure in the EU?

As mentioned above, in this paper we have used harmonised data on social protection benefits (SP) and Gross Domestic Product (GDP) collected by EUROSTAT. We then look at the SP/GDP ratio. Our sample covers the period 1970-99 (the latest available), and the countries under study are the EU-12 countries (i.e. Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain and the United Kingdom) that formed the Union before the last enlargement.

Given the central role of Germany in the European Union (see, e.g. Bajo-Rubio et al., 2001), to test for unit roots we apply the Augmented Dickey-Fuller tests to the difference of Social Protection/GDP ratios with respect to Germany. In Table 1 the statistics are reported for the levels and first differences, where the lag length (k) is optimally chosen using the sequential procedure suggested by Perron (1989), with the maximum lag length (k_{max}) set to 5.[3] As one can see, for all the series the null hypothesis of a unit root cannot be rejected at conventional significance level. These results suggest that there has not been (long-run or strong) convergence between these countries and Germany.

Table 1. Augmented Dickey-Fuller unit root tests [a,b,c]
        Difference of Social Protection/GDP ratios with respect to Germany (1970-1999)

Variable	I(2) vs. I(1)			I(1) vs. I(0)		
	τ_τ (1)	τ_μ (2)	τ (3)	τ_τ (1)	τ_μ (2)	τ (3)
Belgium	-3.98[*]	-3.96[**]	-4.01[**]	-1.53	-1.62	-1.60
Denmark	-3.60[*]	-3.61[*]	-3.65[**]	-2.20	-1.59	-1.60
France	-3.64[*]	-3.72[**]	-3.69[**]	-2.32	-0.90	-1.17
Greece	-4.14[*]	-3.92[**]	-3.80[**]	-3.11	-0.33	-0.86
Ireland	-3.82[*]	-3.40[*]	-3.11[**]	-0.59	-0.40	0.77
Italy	-3.60[*]	-3.58[*]	-3.63[**]	-2.39	-1.09	-0.68
Luxembourg	-3.80[*]	-3.71[**]	-3.75[**]	-1.66	-1.73	-0.20
Netherlands	-3.69[*]	-3.21[*]	-3.29[**]	-0.18	-1.19	-1.05
Portugal	-5.73[**]	-5.70[**]	-4.78[**]	-2.51	-0.32	-1.41
Spain	-3.59[*]	-3.58[*]	-3.64[**]	-2.47	-1.53	-0.64
UK	-4.33[*]	-4.44[**]	-4.49[**]	-2.74	-1.38	-1.25

Notes:
a.   The optimum lag length is selected as suggested by Perron (1989).
b.   (1), (2) and (3) denote the Augmented Dickey-Fuller statistics with an intercept and trend, with an intercept, and without an intercept, respectively.
c.   * and ** denote significance at the 5% and 1% levels, respectively, using Mackinnon's (1991) extended tabulations of critical values.

Next, the test by Perron (1997) and Vogelsang and Perron (1994) is applied to the difference of Social Protection/GDP ratio between these countries and Germany. This test allows us to distinguish between series that are I(1) and series that are stationary around a trend with a structural change. In the former case there will not be convergence, while in the latter case we will find catching-up or weak convergence.

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[3] Test results remain qualitatively the same when the maximum lag length k_{max} is set to 10. They are not reported to economise on space.

After visual inspection of the data, it was decided to apply the following models to each country: Innovational Outlier Model 2 (IOM-2) (i.e. a gradual change in both the intercept and the slope of the trend function) for Belgium, France, Greece, Ireland, Italy, Spain and the United Kingdom; Additive Outlier Model 2 (AOM-2) (i.e. an instantaneous change in both the intercept and the slope of the trend function) for Denmark and the Netherlands; and Additive Outlier Model 3 (AOM-3) (i.e. a change in the slope of the trend function without any sudden change in the level at the time of the break) for Luxembourg and Portugal.

Table 2. Perron unit root test ^{a,b}
    Difference in Social Protection/GDP ratio with respect to Germany (1970-1999)

Country-model	Break date T_b	Truncation lag k	Pre-break slope $\hat{b}$	Intercept change $\hat{q}$	$\hat{g}$ [c]	$\hat{a}$ [d]	$t_{\hat{a}}$ [d]
Belgium IOM-2	1981	4	1.02 (5.31)	18.04 (6.05)	-1.23 (-5.68)	-0.56	-.6.17***
Denmark AOM-2	1987	5	0.14 (2.74)	0.73 (2.65)		-0.25	-5.25**
France IOM-2	1990	4	0.48 (5.92)	12.47 (4.44)	-0.58 (-5.05)	0.04	-6.41***
Greece IOM-2	1989	4	0.92 (5.96)	22.36 (4.22)	-0.87 (-3.51)	-0.12	-4.07
Ireland IOM-2	1988	4	0.35 (5.04)	25.56 (6.86)	-1.22 (-7.04)	-0.15	-6.98**
Italy IOM-2	1988	4	0.52 (5.50)	17.74 (4.92)	-0.76 (-4.66)	-0.15	-5.97**
Luxembourg AOM-3	1985	4	0.19 (2.84)		-0.63 (-2.83)	0.12	-5.41**
Netherlands AOM-2	1986	5	0.39 (5.52)	17.18 (6.37)		0.07	-5.89***
Portugal AOM-3	1985	0	0.20 (4.19)		0.41 (4.69)	0.05	-5.01***
Spain IOM-2	1990	4	0.65 (7.29)	28.44 (6.90)	-1.21 (-7.28)	-0.27	-6.49***
UK IOM-2	1988	4	0.42 (4.70)	6.87 (2.34)		-1.24	-5.51**

Notes:

a.   *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively (see Perron 1994).

b.   t-ratios in parentheses.

c.   Estimate of the change in the slope of the trend function in models IOM-2 and AOM-3. For model IOM-1, it is the estimate of the change in the intercept of the trend function.

d.   Estimated parameters related to the estimate of the sum of the autoregressive coefficient $\left(\hat{a}\right)$ and its associated *t*-statistics of the above estimates for testing $a = 1$ ($t_{\hat{a}}$).

Table 2 presents the empirical results of these tests for each country with the corresponding model of the selected trend function. Columns 1 and 2 give, respectively, the date of break in the trend function and the value of the truncation lag parameter k in the autoregression. Columns 3, 4 and 5 present key estimated parameters of the autoregressions along with their *t*-statistics in parentheses: $\hat{b}$ is the estimate of the initial (pre-break) slope of the trend function, $\hat{q}$ is the estimate of the change in the intercept of

the trend function in the case of models IOM-2 and AOM-2, and $\hat{g}$ is the estimate of the change in the slope of the trend function in models IOM-2, AOM-2 and AOM-3. Columns 6 and 7 present the key estimated parameters related to the estimate of the sum of the autoregressive coefficient ($\hat{a}$) and its associated *t*-statistics for testing $a=1$ ($t_{\hat{a}}$).

As can be seen in Table 2, we reject the null hypothesis of the unit root for all countries considered, except for Greece. Therefore, we find evidence of weak convergence or catching-up with respect to Germany for 10 of our 11 countries.

It should be noted that the break date for most countries tends to lie around 1988 to 1990, with few exceptions. In 1990, German reunification took place just before the deep recession of the early 1990s. Regarding the exceptions social protection ratios in Belgium and Luxembourg started to catch-up with that of Germany after having been well above it until, respectively, 1981 and 1985. In Portugal, however, this catching-up process started in 1985, just before its accession to the EU, from a much lower position.

Since the time-series version of catching-up captures a version of cross-sectional test of convergence (see Oxley and Greasley, 1995), our results are in line with those presented in Alonso *et al.* (1998), where the traditional indicators (*b*-convergence and *s*-convergence) suggest a certain degree of convergence in social protection benefits for a panel of 11 EU countries during the 1966-94 period.

As a further test, we also consider the difference of Social Protection/GDP ratios with respect to the EU average. In Table 3, we report the results from the Augmented Dickey-Fuller tests. As shown, for all the series the null hypothesis of a unit root cannot be rejected at conventional significance level. These results suggest that there has not been (long-run or strong) convergence between these countries and the EU average.

Table 3. Augmented Dickey-Fuller unit root tests [a,b,c]
Difference of Social Protection/GDP ratios with respect to EU-12 average (1970-1999)

Variable	I(2) vs. I(1)			I(1) vs. I(0)		
	τ_τ (1)	τ_μ (2)	τ (3)	τ_τ (1)	τ_μ (2)	τ (3)
Belgium	-4.25*	-3.97**	-4.05**	-1.66	-1.30	-0.72
Denmark	-4.08*	-4.00**	-4.09**	-2.81	-2.51	-1.05
France	-4.50**	-4.60**	-4.46**	-2.29	-1.08	0.09
Germany	-4.09*	-4.18**	-4.21**	-2.19	-1.09	-0.95
Greece	-4.21*	-3.76**	-3.69**	-2.80	-0.31	-0.81
Ireland	-3.66*	-3.23*	-3.11**	-0.89	-1.06	-0.94
Italy	-3.60*	-3.27*	-3.33**	-2.08	-1.60	-0.53
Luxembourg	-3.64*	-3.35*	-3.33**	-1.83	-0.89	-0.35
Netherlands	-3.88*	-3.46*	-3.42**	0.14	-0.25	-0.56
Portugal	-5.56**	-5.57**	-5.10**	-2.31	-1.13	-1.45
Spain	-3.86*	-3.43*	-3.19*	-2.22	-1.90	-0.35
U.K.	-3.71*	-3.34*	-3.25**	-2.28	-1.63	-1.26

Notes:

a. The optimum lag length is selected as suggested by Perron (1989).

b. (1), (2) and (3) denote the Augmented Dickey-Fuller statistics with an intercept and trend, with an intercept, and without an intercept, respectively.

c. * and ** denote significance at the 5% and 1% levels, respectively, using Mackinnon's (1991) extended tabulations of critical values.

Visual inspection of the differences of Social Protection/GDP ratio between individual countries and the EU average suggest applying the following models to each country: Innovational Outlier Model 1 (IOM-1) (i. e., a gradual change in the intercept of the trend function) for France, Ireland and Italy; Innovational Outlier Model 2 (IOM-2) (i.e. a gradual change in both the intercept and the slope of the trend function) for Belgium, Denmark, Germany, Greece, Netherlands, Portugal and Spain; and Additive Outlier Model 3 (AOM-3) (i.e. a change in the slope of the trend function without any sudden change in the level at the time of the break) for Luxembourg and the United Kingdom. In Table 4 we present the empirical results obtained when applying the tests proposed by Perron (1997) and Vogelsang and Perron (1994). It must be noted that, for model IOM-1, $\hat{g}$ is now the estimate of the change in the intercept of the trend function.

Table 4. Perron unit root test [a,b]

Difference in Social Protection/GDP ratio with respect to the EU-12 average (1970-1999)

Country Model	Break date T_b	Truncation lag k	Pre-break slope $\hat{b}$	Intercept change $\hat{q}$	$\hat{g}$ [c]	$\hat{a}$ [d]	$t_{\hat{a}}$ [d]
Belgium IOM-2	1995	4	0.61 (2.81)	-14.60 (-2.81)		0.57	-5.37[**]
Denmark IOM-2	1992	5	0.08 (2.77)	18.26 (3.99)	-0.61 (-3.72)	-0.83	-5.61[***]
France IOM-1	1989	3	0.13 (3.11)	-1.11 (-3.13)		0.13	-4.81[**]
Germany IOM-2	1990	4	-0.34 (-6.09)	-13.02 (-4.80)	0.55 (5.14)	-0.14	-5.51[***]
Greece IOM-2	1989	0	0.12 (4.38)	-8.66 (3.66)	0.31 (3.41)	0.84	-2.39
Ireland IOM-1	1992	2	-0.09 (2.95)	-4.49 (6.22)		0.56	-4.87[**]
Italy IOM-1	1991	3	0.17 (4.74)	-1.71 (-3.16)		0.46	-4.71[**]
Luxembourg AOM-3	1977	4	0.63 (4.15)		-0.95 (-5.36)	0.11	-4.09[**]
Netherlands IOM-2	1990	5	0.30 (3.79)	14.90 (3.22)	-0.73 (-3.64)	-0.21	-5.94[***]
Portugal IOM-2	1985	5	-0.49 (-6.95)	-29.31 (-10.26)	1.70 (10.61)	-1.34	-9.77[***]
Spain IOM-2	1990	4	0.34 (6.19)	20.43 (5.95)	-0.83 (-6.15)	-0.69	-6.28[***]
UK AOM-3	1988	4	0.06 (2.49)		0.16 (2.40)	-0.23	-4.95[**]

Notes:

a. *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively (see Perron 1994).

b. t-ratios in parentheses.

c. Estimate of the change in the slope of the trend function in models IOM-2 and AOM-3. For model IOM-1, it is the estimate of the change in the intercept of the trend function.

d. Estimated parameters related to the estimate of the sum of the autoregressive coefficient ($\hat{a}$) and its associated *t*-statistics of the above estimates for testing $a = 1$ ($t_{\hat{a}}$).

As shown, we reject the null hypothesis of the unit root for all countries considered, except for Greece. Therefore, we find evidence of weak convergence or catching-up with respect to the EU-12 average for 11 of our 12 countries.

As before, the break date for most countries with respect to the EU-12 average tends to lie around the date of German reunification, although with a wider country variation than in the case where the German social protection ratio was chosen as the benchmark. As a matter of fact, the German and the EU-12 social protection ratios virtually converged in 1990.

V   Concluding remarks

This paper has examined the degree of convergence in social protection registered in the EU during the 1970-99 period. To that end, we study the long-run properties of time series of social protection benefits, applying unit root tests that allow for endogenously determined changes in the deterministic trends to data from Eurostat for the 12 member countries that formed the European Union before the enlargement to Austria, Finland and Sweden.

Our results suggest that there is no evidence of long-run or strong convergence (neither with respect to Germany nor with respect to the EU12 average) in Social Protection expenditure to GDP ratios that would imply equalisation of the latter. However we do find evidence of catching-up or weak convergence with respect to both Germany (as a benchmark) and the EU-12 average for all countries, except Greece.

These results, in turn, suggest that some countries have been carrying out a stronger effort as far as social protection is concerned, resulting in their situation converging with that of other countries where social protection expenditure has been much more significant all through the period. This effort can contribute to facilitate factor mobility within Europe and, as we have argued elsewhere, may have implications for the speed of growth in member states and the EU at large (Herce, Sosvilla-Rivero and de Lucio, 2000 and 2001).

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