Convergence Analysis in Social Protection Expenditure in the European Union

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Abstract

Socio-economic convergence is usually discussed by keeping in mind the harmonisation of income level across countries. This analysis is typically limited to national macroeconomic indicators. This paper adapts theoretical fundamentals and uses methods of socio-economic convergence evaluation to analyse social protection expenditures in EU countries. We have attempted to verify the hypothesis of reduction of differences in social protection expenditure over the period 1993–2000 for two chosen variables: per capita social protection expenditure and total social protection expenditure as a share of GDP.

We use two different approaches to find an answer to this. The first method tests for the presence of *?-convergence* using data which provide an overall measure of changes in dispersion. The second method tests the presence of absolute and conditional *?-convergence* in the same variables. Both methods confirm generally the presence of statistically significant convergence over the periods examined.

Journal of Economic Literature Classification numbers: F42, H53, O52

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1. Introduction

Social protection expenditure in the EU increased in 1993-2000 in connection with the expanding needs for and rise in the level of social protection. Average social protection expenditure in EU in 1993 were 25.4% of GDP, in 2000 27.3%. Social protection expenditure per capita in the same period increased from 4600 PPS to 6148 PPS[1] (The Social, 2002), whereas the amount and change rate of the expenditure vary considerably from country to country.

According to the economic theory of convergence, the economic development level of less developed countries should approach the level of more advanced countries with the same economic resources or fundamentals. Accordingly, estimates of social protection expenditure in EU countries indicate faster development of countries with lower level of social protection in recent years. Many reforms accomplished there have helped to raise the social protection level in less developed countries. A comparison of social protection expenditure and evaluation of changes there should also characterise the social convergence process between EU countries. This chapter seeks to evaluate and verify the presence or non-presence of convergence in social protection in EU countries and find which have been the most significant conditional factors that have influenced this process.

The paper examines the degree of convergence in social protection across EU countries. We have used two principal methods of convergence evaluation for analysing this problem. The first method tests for the presence of *?-convergence* using data over the period 1993–2000. This method provides an overall measure of change in dispersion for two chosen variables: total social protection expenditure as a share of GDP and per capita social protection expenditure. The second method tests for the presence of absolute and conditional *?-convergence* in the same variables but also includes initial level of

social protection expenditure as an explanatory variable in the derivation of a log linear regression model.

This chapter is organised as follows. In section 2, we present the theoretical concepts and econometric models of the assessment of convergence. In the next section, we present the basic data and trends of social protection expenditure. Section 4 reports the empirical results of *?-convergence* and *?-convergence* in social protection expenditure. In the end, there are some concluding remarks offered.

2. Methods and Data

Socio-economic convergence is mainly discussed in the context and on the basis of two main economic growth theories: neo-classical (Solow, 1956; Barro and Sala-i-Martin, 1992) and endogenous (Grossman and Helpman, 1994; Baldwin, 1992)[2]. But both approaches lead to the same three principal measures of convergence (Quah, 1996; Sala-i-Martin, 1996): *?-convergence*, absolute *?-convergence* and conditional *?-convergence*.

One of the simplest methods for estimating socio-economic convergence is calculation of *s-convergence*, which is based on standard deviation. With this method, it is possible to examine how the dispersion between national income levels (or other indicators) has changed, or how the differences of indicators inside groups of countries are changing compared to the average (Streissler, 1979; Barro, 1984; Baumol, 1986; Dorwick and Nguyen, 1989; Barro and Sala-i-Martin, 1991, 1992a, 1992b). A reduction of the standard deviation of indicators indicates a reduction of the difference or the presence of *s-convergence*.

The test for the presence of *?-convergence* (Barro, 1984; Baumol, 1986; DeLong, 1988; Barro and Sala-i-Martin, 1991, 1992a, 1992b; Sala-i-Martin, 1994; Boyle and McCarthy, 1997) posits that *?-convergence* exists if a poor economy tends to grow at a faster rate than a rich one so that the poor country tends to catch up in terms of per capita income or product.

The literature makes distinction between absolute (unconditional) and conditional *?-convergence*. Absolute *?-convergence* pertains to the coefficient *?* of the bivariate equation. This is based on the assumption that all countries in the sample converge to the same steady state. Conditional *?-convergence* pertains to the coefficient *?* of the socio-economic level variable in an equation that includes additional explanatory variables reflecting differences across

countries, which direct each economy to converge to its own steady state. In both cases, the convergence hypothesis is that the growth rate of a socio-economic indicator will be negatively related to the level of this indicator.

Technically, *?-convergence* exists if the rate of growth of output is negatively correlated with the level of per capita income in a regression model. Although it is generally assumed that a precondition for *s-convergence* to work is the presence of *ß-convergence*, several authors (for example, Sala-i-Martin, 1996) state that *?-convergence* is a necessary but not sufficient condition for *?-convergence*.

Barro and Sala-i-Martin (1991, 1992) and Sala-i-Martin (1996) show that absolute convergence of income in the United States has occurred from 1840 to 1980, with the rate of *?-convergence* estimated to be around 2 percent per year. As a rule, most other researchers have found similar results for the speed of convergence as they have adopted the particular estimation procedures used by Barro and Sala-i-Martin.

We used the following equation to estimate absolute *?-convergence*:

$$(1/T)\ln(Y_{iT}/Y_{i0}) = ?_0 + ?_1 \ln(Y_{i0}), \quad (1)$$

where the left-hand side is the average annual growth rate of social protection expenditure in country *i* from year *0* to year *T*. The condition for *?-convergence* is the test that $?_1 < 0$.

That is, the lower the initial level of social protection expenditure, the higher the growth rate, or poor countries grow faster than rich ones and as a consequence, social protection expenditure inevitably converge. However, $?_1 < 0$ does not necessarily guarantee that the variance of dependent variable is lower at the end of the period than at the beginning.

For estimation of the rate (speed) of convergence we used the following equation:

$$(1/T)\ln(Y_{iT}/Y_{i0}) = ?_0 - [(1-e^{(-?T)})/T]\ln Y_{i0}, \quad (2)$$

where $?$ is the rate (speed) of convergence and the rate of convergence grows with parameter $?$.

Conditional *?-convergence* recognises that different countries may have different steady states so that at any given level of capital per worker, the marginal product will differ between countries. Arena *et al.* (2000) has emphasised that evidence of conditional *?-convergence* of real regional GDP per capita does not imply that real

regional income will converge on the same value, but, rather that there will be convergence to different steady state levels of real income.

Conditional *?-convergence* is equivalent to sustained differences in the levels of regional real income per head. The very rapid rates of income convergence that were found arise, at least in part, from the regions having fairly similar levels of income per head. According to Barro and Sala-i-Martin (1991), the more diverse initial levels of regional incomes and the longer sample period are the reasons for the slower estimated income convergence. Cho (1994, 1996) and Easterly (2001) argue that the control variables used to hold the steady state level of income constant are endogenous to the level of income. Cho argues that once the simultaneity bias is eliminated, conditional convergence does not hold[3].

Tests for conditional *?-convergence* attempt to hold constant the steady state by adding variables to equation (1), so the specification of the test for convergence changes from version of equation (1) and includes additional explanatory variables:

$$(1/T)ln(Y_{iT}/Y_{i0}) = ?_0 + ?_1 ln(Y_{i0}) + ?X_i \,, \qquad (3)$$

where X_i is a vector of variables that controls for the additional characteristics affecting the steady state and $?$ is a coefficient vector. The test for convergence is a test that $?_1 < 0$.

For estimation of conditional *?-convergence* to take account of both the temporal pattern of convergence and the cross-sectional variety of the EU countries, we use at the example of Nixon (1999) the following equation:

$$ln(Y_{i,t}/Y_{i,t-1}) = ?_0 + ?_i D_i + (?_1 + ?_i D_i)\, ln(Y_{i,t-1}) + ?X_{i,\,t-1} \,, \qquad (4)$$

where $X_{i,\,t-1}$ is a vector of variables that hold constant the steady state,
D_i is a set of dummy 1 or 0 variables for each country i=1…15,
$?_i$ is a shift parameter and
$?_i$ is a slope parameter.

In this equation, the statistical significance of the country-specific parameters allow for diversity in the steady state and in the speed of convergence. We choose this method as opposed to analysis of time series tendency for convergence across EU countries because of the short time series of the study.

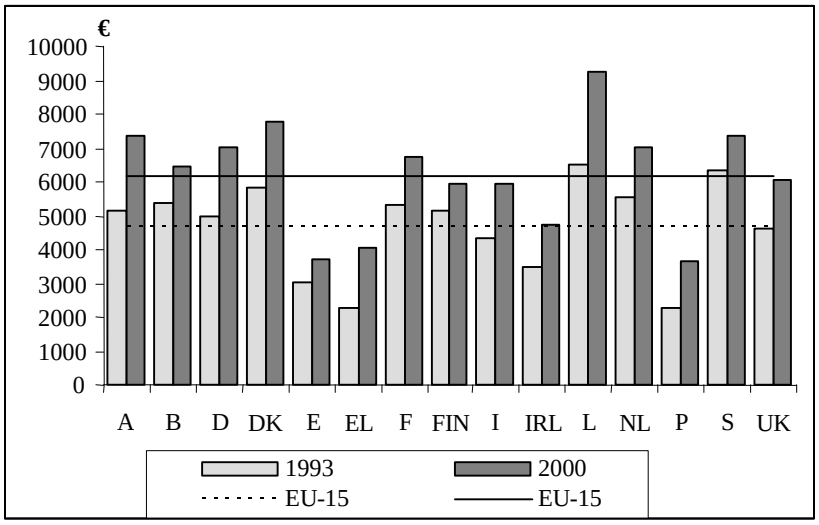
We assess the social protection level in EU countries with the help of several indicators. The share of social protection expenditure in gross domestic product (GDP) gives us the most general idea. Another indicator used is social expenditure per capita, which is in

order to reduce the influence of price differences between countries expressed on the basis of purchasing power parity (PPS). To evaluate social protection level, we also use indicators that characterise proportions between individual functions of social protection. Changes in the structure of social protection financing at the main contributor level as a possible convergence evaluation indicator have been thoroughly studied by Hagfors (1999, 2000), and they are therefore not discussed here. In this paper, convergence of social protection expenditure has been studied using the two first-mentioned indicators. We have analysed presence of convergence in four major functions of social protection: old age and survivors, sickness/health care and disability, family/children, unemployment. We have used harmonised data of social protection expenditure and GDP collected by Eurostat and European Commission. Our sample covers the period of 1993–2000 and the countries under study are the EU 15 member states.

3. Background

In 2000, social protection expenditure as a percentage of GDP remained stable in EU-15 at the level of 27.3%. The trend in this ratio was irregular in the period 1990–2000. A substantial growth was registered between 1990–1993 (the ratio increased by 3.5 percentage points), primarily as a result of a slow-down in GDP growth and a rise in unemployment benefits (Abramovici, 2002). The biggest growth in this period was in Finland (9.1 percentage points). Between 1993–1996, expenditure on social protection as a percentage of GDP showed a slight downward trend, due partly to an upturn in GDP and partly to a slow-down in the growth of social protection expenditure (largely a result of a drop in unemployment benefits). In 1997, social protection expenditure started to diminish slowly (by 2000, 1.4 percentage points compared to 1996). The fall in the share of expenditure in GDP between 1996 and 2000 was most obvious in Finland (?6.9 points), in Ireland and Denmark (?4.8 points). The biggest decline has been in countries with larger social protection expenditure and the biggest growth in countries with smaller expenditure, with the exception of Ireland where the level of social protection expenditure in GDP has been the lowest among EU member states since 1993 and is still falling. The strong growth of GDP in recent years largely explains the fall in the ratio in Ireland.

Figure 1. Social Protection Expenditure Per Capita at PPS, Constant Prices in the Years 1993 and 2000 in EU



Social protection expenditure per capita (PPS, constant prices) in EU-15 increased on the average 4.1% per year over the period 1990-1993, with the biggest growth in Portugal and United Kingdom. Only in Greece both the share of social protection expenditure in GDP and social protection expenditure per capita diminished in this period. In the period 1993–1996, the average growth slowed down to 1.6% per year in EU-15. In Portugal and UK, the real rate of growth fell sharply compared with the previous period (by 4.3% and 1.6% respectively per year). In Spain, the Netherlands and Sweden per capita expenditure actually fell in real terms. The biggest growth in real expenditure was in Denmark, Germany and Ireland, though in the latter the share of social protection expenditure in GDP started to decline in 1995. The growth rate in EU-15 between 1995 and 2000 was similar ? 1.7% per year. The rates increased in all countries except in Finland and Denmark. The biggest growth was in Greece (6.9% per year) and Portugal (5.8% per year).

The gaps between countries are generally related to disparate levels of wealth and reflect differences in institutional structure of the social protection systems, demographic change, unemployment rates and economic factors.

Social protection systems cover the same functions in all EU countries. Social protection generally embraces 8 functions: sickness/health care, disability, old age, survivors, family/children,

unemployment, housing and social exclusion not elsewhere classified. For this analysis, we merge the spheres that fulfil principally similar functions and discuss them as follows: old age and survivors, sickness/health care and disability, family/children, and unemployment. Expenditures on these spheres account for over 95% of all expenditures (the largest part not covered in analysis in the Netherlands ? 7.3% and the smallest in Italy – 0.2%). The proportions of the spheres vary across countries, over time and are influenced by different growth rates of expenditure compared to the EU average.

The bulk of social protection expenditures in all countries are expenditures on old-age and survivor's pensions, which accounted on average for 46.4% of total expenditure in EU-15 in 2000 and have increased on average by 2.5 percentage points since 1993. Much different from other countries are Italy, where this expenditure accounted for 63.4% in 2000, and Ireland where the expenditure accounted only for 25.4% of total expenditure. The contributory factor to these differences includes the high percentage of population aged 65 or over in Italy (18.2%) and the relatively low retirement age (60 years for women) compared to other countries. In Ireland, however, the population is the youngest in Europe (those aged 65 and over account for only 11.2%) and the retirement age is one of the highest in Europe (66 years). With the growing old-age dependency rate (those aged 65 years or more accounted on average for 14.5% of the population in EU in 1990 and 16.3% in 2000), several countries are reforming their retirement systems. The effects of these reforms will be evident in the future and are not discussed here.

Another major sphere of social protection expenditure in all countries is sickness/health care and disability. The sickness/health care functions together showed a more moderate growth rate than the average increase in total per capita expenditure. The share of health expenditure in total expenditure has remained on the same level as in 1993 – approximately 35%.

Expenditures on unemployment (growth 48% and rise of share in total expenditure 2.4 percentage points) increased sharply in 1990–1993 and started to fall again in 1996 (share in total expenditure dropped from 8.1% to 6.3% in the period 1996–2000). There are notable differences across countries in this function, with the smallest expenditure in Italy and Luxembourg, the highest in Spain, Belgium, Finland and the United Kingdom. The fall of expenditures on unemployment was determined in part by a gradual improvement in the economic situation and in part by reforms in the compensation system in some countries, limiting the duration of payment of benefits

and changing the conditions of eligibility for such benefits.

Average expenditures on the children/family function as a percentage of total expenditure in EU-15 went up from 7.7% in 1993 to 8.2% in 2000. This growth was marked in 1996 when Germany introduced reforms and extended the family benefit system. The child benefits have grown nearly twofold in Luxembourg, France and Denmark. However, there are still great differences in child benefit rates and also in expenditures on child benefits across countries.

4. Empirical Results

4.1. Sigma-convergence

A simple method for evaluation of convergence is calculation of *s-convergence* based on standard deviation. A reduction of the standard deviation of indicators indicates a reduction of differences or presence of *s-convergence*. We evaluate social *s*-convergence between EU countries using both social protection expenditure per capita at PPS (Table 1) and share of social protection expenditure in GDP (Table 2). In order to assess *s-convergence*, we take the EU average level as the basis for comparison and find the level of each EU country compared to the average over the period of analysis.

Table 1. Evidence of ? -Convergence of Social Protection Expenditure Per Capita at PPS in EU, 1993–2000

	1993	1994	1995	1996	1997	1998	1999	2000
Arithmetical mean ($\bar{x}$)	1.004	1.014	1.015	1.006	1.006	1.004	1.009	1.008
Standard deviation (s)	0.287	0.289	0.286	0.284	0.270	0.265	0.264	0.259
Variation coef. ($s/\bar{x}$)	0.286	0.285	0.282	0.282	0.269	0.264	0.261	0.257
Max ratio to EU-15	1.400	1.402	1.444	1.438	1.424	1.416	1.479	1.500
Min ratio to EU-15	0.490	0.504	0.521	0.523	0.548	0.578	0.593	0.597

This analysis indicates that the standard deviation (indicator of *s-convergence*) of social protection expenditure per capita decreased in the years 1993–2000 (from 0.286 to 0.259), but there is no evidence of

s-convergence in income since 1997 (Rajasalu, 2001). Earlier studies on social protection expenditures demonstrated (Sosvilla-Rivero, 2003) that they increased most in rich countries in EU in the period 1985–1995, and started to decline after 1995. The growth of social protection expenditures in poor countries continued. The ratio of maximum and minimum expenditure to EU average as depicted in Table 1 indicates that both the maximum and minimum indicator has increased compared to EU average: the growth of the maximum indicator in ratio to EU average from 1.400 to 1.500 and the growth of the minimum indicator from 0.490 to 0.597. In order to take into consideration the impact of price changes in different countries, we evaluate *s-convergence* of social protection expenditure also on the basis of constant prices. Calculations at constant prices (Püss and Viies, 2002) confirmed the occurrence of social convergence (indicator of *s-convergence* from 0.322 in 1995 to 0.270 in 1999).

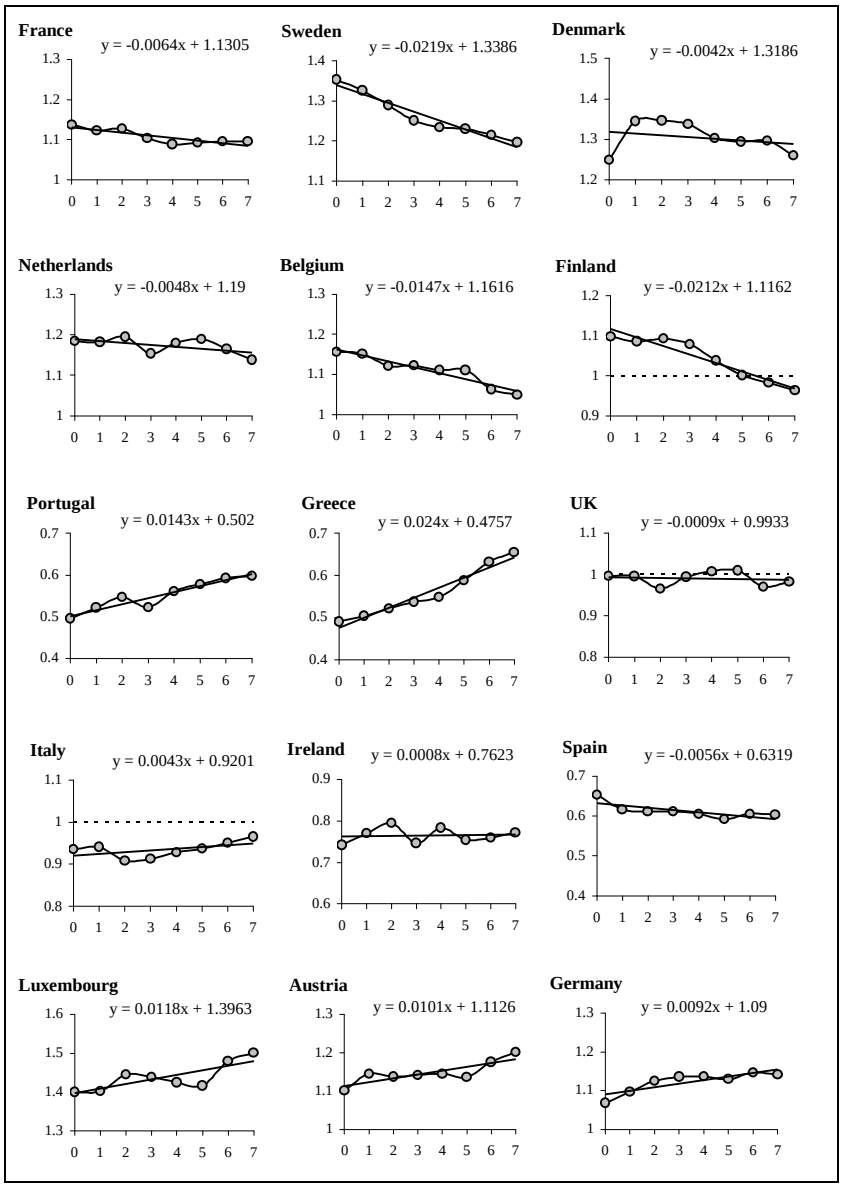
Table 2. Evidence of ? -Convergence of Social Protection Expenditure as a Share in GDP (in %) in EU, 1993 - 2000

	1993	1994	1995	1996	1997	1998	1999	2000
Arithmetical mean ($\bar{x}$)	0.973	0.977	0.972	0.969	0.956	0.954	0.944	0.939
Standard deviation (s)	0.192	0.180	0.177	0.165	0.151	0.151	0.167	0.168
Variation coef. ($s/\bar{x}$)	0.197	0.184	0.182	0.170	0.158	0.158	0.177	0.179
Max ratio to EU-15	1.336	1.304	1.249	1.213	1.196	1.202	1.192	1.183
Min ratio to EU-15	0.633	0.727	0.698	0.659	0.612	0.581	0.533	0.516

Additionally we analyse changes in social protection expenditure per capita in EU member states compared to EU average and ascertain the linear trends that characterise them. The results are illustrated graphically in Figure 2. As you can see, social protection expenditures per capita in six countries with the highest social protection level - France, Sweden, Denmark, Netherlands, Belgium, and Finland - have diminished compared to EU average. The expenditure has increased in four countries with low level of expenditures: in Portugal, Greece, Italy and Ireland. Spain and UK have not converged to EU average in this respect and their relative level has remained unchanged. In sharp contrast with the above general tendencies of convergence are Austria,

Germany and Luxembourg, where these expenditures continue to rise rapidly in spite of the high level of social expenditure per capita.

Figure 2. Social Protection Expenditure Per Capita in EU Member States Compared to EU Average in 1993-2000



Assessment of *s-convergence* based on the share of social protection expenditure in GDP (indicator of *s-convergence* from 0.192 – 0.168) also indicates convergence of social protection levels. Unlike social protection expenditure per capita, the ratio of both maximum and minimum indicator to EU mean has diminished in share changes. The lowest level in 1993 and in 1994 was in Portugal, but since 1995 Ireland has taken this position where the decline compared to EU average continued incessantly. Its possible reasons - relatively young population, fast economic growth, etc. were mentioned above.

Table 3. Evidence of s-Convergence of Social Protection Expenditure by Sphere, at PPS per capita, in EU

	1993	1994	1995	1996	1997	1998	1999	2000
Sickness & disability								
Arithmetical mean ($\bar{x}$)	1.019	1.028	1.038	1.032	1.041	1.040	1.049	1.048
Standard deviation (s)	0.346	0.332	0.345	0.324	0.313	0.299	0.305	0.301
Variation coef. ($s/\bar{x}$)	0.339	0.322	0.332	0.314	0.300	0.287	0.291	0.287
Max	1.505	1.524	1.593	1.601	1.615	1.583	1.594	1.654
Min	0.481	0.532	0.543	0.557	0.551	0.576	0.548	0.587
Old age & survivors								
Arithmetical mean ($\bar{x}$)	0.932	0.951	0.962	0.960	0.951	0.951	0.934	0.932
Standard deviation (s)	0.317	0.325	0.329	0.314	0.302	0.290	0.276	0.277
Variation coef. ($s/\bar{x}$)	0.340	0.342	0.342	0.327	0.317	0.305	0.296	0.297
Max	1.442	1.488	1.548	1.504	1.464	1.441	1.289	1.301
Min	0.389	0.388	0.385	0.354	0.352	0.354	0.332	0.335
Family & children								
Arithmetical mean ($\bar{x}$)	1.169	1.222	1.225	1.145	1.124	1.140	1.149	1.178
Standard deviation (s)	0.663	0.717	0.732	0.656	0.617	0.659	0.685	0.736
Variation coef. ($s/\bar{x}$)	0.567	0.587	0.598	0.573	0.549	0.578	0.596	0.625
Max	2.220	1.462	2.576	2.431	2.356	2.642	2.772	3.063
Min	0.159	0.149	0.154	0.172	0.171	0.187	0.186	0.200
Unemployment								
Arithmetical mean ($\bar{x}$)	1.055	1.099	1.122	1.118	1.129	1.107	1.056	1.075
Standard deviation (s)	0.642	0.652	0.661	0.626	0.604	0.576	0.574	0.550
Variation coef. ($s/\bar{x}$)	0.608	0.593	0.589	0.559	0.535	0.521	0.544	0.511
Max	2.392	2.431	2.509	2.384	2.186	2.123	2.048	2.123
Min	0.191	0.197	0.277	0.282	0.324	0.311	0.293	0.255

As indicated above, developments and changes in social protection functions have been different across countries. Using the indicator of *s-convergence* (see Table 3), we estimate whether and in which spheres convergence of levels between countries has occurred in the period of analysis.

The analysis indicated a reduction of the standard deviation, or convergence of levels in three spheres of social protection in the period of analysis: sickness and disability, old age and survivors, and unemployment. The standard deviation increased in payment of child and family benefits, indicating that no convergence of this function has taken place between countries, which means divergence has occurred.

4.2. Absolute *?-convergence*

We also test for absolute and conditional *?-convergence* of the two measures of real social protection expenditure: social protection expenditures as a share of GDP and per capita (at PPS). We use harmonised cross-sectional data on social protection expenditures per capita (at PPS) and GDP in the EU in 1993-2000 collected by Eurostat. Following Sala-i-Martin (1996), we use log linear regression to estimate the annual growth rate of the expenditure share based on the initial level of the share at the beginning of the period. If the slope coefficient ($?_1$) is negative, we say that there exists absolute convergence in social protection expenditure as a share of GDP and per capita (see, Table 4 and Appendix 1). In the same way, we can estimate the speed of convergence using a non-linear model.

Table 4. Absolute ?-Convergence in Social Protection Expenditure and Speed of Convergence in EU in 1993-2000, Annual Growth Rate Per Capita at PPS

	1993-2000		1993-1996		1996-1997		1997-2000	
	Coef.	Std Error	Coef.	Std. Error	Coef.	Std. Error	Coef.	Std. Error
$?_1$	-0.037***	(0.010)	-0.033*	(0.017)	-0.085***	(0.025)	-0.029*	(0.016)
$?_0$	0.043***	(0.004)	0.054***	(0.006)	0.028***	(0.008)	0.039***	(0.005)
ß	0.043***	(0.014)	0.035*	(0.019)	0.089***		0.031	(0.017)
$Adj.R^2$	0.50		0.22		0.47		0.21	
T_{half}	16		20		8		23	

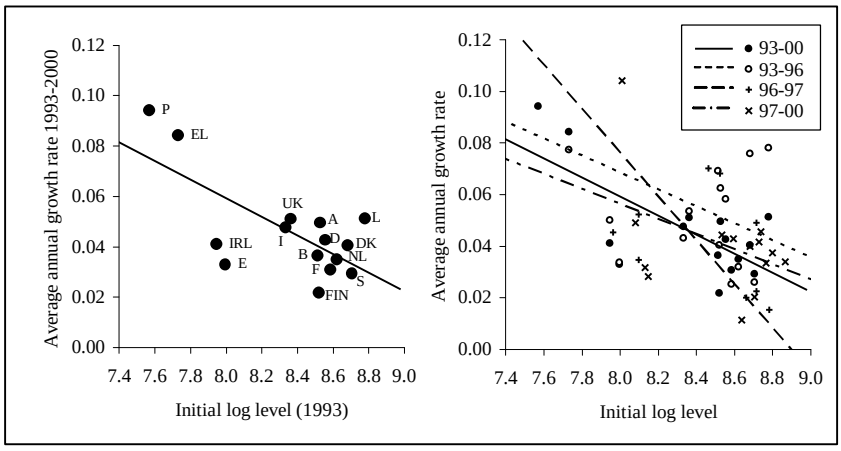
****p<0.01; **p<0.05; * p<0.1*

Our findings are in line with those presented in Alonso *et al.* (1998), where indicators of *?-convergence* suggest a certain degree of convergence in social protection benefits for EU-11 during the period 1966-1994. Our estimation gave statistically significant coefficients of the explanatory variables over all time intervals in the period 1993-2000. In particular, the $?_1$ coefficient is negative and statistically significant in the period 1993-2000 with value $?_{1=}$?0.037 and 95% confidence interval $-0.059<?_1<-0.015$ and also $?_1<0$. Therefore, on the whole, our results satisfy the strong conditions for convergence in social protection expenditures per capita across fifteen EU member states over the time period 1993-2000. Table 4 reports the *?-convergence* regressions separately for 1993-1996, 1997-2000 and 1996-1997. Three time intervals over the period estimated show the different level of convergence, and also different statistical significance.

The speed of convergence has been rather low (see Table 4) and decreased in the later relative to the former period. Starting from the 1993 social expenditure levels it would take approximately 16 years for one-half of the social protection expenditure differences between member countries and EU average to disappear at 4.3% annual rate of convergence (the parameter *?* estimating speed of convergence indicates that social protection expenditure was converging in the period 1993-2000 by 4.3 per cent annually). The speed of convergence was particularly high in 1996-1997 (8.9% annually). But in the period 1997-2000, it would have taken 23 years for one-half of the social protection expenditure differences between member countries to come up to the EU average due to the annual speed of 3.1%.

Figure 3 illustrates the social protection expenditures per head at PPS convergence across EU countries in the period 1993-2000. The initial level is on the horizontal axis and the annual rate of growth on the vertical axis and for the convergence to exist, the regression line must be sloping downwards. Figure 3 presents the evidence on *?-convergence* by plotting the change in the social protection expenditures per capita (at PPS) over the period 1993-2000. The figure displays the convergence hypothesis since a higher initial social protection expenditure level is associated with lower growth in the level over the period. As it was shown already in Table 4, there has been absolute *?-convergence* in social protection expenditure in all periods under study.

Figure 3. Absolute ? -Convergence in Social Protection Expenditure in the EU in 1993-2000, per capita at PPS



Analogously with total social protection expenditure we have also found ? *-convergence* for four social protection spheres (see Table 5 and Appendix 1).

Presence of absolute convergence ($ß_1 < 0$) in all spheres indicates dependence of growth of the respective sphere on the initial level of the indicator. The connection was stronger in the sphere of sickness and disability in the years 1993-2000 ($Adj.R^2$ = 0.51) and in unemployment ($Adj.R^2$ = 0.43). Figure 4 illustrates the presence of *ß-convergence* in 1993–2000. Considering that developments have been relatively uneven throughout the period under study, ? *-convergence* was found to be significantly present also for shorter periods, but the results received were not statistically very reliable in all spheres. The analysis enables us to conclude that convergence between countries in the period under study can be influenced by other factors in addition to level of expenditure.

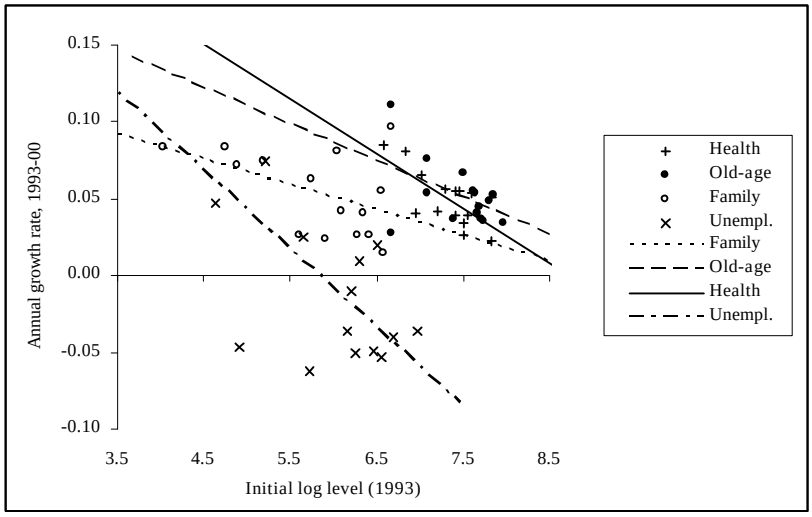
Table 5. ß-Convergence in Social Protection Expenditure by Sphere, at PPS per capita

	1993-2000		1993-1996		1996-1997		1997-2000	
	Coef.	Std Error	Coef.	Std. Error	Coef.	Std. Error	Coef.	Std. Error
Sickness & disability								
$?_1$	-0.036***	(0.010)	-0.027	(0.019)	-0.080**	(0.032)	-0.040*	(0.019)
$?_0$	0.048***	(0.003)	0.049***	(0.007)	0.029**	(0.011)	0.054***	(0.006)
ß	0.041***	(0.013)	0.028	(0.021)	0.083**	(0.035)	0.042*	(0.021)
Adj. R^2	0.51		0.14		0.32		0.26	
T_{half}	17		25		8		17	
Old-age & survivors								
$?_1$	-0.024*	(0.013)	-0.025	(0.021)	-0.038	(0.029)	-0.015	(0.013)
$?_0$	0.048***	(0.005)	0.064***	(0.009)	0.038***	(0.011)	0.038***	(0.005)
ß	0.026	(0.015)	0.026	(0.023)	0.039	(0.030)	0.015	(0.013)
Adj. R^2	0.22		0.10		0.12		0.09	
T_{half}	26		26		18		47	
Family & children								
$?_1$	-0.016*	(0.009)	-0.016	(0.013)	-0.034**	(0.015)	-0.011	(0.013)
$?_0$	0.053***	(0.006)	0.067***	(0.010)	0.033**	(0.011)	0.045***	(0.009)
ß	0.017*	(0.010)	0.016	(0.014)	0.035**	(0.016)	0.011	(0.014)
Adj. R^2	0.22		0.10		0.28		0.05	
T_{half}	40		43		20		63	
Unemployment								
$?_1$	-0.051**	(0.016)	-0.058**	(0.021)	-0.049*	(0.015)	-0.047	(0.033)
$?_0$	-0.013	(0.013)	0.017	(0.016)	-0.029	(0.017)	-0.029	(0.021)
ß	0.063**	(0.025)	0.063**	(0.025)	0.050*	(0.027)	0.050	(0.039)
Adj. R^2	0.43		0.37		0.22		0.13	
T_{half}	11		11		14		14	

** p<0.1; ** p< 0.05; *** p< 0.01*

Regarding the share of social protection expenditures in GDP, our results demonstrate (Appendix 1) that some kind of absolute *?-convergence* possibly took place over the period 1993-2000 (the estimated coefficients of explanatory variables were statistically non-significant). Divergence was found to have taken place in the period 1997-2000.

Figure 4. Absolute ?-Convergence in Social Protection Expenditure by Sphere in the EU in 1993-2000, per capita at PPS



4.3. Conditional ?-*convergence*

?-*convergence* examines whether the initial level of the share of social protection expenditures possesses explanatory power for the subsequent change. Of course, other factors also influence social protection expenditure shares. The ?-*convergence* test allows adding these determinants, thus the test is conditional. Conditional ?-*convergence* makes allowances for underlying factors that may condition the degree of convergence that can occur.

Our set of other explanatory variables that may be relevant in determining the evolution of social protection expenditures includes 53 control variables (macroeconomic, social and demographic indicators, data on income and education, indicators of economic freedom, etc). After correlation analysis, we excluded the statistically non-significant indicators and focus on 6 variables to measure the presence of conditional ?-*convergence*. These factors are (Table 6):

- ? GDP_{ch} - change in GDP per capita at PPS,
- ? DR_o - old age dependency rate,
- ? DR_y - youth dependency rate,
- ? UR_t - unemployment rate,
- ? LFR_m - male employment rate,
- ? LFR_f - female employment rate.

Table 6. Conditional ? -Convergence in Social Protection Expenditure in EU in 1993-2000, annual growth rate per capita at PPS

	Total expenditure	Sickness & disability	Old-age & survivors	Family & children	Unemploy-ment
$ß_1$	-0.0612 ***	-0.0737 ***	-0.0601 ***	-0.0077	-0.0371 *
	(0.0094)	(0.0126)	(0.0105)	(0.0118)	(0.0221)
GDP_{ch}	0.5596 ***	0.6968 ***	0.4538 ***	0.3967 **	0.3339
	(0.1069)	(0.1382)	(0.1151)	(0.1855)	(0.4068)
DR_o	0.3485 **	0.3077	0.4250 **	-0.2778	0.0245
	(0.1639)	(0.1958)	(0.2071)	(0.2895)	(0.6281)
DR_y	-0.1762 *	0.0124	-0.4989 ***	-0.3216	-0.1404
	(0.1058)	(0.1347)	(0.1204)	(0.2210)	(0.3386)
UR_t	-0.3656 ***	-0.4962 ***	-0.2691 **	0.0084	-0.2508
	(0.0933)	(0.1223)	(0.1073)	(0.2068)	(0.2787)
LFR_m	-0.0513	-0.3207 *	0.1037	-0.1396	-0.3462
	(0.1369)	(0.1739)	(0.1547)	(0.2699)	(0.5800)
LFR_f	0.0238	0.1403 *	0.0152	-0.0956	-0.0736
	(0.0579)	(0.0745)	(0.0639)	(0.1196)	(0.2628)
$Adj.R^2$	0.71	0.67	0.73	0.51	0.13

** p<0.1; ** p< 0.05; *** p< 0.01*

As compared with the absolute ? *-convergence*, the additional control variables substantially increased the explanatory power of regression. The $Adj.R^2$ increased from 0.50 to 0.71. Changes in GDP per capita (at PPS), unemployment rate and old age dependency rate perform better than the other explanatory variables and are statistically significant.

Table 6 reports the results for four major categories of social protection expenditures and reveals sizeable differences across expenditure components. A low level of convergence is rejected for family benefits and unemployment sphere ($ß_1$= ?0.0077 and $ß_1$= ?0.0371, respectively), and in contrast, pensions and health expenditure exhibit strong conditional convergence.

Our next step includes state dummies to estimate country-specific shift and slope parameters additionally to the variables described above as it is one of the most suitable alternative to the test of stationarity in the case of shorter time series (see Table 7). The $?_1$ coefficients increase after including dummies from ?0.0612 to

?0.1586 and range from –0.1468 to –0.3205 for the different components of social protection expenditures. This implies much more rapid convergence, not to speak of comparison with absolute ?-*convergence* (?$_1$ = ?0.0369) and an increase in statistical significance of variables (*Adj.*R^2 increase from 0.71 to 0.79). Across social protection expenditures, the statistical significance of unemployment increased and this component exhibits much stronger conditional convergence.

Table 7. Conditional ?-Convergence with Dummies in Social Protection Expenditure in EU in 1993-2000, annual growth rate per capita at PPS

	Total expenditure	Sickness & disability	Old-age & survivors	Family & children	Unemploy-ment
$ß_1$	-0.1586 ***	-0.2282 ***	-0.1468 ***	-0.2154 ***	-0.3205 ***
	(0.0370)	(0.0508)	(0.0399)	(0.0688)	(0.0780)
GDP_{ch}	0.5622 ***	0.6642 ***	0.5201 ***	0.8559 ***	0.4329
	(0.1317)	(0.1538)	(0.1318)	(0.2823)	(0.3697)
DR_o	0.3264 *	0.3925 *	0.5323 *	1.2319	3.0583
	(0.1724)	(0.2423)	(0.2794)	(1.6947)	(2.0807)
DR_y	-0.2486 **	0.0534	-0.2600	0.3341	-2.0917 *
	(0.1175)	(0.1493)	(0.1773)	(0.7994)	(1.2187)
UR_t	-0.2726 **	-0.4078 ***	-0.2660	0.2167	2.9348 ***
	(0.1368)	(0.1426)	(0.1675)	(0.6271)	(0.7929)
LFR_m	-0.0652	-0.2369	0.0064	-0.2640	2.5228 **
	(0.1530)	(0.2070)	(0.1854)	(0.8646)	(0.9724)
LFR_f	0.0184	0.1872 **	0.0199	0.6147	-1.3984
	(0.0648)	(0.0951)	(0.0831)	(0.8094)	(1.0689)
Adj.R^2	0.79	0.75	0.80	0.66	0.47

** p<0.1; ** p< 0.05; *** p< 0.01*

The statistically significant and positive country-specific slope parameters in Greece and Portugal reduce the slope (?$_1$ - ?) for these countries, which still remains negative. According to the equation (4) the convergence in these countries was less steep. But *ceteris paribus*, the differences across EU countries in social protection expenditure in 1993-2000 have declined by the existence of convergence phenomena also in Greece and Portugal.

5. Conclusions

This paper examined the evidence and degree of cross-country convergence in social protection expenditures in the EU during the period 1993–2000. Our findings support in general the notion of *s-convergence*, absolute *ß-convergence* and conditional *ß-convergence* for both social protection expenditures per capita and as a share in GDP. The low social protection expenditure countries of the south (Portugal, Greece and Italy) have all been converging upwards towards the EU average. The high social protection expenditure group of countries, particularly in the north (Sweden, Finland and Denmark), has been converging downward.

Our analysis indicated *s-convergence* of social protection expenditures per capita as well as of the share of social protection expenditures in GDP. The analysis also indicated convergence of levels in three spheres of social protection in the period of analysis: sickness and disability, old age and survivors, and unemployment. There was no evidence of *s-convergence* in payment of child and family benefits between countries.

There has taken place absolute *?-convergence* in social protection expenditure in all periods under study. As compared with absolute *?-convergence*, the additional six control variables substantially increased the explanatory power of regression in predicting country social expenditures. Changes in GDP per capita (at PPS), unemployment rate and old age dependency rate perform better than the other explanatory variables and are statistically significant. Additional state dummies to estimate country-specific shift and slope parameters as one of the most suitable alternatives to the test of stationarity in the case of shorter time series indicated the higher level of conditional *?-convergence* and increase in statistical significance of the variables.

?-convergence in a share of social protection expenditures in GDP in these years had lower statistical significance.

Notes

1. PPS (purchasing power standard) – is a unit, which is based on the Eurostat estimates of purchasing power parities (PPP). PPS eliminates the effects caused by the differences of price levels between countries. PPP expresses the real purchasing power of national currency and differs from the official currency exchange rate.

2. This has been thoroughly discussed by Martti Randveer (2000).
3. We can distinguish also between *catching-up* and *long-run convergence* (Bernard and Durlauf, 1995, 1996; Oxley and Greasley, 1995). C*atching-up* implies that difference between two series is a stochastic variable with a non-zero mean, suggesting that the deviation between the series even if expected to decrease, would not disappear. A sufficient condition for *catching-up* would be the existence of stochastic cointegration between both variables. Conversely, *long-run convergence* is a more demanding level of convergence, since it implies the absence of the difference between the series of countries in the long time trend.

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Appendix 1. Absolute *β-convergence* in Social Protection Expenditure and Speed of Convergence in EU in 1993-2000 (share of GDP)

	1993-2000		1993-1996		1996-1997		1997-2000	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Total								
β_1	-0.045	0.030	-0.060 *	0.031	-0.076	0.065	0.042	0.040
β_0	-0.015 **	0.006	-0.005	0.006	-0.036 ***	0.012	-0.015 *	0.007
β	0.054	0.044	0.066	0.038	0.079	0.070	-0.040	0.036
Adj.R^2	0.15		0.22		0.10		0.08	
T_{half}	13		10		9		-18	
Sickness&disability								
β_1	-0.050 **	0.019	-0.064 **	0.028	-0.115	0.076	-0.055	0.041
β_0	0.049 ***	0.004	0.045 ***	0.005	0.028 *	0.013	0.057 ***	0.006
β	0.062 *	0.030	0.071 *	0.035	0.123	0.086	0.060	0.049
Adj.R^2	0.34		0.29		0.15		0.12	
T_{half}	11		10		6		12	
Old-age&survivors								
β_1	-0.018	0.023	-0.031	0.036	-0.019	0.044	0.013	0.016
β_0	0.049***	0.006	0.064***	0.010	0.040***	0.012	0.041***	0.005
β	0.019	0.026	0.032	0.039	0.019	0.045	-0.013	0.016
Adj.R^2	0.04		0.05		0.02		0.05	
T_{half}	37		21		36			
Family&Children								
β_1	-0.022 **	0.010	-0.019	0.016	-0.043 **	0.018	-0.019	0.016
β_0	0.053 ***	0.006	0.068 ***	0.010	0.032 **	0.011	0.044 ***	0.009
β	0.024 *	0.012	0.020	0.017	0.044 **	0.019	0.020	0.017
Adj.R^2	0.28		0.10		0.31		0.10	
T_{half}	29		35		16		35	
Unemployment								
β_1	-0.052 **	0.017	-0.063 **	0.021	-0.045	0.029	-0.038	0.037
β_0	-0.012	0.013	0.017	0.015	-0.029	0.017	-0.029	0.021
β	0.065 **	0.027	0.070 **	0.026	0.046	0.030	0.040	0.042
Adj.R^2	0.41		0.41		0.16		0.07	
T_{half}	11		10		15		17	

** p<0.1; ** p< 0.05; *** p< 0.01*

Appendix 2. The Estimation of Country-Specific Differences in Shift and Slope Parameters (compared with EU average)

	? (shift)	*d* (slope)
Austria	0.0192	-0.0006
Belgium	0.0048	-0.0156
Germany	0.0119	-0.0083
Denmark	0.0487 *	-0.0116
Spain	-0.0742 ***	-0.0164
Greece	-0.0387	0.0483 ***
France	-0.0030	-0.0218
Finland	-0.0187	-0.0322 *
Italy	-0.0106	-0.0012
Ireland	-0.0642 ***	-0.0068
Luxembourg	0.0542 **	-0.0004
Netherlands	0.0087	-0.0173
Portugal	-0.0293	0.0592 **
Sweden	0.0106	-0.0240
United Kingdom	-0.0190	-0.0188

** p<0.1; ** p< 0.05; *** p< 0.01*