

## Social convergence in the European Union

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### Abstract

The main goal of this paper is to analyze the existence of social convergence across European Union countries over the period 1995-2012. In the literature, an emphasis is put on an economic convergence, often without taking into consideration the social convergence. However, from the point of view of sustainable development, social area is as much important as economic one. In this paper social convergence refers to a reduction in the dispersion of the standard of living across countries. Due to the fact that the standard of living is a multi-dimensional category the synthetic variable was used as its approximation. In order to verify that the social convergence process has place in the European Union the occurrence of sigma-, beta- and gamma-convergence was tested. The existence of convergence was tested for the global aggregated measure of the standard of living, and as well for 10 groups of factors affecting this phenomenon.

**Keywords:**  $\sigma$ -convergence,  $\beta$ -convergence, social convergence, standard of living.

**JEL Classification:** C43, I31

### 1. Introduction

In economy the term *convergence* usually refers to the harmonization of income level across countries. However, examining the social convergence is similarly important as analyzing the economic convergence. In this paper term *social convergence* refers to a reduction in the dispersion of the standard of living across countries. In the Article 2 of the Treaty Establishing the European Community one can read that: “The Community shall have as its tasks (...) the raising of the standard of living and quality of life, and economic and social cohesion and solidarity among Member States”. The social convergence analysis can be implemented to evaluate the effectiveness of the European Cohesion Policy. It should be pointed out that the standard of living is a multidimensional category and GDP per capita cannot be used alone as its measurement (Khan, 1991), (Zienkowski, 2001), (Clarke, 2005), (Stiglitz, Sen & Fitoussi, 2009).

The main goal of this paper is to evaluate and verify the existence of social convergence among 24 European Union countries (Cyprus, Malta and Luxemburg were excluded due to the lack of data) in the period 1995-2012. Research conducted by Hobijn and Franses (2001), Neumayer (2003), Puss, Viies and Maldre (2003), Berbeka (2006), Molina and Purser (2010) show that methods previously used to economic convergence analysis can be adapted to

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evaluate the presence of social convergence. In order to verify that the social convergence process has place in the European Union the occurrence of  $\sigma$ -,  $\beta$ - and  $\gamma$ -convergence was tested.

## 2. The standard of living measurement

In this article social convergence refers to a reduction in the dispersion of the standard of living across countries. The standard of living is a multidimensional and interdisciplinary category thus it is hard to define and quantified it in a direct manner. In this paper the definition proposed by Bywalec and Wydmus (1992) has been used. It refers to the level of wealth, comfort, material goods and necessities available to a certain socioeconomic class in a certain geographic area. A good approximation of such a comprehensive phenomenon can be a synthetic variable which is a combination of several other variables.

Methodology proposed by Zeliaś (2002, 2004) was applied to calculate the standard of living in the European Union countries. In the first stage of the study a wide range of potential diagnostic variables has been prepared (110 variables divided into 10 categories). Variables which do not meet the conditions of formal correctness have been eliminated (Zeliaś, 2002), the final set of diagnostic variables is included in Table 1. All those variables according to formal and essential conditions are crucial to describe the studied phenomenon. The matrix of standardized diagnostic variables was the basis for the construction of a synthetic variable according to the formula (Malina & Zeliaś, 1997):

$$z_i = \frac{1}{p} \sum_{q=1}^p z_{iq}, \quad (1)$$

where  $z_i$  – synthetic variable describing the standard of living in country  $i$ ,  $z_{iq}$  – synthetic variable for country  $i$  calculated on the base of variables belonging to  $q$  group,  $p$  – number of groups.

The measurement of the convergence across the standard of living is a difficult task because one has to decide whether to consider the set of variables separately (Neumayer, 2003) or whether to combine them in one aggregated index (Berbeka, 2006). According to previous assumption, in this article the synthetic measure will be used in social convergence analysis.

<b>Domain</b>	<b>Variables</b>
Population	total fertility rate; the old age dependency ratio
Labour market and job security	unemployment rate; employment rate; number of deaths due to the accident at work per 100 000 inhabitants
Health and social care	number of doctors per 100 000 inhabitants; number of nurses per 100 000 inhabitants; number of hospital beds per 100 000 inhabitants; number of deaths due to tuberculosis per 100 000 inhabitants; number of deaths due to diabetes per 100 000 inhabitants; infant mortality rate; number of new AIDS cases per 100 000 inhabitants; obesity rate
Education	number of university students per 1000 inhabitants; number of academic teachers per 1 student
Leisure time	annual cinema trips per capita, number of hotels per 1000 inhabitants
Living conditions	number of newly build dwellings per 1000 households
Transport and communication	number of newly registered passenger cars per 1000 inhabitants; airline passenger transport in passenger-km per capita; railway transport in passenger-km per capita; density of road network; proportion of paved roads in total road network; number of mobile phone subscribers per 1000 inhabitants, percentage of population with access to the Internet
Social security	corruption perception index; number of murders per 100 000 inhabitants; number of drugs related crimes per 100 000 inhabitants; number of suicides per 100 000 inhabitants, number of divorces per 1000 inhabitants
Population incomes and expenditures	total savings as a percentage of disposable income; tax and social contributions as percentage of gross income; inflation rate; wage per hour in manufacturing (in euro - fixed exchange rate 2012)
Natural environment	particulate matters emission in micrograms per square meter; nationally protected areas as percentage of total land; carbon dioxide emission in kg per capita; forest land as percentage of total land; water pollutant emission in kg per 1000 inhabitants

**Table 1** The set of diagnostic variables.

## 2. Empirical analysis

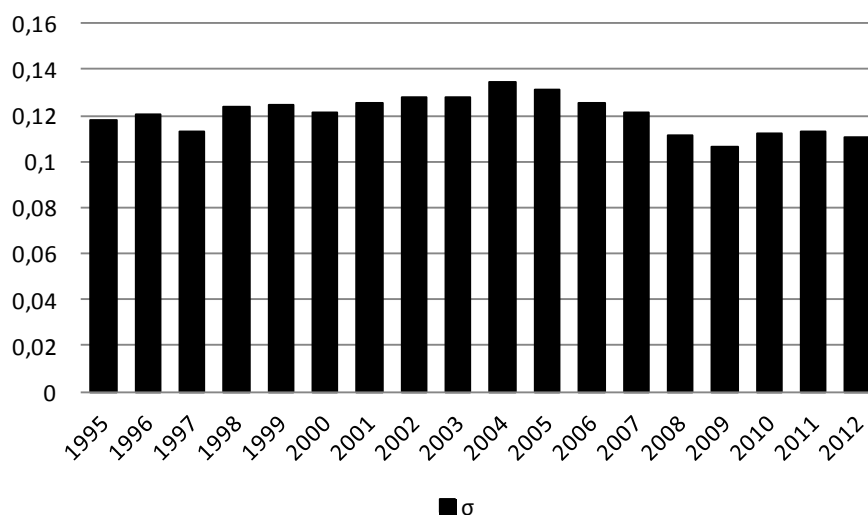
Estimated values of synthetic variables  $z_i$  (see Table 2) and  $z_{iq}$  were basis to test the occurrence of *sigma*-, *beta*- and *gamma*- convergence. The additional analysis for group of determinants was conducted because the convergence in one group of social indicators generally does not have to imply convergence in another group.

ISO Country code	Year						
	1995	1998	2001	2004	2007	2010	2012
AT	0.4797	0.4842	0.4609	0.4547	0.4374	0.5055	0.4905
BE	0.4470	0.4042	0.3851	0.3768	0.3812	0.4365	0.4418
BG	0.2371	0.2133	0.1872	0.1773	0.1986	0.2317	0.2179
DK	0.4174	0.4416	0.4442	0.4808	0.4861	0.4635	0.4450
EE	0.2629	0.2736	0.2790	0.2903	0.3384	0.3172	0.3595
FI	0.4467	0.4470	0.4418	0.4358	0.4299	0.5138	0.4988
FR	0.4474	0.4320	0.4442	0.4373	0.4670	0.5211	0.4928
GR	0.3729	0.4231	0.4343	0.4279	0.3930	0.3972	0.3582
ES	0.3646	0.3872	0.4473	0.4434	0.4435	0.4502	0.3895
NL	0.5100	0.5148	0.4993	0.5075	0.4979	0.5301	0.4964
IE	0.5557	0.5891	0.6274	0.6676	0.6369	0.5701	0.5395
LT	0.3016	0.2851	0.2876	0.2906	0.3084	0.3180	0.3048
LV	0.1961	0.2093	0.2305	0.2544	0.2937	0.2686	0.2701
DE	0.4648	0.4696	0.4463	0.4320	0.4062	0.4523	0.4329
PL	0.3032	0.2927	0.2921	0.2597	0.2732	0.3382	0.3201
PT	0.3821	0.4295	0.4287	0.3612	0.3285	0.3798	0.3308
CZ	0.3288	0.3099	0.3130	0.3201	0.3321	0.4250	0.3871
RO	0.2447	0.2560	0.2554	0.2199	0.2338	0.2813	0.2633
SK	0.3092	0.3289	0.3110	0.3076	0.3230	0.3997	0.3762
SI	0.3264	0.3470	0.3307	0.3622	0.3545	0.4042	0.3766
SE	0.4245	0.4115	0.4540	0.4653	0.4413	0.5082	0.5095
HU	0.2836	0.2568	0.2781	0.2771	0.2491	0.2572	0.2364
UK	0.4653	0.4987	0.4712	0.5337	0.5595	0.5594	0.5412
IT	0.3066	0.3217	0.3489	0.3443	0.3494	0.3961	0.3629

**Table 2** Values of synthetic variables for European Union countries.

## 2.1. Sigma convergence

Sigma-convergence refers to a reduction of disparities among countries. The most frequently used measure of  $\sigma$ -convergence is the standard deviation. However, in literature one can also find other measures, for example: the coefficient of variation, Theil Index or the Gini coefficient. Fig. 1 shows the evolution of the standard deviation of log-transformed synthetic measure for 24 European Union countries for the period 1995-2012.



**Fig. 1.** Standard deviation: log of the standard of living synthetic measure.

From 1995 to 2004 the evolution of disparities among EU countries shows a slight upward trend, the standard deviation increased from 0.117 to 0.134. Since 2004 the downward trend is observed, the standard deviation is decreasing from 0.134 to 0.106. There is a slight increase in the disparities from 2008-2012 which is reflecting the effect of the global crisis. To test if the sigma convergence exist the linear trend model was estimated:

$$S_{zt} = \alpha_0 + \alpha_1 t + \varepsilon_t, \quad (2)$$

where  $S_{zt}$  – standard deviation of log transformed variable.

If  $\alpha_1$  is negative and significant the sigma convergence occurs. The results of estimation are included in Table 3. The value of  $\alpha_1$  is negative but it is not significant, so hypothesis about the existence of the sigma-convergence in the standard of living can be rejected.

Additionally the evolution of the standard deviation of log-transformed variables for 10 groups of factors affecting the standard of living was calculated. Thus, it will be possible to indicate if the convergence in any sphere of standard of living occurred. The results are as follows: sigma-convergences process ( $\alpha_1$  is negative and significant) take place in groups: leisure time, living condition, transport and communication, social security. Sigma-

divergence process ( $\alpha_1$  is positive and significant) take place in groups: population, health and social care.

	$\alpha_0$	$\alpha_1$	$R^2$
Standard of living	0.1259	-0.0006	0.1449
Population	0.222 ***	0.0038***	0.4324
Labour market and job security	0.220 ***	-0.00099	0.1410
Health and social care	0.100 ***	0.0023 ***	0.7529
Education	0.1748 ***	-0.0011	0.0676
Leisure time	0.5580 ***	-0.0167 ***	0.9177
Living conditions	0.7424 ***	-0.0086 ***	0.4778
Transport and communication	0.2382 ***	-0.0026 ***	0.5459
Social security	0.3148 ***	-0.0092 ***	0.6211
Population incomes and expenditures	0.1694 ***	-0.0010	0.1032
Natural environment	0.1408 ***	-0.0004	0.0532

**Table 3** The linear trend for standard deviation of log-transformed variables.  
 \*\*\*  $p < 0.01$ ; \*\*  $p < 0.05$ ; \*  $p < 0.1$

## 2.2. Beta convergence

Beta convergence is a process in which countries with lower standard of living are improving faster than those with higher standard of living. It is worth mentioning that  $\beta$ -convergence is necessary but not sufficient for  $\sigma$ -convergence. It is a necessary condition because without the catching up the spread between countries cannot shrink. It is not a sufficient condition because it is possible (at least theoretically) that countries with lower standard of living can overtake those with higher standard of living, so this may increase the disproportion (Sala-i-Matin, 1996). The methodology used to measure  $\beta$ -convergence generally involves estimating a growth equation according to formula:

$$g_i = \alpha + \beta \log z_{i,0} + \varepsilon_i, \quad (3)$$

where  $z_i$  – the synthetic variable describing the standard of living in country  $i$ ,  $g$  – average change of the indicator over the analyzed period, calculated as:

$$g_i = \frac{1}{T} \log \left( \frac{z_{i,T}}{z_{i,0}} \right). \quad (4)$$

A negative relationship between the growth rate and the initial level of the standard of living (i.e.  $\beta$  must be negative and statistically significant) is an evidence that the followers

are catching up with the leaders (Barro & Sala-i-Matin, 1992). The log linear regression was used to estimate the annual growth rate of the standard of living based on the initial level of the standard of living. In the same way, the annual growth in each sphere of the standard of living was calculated (see Table 4). The results are as follows: beta-convergence process ( $\beta$  is negative and significant) take place in groups: education, leisure time, living conditions, transport and communication, social security, population incomes and expenditures.

	$\alpha$	$\beta$	$R^2$
Standard of living	-0.0022	-0.0087	0.0985
Population	-0.0074	-0.0135	0.1005
Labour market and job security	0.0048	-0.0165 *	0.1420
Health and social care	-0.0050	-0.0051	0.0986
Education	-0.0208 ***	-0.0477 ***	0.4151
Leisure time	-0.1717 ***	-0.0308 ***	0.7286
Living conditions	-0.0339 **	-0.0321 **	0.3074
Transport and communication	-0.0026 **	-0.0112 **	0.2541
Social security	-0.0144 ***	-0.0344 ***	0.8884
Population incomes and expenditures	-0.0055	-0.0210 **	0.2455
Natural environment	-0.004	-0.0123	0.0904

**Table 4** Absolute  $\beta$ -convergence in the domains of standard of living.

\*\*\*  $p < 0.01$ ; \*\*  $p < 0.05$ ; \*  $p < 0.1$

### 2.3. Gamma convergence

Gamma convergence is a concept proposed by Boyle & McCarthy (1999). It requires an examination of the change in the ranking of countries. Simple measure that captures the change in rankings is Kendall's index of rank concordance calculated as:

$$\tau = \frac{C - D}{n(n-1)}, \quad (5)$$

where  $\tau$  – Kendall's index of rank concordance,  $C$  – number of concordant pairs,  $D$  – number of discordant pairs,  $n$  – number of observations.

If the  $\tau$  is closer to zero than the changes within distribution are higher and  $\gamma$ -convergence occurs. Based on the data included in Table 4 and significance level  $\alpha = 0.05$  gamma-convergence occurs in: education and population incomes and expenditures.

	$\tau$	p-value
Standard of living	0.7174	0.0000
Population	0.5699	0.0001
Labour market and job security	0.4637	0.0016
Health and social care	0.5725	0.0000
Education	0.1739	0.2437
Leisure time	0.7536	0.0000
Living conditions	0.3696	0.0122
Transport and communication	0.7608	0.0000
Social security	0.5290	0.0003
Population incomes and expenditures	0.1957	0.1886
Natural environment	0.3478	0.0184

**Table 5** Values of  $\tau$ -Kendall index of rank concordance and corresponding p-values.

## Conclusion

This paper has reviewed the existence of social convergence among European Union countries in the period 1995-2012. On the basis of obtained results, hypothesis about existence of *sigma*-, *beta*- and *gamma*-convergence should be rejected. Obtained results show that approach based on one synthetic measure may be biased because negative effects cancel out the positive ones. The single synthetic measure is convenient and helpful indicator but may fail to capture movements that are relatively small. It therefore seems that the assessment of convergence cannot be based on one single measure. For that reason, in each group of standard of living determinants the occurrence of social convergence was tested.

The analysis indicated  $\sigma$ - and  $\beta$ -convergence in following groups of variables: leisure time, living condition, transport and communication and social security. That means that countries with poor performance at the start period have improved more in percentage term than countries with strong performance at above mentioned areas. The process of catching up can be observed.

The analysis indicated  $\beta$ - and  $\gamma$ -convergence in following groups of variables: education and population incomes and expenditures. That means that countries with poor performance at the start point leapfrogged those with strong performance. The overshooting in group population incomes and expenditures may be a result of the economic crisis. Some countries (for example: Denmark, France and Italy) which were at the top of the ranking at the beginning of analyzed period were hit hard by the crisis and thus lost their high position. Therefore it



appears that  $\gamma$ -convergence in this group is not the result of outstanding performance in countries with the lower standard of living but rather a strong decline in countries with the higher standard of living. Thus it should not be identified as a positive phenomenon.

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