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REAL WAGE CONVERGENCE IN ROMANIA: EMPIRICAL EVIDENCE BASED ON CLUB CONVERGING

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Abstract. The study aims to explore the real wage convergence across the 42 Romanian counties from 1991 to 2016 by using the convergence algorithm developed by Phillips and Sul (2007). The process of divergence is identified in the period of 1991-2016 as well as a number of 4 convergence subgroups (clusters). Transitional curves indicate that over the long-run the real wage tends to converge. Policy implications of the paper's findings are also provided.

Keywords: convergence, wages, panel data, econometric output

JEL Codes: O47, J31, R15, C33.

1. Introduction

The European Union (EU) cohesion policy states as a major objective to reduce social and economic disparities between various regions. The economic convergence represents an essential objective for Romania's economic integration in the EU and became the focus of applied research dedicated to European integration and of decision-makers' interest.

Many empirical studies examine the territorial convergence (among regions and states) in terms of a negative relationship between growth rate and the initial level of GDP per capita or labor productivity and less are focused on the convergence within countries/regions. Differentiation of GDP per capita is widely discussed and analyzed while is not so much research regarding the disparities in wages. Labor plays a major role in the functioning of economies. From the employers' view, labor is a cost including wages and non-wage expenditures (social contributions). From the employees' side, wages comprise the price of their work representing the

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main source of income, and also, for the most part of them, an expression on their life standard.

The present paper brings a contribution to the existing literature as none of the studies have explored the club convergence of real wages, in the case of Romanian counties using the regression-based convergence test and algorithm developed by Phillips and Sul (2007) referred to bellow as the log (t) test.

The rest of the paper proceeds as follows. Section 2 defines the research methodology and presents data. Section 3 exposes the empirical analysis and section 4 is dedicated to conclusions and policy implications.

2. A short literature review

Wage convergence was examined in several studies in connection with various economic factors, contexts or perspectives: immigrant wage (Hersch&Schinall, 2018), level of workers' skill (Cai & Du, 2011), European regions or country level (Naz et al., 2017; Ferens, 2015; Brülhart and Koenig, 2006; Rosés and Sánchez-Alonso, 2002), use of advanced Internet technologies (Forman et al., 2012), labor force migration (Enflo et al., 2014), the gender gap in wages (Cha & Vedeen, 2014), trade openness in CEE countries (Egger et al., 2005), historical view on wages (Broadberry and Gupta, 2006).

The issue of convergence of real wages across Romanian counties was examined in the study developed by Zaman and Goschin (2014) providing evidence in favor of beta convergence of real wages in Romania and sigma-divergence over 1991-2011 and by Cucoș (2016) identifying a clear trend toward wage convergence over 2005-2014.

Phillips and Sul (2007) proposed a new approach to test the convergence hypothesis, based on a variance ratio of the variable of interest and a non-linear time-varying factor model incorporating a possible transitional heterogeneity or transitional divergence. The method of Philip and Sul (2007) was largely used so far to provide evidence on club convergence of energy intensity (Zhang and Broadstock, 2016; Yu et al., 2015), energy productivity (Aspergis and Christou, 2016), per capita dioxide emissions (Aspergis and Payne, 2017) or global development trends on low-carbon technologies (Yan et al., 2017). But it was used also to examine the regional GDP per capita convergence in Europe (Bartkowska and Riedl, 2012), integration process in Asian money and bond markets (Rughoo and You, 2016), bank performance (Carvallo and Kasman, 2017; Olson and Zoubi, 2017; Matousek et al., 2015), financial markets convergence (Nițoi and Pochea, 2016a), equity markets convergence (Aspergis et al., 2014), digital divide phenomenon (Park et al., 2015), or labor productivity clustering (Nițoi and Pochea, 2016b).

The present study makes a clear contribution to the existing literature by exploring the club convergence in wages in a case study on Romanian counties.

3. Data and methodology

The paper uses a panel of data on wages covering the interval 1991 to 2016 and 41 counties* (NUTS 3) plus București municipality. Data on wages and consumer price index (CPI) were extracted from National Institute of Statistics, Tempo online data base. The variables were calculated in real terms by deflating nominal wages by the annual consumer price index.

According to the Phillips and Sul (2007) methodology, the convergence can be tested by using the following regression:

$$log(H_1/H_t) - 2log(L(t)) = c + b \cdot log\, t + u_t \quad (1)$$

where:

$$H_t = \frac{1}{N} \sum_{i=1}^{n} \left(h_{it} - 1\right)^2 \to 0 \quad (2)$$

$$h_{it} = \frac{W_{it}}{\frac{1}{N} \sum_{i=1}^{n} W_{it}} \to 1 \quad (3)$$

and h_{it} is a transition coefficient, H_t is the variance of h_{it}, $W_{it}$is the real wage in the county i at the time t, and N is the number of counties.

$T = [rT], [rT+1], [rT+2], \ldots T$, where: $[rT]$ is the integer part of rT, T is a period of time taken into the analysis, r is a positive number, set by Phillips and Sul at 0.3 (when $T \leq 50$).

When running the log (t) test (equation 1) and the value of t-statistic is higher than -1.65 the null hypothesis of convergence is accepted. If the value of t-statistic is lower than -1.65 the null hypothesis of convergence is rejected and the presence of divergence is detected.

If in the full panel of counties, the divergence is detected convergence clubs or subgroups can be identified by using the clustering algorithm developed by Phillips and Sul (2007). Briefly, the steps are the following:

1) the panel is arranged in descending order according to the county with the highest level of real wage in the last period;

* Bihor (BH), Bistrița-Năsăud (BN), Cluj (CJ), Maramureș (MM), Satu Mare (SM), Sălaj (SJ), Alba (AB), Brașov (BV), Covasna (CV), Harghita (HR), Mureș (MS), Sibiu (SB), Bacău BC), Botoșani (BT), Iași (IS), Neamț (NT), Suceava (SV), Vaslui (VS), Brăila(BR), Buzău (BZ), Constanța (CT), Galați (GL), Tulcea (TL), Vrancea (VR), Argeș (AG), Călărași(CL), Dâmbovița (DB), Giurgiu (GR), Ialomița(IL), Prahova (PH), Teleorman (TR), Ilfov (IF), Dolj (DJ), Gorj (GJ), Mehedinți (MH), Olt (OT), Vâlcea (VL), Arad (AR), Caraș-Severin (CS), Hunedoara (HD), Timiș (TM)

2) the log (t) test is run on the k first counties ($2 \leq k < N$); the size of this core group is chosen according to the maxim of $t_b > -1.65$;
3) counties are added one by one to this group if the associated t-statistic is greater than the critical value C=0;
4) a second group is formed by all remained counties, after running the log (t) test of convergence ($t_b > -1.65$), if divergence is detected, the steps 1-3 are repeated; if no core group is found, all other counties remain divergent.

4. Empirical analysis

Table 1 reports the results of the panel convergence test (logt test). When the log t test is applied to real wages in all 42 counties, the null hypothesis of overall convergence is rejected at the 5% significance level. We conclude that the Romanian counties do not converge to the same steady-state equilibrium in terms of real wages. By applying the clustering algorithm, a number of 4 convergence subgroups were identified.

Table 1 The clubs of Romanian counties

Club	Counties	t-statistic	b-Coefficient	SE	Average Wage (lei)
Full panel (42 counties)	TM,CJ,AG,SB,BV,OT,IS,CT, GJ,MS,DJ,AR,AB,OT,GL,BC, DB,GR,TL,SM,BZ,CS,MH,VS, CL,SJ,VL,HD,SV,TR,BR,BN, IL,NT,MM,BT,BH,VR,CV,HR	-16,49	-1,56	0,09	1810,75
Subgroup 1 (2 counties)	TM, GJ	2,07	1,79	0,86	2135,60
Subgroup 2 (6 counties)	SB, BV,PH, IS,CT,MS	2,23	0,6	027	1977,31
Subgroup 3 (14 counties)	OT, GL,BC,DB,GR,TL,SM,BZ, CS,MH,VS,CL,SJ,HD	2,20	0,40	0,2	1699,41
Subgroup 4 (11 counties)	VLSV,TR,BR,BN, IL,NT,MM,BT,BH,VR	2,11	0,63	0,3	1604,41
Divergent counties	IF, București, CJ, AG, DJ,AR,AB,CV,HR				

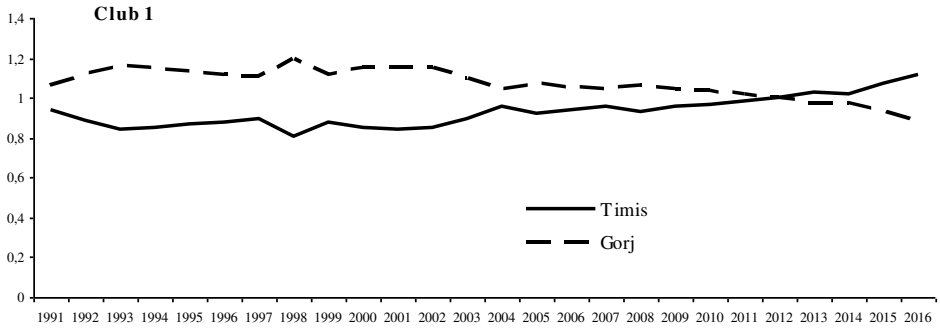
Source: Author's own computation based on INS data

We note that the regressions are validated for a significance threshold of 5%.
The first convergence subgroup consists of 2 counties (Timiș and Gorj) with a real wage average of 2135.60 lei. These counties are located in different regions: Western and respectively South-Western. 3 of the 6 counties included in the second convergence subgroup are located in the same region (Centre), the rest of counties belongs to different and non-adjacent regions. The 3-rd and 4-th subgroups are built from counties included also in different and non-adjacent regions.

With extreme high wages, București Municipality and county of Ilfov (located in the South of Romania) are diverging and not included in any convergence subgroup. For example, in 2016 the real wage in București (2925 lei) was 1.92 times higher than in the county of Harghita (1519 lei). Diverging counties are also: Cluj, Argeș, Dolj, Arad, Alba, Covasna and Harghita. They belong to different NUTS 2 regions: Cluj to North-West, Alba, Covasna and Harghita to Centre, and, respectively, Argeș and Dolj to the southern regions. Cluj and Argeș counties register a high level of wages and economic development while Harghita and Covasna have the lowest level in the national wage ranking.

The members of convergence clusters are belonging to different and non-adjacent regions, reflecting persistent development and income disparities across Romanian regions over 1991 -2016, excepting the second cluster, within which 3 counties (Brașov, Sibiu and Mureș) are contiguous, indicating the second area of high wages and economic prosperity beside of the southern region (București Municipality and Ilfov county).

The transitional curves by cluster in Figure 1 report the tendency of cluster members to converge and diverge from above or below 1. Until 2007 (before Romania's accession into the EU) the variation of transitional parameters (h_{it}) around 1 is higher than in the next period (2008-2016) when the convergence paths in all 4 clusters is evident.



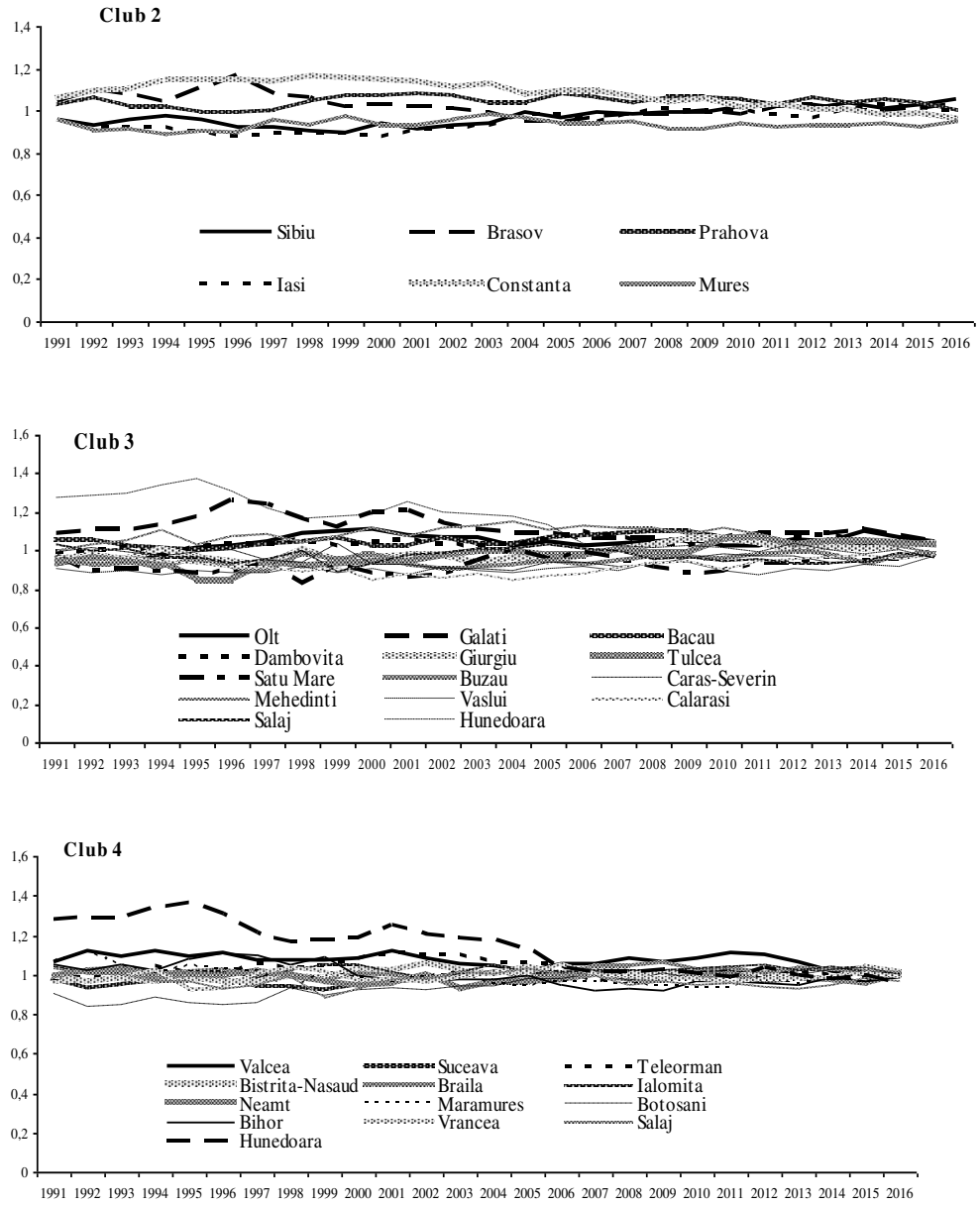


Figure 1 Transitional curves in convergence subgroups
Source: Author's own computation based on INS data

5. Conclusions and policy implications

The present paper examined the territorial real wage convergence across Romanian counties. The Phillips and Sul (2007) methodology document a process of divergence for the total 42 counties and the presence of 4 convergence subgroups as well as a number of 9 diverging counties. 4 of these 9 counties are situated in Southern regions, indicating consistent disparities between the Northern and Southern regions, including Ilfov county and the București Municipality, and significant dissimilarities among individual counties within each of the convergence subgroups.

The presence of convergence subgroups, with heterogeneous members belonging to different regions as geographic location suggests territorial discrepancies related to the structure of local economies, infrastructure, efficiency, resources management and inadequate public economic and social policies. It is suggested also that economic concentration residing in the cluster of București municipality and Ilfov County, respectively of Brașov, Mureș and Sibiu, with higher wages, needs a distinct policy approach when discussing appropriate public measures contributing to the economic and social cohesion within Romania. Regional convergence in Romania requires taking into consideration the trends in regional specialization and economic concentration (i.e., Neagu&Neagu, 2016).

Further studies can be developed on the relationship between wages and labor productivity in Romania, as a basis for the analysis of territorial convergence, taking into considerations the positive association between labor productivity (as an expression of the effectiveness of labor) and GDP growth (i.e., Nakamura et al., 2019; Martino 2015; Astra, 2014; Neagu, 2012).

Finally, as the real economic convergence represents an essential objective for Romania's economic integration in the EU, the paper's findings are relevant for the local and regional policymakers, in designing appropriate strategies meant to increase the economic and social cohesion at regional and county level. The paper's findings are also relevant for the identification of tendencies of the convergence process in Romania and to suggest new governmental actions meant to reduce income inequalities in the next programming period (2021-2027).

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