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WAGE CONVERGENCE AFTER EURO ADOPTION – THE CASE OF SLOVAKIA*

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Abstract. According to the theory of integration, welfare increase is the long-term indirect effect of joining the euro area. Monetary integration accelerates the processes of economic convergence, including income convergence, which is particularly desired by the societies of catching-up economies. This process is crucial for increasing the long term potential for macroeconomic sustainable growth of the economy. The countries of the Visegrad Group are institutionally and structurally similar. But only Slovak Republik adopted euro in 2009, another Visegrad countries stay by their own currencies. So it is a good opportunity to assess the effects of joining the euro zone on wage growth in the medium term through a comparative analysis. The aim of the research is to assess the impact of joining the euro area on the wage growth rate in Slovakia. The research was carried out using the comparative method. Three types of convergence are taken into account: beta, sigma and gamma. An extension of the implementation of the concept of beta, sigma and gamma convergence is the estimation for variables other than GDP, i.e. for the wage growth rate. The analysis covers the 2009-2019 period. The study confirms the existence of beta and sigma convergence. The convergence of earnings between EU countries occurs, wages in less developed CEE countries, tend to grow faster than do in wealthier ones. On the other hand, no gamma convergence was found. The higher rate of wage growth in Slovakia as compared to other countries of the Visegrad group was also not confirmed.

Keywords: economic convergence; wage convergence; euro adoption; monetary integration; Visegrad Group

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1. Introduction

In 2004, 10 countries joined the European Union, including the Visegrad Group: Poland, Hungary, Czechia and Slovakia. The Visegrad countries are now regarded as an example of a successful transition from a centrally planned to a market economy. The modernisation process has increased their competitiveness in the globalised economy (Bieszk-Stolorz & Dmytrów, 2020). Although all Visegrad countries committed to adopting the euro, only Slovakia joined the euro area in 2009.

The Central-Eastern Europe economies can be deemed relatively homogeneous. This results firstly from the fact that in the transition period, these countries have pursued quite similar systemic transformation strategies, socio-economic policies and structural reforms, geared towards building a fully-fledged market economy, strongly influenced by Western patterns. Secondly, the membership in the EU create similar economic conditions in terms of their institutional environment, economic structure, directions of trade and capital flows (so called integration anchor). Thirdly, all CEE countries have been offered similar windows of opportunity to use the EU aid funds. Hence, it can be assumed that all present members of the enlarged European Union face the same long run equilibrium or steady-state. They should, therefore, tend to equalize income levels as suggested - inter alia - by neoclassical models of economic growth. The process of equalization in GDP per capita levels is further fostered by the objectives of the EU policy, intended to reduce income disparities between countries and regions of the enlarged European Union (Rapacki &Próchniak, 2019). The problem of wage inequality is one step away from the problem of income inequality (Horodecka &Vozna, 2018). Sustainable growth is closely related to the process of equalizing the incomes of citizens from different Member States.

The concept of wage convergence, which is derived from factor price equalization, can be explored via the literature on international trade and labour economics. In the international trade literature, factor price equalization can be discussed as an outcome of the Hecksher–Ohlin trade model, which is designed for two economies, two products, and two production factors. It is a trade model that shows patterns of trading for those goods that are produced by the factor that is abundant in a certain country. Factor price equalization has certain restrictions such as identical technologies and sufficiently similar factor supply ratio. Moreover, it also demands an absolute equality of prices of commodities and factors, whereas the concept of factor price convergence is more flexible in the sense that it does not require the absolute equality of factor and commodity prices among the countries under free trade (Naz et al. 2017). Leamer (1995) attempted to define factor price convergence as a process that occurs “When two countries eliminate their mutual trade barriers, product price equalization eliminates factor price differences." The adoption of common currency is a factor reducing the real barriers to trade and foreign investments by eliminating the exchange rate risk and costs of currency exchange.

The establishment of monetary union is expected to reduce wage differentials between the countries involved. There are three possible reasons for the fall in wage differentials in the Euro-area countries recorded since the establishment of European Monetary Union (EMU): migration, the Balassa-Samuelson effect, and the role of trade unions. With regard to the first of these factors, if workers from low wage economies move to those with high wages, the process of wage equalization is enhanced. The second possible explanation of the reduction in wage differentials is the existence of the Balassa-Samuelson effect. Third, EMU may reduce wage differentials across countries due to a “demonstration” or “fair wage” effect (Mora et al. 2005).

On 1 January 2009, Slovakia adopted the Euro as its national currency. Despite being a small economy, Slovakia is the largest new member of the euro area. In addition, it is institutionally and structurally similar to other countries of the Visegrad group (the Czech Republic, Hungary and Poland). Hence, it is possible to conduct a comparative analysis to assess the impact of the euro on wage growth in the catching-up economy.

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Many empirical studies examine the territorial convergence among states in terms of a negative relationship between growth rate and the initial level of GDP per capita or labour productivity and less are focused on the wage. Differentiation of GDP per capita is widely discussed and analysed, while there is not so much research regarding the disparities in wages. GDP is the most synthetic indicator, but for people GDP is more abstract than their own earnings. For the inhabitants of Central and Eastern Europe, the more intriguing question is whether the euro adoption by the country accelerates wage growth?

The aim of the research is to assess the impact of joining the euro area on the wage growth rate in Slovakia. The secondary goal is assess of wages convergence between the countries of Central and Eastern Europe (CEE) which have accessed the European Union (EU11) and the 15 countries of Western Europe (EU15) which represent the EU's "old core". Cyprus and Croatia are excluded due the lack of data. The analysis covers the period 2009-2019, i.e. after Slovakia joined the euro area. The used methods are three type of convergence: β-convergence (beta), σ-convergence (sigma), γ-convergence (gamma) and a comparative analysis with particular emphasis on Slovakia. The used indicator is a average gross earnings, a source of data is Eurostat Database.

The structure of the research study is as follows: the introduction offers a clarification of the importance of addressing the research issue and a short review of relevant theory. Section 2 contains the short review of relevant literature. Section 3 provides details about data and their sources, hypotheses, detailed descriptions of concepts and methods on convergence. The next section contains the results of investigation and a discussion of the results, finally, Section 5 concludes the study.

2. Literature review

Although there is an extensive body of literature regarding EU- and eurozone enlargement, the economic convergence effects within the major EU countries and between developed and emerging economies, studies focusing on the CEE countries in context of wage equalization remain limited (Bernardelli at al. 2021). The prevalence of a real convergence of CEE countries vis-à-vis the EU15 group can be explained as a combined effect of multiple factors, including a comparable level of economic development and the structure of economies, similar direction of systemic reforms, mutual economic cooperation, trade liberalization, and dismantling barriers hampering the flows of productive factors (in particular labour and capital) between countries (Rapacki&Próchniak, 2019, Janus, 2019). The adoption of the common currency facilitates trade and the mobility of production factors, so it can be expected that it will also accelerate the convergence processes. An extensive body of literature exists on the affect euro on the economy (Moździerz, 2019). Kunroo et al. (2016) showed that the euro can cause economic convergence among Eurozone countries through intra-industry trade. The euro has also affected foreign direct investment (FDI). Petroulas (2007), Schiavo (2007), Brouwer et al. (2008), and Baldwin et al. (2008) suggested that the euro had a profound impact on intra-Eurozone FDI flows as well as FDI flows to and from the Eurozone to third countries. Lane (2006) argued that the elimination of exchange rate uncertainty would lead to real convergence between members, and in turn, higher levels of output and growth. Barrell etal. (2008) showed that the euro affected output growth directly, reduced real exchange rate volatility, and influenced the accumulation of production capital. Subsequent studies have demonstrated that the Eurozone has encountered difficulties but the trend about the euro has continued to be optimistic. Senjur (2012) argued that the success of the Eurozone's small middle-income members is questionable. Khan (2020) investigated the spillover effects of trade shocks in the Central and Eastern European and Baltic Countries. His study showed that the larger countries in the block, such as Poland and the Czech Republic, are the least affected by foreign trade shocks. Therefore, further integration is likely to enhance the growth potential of these countries. For Slovakia, the country in the sample most sensitive to external trade shocks, further integration may increase its risks during economic downturns in other countries. Slovakia already experienced this after the financial crisis of 2007-2008, when it suffered the most of all the CEE-Baltic countries. This indicates that although things can go well when there are positive shocks emanating from other countries, negative shocks can very quickly change the situation.

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Khan (2020) conclude this can worsen when countries share a currency, as it limits their ability to handle the situation using country-specific tools of monetary policy.

The positive effects of joining the euro area in Slovakia occurred even before the official conversion of the Slovak koruna to the common European currency. This was the result of, inter alia, increased confidence in the Slovak economy. Comparing Syntetic Control Method with the actual performance of the Slovak economy after 2006 Zudel and Meloris (2016) found that by 2011 euro adoption increased the real GDP per capita in Slovakia by approximately 10%. Two thirds of the positive gain is observed already by 2008, emphasizing a strong anticipation effect. Nevertheless, the gap in GDP per capita widens between 2008 and 2011 by additional 3 percentage points. Grabia (2019) points out that if a similar method was used for the next five-year period (2012-2016), real GDP in Slovakia would also be higher thanks to the adoption of the euro, but only by approx. 1%.

However, studies focusing on the impact of the euro on wage growth in the new member states are rare**.** Mora et al. (2005) conducted convergence analysis to wages and productivity for Euro-area countries in the period from 1981 to 2001. Their study is based on three different methods of convergence: β convergence, σ convergence, and the unit root method. They found support for the β convergence of wages but no evidence for σ convergence or with respect to time series unit root tests for convergence. Their results support wage convergence but not productivity convergence. Further, their research suggested that the establishment of a single currency area has not accelerated the process of wage equalization.

From the review of the literature it may be seen that the most papers on the economic convergence between the rich, old EU and the CEE countries used a GDP per capita. Study focusing on wage convergence between CEE countries and old EU-15, especially in the context of euro adoption, remain limited. This paper complements the gap in existing literature.

3. Research methodology

The concept of real convergence is defined as the tendency to level off income among countries. Most research use GDP per capita as an income indicator. But this study concern on wages, so used indicator is annual gross earnings single person without children earning 100% of the average earning in euro. That way the redistribution effect of fiscal policy is not taken into account. The analysis covers the 2009–2019 period for 26 EU countries, Cyprus and Croatia are excluded in the analysis owing to a lack of data, whereas the UK is included, as it was an EU member state during the analysed time period. The calculations were based on annual gross earnings time series obtained from Eurostat database.

Two research hypotheses were formulated:

1. The convergence of earnings occurs between EU countries, wages in less developed CEE countries, with lower wage level, tend to grow faster than they do in wealthier ones, with higher wages.
2. After the adoption of the euro, Slovakia is characterized by higher wage growth than the other countries of Visegrad group.

The literature on economic growth proposes several methods to capture convergence. This study will use the concept of β (beta), σ (sigma) and γ (gamma) convergence. In general, β convergence reflects a negative association between the growth rates of a variable and the initial values of that particular variable. Wage convergence is actually a part of real convergence. In the context of wages, β convergence is said to exist if growth rates of wages are negatively correlated with the initial values of wage rates for each region. In other words, a country with smaller initial values of factor prices has a higher rate of growth than a country with higher initial values of factor prices (Naz et al. 2017). Therefore, lower-wage member states grow faster than higher-

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wage one. Thus, in the long run, all labour markets tend to converge toward the same average wage. This convergence can be conditional or unconditional.

To verify empirically the hypothesis of the absolute β-convergence, the following equation should be estimated:

$$\frac{1}{T}(lnY_T - lnY_0) = \alpha_0 + \alpha_1 lnY_0 + \varepsilon_t \quad (1)$$

where:
lnY_T – logarithm value of average gross earning at the end of the analysed period
lnY_0 – logarithm value of average gross earning at the beginning of the analysed period
T – periods number
α_0, α_1 – equations parameters
ε_t – random walk.

The explained variable is the average rate of gross earnings growth in examined period (from 0 to T), the explanatory variable is the logarithm of the initial level gross earning, while ε_t is a random component. A negative and statistically significant value of the α_1 parameter means the occurrence of the β-convergence. In this case, the value of β-coefficient measuring the rate of convergence, can be calculated from the formula (see e.g. Barro & Sala-i-Martin, 2003, Heller & Warżała, 2019, Kijek & Matras-Bolibok, 2020):

$$\beta = -\frac{1}{T} ln(1 + \alpha_1 T) \quad (2)$$

In addition, the hypothesis concerning the occurrence of σ-convergence was verified, according to which the decreasing dispersion of annual gross earnings follows among the studied countries. The estimated σ-convergence quotation was as follows:

$$\sigma(lnY_t) = \alpha_0 + \alpha_1 t + \varepsilon_t \quad (3)$$

The logarithms of gross earning standard deviation in individual countries was the explained variable, and time series (t = 1, ..., 11 for the period 2009-2019) was the explanatory variable. The ε_t - as before - is a random walk component. A negative and statistically significant value $\alpha_1$parameter means existence of σ-convergence.

Generally, γ-convergence occurs when countries change their positions in the ranking ordered in terms of some features (Próchniak, 2019). Gamma convergence (γ-convergence) is defined as the ranking concordance over time of per capita incomes within a group of countries (Siegel, 1956, Boyle & McCarthy, 1997). In other words, γ-convergence highlights whether, and to what extent, the highest-income and lowest-income countries remain the same within a given country grouping over time. Together with σ-convergence, γ-convergence helps to capture the complex dynamics of time-varying cross-country income distributions (Diaz del Hoyo et al. 2017). The Kendall rank concordance coefficient can be used to verify the γ convergence hypothesis (Próchniak, 2019). Kendall's coefficient of concordance ranges from 0 (no agreement) to 1 (complete agreement). Value of 0 indicates γ convergence and value of 1 indicates no γ convergence.

Annual gross earning as a percentage of EU-15 average was calculated only for Slovakia, Czechia, Hungary and Poland. For the purposes of this analysis, the average growth rate of gross earnings covering the years 2001-2003, 2004-2008 and 2009-2019 was calculated, i.e. the subperiod before accession to the EU, EU membership before accession to euro area, and in the third subperiod Slovakia is a member of the euro area.

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4. Results and discussion

Taking into account the parameters included in table 1 it can be stated, that among examined EU countries the *β*-convergence was confirmed. This is because the α_1 parameter value is negative and statistically significantly dependent on the initial level of average gross earnings. Moreover, obtained α_1 parameter estimation is also negative, t-student statistic value (-7.45375), *p*-value (0.0000) and coefficient of determination value (69.8%) also confirm existing *β*-convergence. The catching-up process took place among the 26 countries of the whole examined sample. Countries with lower initial wage levels recorded more rapid growth on average than those with higher initial wage levels.

Table 1. Results of the estimation of regression equation parameters in relation to β-convergence in 2009-2019

Specificationt	Value
α_1	-0.022464
standard error	0.003014
t-students statistics	-7.45375
Value p	0.000000
α_0	0.0250344
standard error	0.029803
t-students statistics	8.40008
Value p	0.000000
N	11
R^2	0.698335
β convergence	Yes
β ratio	0.025803

Source: own calculations based on Eurostat database

The *β*-coefficients, measuring the speed of convergence, stand at 2.58%. These coefficients allow us to estimate the time needed to reduce the wage gap between the examined countries by a half. If the average growth patterns observed in 2009–2019 continued, the countries of the enlarged EU would need about 26–27 years to reduce the distance to their hypothetical common steady state by a half. These results point to a relatively slow catching-up process between Central Eastern and Western Europe. Based on these estimates, it cannot be expected that CEE countries will reach the wage levels seen in Western Europe soon.

The σ-convergence was measured by gross earnings standard deviation logarithms. To achieve this, the regression equation (3) parameters were estimated. The procedure results are presented in table 2**.** Similarly to results obtained by the β-convergence, also the σ-convergence among countries surveyed in researched period was confirmed. Negative and statistically significant α_1 parameter value and other factors placed in table 2 (*p* values standing at 0,000009, coefficient of determination value at 0.899) demonstrate very good fit of regression function to empirical data. The σ-convergence existence denotes that gross earnings dispersion among examined EU member states is shrinking.

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Table 2. Results of the estimation of regression equation parameters in relation to σ -convergence in 2009-2019

Specification	Value
α_1	-0.017226
standard error	0.001925
t-students statistics	-8.94744
Value p	0.000009
α_0	0.820874
standard error	0.013057
t-students statistics	62.86680
Value p	0.000000
N	11
R^2	0.898941
σ convergence	Yes

Source: own calculations based on Eurostat database

The Kendall concordance coefficient stand at 0.901538462. With *p*-values standing at 0.000000 significance level is high. The indicator at the level of 0.9 should be assessed as the almost complete absence of γ convergence, because value of 0 indicates γ convergence and value of 1 indicates no convergence.

Annual gross earnings as a percentage of EU-15 average were calculated only for four states: Czechia, Hungary, Poland and Slovakia (table 3). Examined countries upon accession to the EU represent a similar, low level of wages at the level of about one fifth of the old EU average. At the end of the analysed period, they reach the level of one third, which confirms the process of wage convergence. In the year preceding the accession to the euro area (i.e. 2008), average earnings were the lowest in Slovakia in the entire surveyed Visegrad group. Despite a noticeable increase, 11 years after joining the euro, wages in Slovakia are still somewhat lower than in the compared countries.

Table 3. Annual gross earnings as a percentage of EU-15 average

Country	2000	2004	2008	2009	2019
Czechia	15.1	20.0	30.9	30.6	37.8
Hungary	14.0	20.6	26.3	24.9	32.5
Poland	19.3	18.2	27.2	23.1	32.8
Slovakia	16.9	19.4	25.0	25.9	31.3

Source: own calculations based on Eurostat database

The average growth rate of gross earnings in 2009-2019, calculated on the basis of Eurostat data, is 3.75% in Slovakia, 3.59% in the Czech Republic, 3.68% in Hungary, 3.64% in Poland (see Table 4). Although in this group the highest wage growth rate was recorded in Slovakia, the differences are not significant, so it cannot be concluded on this basis about the positive impact of the euro on wages growth acceleration.

Table 4. Average growth rate nominal gross earnings in euro

Country	2001-2003	2004-2008	2009-2019
Czechia	11.1%	12.26%	3.59%
Hungary	13.86%	8.71%	3.68%
Poland	2.05%	9.98%	3.64%
Slovakia	4.36%	9.0%	3.75%
EU-15	1.94%	2.26%	1.62%

Source: own calculations based on Eurostat database

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It must be remembered that the absence of convergence γ does not necessarily mean a lack of convergence β and the lack of reducing disparities in income levels between countries. If the less developed countries show a faster pace of growth, but not fast enough to overtake the more developed countries, then the β convergence occurs and there is a decrease in income disparities, but the γ convergence does not occur (Próchniak, 2019).

A weakness in the use of the time series of nominal wages denominated in euro is their sensitivity to fluctuations in the exchange rate. This may affect the results of the countries using the floating exchange rates.

The results of the present research are concordant with performed analyses of Diaz del Hoyo et al. (2017). Starting with the dimension of real convergence, in the period 1999-2016 income convergence towards the EU average occurred and was significant in some of the late euro adopters (the Baltics and Slovakia), but not in the south of Europe. As for CEE countries, it seems that the transition to a market economy and the integration into global value chains, alongside the incorporation of the acquis communautaire, have played a much more important role than the introduction of the euro per se (Diaz del Hoyo et al. 2017).

Papai (2017) points out that flexibility of the Slovak economy has declined. The monetary regime change in Slovakia in 2009 affected significant labour market frictions present in the Slovak Republic and the recession in the examined small open economy was mainly caused by shocks originating in the foreign sector. In the periods 2006-2008 the positive situation in the euro area significantly boosted the Slovaks economy. However, with the arrival of the recession, the foreign sector had become the main cause of the economic slowdown (Papai, 2017). On the other hand, the study of Kliber & Płuciennik (2017) finds that Euro adoption did not make Slovakia more vulnerable to the pan-European problems.

Parteka & Wolszczak-Derlacz (2015) suggest that despite a considerable rise in trade integration, which is also visible in cross-border flows of intermediates, there is no evidence supporting absolute skill-specific wage convergence in the EU-27. Both descriptive evidence and the results obtained from the regression models estimated show that wage differentials in the EU-27 prove to be highly persistent. Similar studies documenting strong cross-country wage differentials (Magda et al. 2011) combined with a lack of a (or a very slow) wage equalization process in Europe (Mora et al. 2005) and rejection of an unconditional wage convergence hypothesis (Egger & Pfaffermayr, 2004). In general the findings in the article compared to findings of other authors are corresponding.

Conclusions

In theory establishment of monetary union is expected to reduce wage differentials between the countries involved, especially accelerate convergence process in catching-up economies. Studies on the impact of the euro on the convergence of earnings are of particular interest for societies facing the decision whether and when to change the currency regime and adopt the common currency.

The β– and σ-convergence existence denotes that gross earnings dispersion among examined EU member states is shrinking. The insights are economically substantial and highly statistically significant. The first hypothesis has been confirmed: The convergence of earnings occurs between EU countries, wages in less developed CEE countries, with lower wage level, tend to grow faster than they do in wealthier ones, with higher wages. The catching-up process took place among the EU countries, but based on β-coefficients estimates, it cannot be expected that CEE countries will reach the wage levels seen in Western Europe soon.

The higher rate of wage growth in Slovakia as compared to other countries of the Visegrad group was also not confirmed, so it cannot be concluded on this basis about the positive impact of the euro on wages growth

acceleration. The second hypothesis: After the adoption of the euro, Slovakia is characterized by higher wage growth than the other countries of Visegrad group, was verified negatively.

This research used the nominal gross earnings in euro indicator only. This indicator is sensitive to exchange rate fluctuations, which may distort the results in relation to countries outside the euro area. Another limitation is the relatively short time series. We must remember that Slovakia joined to eurozone during last world economic crisis, what must have additional influence on economic indicators. For future research, it would be interesting to assess the impact of the Covid-19 pandemic on the pace of the wage convergence among "old" and "new" EU.

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