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Co-movement between the convergence of economic and health status in Central and Eastern Europe

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ABSTRACT

The Central and Eastern European countries have made considerable economic progress since the capitalist transformation. This paper investigates whether there is a co-movement between two factors of well-being, improvement of economic and health status between 1995 and 2018 compared to the six founding European Union (EU) member states. Applying the Pedroni- and Fisher-type cointegration test and a panel vector error correction model, our estimations suggest that there is a mutual causal relationship between economic convergence measured in GDP per capita and health status convergence measured by life expectancy. The long-term bi-directional effects are also proved by impulse response functions. Using the same econometric methods, the examination of the relationship between government health expenditure and life expectancy indicates that governmental health expenditure promotes the health status convergence. This study concludes that the FDI-based, low-wage growth model of the Central and Eastern European countries has not impeded the convergence in both factors of well-being to the founding EU member states. The results demonstrate that the improvement of the healthcare system may be a channel for the acceleration of convergence.

KEYWORDS

health status, life expectancy, convergence, cointegration, Central and Eastern Europe

JEL CLASSIFICATION INDICES

H51, I15, O47

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1. INTRODUCTION

The economic convergence of the Central and Eastern European (CEE) countries to the European Union (EU) average measured in GDP per capita has been substantial since the capitalist transformation. There are indicators which suggest that not only incomes, but other factors of well-being have also improved. For example, the Eurostat database demonstrates that life expectancy has also increased significantly since the beginning of the transformation. The survey of the Pew Research Center conducted at the 30th anniversary of the fall of communism indicated a great increase (of 30–40 percentage points) between 1991 and 2019 in the share of persons who were satisfied with their lives (Pew Research Center 2019: 77). However, in the ranking list of both economic convergence and life expectancy the CEE countries are behind the Northwestern EU member states.[1] The latest available Eurostat data of 2018 show that on the ranking list of overall life satisfaction the last 13 are the CEE and Mediterranean countries.[2] In the perceptions of individual well-being, the quality of healthcare is a significant element that seems critical in CEE. The latest available survey on the satisfaction with the healthcare system shows that in 8 CEE countries healthcare received minus indices, in Czechia, Slovenia and Estonia from 1.7 to 0.1 on a +/− 10 scale (European Commission 2014: 48). The Human Development Report also highlights the gap in citizens' satisfaction with healthcare between the Northwestern and the CEE EU members, only Slovenia and Czechia are close to the former group (United Nations Development Programmes 2016: 250).

The relationship between economic growth and healthcare or/and health status is very complex and extensively analysed in literature. In the CEE countries there is a special aspect which makes the relationship between economic and health convergence in the EU interesting. After the capitalist transition a model has evolved which is based on FDI inflows attracted by the low level of wages (Nölke – Vliegenthart 2009; Farkas 2016; Galgóczi – Drahokoupil 2017). The relatively low level of value added in both foreign subsidiaries and domestic firms and low incomes make the relatively low level of investment in human capital (education and healthcare) possible. These features of the CEE growth model raise the question whether there is a co-movement between the convergence of economic and health status to the core countries which can be identified with the founding EU member states. The health expenditure as a percentage of GDP is lower in the CEE countries than in other EU members (with the exception of some Mediterranean countries). Thus, a further question arises whether there is an effect of health expenditure on health status.

This paper aims to investigate these two questions using panel cointegration tests. We apply life expectancy in our calculation because it is the most precise available data for the analysed period between 1995 and 2018, and life expectancy is used as a proxy for health status in the literature. It is obvious that health status depends on many factors besides economic conditions (healthy lifestyle, demographic composition of the population, etc.). It is also known that expenditure data do not reveal the efficiency of the healthcare system.

[1] Austria, Benelux States, Denmark, Finland, France, Germany, Ireland, Sweden.

[2] https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Subjective_well-being_-_statistics#Overall_life_satisfaction_in_the_EU.

This paper does not address the analysis of healthcare systems[3] but the relationship between two decisive aspects of convergence: economic and health status. The novelty of our analysis is that it focuses on CEE in the context of economic and health status convergence, and the investigation is related to the growth model of the region. The co-movement of economic and health status and the effect of public health expenditure on life expectancy can disclose some aspects of the CEE growth model which have not been investigated so far. The data of private health expenditure are not available for the whole investigated period (1995–2018), thus only government health expenditure is considered.

Our paper is organised as follows. The literature review in Section 2 summarises the recent research results on the relationship between economic growth and health status and between healthcare expenditure and economic growth. Section 3 introduces the data and research method, Section 4 presents the results and discussion, and finally Section 5 provides our conclusions.

2. LITERATURE REVIEW

In the 1950–60s, the first generation of growth theories based on the neoclassical model regarded labour as a source of economic growth but without any further characteristics. In the endogenous growth theories of the 1980–90s, the concept of capital has been broadened from physical goods to human capital in the forms of education, experience and health. Better health status, which is usually measured in life expectancy, directly increases productivity. In addition, improvement in health has an indirect positive effect on productivity. Better health status lowers the rates of mortality and disease, which decreases the effective rate of depreciation on human capital. Through this channel, improvement in health raises the demand for human capital and thereby induces a further increase in productivity (Barro 2013).

Numerous studies prove this type of causality and share the view that better health status results in higher income. Moreover, as an additional impact, longer life expectancy increases both private and public investments in human capital, which later can enhance economic growth.[4]

Examining data from 91 countries between 1960 and 2005, Monterubbianesi et al. (2017) found that a one-year improvement in life expectancy increases per capita income by 2.6 and 8.3%, depending on the model used. Based on the data of 62 low- and middle-income countries within the period of 1985 and 2007, Grimm (2011) concludes that the inequality in health status within a country can diminish the potential for future economic growth. This impact should be noted even within the EU, since enormous differences exist in life expectancy among the member states, if we compare the relevant data of income quintiles or social groups with different educational backgrounds (Eurostat; Mackenbach et al. 2013).

Sharma (2018) analysed a 143-year time series with data from 1870 to 2013 in 17 developed countries and finds that increasing life expectancy, which serves as proxy for the improving health status, significantly increases per capita income in the long-run. However, he highlights

[3]On the efficiency of the healthcare systems in the EU and OECD countries in our journal, see Dincă et al. (2020) and Kozuń-Cieślak (2020).

[4]e. g., Ehrlich – Lui 1991; Barro 1996; Maudos et al. 1999; Bloom et al. 2004; Bloom – Canning 2008; Tzeremes 2014.

that the reversed causality is also present, thus endogeneity should be handled. This reversed causal relationship between economic growth and health is well documented in the literature. Wealthier countries with higher per capita income have better financial opportunities to improve health. Wealth, higher income and additional investments may have a positive impact on health conditions (Grimm 2011; Barro 2013; Cafri – Samut 2021).

A broad range of literature reveals the relationship between health expenditure and economic growth, but these studies do not reach such unambiguous conclusions as are demonstrated in the case of health status and growth. Chaabouni – Saidi (2017) examine 51 countries[5] with the generalised method of moments (GMM), identifying a positive bi-directional relationship between the two variables. Amiri – Ventelou (2012) provide evidence of a causal relationship from health expenditure to economic growth in 18 OECD countries with the exemption of Norway and Iceland. Ifa – Gueta (2019) show this causality using the autoregressive distributed lag method in the cases of Morocco and Tunisia. Wang (2015) uses the GMM method on the OECD countries' data and points out that the optimal healthcare expenditure is 7.55% of the GDP, and below this optimal point, the increasing healthcare expenditure has a positive effect on economic growth.

Several studies find even weaker causal relationships from health expenditure to growth. Using linear and non-linear Granger, Ye – Zhang (2018) verify causality from government healthcare expenditure to economic growth in 13 countries, but they do not find this relation in seven other cases. Aslan et al. (2015) can present causality in two industrialised countries, but they cannot do it in five cases. Balaji (2011) applies the Johansen cointegration and Granger causality to analyse the data of four Indian states and does not find any causal relationship between the variables. Rivera – Currais (2003) cannot exhibit a casual relation with the dynamic panel method in seventeen Spanish regions. In the EU countries, Tunalı, – Saruç (2018) discover only a unidirectional causality from growth to healthcare expenditure with the Dumitrescu-Hurlin test developed for the panel Granger causality method.

Some studies explore the impact of healthcare spending on health conditions and life expectancy but cannot establish a direct positive impact (Wennberg 2002; Wang 2015). On a global scale, some countries with lower levels of health expenditure per capita achieve better health status than others with higher healthcare spending (Ray – Linden 2020). Likewise, in the EU, Germany, the Netherlands, Sweden and Austria spend twice as much on healthcare than Greece, Italy, Spain, Portugal or Slovenia, but they achieve similar results in life expectancy (OECD 2019). However, these investigations show static comparisons and do not reveal trends.

To the best of our knowledge, the co-movement of health status and growth has not been examined in the context of convergence yet. The literature confirms the mutual causality between the two variables. Thus, this mutual causality can be assumed in the convergence of the CEE countries as well. The literature on the relationship between health expenditure and economic growth indicates ambiguous, mixed results. Considering this fact, we investigate the effect of government healthcare expenditure on the convergence of health status in terms of life expectancy.

[5]https://www.google.hu/search?sxsrf=ALeKk032zxMcdCX78Jtsxy10GdyH-u9G0Q:1588262507979&q=dynamic+simultaneous+equations&spell=1&sa=X&ved=2ahUKEwiphOT0wpDpAhVmhosKHQvoDFYQkeECKAB6BAgMEC0.

3. DATA AND METHODOLOGY

All of the data analysed here are collected from the Eurostat databases between 1995 and 2018. We analyse the health convergence based on life expectancy, the economic convergence based on GDP per capita in purchasing power standard (PPS), and the government healthcare expenditure expressed in natural logarithm of expenditure in million EUR.[6] We consider the six founding EU member states[7] as a reference point, and we analyse the health and economic convergence of the CEE countries to these member states. On the one hand, people in CEE compare their living standard (including their health care) with the performance of the Northwestern countries. On the other hand, the common historical root of their social insurance systems (the Bismarck model) also justifies the choice of the Northwestern continental countries. This group of countries can be well-identified with the founding EU member states. In the case of health and economic convergence, we use average GDP and life expectancy of the six founding EU member states as a reference point. We measure the difference of life expectancy between the CEE countries and the EU6 average with the following ratio: life expectancy of the country/average EU6 life expectancy. Economic convergence is expressed by the ratio of GDP per capita in PPS of the country/average EU6 GDP per capita in PPS. An increasing ratio means health and economic convergence, while a decreasing ratio means divergence.

Before the analysis, a first look at the data (Figures 1 and 2) suggests that there can be some relation between economic and health convergence, and between healthcare expenditure and health convergence, and they are related positively. Furthermore, it is visible that the Baltic States have taken the longest way vertically, that is, the economic convergence is the fastest in these countries (Figure 1).

As the literature review mentioned, some studies used simple time series techniques because they examined the countries separately, and some of them applied panel data and panel methods. We also handle our sample as a whole, thus we use panel data and panel methods. We apply panel cointegration techniques and a panel vector error correction model, because if they are cointegrated, we can analyse the possible long-term and short-term connections between the variables. The advantage of this model is that if there is a long-term co-movement between the two-time series and a causal relationship between them, then the estimation indicates which variable adapts to the other and corrects it to the long-run equilibrium. We use the Eviews software in the analyses and estimations.

First of all, we use a panel unit root test of Im et al. (2003) to check whether the variables are unit root processes or stationery at level and after differentiation. After that, we examine the panel data whether they are cointegrated or not. To decide this, we use the Kao panel cointegration test (Kao 1999) and the Fisher-type panel cointegration test (Maddala – Wu 1999). The first test is based on the classical Engle-Granger (1987) cointegration test which estimates what is called the cointegrating equation (after it diagnosed that the two time series are integrated in the same order, that is, they are both I(1) processes) and analyses its error term in the following form:

[6]Initially, we wanted to use healthy life expectancy but in these time series there were a lot of breakpoints because of methodological changes, thus the data were not consistent. We do not use the government healthcare expenditure/GDP ratio because the changes of GDP could distort the relationship between government healthcare expenditure and life expectancy. As the differences of the natural logarithm of expenditure are calculated, the different sizes of the countries do not distort the cointegration test.

[7]Belgium, the Netherlands, Luxembourg, France, Germany and Italy.

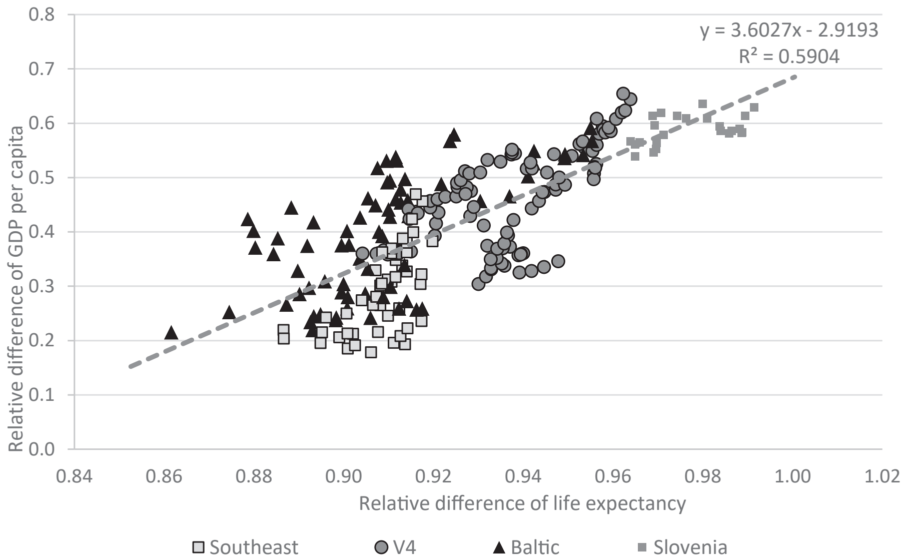

Fig. 1. The relation between health and economic convergence (1995–2018)
Source: Own calculation based on data from Eurostat.

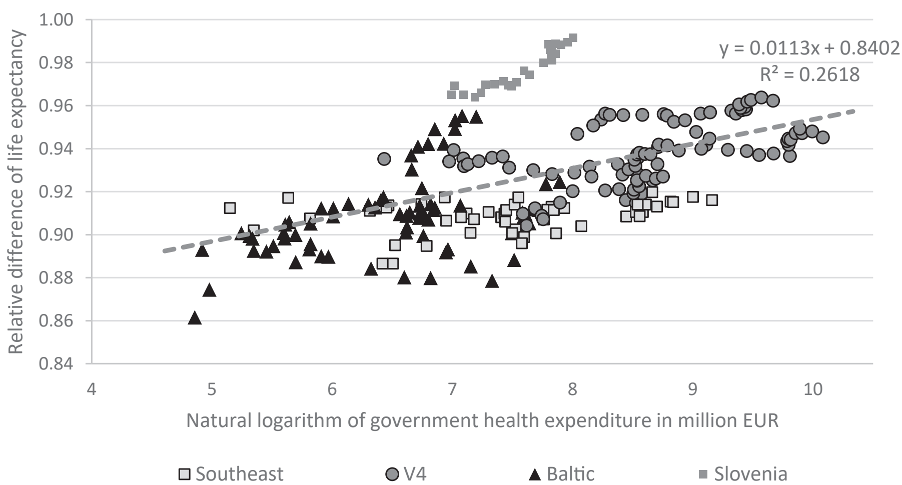

Fig. 2. The relation between government healthcare expenditure and life expectancy (1995–2018)
Source: Own calculation based on data from Eurostat.

$$X_t = a_0 + a_1 Y_t + E_t, \tag{1}$$

where E_t is the error term. If this time series of error terms is stationary and not a unit root process, then the two (or more) time series are cointegrated. The Fisher-Johansen test is based on the classical Johansen (1988) cointegration test, which estimates cointegrating vectors between the variables. If there is more than zero cointegrating vector, but less than the number of variables, they are cointegrated. The Kao and Fisher-Johansen tests are similar to the above-mentioned time series techniques (Engle-Granger and Johansen), adding a cross-sectional dimension to them.

If the variables are cointegrated, we can estimate a panel vector error correction model. This model is actually the same as the classical vector error correction model (VECM) with a cross-sectional dimension (j), and it can be written in the case of two variables in the following form:

$$\Delta X_{j,t} = \alpha_0 + \alpha_1 E_{j,t-1} + \sum_{i=1}^{n} \alpha_{2i}(1-L)\Delta X_{j,t-i} + \sum_{i=1}^{n} \alpha_{3i}(1-L)\Delta Y_{j,t-i} + u_{j,t}, \tag{2}$$

$$\Delta Y_{j,t} = \beta_0 + \beta_1 F_{j,t-1} + \sum_{i=1}^{n} \beta_{2i}(1-L)\Delta X_{j,t-i} + \sum_{i=1}^{n} \beta_{3i}(1-L)\Delta Y_{j,t-i} + v_{j,t}, \tag{3}$$

where $\Delta X_{j,t}$ is the change of the X variable in the period t, and $E_{j,t-1}$ is the error-correction term, and α_1 shows what percentage of the lagged residual is corrected in the period t, and $u_{j,t}$ is the error term. The same interpretations are true for ΔY_t, v_t, F_{t-1} and β_1. After estimating the above equations, we can decide from the significant or insignificant α_1 and β_1 parameters which variable adapts to our other variable in the long-run, so we can find the direction of the long-term causal relationship between our variables. Naturally, if both α_1 and β_1 are significant, bi-directional causality is present between the two-time series. In these equations L is the lag operator, and ΔX_{t-i} and ΔY_{t-i} are the changes of the X and Y variables in the previous period. The optimal lag number is chosen based on the Schwartz information criteria (BIC).

Using the VECM, we are able to analyse short-term causal effects in addition to the long-term relationship. If α_{2i}, a_{3i}, β_{2i} or β_{3i} coefficients are jointly significant, we can identify a short-term causal relationship between the variables. To decide whether they are significant, we apply the Wald Chi-Squared test. After estimating the VECM, we can also investigate the effect between the variables with the impulse response function. The impulse responses show how the variables respond to a positive standard deviation shock in the different variables in the next periods. The accumulated impulse response function reveals the aggregated impulse reactions until the given period.

4. RESULTS AND DISCUSSION

First of all, we use the Im-Pesaran-Shin panel unit root test for analysing the integration order of variables. The null hypothesis of this test is that the data follow a unit root process and if the probability is less than 0.05, we can reject this null hypothesis. The results of the unit root tests show that all of our panel data are unit root processes at level, and they are stationary after differentiation (Table 1). They are integrated in the same order, thus, the panel cointegration tests can be calculated. The results of the cointegration test confirm that our panel data series are cointegrated. The Kao and the Fisher-type panel cointegration tests display that both pairs, the health and economic convergence and the health convergence and government health expenditure, are cointegrated.

First, we examine the relationship between the relative difference of life expectancy and relative difference of economic growth with the panel VECM (Tables 2 and 3). We apply a

Table 1. *P*-values of Im-Pesaran-Shin unit root tests and panel cointegration tests for the analysed variables

Data series	Unit root test		Cointegration	
	At level	1st difference	Kao *P*-value	Fisher-type cointegration
Relative difference of GDP per capita	0.9997	0.0000	0.0230	None: 0.0000 At most 1: 0.3176
Relative difference of life expectancy	0.7400	0.0000		
Relative difference of life expectancy	0.7400	0.0000	0.0013	None: 0.0000 At most 1: 0.6649
Government healthcare expenditure	0.1617	0.0000		

Source: Own calculation.

Table 2. Panel VECM estimation on relative GDP difference to relative life expectancy difference

	ΔGDP_diff$_t$			
	Coefficient	Std. error	t-ratio	*P*-value
Error correction term	–0.0298	0.0150	–1.9856	0.0479
ΔGDP_diff$_{t-1}$	0.3257	0.0693	4.6979	0.0000
ΔGDP_diff$_{t-2}$	–0.0195	0.0705	–0.2763	0.7825
ΔGDP_diff$_{t-3}$	–0.1043	0.0680	–1.5340	0.1259
ΔGDP_diff$_{t-4}$	0.0298	0.0649	0.4595	0.6462
ΔLE_diff$_{t-1}$	–0.1799	0.2363	–0.7613	0.4470
ΔLE_diff$_{t-2}$	0.2821	0.2286	1.2341	0.2180
ΔLE_diff$_{t-3}$	–0.1112	0.2207	–0.5040	0.6146
ΔLE_diff$_{t-4}$	–0.2696	0.1827	–1.4754	0.1410
Constant	0.0027	0.0030	0.8717	0.3839
Crisis	–0.0218	0.0044	–4.9254	0.0000
Baltic	0.0134	0.0037	3.5836	0.0004
V4	0.0055	0.0033	1.6775	0.0943
Southeast	0.0061	0.0036	1.7177	0.0867
Mean dependent	0.0109	S.D. dependent		0.0144
Sum sq. resids	0.0270	S.E. equation		0.0124
R-squared	0.3079	Adjusted R-squared		0.2568
Wald Chi-Square test of ΔLE_diff coefficients	Chi-square 5.3482		*P*-value 0.2534	

Source: Own calculation.

Table 3. Panel VECM estimation on relative life expectancy difference to relative GDP difference

	ΔLE_diff$_t$			
	Coefficient	**Std. error**	**t-ratio**	***P*-value**
Error correction term	−0.0726	0.0202	−3.5975	0.0004
ΔLE_diff$_{t-1}$	−0.0186	0.0746	−0.2498	0.8029
ΔLE_diff$_{t-2}$	0.0266	0.0722	0.3685	0.7127
ΔLE_diff$_{t-3}$	−0.0040	0.0697	−0.0577	0.9540
ΔLE_diff$_{t-4}$	−0.0512	0.0577	−0.8864	0.3760
ΔGDP_diff$_{t-1}$	−0.0199	0.0219	−0.9093	0.3638
ΔGDP_diff$_{t-2}$	−0.0338	0.0223	−1.5207	0.1292
ΔGDP_diff$_{t-3}$	−0.0130	0.0215	−0.6065	0.5445
ΔGDP_diff$_{t-4}$	0.0011	0.0205	0.0554	0.9558
Constant	0.0023	0.0010	2.3953	0.0171
Crisis	0.0025	0.0014	1.7852	0.0751
Baltic	−0.0011	0.0012	−0.8968	0.3705
V4	−0.0013	0.0010	−1.2498	0.2122
Southeast	−0.0005	0.0011	−0.4403	0.6600
Mean dependent	0.0009	S.D. dependent		0.0040
Sum sq. resids	0.0027	S.E. equation		0.0004
R-squared	0.1247	Adjusted R-squared		0.0600
Wald Chi-Square test of ΔGDP_diff coefficients	Chi-square 4.8559		*P*-value 0.3024	

Source: Own calculation.

model with four lagged values based on the Schwartz information criteria. In the estimation, we control the effect of the global crisis (2009) with a crisis dummy variable, because it had a large impact on economic growth. Considering regional heterogeneity, Baltic (Estonia, Latvia, Lithuania), V4 (Hungary, Poland, Slovakia, Slovenia) and Southeastern (Romania, Bulgaria) country dummies are incorporated in the estimation.

Our findings prove the assumption that *health status has a significant positive effect on economic convergence.* The coefficient of the error term is significant, so there is a long-term relationship between health and economic convergence. If there is a difference from the long-run equilibrium, economic convergence corrects with 3% to this equilibrium in the next year. This means that the *life expectancy convergence results in the economic convergence in the long-run*. However, the Wald Chi-Square test shows that there is not a significant effect from health to economic convergence in the-short run, and they are jointly insignificant which means we cannot reject the null hypothesis that these coefficients equal zero. This is not a surprise because higher life expectancy can affect growth in the long-run but not immediately. Both the quite low value of the error-term coefficient (0.03) and the insignificant short-term effect strengthen the long-term effect of improving health status (Table 2).

The accumulated impulse response function also underpins this slow effect. The impact of one standard deviation shock of health convergence on the GDP convergence is visible in 6–8 years (Figure 3). As can be expected, the coefficient of the crisis dummy is significant and negative. The significant and positive coefficient of the Baltic dummy is in line with the fact that economic convergence in the Baltic States is faster than in other CEE countries (Table 2).

The reversed long-term causal relationship – from the economic convergence to health status – is also observable and the error term is even higher (0.07) than in the previous case. It complies with the findings of the literature that a higher income results in a higher standard of living, which can increase average lifetime. The short-term coefficients are insignificant also in this case (Table 3). Economic convergence does not influence life expectancy straight away.

In the causal relationship from economic convergence to health status, the accumulated impulse response function also suggests a quite slow effect and the positive impact appears in 6–8 periods (Figure 4).

After confirming a bi-directional causal relationship between health and economic convergence, we examine whether health status is related to government healthcare expenditure. If this relationship exists, the governments of the CEE countries can help economic convergence with a higher healthcare expenditure through the life expectancy channel. We run a panel VECM again to scrutinise this possible relationship (Table 4).

The result of the estimation supports this supposition. The error correction term is significant, which means that there is a long-running co-movement between health expenditure and health convergence, and increasing expenditure results in health convergence. The coefficient of the error correction term is only 2%, which means that this effect prevails slowly. The Wald-test of the short-term coefficients and the accumulated impulse response function (Figure 5) also strengthen this statement, and the effect of the increased health expenditure appears in 4–5 periods based on the impulse response.

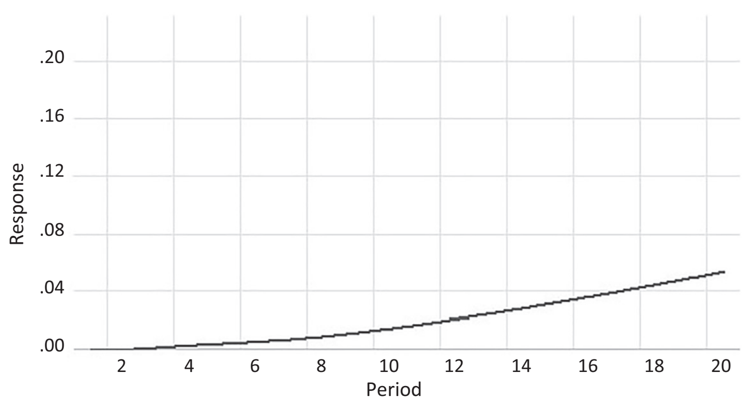

Fig. 3. The accumulated response of relative GDP difference to relative life expectancy difference
***Source*: Own calculation.**

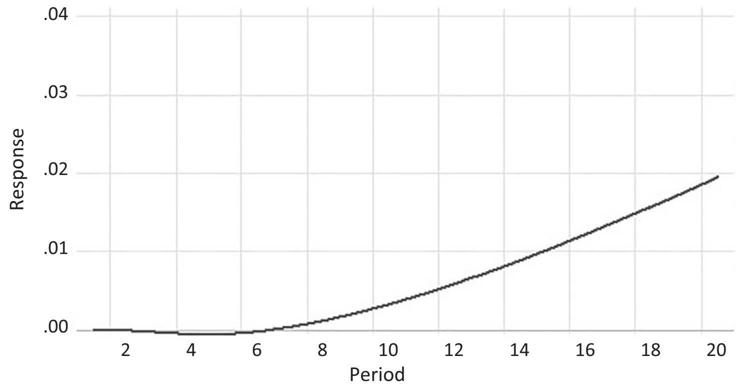

Fig. 4. The accumulated response of relative life expectancy difference to relative GDP difference
Source: Own calculation.

Table 4. Panel VECM estimation on relative life expectancy difference to government health expenditure

	ΔLE_diff$_t$			
	Coefficient	**Std. error**	**t-ratio**	***P*-value**
Error correction term	–0.0194	0.0098	–1.9780	0.0488
ΔLE_diff$_{t-1}$	0.0046	0.0746	0.0622	0.9505
ΔLE_diff$_{t-2}$	0.0705	0.0775	0.9099	0.3635
ΔLE_diff$_{t-3}$	–0.0472	0.0748	–0.6315	0.5282
ΔLE_diff$_{t-4}$	–0.1154	0.0725	–1.5910	0.1126
ΔLE_diff$_{t-5}$	–0.1220	0.0611	–1.9957	0.0468
ΔGov_exp$_{t-1}$	0.0031	0.0031	0.9919	0.3220
ΔGov_exp$_{t-2}$	–0.0020	0.0029	–0.7159	0.4745
ΔGov_exp$_{t-3}$	0.0002	0.0028	0.0677	0.9461
ΔGov_exp$_{t-4}$	0.0028	0.0026	1.0956	0.2741
ΔGov_exp$_{t-5}$	0.0004	0.0023	0.1618	0.8716
Constant	0.0024	0.0011	2.1620	0.0313
Baltic	–0.0002	0.0011	–0.1757	0.8607
V4	–0.0030	0.0015	–2.0131	0.0449
Southeast	–0.0027	0.0014	–1.8679	0.0627

(continued)

Table 4. Continued

	ΔLE_diff$_t$			
	Coefficient	**Std. error**	**t-ratio**	***P*-value**
Mean dependent	0.0008	S.D. dependent		0.0040
Sum sq. resids	0.0026	S.E. equation		0.0040
R-squared	0.1014	Adjusted R-squared		0.0251
Wald Chi-Square test of ΔGov_exp coefficients	Chi-square 2.7966 *P*-value 0.7313			

Source: Own calculation.

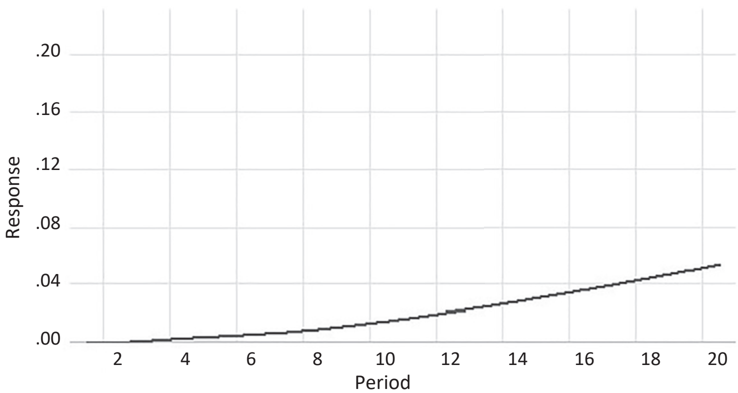

Fig. 5. The accumulated response of relative life expectancy difference to government health expenditure
Source: Own calculation.

5. CONCLUSION

The goal of this study is to explore the relationships between health and economic convergence and between government healthcare expenditure and health status. The results of the panel VCEM estimations suggest that there is a co-movement between the variables in both cases.

In the CEE countries not only the GDP per capita and expected lifetime have increased but these countries have been able to converge to the founding EU member states, which represent the group of core countries and which are regarded in the CEE countries as the reference points. The low-wage growth model of the CEE countries has not made the convergence in both factors of well-being impossible. In addition, this study confirms the mutual causal relationship between the two factors, similarly to the other samples of countries discussed already by many studies. The effect of economic convergence on health convergence is stronger than the other way around. However, it is noteworthy that an increasing life expectancy has a positive effect on economic convergence despite the rapidly ageing CEE societies.

Considering the progress in well-being, the low ranking of the CEE countries in Eurostat overall life satisfaction surveys seems to be contradictory. It presumably emerges from the expectations of the CEE societies, which are based on the comparison with more developed countries.

It is remarkable that the regional dummies reveal a significant, positive effect only in one case. In the Baltic States, the improving life expectancy has had a stronger significant effect on the economic convergence than in the other two subgroups. In the other two estimations, the regional effect does not play a role. It is interesting, because in the literature the CEE countries are classified usually into the groups of Baltic States, Visegrad and Southeastern countries, and one of the most important distinctive features is the difference in their social security systems and social services (e.g., Bohle – Greskovits 2012). Our study indicates that if the co-movement of these two very fundamental variables are scrutinised, there is no significant difference among them.

In the second examination, we have found a relatively weak causal relationship from government healthcare expenditure to health convergence but taking into account the long-running impulse response, it is not negligible. However, this investigation has limitations. To draw up policy options, several other aspects (e.g., the efficiency of the public healthcare system and private health expenditure) should be analysed in individual countries.

The Covid-19 pandemic has severely detrimental impact on both economies and healthcare. Hopefully, the coronavirus does not affect the life expectancy in the long-term. However, due to the uncertain economic consequences of pandemic, future research has to control the revealed co-movement of economic and health convergence.

To sum up, the co-movement of economic and health convergence draws attention to the importance of healthcare in the catching-up of the CEE countries with more developed EU member states. The improvement of the healthcare system and increasing investment in human capital may be a channel for the acceleration of convergence.

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