Article

Causality in the Relationship between Economic Growth and Compensation

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Abstract: Compensation of labour and economic growth are two economic variables of particular interest to researchers. There have been many theories linking these quantities in causal relationships. Similarly, some studies suggest that changes in wages lead to economic growth, while others contradict this and suggest that economic growth is the cause of changes in wages. It is important to determine which of these quantities is the cause and which is the effect, as this allows for a more effective implementation of fiscal policy. The research presented in this article addresses this issue. They are based on data from OECD countries for the years 2003–2021. Correlation and cointegration analysis were used in the description. Both general dependencies, i.e., based on annual averages obtained for each country, and specific dependencies, i.e., for each country separately, have been examined. The general conclusion is that current compensation acts as a brake on economic growth, while current economic growth stimulates future compensation. Such results can be the basis for designing government programmes aimed at stimulating the economy rather than regulating wages. However, the specifics of some countries differ from the general conclusion. However, these countries are in the minority.

Keywords: causality; compensation; GDP growth; cointegration

1. Introduction

Economic change is an ongoing process. Companies change and new professions, goods and financial products are created, and, even if economies are temporarily in crisis, this does not prevent long-term growth, increasing the economic activity of companies and changing labour market relations [1,2]. This sustained economic growth is associated with an average increase in real wages and an improvement in the living conditions of entire societies. Although countries are still divided into highly developed and underdeveloped countries, in retrospect, the global changes have certainly been beneficial for societies as a whole [3].

The study of economic growth is part of basic economic research. It is quite easy to list the factors of economic growth, as they are directly derived from theoretical models that have been subjected to positive empirical verification. Among the best known and described models of economic growth are the Harrod, Domar, Harrod–Domar, Solow, Mankiw–Romer–Weil and Nonneman–Vanhoudt models [4]. Looking at the economy from the point of view of society, the most important issue is the income of the population, especially the income earned from work. The level of wages as a variable describing the well-being of the population was pointed out by the classical economists Marshall [5] and Hicks [6]. Based on their research, the Hick–Marshal law of secondary demand was formulated. The Hick–Marshal model makes it possible to explain the effects of changes in wage level on the labour market and the goods market.

Recent years have seen a clash between two schools of economics, the neoclassical and the Keynesian [7]. In highly developed countries, the Keynesian approach tends to

prevail. According to this approach, wages have a direct positive impact on the country's economic growth, and one of the most important policy instruments influencing the labour market and economic growth is the minimum wage. It is suggested that an increase in the minimum wage can be an impetus for an increase in the level of average wages, as well as an increase in consumer demand and thus general economic growth [8–10]. At present, the minimum wage is one of the basic instruments of fiscal policy and the state's influence on the economy, and the strength of this influence is currently significant, especially in regulatory matters [11]. Opponents of the concept point out that raising the minimum wage is a populist measure that burdens employers. Although it is beneficial for the state budget, which is fed by additional wage-related burdens in the form of taxes, social security contributions, etc., it can also contribute to inflation and encourage the development of an informal economy. In general, opponents of the regulatory role of the state emphasise the many drawbacks of such a policy, in particular unsuccessful trial and error, the creation of new regulations, the mixing of economic and political issues and succumbing to social demands [12].

Given the importance of economic growth for quality of life and social development [13], and the controversy surrounding the instrumental regulation of wages, two problems were posed for study:

Q1: *What is the overall relationship between compensation levels and economic growth?*

Q2: *What is the direction and strength of the causal relationship in the relationship between compensation and economic growth?*

The research is based on 36 OECD countries for which data on economic growth and the share of compensation in GDP have been collected. The period covered by the analyses is 2003–2021.

The research carried out and the answers to the research questions are particularly important for the design of fiscal policy and economic stimulus programmes. Identifying the causality in the relationship between compensation and economic growth allows for appropriate programming of fiscal policy. Other programmes will be aimed at stimulating wages and others at stimulating economic growth. The programmes to be implemented should be consistent with the direction of causality, as this will increase their effectiveness.

Wages and compensation are very similar terms. They are sometimes used interchangeably, but compensation is a broader concept. In national accounts, compensation of employees is defined as the total remuneration, in cash or in kind, payable by an employer to an employee in return for work carried out by the latter during an accounting period. Compensation of employees consists of wages and salaries in cash or in kind and employer's actual and imputed social contributions.

The research analysis was based on three points. First, the average economic growth dynamics and the average compensation share in GDP were determined for each country (described in Section 4.1), and then the correlation relationship between these values was determined (described in the first part of Section 4.2). This study allowed us to answer question Q1. In order to make the results obtained credible, an assessment of the relationship between annual economic growth and annual changes in the compensation share of GDP was carried out separately for each country (described in the second part of Section 4.2). In addition, cointegration analysis was carried out to answer question Q2 (in Section 4.3).

2. Literature Review

At the turn of the 20th and 21st centuries, there was a debate in the literature about the impact of the minimum wage on economic growth. An example of a study that found a positive answer, i.e., a positive correlation between minimum wage increases and economic growth and employment, is the study by Card and Krueger [14]. In contrast, Neumark

and Wascher [15] analysed and synthesised the results of more than 90 studies following Card and Krueger on the effects of minimum wage changes on economic growth and employment. These studies include empirical evidence for the United States, some Organisation for Economic Co-operation and Development (OECD) countries, Latin America and Indonesia. The authors conclude that, in general, increases in the minimum wage reduce the employment of low-skilled workers. More specifically, Neumark and Wascher [15] find a wage elasticity of employment between −0.1 and −0.3, thus contributing to slower economic growth.

Dube, Lester and Reich [16] found similar results to Card and Krueger in terms of economic growth and employment (i.e., a weak effect), but a positive effect on earnings. Stewart [17] analysed the impact of the introduction of the national minimum wage in the UK in April 1999 and its subsequent increases in 2000 and 2001. He found no evidence of a negative employment effect of the minimum wage. Another recent UK study also found no evidence of a negative effect [18]. Abundant research has been done on the impact of the minimum wage on employment, earnings and economic growth [19–26]. Their results tend to be on the borderline of statistical significance and depend on the country and the reforms carried out, as well as on the level of wages in a given country. There are even studies on the impact of the minimum wage on the state of the natural environment [27]. Neither the arguments in favour of the minimum wage nor the arguments against it can be clearly stated. With results bordering on statistical significance, the issue is often more political than economic.

Apart from government regulation, another issue to consider when analysing wages and their impact on employment and economic growth is the bargaining power of workers. The similarity of attitudes among employees makes them aware of the greater bargaining power in demanding higher wages [28]. Workers do not want their wage rate to differ too much from that of the neighborhood [29]. Employees expect a fixed wage rate that is not too different from that in other companies. If the most productive area raises wage rates due to a positive productivity shock, workers in the less productive area may, on the basis of fair judgement, demand equal wage increases without adjusting for relative productivity gains [30]. With relatively low wages and a wide wage spread, such demands may be justified and usually do not cause much harm [31,32].

An increase in wages leads to an increase in labour costs. The increase in labour costs is a burden for employers, so they will be willing to pay higher wages if employee productivity also increases. The wage rate is closely related to labour productivity [33,34]. The higher the labour productivity, the higher the output that can be produced. Wages analysis is not only about hard variables such as experience but also about soft variables such as empowerment and engagement [35].

In addition, labour productivity is identified by the type of employees, innovation and physical capital. The level of education of the workforce and the level of physical capital have a significant impact on labour productivity [36]. Technology is the critical factor that determines the level of output. Higher efficiency can only be achieved with better technology. Better technology is conducive to increasing the efficiency of production equipment, so that the production process can create more value [37]. However, the operation of technologically advanced production equipment requires highly skilled workers. Therefore, the efficiency of the use of the means of production will increase if the skills of the workers also increase.

Research on the impact of wages on economic growth is not easy. This is mainly due to the interdependence of economic variables, variability of economic conditions and time shifts [38].

The basic problem is that the income of the population in the form of wages is a component of GDP, which is calculated according to the income method. According to this method, GDP is the sum of the incomes of all owners of the factors of production, i.e., income from work (wages), income from capital, government revenue and depreciation [39].

The links between labour productivity growth and wage growth have been the subject of many studies. Of particular interest is the behaviour of these measures in critical periods. Recent research has pointed to weak labour productivity growth as part of the explanation for low wage growth [40,41]. At the same time, automation, technological changes, the increasing global integration of production and offshoring have affected some segments of the labour market [42,43]. These changes may be perceived (rightly or wrongly) by workers as reducing job security and increasing competitive pressures, and may therefore contribute to some extent to the slowdown in wage growth [44]. Despite generally rising wages worldwide, in the long run, from a firm's perspective, an employee's real wages should reflect how much they can produce per unit of labour input [45].

Improving the living conditions of society and increasing real wages is one of the fundamental objectives of macroeconomic policy. The question is always how to achieve this. Possible solutions may be either to stimulate economic growth and then to distribute this growth appropriately, or to regulate wages, in particular the minimum wage, in the expectation that higher wages will lead to higher consumption, which will stimulate further economic growth. Further consideration will be given to the relationship between economic growth and the compensation of labour, as an issue with a major impact on prosperity and socio-economic development.

3. Research Methodology

The research material is data on GDP and the compensation of employees for the years 2003–2021, obtained from the OECD Statistical Office. GDP growth has been calculated on the basis of GDP at constant prices:

$$GDP\ growth\ (t) = \frac{GDP(constant\ prices)_t}{GDP(constant\ prices)_{t-1}}.$$

Based on GDP data in current prices and the compensation of employees, the share of compensation of employees in a country's GDP has been calculated:

$$Compensation/GDP\ (t) = \frac{Compensation\ of\ employees_t}{GDP(nominal\ prices)_t}.$$

GDP growth and *Compensation/GDP* are relative values and can be compared between the countries participating in the study.

The *Compensation/GDP* value is a static value; therefore, in the dynamic tests, an increment of this value was used:

$$d(Compensation/GDP)\ (t) = Compensation/GDP\ (t) - Compensation/GDP\ (t-1).$$

Such increments are values expressed in percentage points.

It should be noted that the *GDP growth* and *d(Compensation/GDP)* used in the calculations are increments. Incremental dependency modelling satisfies the assumptions of normality and stationarity. The increment-based modelling used in the research allows the true dependencies to be captured. In the case of level modelling and the presence of a trend in the data, the relationships obtained are apparent. This is not the case here. Detailed diagnostic tests have been omitted as they show that all necessary assumptions are met.

Descriptive statistics were calculated for *GDP growth* and *Compensation/GDP*, which were used to classify countries according to the speed of economic development and the bargaining power of employees, as reflected in the share of compensation in the country's GDP:

- mean and standard deviation,
- minimum and maximum.

The average values of *GDP growth* and *Compensation/GDP* were presented in column charts and used for the correlation study, which allowed us to answer the first research ques-

tion (Q1). A correlation coefficient has been calculated between the average annual *GDP growth* and *Compensation/GDP*. This makes it possible to assess the strength of the overall relationship between *GDP growth* and *Compensation/GDP* in the group of all countries.

This study may have a drawback in that the amount of *Compensation/GDP* is a level of participation, not an increase. Therefore, it was treated as a preliminary study, and the correlational research was based on the value increases for each country individually.

In the next part, the relationships were subjected to a correlation study for each country, assuming that the direction of the cause-and-effect relationship results from appropriate time shifts (Q2):

d(Compensation/GDP) (t) ↔ GDP growth (t)	this relationship concerns the relationship between the simultaneous change in economic growth and employees' compensations;
d(Compensation/GDP) (t) → GDP growth (t + 1)	this relationship concerns the impact of changes in employees' compensations on future economic growth;
GDP growth (t) → d(Compensation/GDP) (t + 1)	this relationship concerns the impact of economic growth on future employees' compensations.

The last part of the research is cointegration analysis. The cointegration test can be used to determine the existence of a long-running relationship between economic variables. From a statistical point of view, a long-running relationship means that the variables move together over time so that short-term disturbances in the relationship resulting from a long-term trend are corrected [46].

The procedure for the determination of the existence of a cointegration relationship is as follows [47]:

1. The long-running relationship called the cointegrating regression is estimated using OLS:

$$y_{1t} = \alpha + \beta y_{2t} + \varepsilon_t$$

2. The residuals from this regression are retained:

$$\mu = y_{1t} - \alpha^{OLS} - \beta^{OLS} y_{2t}$$

3. The PP test is applied to the residual as follows:

$$\Delta \mu_t = \theta \mu_{t-1} + \sum_{i=1}^{m} \varphi_i \Delta \mu_{i-1} + v_t$$

In PP tests, the null hypothesis $H0 : \theta = 0$ is tested against the alternative $H0 : \theta < 0$. The null hypothesis of the cointegration test is that the series formed by the residuals of each of the cointegrating regressions is not stationary. The alternative hypothesis of the cointegration test is that the series formed by the residuals of each of the cointegrating regressions is stationary. The alternative hypothesis means that there is a long-term relationship between variables y_1 and y_2, and therefore it is a real relationship, not an apparent one.

4. Results

4.1. Descriptive Statistics

The OECD countries differ considerably in terms of economic growth (Table 1). Among the fastest growing countries in 2003–2021 were Turkey and Ireland, which recorded average annual economic growths of 5.40% and 5.06%, respectively. Israel came third with an average annual growth of 4.04%. Spain, Japan and Portugal, with an average annual economic growth of less than 1%, and Italy and Greece, which recorded negative average annual economic growths of −0.05% and −0.76%, respectively, occupied the bottom places.

Table 1. Economic growth and compensation in OECD countries in 2003–2021.

Country	GDP Growth				Compensation/GDP			
	Mean	St. Dev.	Min	Max	Mean	St. Dev.	Min	Max
Turkey	5.40%	0.0406	−4.82%	11.35%	27.6%	0.0221	24.7%	32.0%
Ireland	5.06%	0.0652	−5.10%	24.37%	35.7%	0.0580	26.1%	43.9%
Israel	4.04%	0.0215	−1.86%	8.61%	43.3%	0.0073	42.4%	44.8%
Poland	3.91%	0.0219	−2.02%	7.06%	38.4%	0.0114	36.5%	41.0%
Costa Rica	3.80%	0.0284	−4.27%	8.22%	44.5%	0.0146	41.8%	46.4%
Colombia	3.76%	0.0354	−7.25%	11.02%	33.3%	0.0123	31.4%	37.3%
Slovakia	3.46%	0.0377	−5.46%	10.83%	38.3%	0.0272	35.2%	43.9%
Korea	3.38%	0.0171	−0.71%	6.80%	44.6%	0.0164	42.5%	48.2%
Lithuania	3.34%	0.0512	−14.84%	11.11%	42.5%	0.0288	38.7%	48.0%
Estonia	3.01%	0.0562	−14.63%	9.77%	46.5%	0.0228	43.4%	50.9%
Latvia	2.62%	0.0604	−14.26%	11.97%	44.0%	0.0365	38.2%	50.0%
Australia	2.60%	0.0088	−0.05%	3.90%	47.6%	0.0071	45.6%	49.0%
Iceland	2.58%	0.0444	−7.66%	8.45%	51.7%	0.0303	45.2%	55.8%
Luxembourg	2.52%	0.0257	−3.24%	8.10%	47.7%	0.0134	45.8%	50.3%
Czechia	2.43%	0.0334	−5.50%	6.77%	42.0%	0.0178	40.2%	46.0%
Slovenia	2.16%	0.0387	−7.55%	8.21%	50.4%	0.0133	48.7%	53.6%
Sweden	2.14%	0.0260	−4.34%	5.95%	46.5%	0.0120	44.2%	48.0%
Hungary	2.09%	0.0341	−6.60%	7.20%	43.6%	0.0176	39.7%	46.1%
U. States	1.94%	0.0200	−2.77%	5.95%	53.8%	0.0088	52.5%	55.5%
Switzerland	1.94%	0.0177	−2.38%	4.22%	57.0%	0.0155	54.1%	59.7%
Mexico	1.74%	0.0328	−7.99%	5.12%	27.7%	0.0094	26.0%	29.9%
Canada	1.73%	0.0229	−5.07%	5.01%	50.3%	0.0091	48.8%	52.5%
Norway	1.56%	0.0152	−1.94%	4.01%	44.8%	0.0268	40.0%	50.2%
Belgium	1.52%	0.0234	−5.36%	6.29%	50.3%	0.0108	48.5%	52.2%
Netherlands	1.38%	0.0223	−3.89%	4.86%	48.6%	0.0104	46.9%	50.6%
Denmark	1.37%	0.0217	−4.91%	4.86%	51.7%	0.0098	50.5%	54.9%
Austria	1.26%	0.0256	−6.45%	4.56%	47.3%	0.0128	45.1%	50.5%
Germany	1.22%	0.0242	−5.69%	4.18%	51.3%	0.0149	48.2%	54.3%
U. Kingdom	1.15%	0.0366	−11.03%	7.60%	49.3%	0.0110	47.8%	51.9%
Finland	1.15%	0.0302	−8.07%	5.30%	47.6%	0.0123	45.9%	49.8%
France	1.07%	0.0279	−7.78%	6.82%	51.7%	0.0060	50.5%	52.4%
Spain	0.83%	0.0385	−11.33%	5.52%	47.2%	0.0146	45.0%	49.7%
Japan	0.52%	0.0227	−5.69%	4.10%	50.0%	0.0121	48.3%	52.5%
Portugal	0.50%	0.0312	−8.30%	5.50%	46.1%	0.0161	43.5%	48.4%
Italy	−0.05%	0.0323	−8.98%	6.99%	39.3%	0.0094	37.6%	40.9%
Greece	−0.76%	0.0489	−10.15%	8.43%	35.5%	0.0169	33.1%	39.9%

The countries that developed most rapidly were not very stable (high values for the standard deviation and the difference between the minimum and maximum). On the other hand, the most stable country was Australia, which had the lowest value of standard deviation (0.0088), but the average result of 2.60% placed Australia in 12th place.

Similar to the economic growth statistics, the *Compensation/GDP* statistics vary considerably between OECD countries. Two countries have a *Compensation/GDP* ratio below 30%—Turkey (27.6%) and Mexico (27.7%). At the other end of the scale is Switzerland with 57.0%.

The ratio of compensation to GDP is quite stable, but we can find countries with relatively high standard deviations, e.g., Ireland, where an average of 35.7% was obtained, with a standard deviation of 0.0580 and a min–max range of 26.1% to 43.9%.

Given that a period of 20 years is examined, differences of more than five percentage points in *GDP growth* can be considered significant. It is also worth noting that the fastest-growing countries include countries that are considered less rich, while the slowest-developing countries include countries that are considered rich. This is often described in the literature as an effect of the stabilisation of the development of the rich countries and the above-average growth rate of the less rich countries.

Differences between the average growth rate of GDP are shown in Figure 1 and between *Compensation/GDP* in Figure 2.
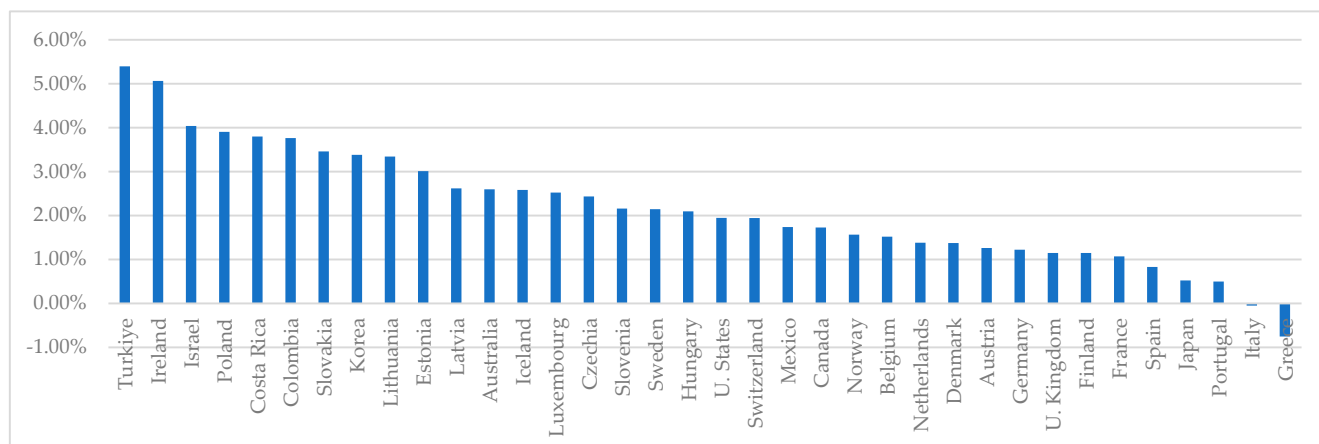

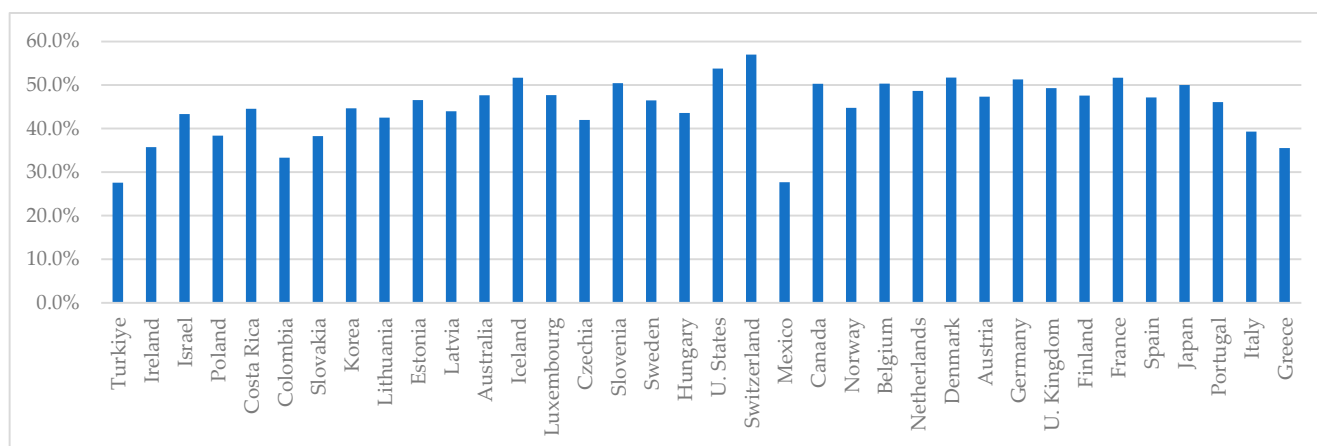**Figure 1.** GDP growth in OECD countries in 2003–2021.

Figure 2. Compensation/GDP relation in OECD countries in 2003–2021.

The order of countries in Figure 2 is the same as in Figure 1. There are very large differences in this ratio, reaching almost 30 percentage points. However, it is difficult to talk about trends here, although they do become clear when the data on average annual economic growth and the *Compensation/GDP* ratio are combined (Figure 3).
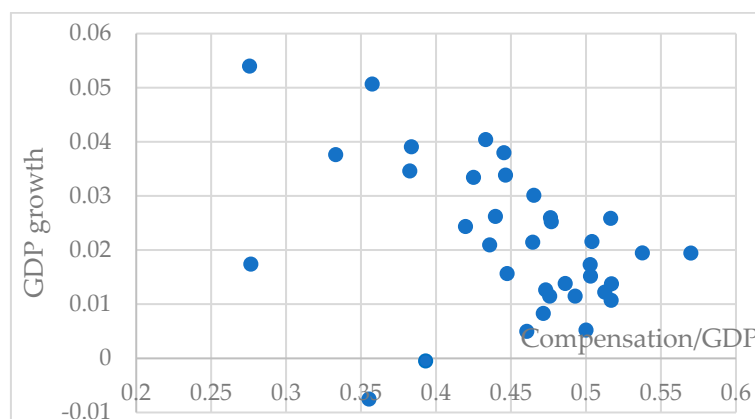

Figure 3. Relationship between average annual GDP growth and average Compensation/GDP ratio.

4.2. Correlation Analysis

It turns out that the relationship between the average annual GDP growth and the average *Compensation/GDP* ratio is negative (Figure 3), which means that a higher *Compensation/GDP* relationship corresponds to lower average *GDP growth* values. A Pearson linear correlation coefficient of −0.4007 was obtained for the data analyzed. Three countries seem to deviate from this general relationship, namely Mexico (coordinates 0.277 and 0.0174), Greece (0.355; −0.0076) and Italy (0.399; −0.0005). The estimated correlation after excluding these countries is −0.7538. Such results are to be expected, as richer countries tend to be characterised by lower *GDP growth* and higher wages. Therefore, this situation cannot be described as a cause-and-effect relationship, but as a certain statistical image.

If a regression line were drawn in Figure 3, the regression coefficient would be −0.08. This would imply that every one percentage point increase in the *Compensation/GDP* ratio leads to a 0.08 percentage point slowdown in *GDP growth*.

This general relationship cannot be fully interpreted as a rule. The dependencies in each country may differ from this dependency. A specific situation may lead to different behaviour. It is therefore important to identify the changes that have occurred in each country. This is the subject of further evaluation.

Figure 4 shows correlations in individual countries for data from 2003 to 2021. The graph shows three potential causal relationships:

(a) Relating GDP growth to the increase in d(*Compensation/GDP*) without time shifts. The dependence obtained for the vast majority of countries is negative. Out of 36 countries, only 3 countries obtained positive values of the correlation coefficient, while for 33 countries, it was negative, of which as many as 29 countries have a relationship of at least medium strength ($r < -0.3$), including 22 countries with $r < -0.5$. It can therefore be concluded that wage growth generally has a negative impact on current *GDP growth*.

(b) Impact of wage growth d(*Compensation/GDP*)(t) on future *GDP growth*(t + 1). The results vary widely, from quite clearly negative to clearly positive. The lack of a clear regularity does not allow for the claim that wage increases affect future economic growth.

(c) Impact of *GDP growth*(t) on future wage growth d(*Compensation/GDP*)(t + 1). Here, we see that the dependencies obtained are positive for the vast majority of countries. Thus, the higher the economic growth, the faster the future wage growth can be expected, and this is confirmed for 35 out of 36 countries, 24 of which have at least an average relationship ($r > 0.3$).

The results obtained are independent of the level of economic development of the country. It can be seen that the countries with the strongest negative relationship (part a) include Mexico and Colombia, countries with a lower level of economic development in this group, but also Austria and Switzerland, i.e., countries with a high level of economic development. However, the countries with the strongest positive relationship (part c) also include countries with higher and lower levels of economic development, namely Belgium and Canada, as well as Latvia, Lithuania and Poland.

The fact that individual groups are formed by countries with different levels of economic development, and that the number of cases deviating from the general regularities in parts (a) and (c) is small, lends credibility to the study.

4.3. Cointegration Analysis

Table 2 presents the parameters of cointegration analysis. These models correspond to the situation in Figure 4:

$$M1: \; GDP \; growth \; (t) = \alpha + \beta d(Compensation/GDP) \; (t)$$

$$M2: \; GDP \; growth \; (t+1) = \alpha + \beta d(Compensation/GDP) \; (t)$$

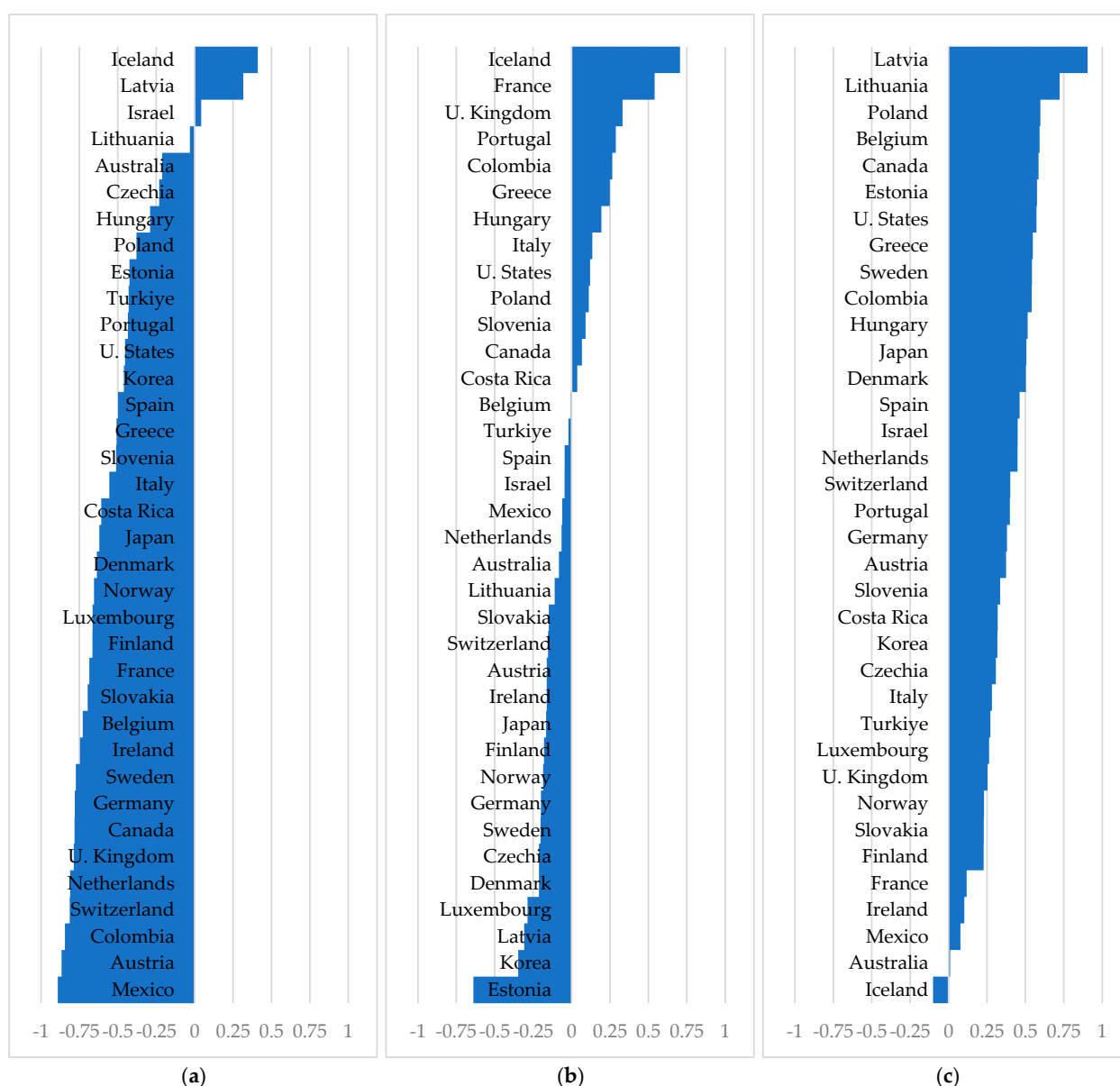$$M3: \; d(Compensation/GDP) \; (t+1) = \alpha + \beta GDP \; growth \; (t)$$

Figure 4. The relationship between *GDP growth* and the *Compensation/GDP* relationship in OECD countries in 2003–2021. (**a**) *GDPg*.(t) ↔ d(*Compen./GDP*)(t); (**b**) d(*Compen./GDP*)(t) → *GDPg*.(t + 1); (**c**) *GDPg*.(t) → d(*Compen./GDP*)(t + 1).

The table has been constructed so that the parameters and statistics of the cointegrating equation are in the following cells:

$$y_{1t} = \alpha + \beta y_{2t} + \varepsilon_t$$

Pearson's r coefficient	Cointegration β coefficient	β—*p* value	PP conintegration test statistics	PP—*p* value
	Cointegration α coefficient	α—*p* value	Log likelihood statistics	Hannan–Quinn criter. statistics

Table 2. Parameters and statistics of cointegration models between GDP growth and the Compensation/GDP.

Country		M1 GDPg.(t) ↔ d(Compen./GDP)(t)					M2 d(Compen./GDP)(t) → GDPg.(t + 1)					M3 GDPg.(t) → d(Compen./GDP)(t + 1)			
Australia	−0.2109	−0.2253	0.4008	−3.3942	0.0021	−0.0822	−0.1114	0.7538	−2.9850	0.0055	0.0101	0.0098	0.9692	−3.1336	0.0039
		0.0257	0.0000	60.1173	−6.4438		0.0257	0.0000	56.1643	−6.3625		−0.0017	0.7989	57.1191	−6.4749
Austria	−0.8658	−3.0225	0.0000	−4.1378	0.0004	−0.1612	−0.5918	0.5365	−7.6553	0.0000	0.3745	0.1061	0.1386	−4.3915	0.0002
		0.0165	0.0001	52.8906	−5.6409		0.0131	0.0744	38.0799	−4.2350		0.0006	0.7410	61.2769	−6.9640
Belgium	−0.7280	−1.9703	0.0006	−4.0141	0.0005	−0.0057	−0.0165	0.9826	−7.4217	0.0000	0.5930	0.2384	0.0121	−3.2073	0.0033
		0.0122	0.0088	48.8168	−5.1882		0.0142	0.0344	39.5832	−4.4118		−0.0040	0.0705	60.7115	−6.8975
Canada	−0.7816	−1.7198	0.0001	−4.3184	0.0002	0.0672	0.1655	0.7978	−6.0773	0.0000	0.5861	0.2826	0.0134	−6.3853	0.0000
		0.0186	0.0001	50.9488	−5.4251		0.0165	0.0167	39.8182	−4.4395		−0.0036	0.2104	56.6658	−6.4215
Colombia	−0.8438	−2.4588	0.0000	−3.0371	0.0047	0.2651	1.0280	0.3038	−3.9075	0.0007	0.5408	0.2107	0.0250	−4.2314	0.0003
		0.0390	0.0000	45.7811	−4.8509		0.0350	0.0018	32.8822	−3.6235		−0.0064	0.1237	53.4933	−6.0483
Costa Rica	−0.6069	−1.9607	0.0076	−3.1570	0.0036	0.0369	0.1313	0.8883	−3.8559	0.0008	0.3200	0.0947	0.2106	−2.9406	0.0061
		0.0385	0.0000	42.6817	−4.5065		0.0379	0.0002	35.9531	−3.9847		−0.0024	0.4755	58.5662	−6.6451
Czech Republic	−0.2306	−1.2072	0.3572	−3.1498	0.0036	−0.2117	−1.1267	0.4147	−3.7240	0.0010	0.3080	0.0579	0.2290	−3.5565	0.0015
		0.0283	0.0057	36.1557	−3.7814		0.0271	0.0124	33.8327	−3.7353		0.0017	0.3937	62.5112	−7.1092
Denmark	−0.6363	−1.4636	0.0045	−2.5995	0.0128	−0.2118	−0.5003	0.4144	−4.0086	0.0005	0.5032	0.2309	0.0395	−3.3320	0.0025
		0.0136	0.0050	48.1081	−5.1095		0.0134	0.0295	41.1022	−4.5905		−0.0025	0.3228	57.6424	−6.5364
Estonia	−0.4243	−1.4340	0.0793	−2.2782	0.0258	−0.6384	−2.2814	0.0058	−2.4255	0.0190	0.5760	0.1735	0.0155	−2.7278	0.0098
		0.0354	0.0142	28.0552	−2.8814		0.0388	0.0048	28.9850	−3.1650		−0.0021	0.6174	48.5251	−5.4638
Finland	−0.6645	−2.1361	0.0026	−3.2970	0.0026	−0.1790	−0.5664	0.4918	−5.6044	0.0000	0.2283	0.0717	0.3780	−3.5095	0.0017
		0.0124	0.0422	42.7274	−4.5116		0.0102	0.2024	35.6337	−3.9472		−0.0004	0.8765	55.2490	−6.2548
France	−0.6847	−3.3685	0.0017	−3.8717	0.0007	0.5403	2.6764	0.0252	−4.4493	0.0002	0.1182	0.0271	0.6515	−4.9662	0.0001
		0.0106	0.0545	44.5592	−4.7152		0.0098	0.1328	39.3466	−4.3840		−0.0001	0.9555	63.7889	−7.2595
Germany	−0.7798	−2.0502	0.0001	−3.4811	0.0017	−0.1995	−0.5540	0.4426	−8.6703	0.0000	0.3808	0.1402	0.1316	−3.4221	0.0020
		0.0139	0.0022	49.8507	−5.3031		0.0133	0.0545	38.9791	−4.3407		−0.0003	0.8881	57.1110	−6.4739
Greece	−0.5076	−2.4090	0.0315	−1.8155	0.0671	0.2493	1.2724	0.3345	−2.4697	0.0173	0.5483	0.1288	0.0227	−4.8049	0.0001
		0.0003	0.9770	31.4766	−3.2615		−0.0146	0.2792	27.9629	−3.0447		0.0045	0.0748	56.3005	−6.3785
Hungary	−0.2900	−1.3478	0.2431	−3.2754	0.0027	0.1947	0.9823	0.4539	−3.8933	0.0007	0.5145	0.1182	0.0346	−3.6844	0.0011
		0.0172	0.0717	36.0586	−3.7706		0.0222	0.0295	33.5087	−3.6972		−0.0056	0.0109	61.6145	−7.0037
Iceland	0.4115	0.8736	0.0897	−3.4580	0.0018	0.7064	1.4506	0.0015	−3.7258	0.0010	−0.1010	−0.0477	0.6997	−2.4334	0.0187
		0.0274	0.0156	32.1759	−3.3392		0.0239	0.0094	34.8910	−3.8598		0.0009	0.8920	41.2399	−4.6067
Ireland	−0.7461	−2.2298	0.0004	−1.3624	0.1541	−0.1615	−0.4825	0.5358	−3.2593	0.0029	0.1025	0.0358	0.6955	−3.3408	0.0024
		0.0384	0.0037	30.9362	−3.2015		0.0487	0.0147	22.0697	−2.3514		−0.0087	0.2409	40.6454	−4.5368
Israel	0.0435	0.1431	0.8639	−6.2309	0.0000	−0.0459	−0.1607	0.8613	−6.6409	0.0000	0.4501	0.1503	0.0699	−4.4839	0.0002
		0.0406	0.0000	43.5993	−4.6085		0.0402	0.0000	40.7500	−4.5491		−0.0053	0.1247	63.8439	−7.2660
Italy	−0.5545	−4.2601	0.0169	−3.9213	0.0006	0.1356	1.0415	0.6038	−5.1899	0.0000	0.2821	0.0422	0.2726	−3.0687	0.0045
		0.0075	0.3195	39.5329	−4.1567		−0.0028	0.7688	33.9832	−3.7530		0.0021	0.0628	69.4511	−7.9257

Table 2. *Cont.*

Country	M1 GDPg.(t) ↔ d(Compen./GDP)(t)									M2 d(Compen./GDP)(t) → GDPg.(t + 1)									M3 GDPg.(t) → d(Compen./GDP)(t + 1)								
Japan	−0.6201	−1.7865	0.0093	0.0060	0.0613	−3.8171	46.9645	0.0008	−4.9824	−0.1660	−0.4715	0.0056	0.5244	0.3753	−5.6558	40.2470	0.0000	−4.4899	0.5067	0.1757	0.0017	0.0379	0.3673	−2.6635	60.5187	0.0113	−6.8748
Korea	−0.4606	−1.2770	0.0376	0.0544	0.0000	−3.6503	49.8415	0.0011	−5.3021	−0.3476	−0.9563	0.0359	0.1716	0.0000	−4.1999	46.2274	0.0003	−5.1935	0.3183	0.1145	−0.0008	0.2131	0.8087	−2.4017	62.9405	0.0200	−7.1597
Latvia	0.3166	1.0568	0.0220	0.2006	0.1636	−2.3446	25.9209	0.0224	−2.6442	−0.3079	−1.0353	0.0319	0.2293	0.0638	−2.2247	24.3655	0.0292	−2.6215	0.9048	0.2699	−0.0012	0.0000	0.6122	−2.9782	58.1938	0.0056	−6.6013
Lithuania	−0.0299	−0.1114	0.0354	0.9061	0.0198	−3.2808	27.9720	0.0027	−2.8721	−0.1102	−0.4062	0.0352	0.6737	0.0266	−3.5112	26.2127	0.0017	−2.8388	0.7226	0.1931	−0.0018	0.0010	0.5554	−2.5392	54.7580	0.0148	−6.1971
Luxembourg	−0.6635	−1.4976	0.0253	0.0027	0.0001	−4.1533	45.5578	0.0003	−4.8261	−0.2868	−0.6549	0.0248	0.2645	0.0016	−5.2746	38.5529	0.0000	−4.2906	0.2635	0.1192	−0.0026	0.3068	0.5144	−3.7149	52.2202	0.0010	−5.8985
Mexico	−0.8905	−3.9984	0.0136	0.0000	0.0023	−4.3180	50.1493	0.0002	−5.3363	−0.0605	−0.2696	0.0164	0.8175	0.0770	−4.3209	33.7345	0.0003	−3.7237	0.0772	0.0164	−0.0007	0.7684	0.7370	−3.4616	60.3194	0.0019	−6.8514
Netherlands	−0.8104	−1.6041	0.0130	0.0000	0.0011	−2.9507	52.5315	0.0058	−5.6010	−0.0654	−0.1357	0.0137	0.8031	0.0345	−4.3296	40.1103	0.0003	−4.4738	0.4489	0.2412	−0.0031	0.0707	0.3212	−3.6379	53.8113	0.0012	−6.0857
Norway	−0.6546	−0.4319	0.0155	0.0032	0.0001	−3.7365	54.9059	0.0009	−5.8648	−0.1851	−0.1509	0.0148	0.4769	0.0012	−3.9945	48.3158	0.0005	−5.4392	0.2308	0.3680	−0.0047	0.3727	0.5711	−4.0766	40.4173	0.0005	−4.5099
Poland	−0.3782	−0.8589	0.0393	0.1217	0.0000	−3.5294	44.6686	0.0015	−4.7273	0.1126	0.2828	0.0384	0.6669	0.0000	−3.8984	40.6144	0.0007	−4.5331	0.5973	0.2352	−0.0075	0.0113	0.0495	−7.2922	60.9883	0.0000	−6.9301
Portugal	−0.4343	−1.3552	0.0055	0.0717	0.4413	−3.0544	38.7554	0.0045	−4.0703	0.2882	0.9018	0.0044	0.2620	0.5875	−4.0324	35.1568	0.0005	−3.8911	0.3992	0.1383	−0.0001	0.1124	0.9652	−2.7501	55.2025	0.0093	−6.2494
Slovak Republic	−0.6956	−2.6274	0.0427	0.0013	0.0000	−3.2287	39.4070	0.0030	−4.1427	−0.1478	−0.5692	0.0362	0.5713	0.0034	−4.0344	31.4061	0.0005	−3.4498	0.2292	0.0506	0.0024	0.3762	0.4085	−3.1892	57.3188	0.0035	−6.4101
Slovenia	−0.5111	−1.8902	0.0254	0.0302	0.0081	−2.3735	35.7306	0.0210	−3.7342	0.0914	0.3450	0.0203	0.7272	0.0694	−3.3993	30.9107	0.0021	−3.3915	0.3356	0.0979	−0.0002	0.1878	0.9402	−3.3122	53.9385	0.0026	−6.1007
Spain	−0.4979	−1.7686	0.0102	0.0355	0.2421	−2.9351	35.6386	0.0060	−3.7240	−0.0449	−0.1648	0.0080	0.8643	0.4465	−4.1071	30.9358	0.0004	−3.3945	0.4628	0.1359	−0.0001	0.0614	0.9712	−2.5992	54.3735	0.0130	−6.1518
Sweden	−0.7725	−2.3818	0.0236	0.0002	0.0000	−4.3270	48.3600	0.0002	−5.1375	−0.2022	−0.6461	0.0214	0.4365	0.0061	−9.3931	38.1773	0.0000	−4.2464	0.5425	0.1807	−0.0024	0.0244	0.3200	−3.7025	59.9234	0.0011	−6.8048
Switzerland	−0.8122	−1.4927	0.0211	0.0000	0.0000	−5.8779	56.7349	0.0000	−6.0680	−0.1529	−0.2829	0.0195	0.5579	0.0008	−5.3407	44.2268	0.0000	−4.9581	0.4018	0.2179	−0.0022	0.1099	0.4999	−3.4842	56.6941	0.0018	−6.4249
Turkey	−0.4287	−1.3962	0.0561	0.0759	0.0000	−2.9328	33.9530	0.0060	−3.5367	−0.0202	−0.0729	0.0524	0.9386	0.0002	−3.2811	30.4438	0.0028	−3.3366	0.2723	0.0891	−0.0034	0.2904	0.5272	−3.8800	50.6265	0.0007	−5.7110
United Kingdom	−0.7867	−3.1523	0.0169	0.0001	0.0095	−3.5337	42.6645	0.0015	−4.5046	0.3323	1.3702	0.0087	0.1925	0.3673	−3.8690	32.6519	0.0007	−3.5964	0.2542	0.0689	0.0005	0.3249	0.8302	−3.7765	56.0454	0.0009	−6.3485
United States	−0.4529	−1.4539	0.0183	0.0591	0.0009	−3.3752	46.9735	0.0021	−4.9834	0.1209	0.4237	0.0186	0.6440	0.0025	−4.8128	42.5113	0.0001	−4.7563	0.5726	0.2018	−0.0042	0.0163	0.0382	−4.9666	65.2993	0.0001	−7.4372

From the parameters and statistics obtained, it can be concluded that:

M1 The relationship between GDP growth and d(Compensation/GDP) is usually negative and statistically significant ($p < 0.05$ for the regression coefficient β for 23 countries, and $0.1 < p < 0.05$ for 5 countries, making a total of 28 countries out of a total of 36).

M2 The impact of d(Compensation/GDP)(t) on future GDP growth(t + 1) is sometimes positive and sometimes negative, and usually statistically insignificant ($p > 0.05$ for the regression coefficient β for 33 countries from 36 countries).

M3 The impact of GDP growth(t) on future growth d(Compensation/GDP)(t + 1) is positive (except one), but sometimes statistically significant ($p < 0.1$ for the regression coefficient β for 16 countries) and sometimes statistically insignificant ($p > 0.1$ for the regression coefficient β for 20 countries).

The conclusions obtained are very strong because, regardless of the strength of the correlation relationship and its direction, in each case, there was a cointegrating relationship (except for two models, always $p < 0.05$ for the PP cointegrating test), so the relationships obtained are not apparent relationships, but real.

5. Discussion

Research into the relationship between the compensation of labour and the dynamics of economic growth is part of basic economic research. Despite the many activities carried out by researchers, it still arouses a lot of emotion. This is probably due to the inconsistency of the results. Different methodological approaches can sometimes produce different results, and yet they are scientifically sound. It is something of a paradox that the interaction between employee compensation and the dynamics of economic growth can be viewed from different angles.

A desirable phenomenon in the economy is a high level of employee remuneration and productivity. For example, it is generally assumed that countries with high levels of labour compensation and relatively high levels of productivity are doing well economically. Labour productivity affects living standards, determines real wages and reduces regional disparities, especially in the long term [48,49]. Productivity is also considered to be one of the key measures describing the competitiveness of countries [50]. It is therefore worth knowing what factors determine a given level of wages and productivity. Not surprisingly, this has been a subject of interest and research by academics over the last 20 years [51].

Labour productivity can be interpreted in several ways. In its classical form, it is an increase in output per unit of time per worker. More modern definitions also emphasise that an increase in labour productivity does not only mean an increase in the production of a product per unit of time, but above all a reduction in the unit cost of this product, and they also focus on the quality of this product. This ultimately contributes to the competitiveness of the product [52]. A more advanced method of measuring productivity is to estimate two-factor productivity, which is calculated as the result of the joint action of two factors of production: labour and capital [53]. In a simplified way, however, we can talk about GDP growth, which is crucial because it is a prerequisite for the positive development of all other macroeconomic indicators. Countries with high productivity tend to be countries with higher wages. Countries with lower productivity, on the other hand, are countries with lower wages. In addition, countries with lower productivity are chasing countries with higher productivity [54]. This trend may be due to technological investment and improved working conditions, but also to the investment reserves that these countries have [55]. These investment reserves may be the result of lower wages. Relatively higher corporate profits in these countries will translate into investment power. The best example of this is Turkey.

Many studies of economic growth refer to a group of countries. In this study, the group consists of OECD countries, but studies for different groups can be found in the literature. In particular, there are interesting studies on the countries of the European Union. The quality of statistical data on the countries of the European Union is very high, so such studies provide a lot of valuable information. In this study, the countries of the European

Union tended to be in the middle or second half of the group in terms of economic growth. At the same time, this is crucial for improving the quality of life in society. A significant amount of research has been done on how to improve economic growth [56–58]. Although the countries of the European Union are presented as a model of integration, it is estimated that speeding up this process could increase the GDP of the countries of the European Union by an additional 1% per year. For countries such as Greece and Italy, this could help pull them out of deep recession. Another problem facing EU countries is the ageing of their societies. It has been found that labour productivity, and hence GDP growth, declines as the age of the working population increases [59]. These findings are confirmed by other studies [60–63].

The relationship between labour compensation and GDP growth [64], which was of particular interest in this research, is the basis of macroeconomic analysis. According to economic theory, the dynamics of wages should reflect changes in GDP growth and labour productivity, so that these two quantities should grow together. Scholars have confirmed that increases in labour compensation are accompanied by increases in labour productivity, while labour productivity grows faster than labour compensation [65,66]. In addition, it has been found that there is a significant and positive relationship between wages and productivity, but not every increase in productivity leads to an increase in wages, so there is in fact a significant difference between labour productivity and labour compensation [67]. Academics argue whether labour compensation and economic growth actually increase together or whether there is a time lag. On the one hand, higher wages should encourage consumption and thus stimulate economic growth; on the other hand, workers should participate in economic growth, i.e., their compensation should increase. The research in this paper shows that, with some exceptions, wage growth tends to be a lagged effect of economic growth [68–70].

6. Conclusions

The research carried out in this study is part of the research into the relationship between wages and GDP growth. However, unlike other studies, this one did not look at nominal and real wages, but at the share of compensation in GDP. This made it possible to establish cause–effect relationships and time lags between changes in compensation and GDP growth. First, it was found that the current increase in the Compensation/GDP ratio acts as a brake on GDP growth, while current GDP growth stimulates future Compensation/GDP. This has very important implications for government fiscal policy. Namely, it solves the problem of whether wage regulation can stimulate economic growth or whether wages should be a derivative of economic growth. The research carried out clearly shows that the impact on economic growth is crucial here and that instrumental wage increases can have an obstructive effect on the economy.

The relationships obtained in this paper seem to be very strong and clearly indicate the benefits of economic growth for wages and the disadvantages of instrumental wage increases for economic growth. However, there are some limitations to the research presented. First of all, the statistical data refer to annual periods, and it is possible that the actual dependencies and time lags are of different lengths. Also, the compensation value itself applies to the whole economy and does not say anything about the distribution of compensation in society. In addition, the situation varies from country to country, and there are countries to which this general conclusion does not apply. In addition, it should be stated what the objective function is in the short and long term. Sometimes, it may be necessary to treat wages instrumentally in order to calm social sentiment or to equalise opportunities for the poorest groups. Therefore, even if we know the general laws of a given economic system, the choices we make may contradict them.

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