ESTIMATION OF THE GREAT DECOUPLING ON THE EXAMPLE OF CROATIA, AS COMPARED WITH GERMANY AND POLAND

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Summary

There are many papers in the economic literature that examine the link between real wages and labor productivity while each of them have different approaches and aspects of research. It is widely believed that in many countries wage growth has fallen massively behind productivity growth and has caused a productivity-wage gap popularly called "the great decoupling". The paper deals with this important issue at the level of Croatia, Germany and Poland by analyzing trajectories and causality between compensations of employees and productivity per person employed. It is important and unique because it presents a new empirical approach that observes the productivity-wage gap between these countries on the individual state level. The research reveals interesting results about how the great decoupling in the observed countries is a myth according to the rate trends. However, there is causality between labor productivity and compensation of employees (and vice-versa) for Germany and Poland, but not for Croatia.

Key words: *the great decoupling, inverse decoupling, productivity-wage gap, Granger causality.*

1. INTRODUCTION

The divergence of productivity growth and wages has been recently discussed in economic literature due to growing income inequality. This divergence between real labor income and output per hour worked (labor productivity) has been termed "de-

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coupling" (Mishel and Gee 2012). Decoupling does not have a precise definition, but it loosely refers to the difference between wages and productivity, or rather the idea that wage growth is substantially lagging behind productivity growth (Pessoa and Van Reenen, 2013, p. 6). Baker (2007) states that it is widely accepted that most of the workers have received relatively few benefits from the economic growth over the last decades. Unfair upward redistribution has emerged in which most of the national income goes to profit and high wage earners (Baker, 2007).

This paper deals with the productivity-wage gap while empirically testing the causality between productivity per person employed and compensations of employees on the example of Croatia, Germany and Poland. There could be some differences in the wage-productivity gap according to the level of economic development (Dabla-Norris et al., 2015; Sharpe et al., 2008; Van Biesebroeck, 2011). Therefore, the analysis includes Germany which represents one of the world's strongest economies, Poland as one of the most successful and progressive EU economies and Croatia as a less developed economy that still struggles to achieve significant economic development. Even more, the economic situation has an impact on the effectiveness of the labor market and along with some economic, social and demographic features of employees can be the source of wage - productivity gap (Goraus and Tyrowicz, 2014; Zajkowska, 2013).

The existing literature on this topic deals with the productivity-wage gap but most of it does not observe this issue on an individual country level and is concentrated mostly on the connections between real wages and productivity per employee. Our approach is original in researching the impact of labor productivity on compensations for the observed countries while the contribution made by our research is to provide further support in analyzing the degree, direction and even determinants of productivity-wage gap for the European countries. The two-stage Granger causality test has been applied to determine the causality between productivity and compensation of employees by using quarterly data during 2000Q1-2015Q4.

The chapters are structured as follows: Chapter 2 presents the theoretical background of empirical analysis; Chapter 3 deals with the empirical background of "the great decoupling"; methodology and data for the empirical analysis are explained in Chapter 4; the results and discussion can be found in Chapter 5, and the implications of the empirical analysis are revisited in the concluding remarks.

2. THEORETICAL BACKGROUND OF EMPIRICAL ANALYSIS

Each country needs to focus on labor productivity due to its importance for economic development. Labor productivity is a very important variable for planners and policy makers because it measures a country's ability to generate goods and services from a given amount of production factors. Human capital has been one of the most important factors that has significant effects on productivity. Labor force is responsible for planning, starting and ending each action in production while being important in establishing a quality relationship between wages and productivity. The rise in labor productivity should have a positive impact on wages – when there is an increase of labor's marginal productivity, according to theory, an increase in wage rates can be expected. On the other hand, wages motivate workers to make further improvements in their productivity (Patra and Nayak, 2012).

However, if wages and productivity rise together, it means they are sustainable and able to create incentives for further economic growth. Conventional macroeconomic theory supposes that a rise in productivity drives wage growth while the *competitive equilibrium* is a situation when the wage rate equals the marginal productivity rate. There is a causality running from productivity growth to wage growth assuming that productivity growth is unrelated to labor market conditions.

Meager and Speckesser (2011) state that the relationship between wages and productivity is very clear according to the standard microeconomic theory. Although this theory has many simplifying assumptions, theoretical links between productivity and wages have been extensively used as a criterion for the wage setting mechanism. If the growth of wages exceeds productivity growth, companies need to reduce productivity and employment in order to survive. Otherwise, if companies face wage growth that is much faster than productivity growth, they would need to improve productivity growth that reduces employment opportunities. Therefore, in order to maintain high employment levels, companies should have wage growth that is below productivity growth. It is important to emphasize that authors state that it would be more realistic to include total labor compensations growth rather than growth of wages when analyzing the great decoupling.

In the absence of any market distortions, assumptions of the existence of perfect competition in the labor market and profit maximizing behavior of firms under constant returns to scale, imply that real wages should be equal to the marginal product of labor (MPL). When firms take product and factor prices as given, it is obvious from the profit maximization behavior that the real wages should equal the marginal product of labor. However, this theoretical result is not empirically supported for various economies (Elgin and Kuzubas, 2013:2). If there is no link between wage and productivity growth, workers do not receive the appropriate remuneration for their work and cannot fully improve their living standards according to their rising contributions (ILO, 2011).

According to Elgin and Kuzubas (2013), wages are determined as an outcome of the Nash bargaining process between employees and companies. The bargaining power of each side depends generally on the current labor market situation and this process of wage determination reduces the wage productivity gap that could be much higher when one side possesses significant power (workers or company). The unemployment rate has an impact on wages because a higher unemployment rate reduces the probability for finding a job and workers are willing to work for a lower wage. Therefore, unemployment and bargaining power are significant determinants of the great decoupling.

Zavodny (1999) states that the declining power of trade unions contributes to the productivity-wage gap because trade unions strive to increase wages and compensations in relation to productivity growth. Meager and Speckesser (2011) emphasize that countries with greater union coverage should have a clearer link between productivity and wages.

Also, we can investigate the wage-productivity gap according to a different demographic segmentation of employees. Literature mostly deals with the gender wage and productivity gap while expressing various conclusions according to different industries, demographic and social characteristics of the genders etc. (Nestić, 2010; Galen, 2015; Goraus and Tyrowicz, 2014).

3. EMPIRICAL ANALYSIS: EMPIRICAL LITERATURE OVERVIEW

Over the last decade, average wages in advanced economies grew by only 5.2 percent. Despite the negative effect of the crises in the final year of the decade, labor productivity has been growing by 10.3 percent, or almost twice as fast as wages. Productivity-wage gap began to spread due to a low wage growth during the pre-crisis period. Weaker bargaining power of employees and the rise of non-standard forms of employment with low wages contributed to the emergence of the great decoupling (ILO, 2011). Bivens et al. (2014) emphasize that the wage stagnation is a consequence of policy choices that boosted the bargaining power of those with the most wealth and power. However, policy makers began to be aware of the connection between wage stagnation and inequality due to consequences for the society.

Garnero et al. (2016) investigated the impact of fixed-term contracts (FTCs) on labor productivity, wages (i.e. labor cost) and productivity wage gaps (i.e. profits). The authors conducted an analysis of employer-employee panel data for the 1999-2010 period and concluded that the share of FTCs within companies did not have a significant impact on productivity, wages and profits. Lower productivity of permanent and part time workers was compensated by lower wages while company's profits remain unchanged. They did not find causality between FTCs or other types of contracts and productivity, wages or profits.

Werner (1999) found that wage differentials matched productivity differentials for certain groups of workers, while for others they did not. For example, Zajkowska (2013) showed that there was a statistically significant difference in wages per month between men and women on the Polish labor market. Productivity factors were rewarded differently while men had a higher return to both schooling and the potential labor market experience. Van Ours and Stoeldraijer (2010) dealt with age wage-productivity gap and concluded that empirical studies on the effect of age on productivity and wages bring different results. In some studies, it is obvious that workers who grow older contribute to an increasing wage-productivity gap because their wages increase with age while productivity does not or increases at a lower rate. In other studies, there is no age-related wage-productivity gap.

Islam et al. (2015) pointed out that the main observation from the analysis of literature on productivity-wage gap indicated the existence of different forms of linkages between the two variables. There is literature that does not show any clear causality which can explain the connection between labor productivity and real wages, while other empirical literature can clearly explain respective causality.

According to the current market situation, Mistral (2009) stated that a divergence can be found between real wages increase and productivity gain in advanced economies since 1990s. In the last decade, wage trends started to decouple from gains in labor productivity while the wage inequality issue appeared (ILO, 2011). There is an obvious divergence trend between real labor income per hour worked on the one hand, and output per hour worked (labor productivity) on the other in many advanced economies (OECD, 2012).

Brynjolfsson and McAfee (2014) stated that the great decoupling in the United States is more than obvious. Wages have never been lower while profits have never been higher (Brynjolfsson, 2015).

Zulfan Tadjoeddina (2016) examined the links between productivity, wages and employment in Indonesia's manufacturing sector and found out that the decoupling trend between real wages and productivity in the overall manufacturing sector is evident. It is important to emphasize that the author examined only one economic sector and that he also found even a more significant wage-productivity gap between large–medium (LM) and cottage–small (CS) manufacturing firms.

Cowgill (2013) examined real labor income per hour worked on the one hand, and output per hour worked on the other in the Australian case. The author concluded that Australian real wages have not kept pace with productivity growth since 2000, which is also the case in many other OECD countries. Lopez-Villavicencio and Sylva (2011) investigated the relationship between the wage-productivity gap and the unemployment rate in OECD countries between 1985 and 2007 by analyzing how employment protection across countries affected the great decoupling occurrence. The authors emphasized that wage growth exceeded productivity growth for permanent workers while this was not true for temporary workers which had a lower bargaining power.

Elgin and Kuzubas (2013) conducted a research by using a cross-country panel data set consisting of 31 OECD countries over a time span of 50 years between 1960 and 2009. The authors concluded that unemployment and unionization shocks had a significant relationship with the great decoupling. Their paper definitely provides so far the most widely covered approach of the observed issue, although the limitation of their paper consists in focusing on the manufacturing sector due to data unavailability.

Meager and Speckesser (2011) observed the wage-productivity gap for EU-15[2] countries for the period from 1995 to 2009, by using only descriptive statistics - GDP per hour of work and labor compensation per employee were employed, and the conclusion was that United States faced a greater challenge in dealing with the wage-productivity issue than the EU-15 countries.

[2] The EU15 comprised the following 15 countries: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, United Kingdom (OECD glossary).

We found only a few papers that deal with the productivity-wage relationship on the individual European state level. For example, Nikulin (2015) used the average annual macro-data for the period 2002-2013 and found out that trajectories of wages and productivities in Estonia, Hungary, Slovakia, the Czech Republic and Slovenia are diversified while a strong relationship was confirmed between wage and productivity ratio changes in Poland in relation to the Czech Republic, Estonia and Hungary. Lovasz and Rigo (2009) investigated the productivity and wage gaps in Hungary for the period 1986-2005 and concluded that there may be significant differences in productivity and wages between groups of workers, but these mostly become insignificant at the level of the company.

Pessoa and Reenen (2012) definitely shed a new light on the decoupling of wage growth and productivity growth in the United Kingdom, by describing it as a myth. There was no net decoupling as economists would generally think of it, and they came to this conclusion by analyzing the trajectories of wages and productivity growth by employing different types of approach.

There have been no previous precise scientific literature dealing with wage-productivity and compensation-productivity gap for Croatia, Germany and Poland to which we could refer.

4. DATA AND METHODOLOGY

We constructed a data set of total compensation of employees and real labor productivity per person employed in order to determine the causality between these two variables for Croatia, Germany and Poland. Real labor productivity at state level is expressed as the real GDP and total labor compensation (at current prices) as the total remuneration per person employed. Data has been taken from the Eurostat database.

Quarterly data during 2000Q1-2015Q4 was used and the analysis was done in the program Eviews 9. All variables were seasonally adjusted by ARIMA x11 methodology.

In order to test the causality between total compensation and productivity growth, we applied the Granger causality test to analyze to what extent the change of past values of one variable accounts for later variation of other variables. Granger causality exists between variables yt and xt, if by using the past values of variable yt, the variable xt can be predicted with better accuracy, and relating to a case when past values of variables yt are not being used, with an assumption that other variables stay unchanged (Gelo, 2009:330). Therefore, the following two equations are specified as follows:

$$\left(COM\right)_t = \alpha + \sum_{i=1}^{m} \beta_i \left(COM\right)_{t-i} + \sum_{j=1}^{n} T_j \left(PR\right)_{t-j} + \mu_t$$

$$\left(PR\right)_t = \theta + \sum_{i=1}^{p} \phi_i \left(PR\right)_{t-1} + \sum_{j=1}^{q} \Psi_j \left(COM\right)_{t-j} + \eta_t$$

where COM is an abbreviation for compensations and PR for labor productivity. Depending on the specification of the equations, the hypotheses for the Granger causality tests are:

$$H_0 \cdots \sum_{i=1}^{n} \beta_i = 0, x_i \quad \textit{does not influence yt}$$

$$H_1 \cdots \sum_{i=1}^{N} \beta_i \neq 0, x_i \quad \textit{influences yt}$$

The presence of a stochastic trend is determined by testing the presence of unit roots in time series data, which were tested by the Augmented Dickey-Fuller (1979) test and the Philips and Perron (1988) test which is more robust. According to the test results given in Table 1, variables were not stationary in their levels and were transformed into stationary through the form d(x) i.e. integrated of order (1) (Dickey and Fuller, 1979; Esaka, 2003).

Table 1: Unit root tests for Croatia, Germany and Poland

Variable	Croatia			
	Augmented Dickey-Fuller test		Philips and Perron test	
	Level	d(x)	Level	d(x)
COM	-1,05	-2,59**	-0,54	-11,99*
PR	-0,03	-1,87**	-0,57	-2,61*
Variable	Germany			
	Augmented Dickey-Fuller test		Philips and Perron test	
	Level	d(x)	Level	d(x)
COM	-0,57	-3,49**	-2,92	-14,34*
PR	-2,27	-3,59**	-2,60	-14,21*
Variable	Poland			
	Augmented Dickey-Fuller test		Philips and Perron test	
	Level	d(x)	Level	d(x)
COM	-2,69	-4,22**	-2,74	-9,61**
PR	-0,71	-2,72*	-2,03	-14,52**
(*) and (**) indicate significance respectively at 1% and 5%				
Variables: COM – Total compensations of employees in current prices, PR – Labor productivity per person employed.				

Source: created by the author

After stationarity test was done for each variable, Vector Autoregressive (VAR) models with stationary variables were done in order to determine the appropriate lag length. Due to the fact that the Granger causality test is very sensitive to the selection of lag length, we followed the procedure strictly in order to avoid pitfalls. To determine the appropriate lag length, which avoids the problem of spuriousness, we used the Akaike and Hannan-Quinn Information Criterion (Akaike 1987). A maximum of eight lags were considered for each variable when determining the lag length due to the quarterly data (see tables in appendices). After the Vector Autoregressive models were re-specified according to appropriate lag lengths, we tested their significance with the Portmanteau residual auto correlation test, the Portman Lagrange Multiplier test to test for serial correlation of residuals and the Jarque Bera normality test of residuals to be sure that the results of the Granger causality tests would be meaningful. When the models successfully passed all the tests – there were no auto correlations, serial correlations and residuals were normal (see tables in appendices), the Granger causality test for each country, with appropriate lag length, was carried out.

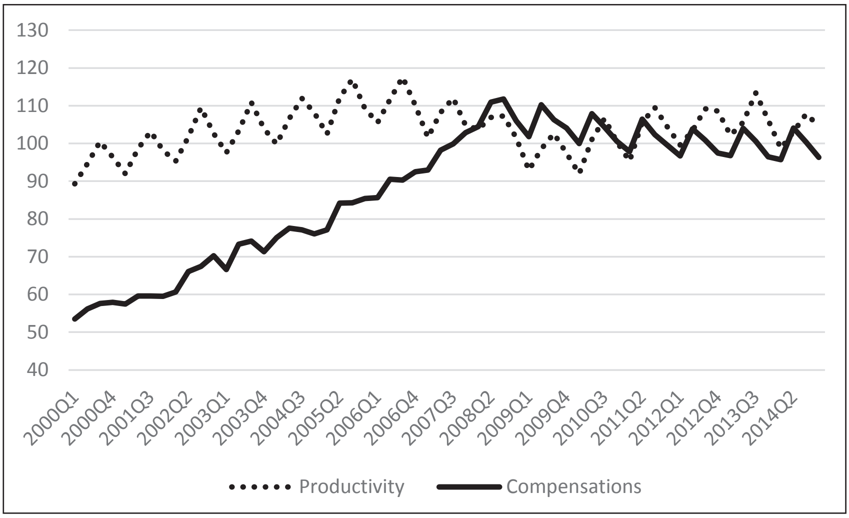
For better graphical observation and explanation of the great decoupling issue, total compensation of employees and real labor productivity per person employed were expressed as indices (2010=100) (figures 1, 2 and 3).

5. RESULTS AND DISCUSSION

According to the ILO (International Labor Organization) report from 2013, the global crisis had significant negative repercussions for labor markets reflected in lower average and real wage growth, while some developed economies even recorded a real wage decline.

It is obvious from Figure 1 that compensations of employees constantly rose until the global crisis, while productivity dropped. After the global crisis, compensations and productivity were constantly intertwined showing clear evidence that the great decoupling cannot be found on the example of Croatia.

Figure 1: Compensation of employees and labor productivity per person employed for Croatia

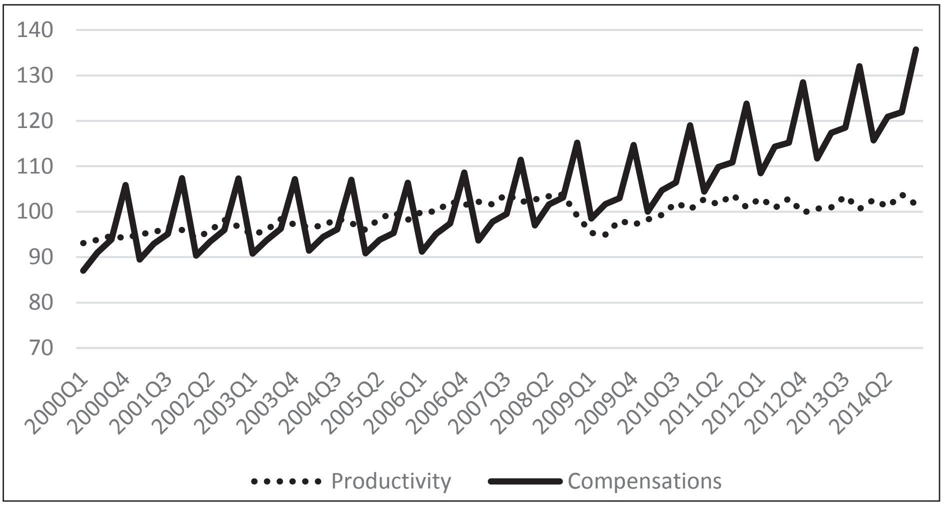


Source: created by the author according to the data collected from the Eurostat database.

In the years before the global financial crisis, expectations of rapid income convergence led to an increase in wages in Croatia, while after the crisis wages in Croatia adjusted more slowly to changes in the macroeconomic environment than in the EU10 countries (Orsini and Ostojić, 2015). Weber (2016) states that Croatian wages and productivity are not aligned because of labor market inefficiency.

Figure 2 shows that German productivity and compensations had almost the same trend until 2009 when compensations started to rise by much higher rates than productivity. Obviously, the great decoupling does not exist because it supposes that productivity grows by a rising marginal rate while compensations constantly decline and cause a widening gap between them. In the German example, the situation is completely different because after 2009, compensations rose by much higher marginal rates and caused the widening gap opposite to the great decoupling term. This phenomenon should be called "*inverse decoupling*" as a new term.

Figure 2: Compensation of employees and labor productivity per person employed for Germany



Source: created by the author according to the data collected from the Eurostat database.

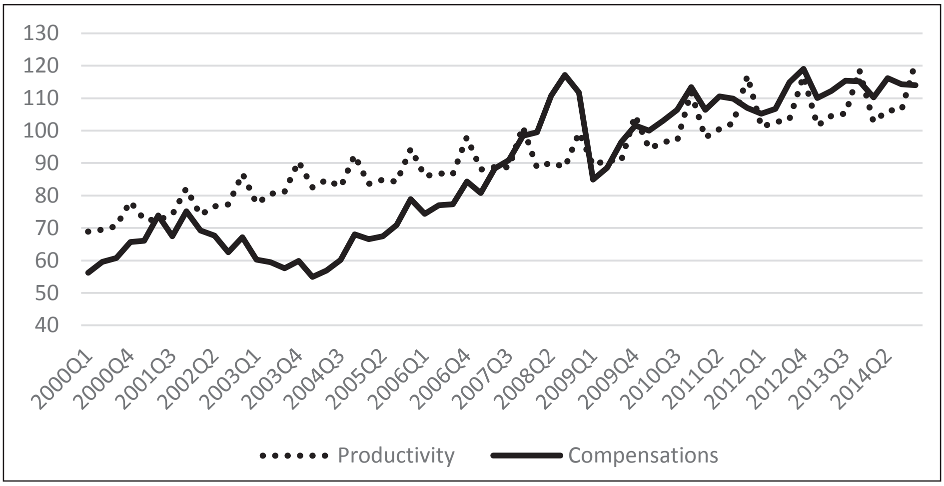
Generally, Germany is a country marked by a low rate of unemployment and a strong economy. Renner (2013) concluded that in the period before the crisis, Germany was marked by a massive shift from full-time jobs to lower-pay part-time employment while average wage figures masked the extremes of wage inequality. It is important to emphasize that Card et al. (2013) stated that the increasing dispersion of West German wages arose from a combination of rising heterogeneity between workers and rising dispersion in the wage premiums at different establishments, while Kluge and Weber (2015:1) demonstrated that almost one half of the observed wage gap between East and

West Germany reflected the differences in workers, establishment, and regional characteristics rather than differences in productivity.

These facts could explain *inverse decoupling* that points to the issue of the possible rising inequality of labor income (wages and compensations) as stated by Felbermayr and Baumgarten (2015) and Schmid and Stein (2013). From the Global wage report (2015) it is obvious that after the crisis, German labor compensations have constantly grown while they now exceed productivity growth. This situation shows us that the general standard of German employees has risen on average. According to Deutsche Welle (2017), German real wages grew in the past few years and caused the highest increase in 2015 compared to 20 years before.

From the Figure 3 we can see that productivity in Poland continued to grow from 2000, while compensations started following productivity growth from 2009. In a short period, from 2002-2005, there was a decoupling of productivity growth and compensation, and then it began to taper until the global crisis. Before the international crisis, productivity growth led to economic growth which caused the convergence of the income with the advanced industrial countries (Mari et al., 2014). Meager and Speckesser (2011) point out that rising productivity per employee can be explained by the growth of Poland's competitiveness.

Figure 3: Compensation of employees and labor productivity per person employed for Poland



Source: created by the author according to the data collected from the Eurostat database.

During the crisis, productivity per employee in Poland did not mark a sharp decline. The most reasonable explanation for this is that Poland had the highest share of employees working under contracts of limited duration (Baranski, 2014) and had the most flexible labor market among all European Union member states (Bogumil, 2015).

Table 2 shows the results of the pairwise Granger causality tests for the observed countries in order to find out if there is any causality between labor productivity and compensations. Evidence that supports the validity of the Granger causality tests has been obtained by the Johansen test of co-integration between these two series (in appendices).

Table 2: Results of the pairwise Granger Causality Tests

Pairwise Granger Causality Test Hypothesis	F-statistic	Probability
Croatia		
No causality between productivity and compensations	1,43	0,22
No causality between compensations and productivity	1,39	0,24
Germany		
No causality between productivity and compensations	8,28	0,0000
No causality between compensations and productivity	11,55	0,0000
Poland		
No causality between productivity and compensations	3,53	0,0134
No causality between compensations and productivity	3,28	0,0188

Source: created by the author

According to the Granger tests, there exists a causality in Germany and Poland between productivity and compensations but also vice versa. This is confirmed by the fact that the Johansen test of co-integration shows that there are two co-integrations between the observed series. On the example of Croatia, there is no causality between productivity and compensations, nor co-integration relationships between these variables.

In Germany and Poland, compensations follow productivity which means, according to Sherk (2013) that workers earn more when they become more productive. A more developed, and better regulated economy leads to better relationships between labor productivity and compensations. Germany and Poland are great examples of this. In addition, Germany and Poland have some of the most flexible labor markets with a significant share of part time and limited contracts that could also be the reason for the existence of causality between productivity and compensations. During economic downturns, these markets can easily adapt their need for labor force according to the market demand.

It is important to emphasize that there is also causality between compensations and productivity in Germany and Poland. Authors like Yamoah (2013), Chun and Lee (2015), and Mphil et al. (2014) state that the impact of compensations on productivity can be found in economies which have well-developed systems of compensation management. Countries that generally have well-developed systems of compensation management are extremely competitive which is, according to Meager and Speckesser (2011), the case in Germany and Poland. The implementation of effective compensation schemes leads to the achievement of organizational goals and reflects the increase in competitiveness.

In the case of Croatia, there is no causality between compensations and productivity (also vice-versa) which is a sign that the country needs to improve its flexibility of the labor market and economic competitiveness.

6. CONCLUDING REMARKS

Economic literature dealing with the wage-productivity gap claims that the labor productivity growth outstripped the real wage growth leading to the decline in the labor income share across the globe. However, according to the trajectories of compensations and productivity in the cases of Croatia, Germany and Poland, it can be concluded that compensation growth has not fallen massively behind productivity growth. Trajectories of compensations and productivity development in observed countries are diversified. In most cases, constant interweaving of productivity growth and compensations are characteristic for all countries. The productivity - compensation gap exists but only for certain periods of time and this is most obvious in Poland. In addition, according to the results of the Granger causality test, it can be concluded that more developed countries should have a stronger link with the productivity and compensation of employees.

From an aggregate macroeconomic point of view, there is no powerful empirical proof which can lead to the conclusion that there exists a large and continuous gap between compensations and productivity of employees in these economies. Increased labor market flexibility does not contribute to the creation of the gap between productivity and compensations, but it could certainly contribute to labor income inequalities.

Results of the conducted research are in accordance with the conclusions of Meager and Speckesser (2011), Sherk (2013) and supported by the research of Pesoa and Renen (2012), which show that over the past 40 years there has been almost no *net decoupling* in the United Kingdom, although there is evidence of substantial gross decoupling in the Unites States. If the United States face the great decoupling, it does not mean that the same trend is also present in Europe.

This research is important and unique because it deals with the compensation – productivity gap between these countries on an individual state level and reveals new insights about the great decoupling issue. The paper does not deal with other less developed countries, nor does it include employment and unemployment rates which could clarify the causes of trajectory movements, and this represents a limitation of the paper. Future research should explore the areas mentioned above.

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APPENDICES

Table(s) 4 VAR tests, defying optimal lag length and Johansen co-integration test for Germany

VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	161.8992	NA	6.48e-06	-6.270558	-6.194800	-6.241609
1	195.8628	63.93134	2.00e-06	-7.445598	-7.218325	-7.358750
2	234.2389	69.22754	5.21e-07	-8.793682	-8.414893	-8.648935
3	331.0903	167.1161	1.37e-08	-12.43491	-11.90461	-12.23227
4	366.1679	57.77500*	4.06e-09*	-13.65364*	-12.97182*	-13.39310*
5	368.9602	4.380090	4.28e-09	-13.60628	-12.77295	-13.28784
6	371.5168	3.809730	4.58e-09	-13.54968	-12.56483	-13.17334
7	374.6237	4.386183	4.80e-09	-13.51465	-12.37829	-13.08041
8	376.0503	1.902263	5.40e-09	-13.41374	-12.12586	-12.92160

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

VAR Residual Serial Correlation LM Tests

Lags	LM-Stat	Prob
1	1.303480	0.8608
2	3.501882	0.4776
3	3.094016	0.5422
4	2.889825	0.5764
5	2.780390	0.5952

Probs from chi-square with 4 df.

VAR Residual Normality Tests

Component	Skewness	Chi-sq	df	Prob.
1	-0.101720	0.094847	1	0.7581
2	-0.248277	0.565045	1	0.4522
Joint		0.659891	2	0.7190
Component	**Kurtosis**	**Chi-sq**	**df**	**Prob.**
1	3.019240	0.000848	1	0.9768
2	3.398984	0.364806	1	0.5458
Joint		0.365654	2	0.8329
Component	**Jarque-Bera**	**df**	**Prob.**	
1	0.095695	2	0.9533	
2	0.929851	2	0.6282	
Joint	1.025546	4	0.9059	

Unrestricted Cointegration Rank Test (Trace)

Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.215220	17.50756	15.49471	0.0246
At most 1 *	0.073153	4.178189	3.841466	0.0409

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Table(s) 5 VAR tests and defying optimal lag length and Johansen co-integration test for Poland

VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	134.0034	NA	2.58e-05	-4.889016	-4.815350	-4.860606
1	147.3834	25.27319	1.82e-05	-5.236421	-5.015422	-5.151190
2	150.3086	5.308737	1.90e-05	-5.196614	-4.828284	-5.054563
3	221.9370	124.6866	1.55e-06	-7.701371	-7.185709	-7.502500
4	249.1205	45.30574*	6.61e-07*	-8.560017*	-7.897023*	-8.304326*
5	250.4314	2.087776	7.34e-07	-8.460422	-7.650095	-8.147911

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

VAR Residual Serial Correlation LM Tests

Lags	LM-Stat	Prob
1	0.528257	0.9707
2	0.623256	0.9604
3	2.901984	0.5744
4	1.918466	0.7508
5	0.846729	0.9321

Probs from chi-square with 4 df.

VAR Residual Normality Tests

Component	Skewness	Chi-sq	df	Prob.
1	-0.795611	5.802477	1	0.0160
2	-0.137774	0.173999	1	0.6766
Joint		5.976476	2	0.0504
Component	**Kurtosis**	**Chi-sq**	**df**	**Prob.**
1	3.945689	2.049502	1	0.1523
2	2.322102	1.053127	1	0.3048
Joint		3.102629	2	0.2120
Component	**Jarque-Bera**	**df**	**Prob.**	
1	7.851978	2	0.0197	
2	1.227126	2	0.5414	
Joint	9.079105	4	0.0592	

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.247292	23.65793	15.49471	0.0024
At most 1 *	0.135899	8.033623	3.841466	0.0046

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Table(s) 6 VAR tests and defying optimal lag length and Johansen co-integration test for Croatia

VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	166.8542	NA	5.34e-06	-6.464870	-6.389112	-6.435921
1	186.6707	37.30174	2.87e-06	-7.085127	-6.857853	-6.998279
2	221.0107	61.94659	8.75e-07	-8.274929	-7.896140	-8.130183
3	224.3175	5.705877	9.01e-07	-8.247745	-7.717440	-8.045100
4	237.9237	22.41017	6.20e-07*	-8.624458*	-7.942637*	-8.363914*
5	241.6364	5.823801	6.31e-07	-8.613190	-7.779854	-8.294748
6	242.1956	0.833436	7.29e-07	-8.478260	-7.493408	-8.101919
7	244.0654	2.639655	8.03e-07	-8.394721	-7.258353	-7.960481
8	253.8980	13.11018*	6.50e-07	-8.623452	-7.335568	-8.131314

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

VAR Residual Serial Correlation LM Tests

Lags	LM-Stat	Prob
1	1.306776	0.8602
2	2.020042	0.7321
3	3.635741	0.4575
4	10.05971	0.0394
5	2.429155	0.6574
6	4.475746	0.3454

Probs from chi-square with 4 df.

VAR Residual Normality Tests

Component	Skewness	Chi-sq	df	Prob.
1	-0.303997	0.831726	1	0.3618
2	0.079453	0.056814	1	0.8116
Joint		0.888540	2	0.6413
Component	**Kurtosis**	**Chi-sq**	**df**	**Prob.**
1	3.764424	1.314774	1	0.2515
2	2.551459	0.452674	1	0.5011
Joint		1.767448	2	0.4132
Component	**Jarque-Bera**	**df**	**Prob.**	
1	2.146500	2	0.3419	
2	0.509489	2	0.7751	
Joint	2.655989	4	0.6169	

PROCJENA FENOMENA "VELIKOG RAZDVAJANJA" NA PRIMJERU REPUBLIKE HRVATSKE U USPOREDBI S NJEMAČKOM I POLJSKOM

Jurica Bosna [3]

Sažetak

U ekonomskoj literaturi mogu se pronaći mnogi radovi koji istražuju vezu između realnih nadnica i produktivnosti radne snage pri čemu *autori koriste različite pristupe i aspekte istraživanja. Rasprostranjeno je mišljenje kako u mnogim zemljama rast nadnica značajno opada u odnosu na produktivnost radne snage* što *uzrokuje jaz produktivnosti i nadnica popularno nazvan „veliko razdvajanje". Rad se bavi ovim važnim pitanjem istražujući „veliko razdvajanje" na primjeru Republike Hrvatske, Njemačke i Poljske analizirajući kretanja i uzročnost kompenzacija zaposlenika i produktivnosti. Važno je i jedinstveno s obzirom da predstavlja novi empirijski pristup istraživanju problema razdvanjanja produktivnosti i nadnica na individualnim državnim razinama. Istraživanje donosi zanimljive rezultate koji ukazuju na to da je fenomen „velikog razdvajanja" u promatranim zemljama mit* što *je očito iz kretanja stopa promatranih varijabli. Međutim, postoji uzročnost produktivnosti i kompenzacija zaposlenika (također obrnuta veza) na primjeru Njemačke i Poljske dok ona na primjeru Republike Hrvatske ne postoji.*

Ključne riječi: *veliko razdvajanje, inverzno razdvajanje, jaz produktivnost-nadnica, Grangerova uzročnost.*

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