
Procyclicality of Changes in Labour Productivity - Labour Hoarding in CEE Countries

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Abstract:

Purpose: This paper aims at the identification of labour hoarding, which is one of options of employment adjustments to changing production in companies, in enterprises in Central and Eastern European countries (CEE countries) from 1998 to 2016. It tries to answer the basic question concerning the occurrence of labour hoarding in enterprises and the direction of its changes.

Design/Methodology/Approach: The occurrence of labour hoarding was researched through analysing the relation of real GDP and dynamics of employment productivity and dynamics of hourly productivity. Type and strength of relation was defined with use of correlative analysis. Analysed variables were prepared by clearing time series from seasonal fluctuations with use of the Census X-12 ARIMA procedure and from the trend with use of the Christiano Fitzgerald (CF) filter.

Findings: Assessment of changes in correlation of the dynamics of GDP and of labour productivity allowed for the conclusion that in CEE countries there occurred three periods of finer adjustment of employment to changes in production volume, i.e. period from 1998 to 2000, from 2002 to 2005, and from 2008 to 2015. The first period constituted the post-transformation time, when process marketisation forced enterprises to apply adjustments of employment volume to production changes. The second moment concerned the accession of CEE countries to the European Union - all analysed countries accessed the European Union in 2004. The 2008 financial crisis constituted another event that affected stronger adjustment of employment to decreasing production in CEE countries, while in Czech Republic and Slovenia that reaction was delayed.

Practical Implications: The results indicate that labour hoarding information is primarily relevant for long-term decisions. In short-term decisions, adjustment mechanism on labour markets is of relatively small importance.

Originality/Value: Research results can be useful from the point of view of shaping instruments for influencing the labour market in the field of employment policy, to assess the changes that have taken place in the labour markets in Central and Eastern Europe.

Keywords: Productivity, labour hoarding, CCE countries.

JEL codes: J23, E32.

Paper type: Research article.

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1. Introduction

The issues of human resources management are often discussed in the literature (Stone, 1923; Wiltshagen and Tros, 2004; Cichocki *et al.*, 2015). The discussed issues concern, at the level of companies, e.g. methods of hiring employees, costs of dismissal and training, remuneration, while, at the macroeconomic level, making working time more flexible, minimum wage, balance of labour market. The concept of labour hoarding constitutes one of concepts of decision optimisation in enterprises within the scope of human resources management under the conditions of economic downturn. Under the conditions of insufficient demand, the hired employees may produce stock, be moved to other positions, or be dismissed. This phenomenon assumes that costs of employment, dismissal and training should be optimised over a long time period, thus providing enterprises with maximum long-term profit. That is why at the level of enterprises the phenomenon of labour hoarding may occur during short-term decreases in demand. Reasons for labour hoarding may concern the enterprise itself or may result from conducted government policy. For fear of permanent loss of valuable employees, enterprises apply the labour hoarding practice towards them.

However, this concerns mainly senior staff members, management, managers, and highly skilled employees for whom companies incur higher costs related to recruitment and training (Strzelecki *et al.*, 2009; McConnell *et al.*, 2017). In addition, government can also affect the strength of employment adjustments to the volume of achieved production, e.g. through making the employment relationship more flexible or through job protection (Dietz *et al.*, 2010). Measurement of labour hoarding may occur at the level of enterprises or with use of aggregated data. Research at the level of companies may be more difficult due to the access to current data on the volume of production and employment in enterprises. Available information on adjustment actions taken by enterprises is rather selective and fragmented. That is why the analysis of macroeconomic data constitutes an alternative method of identification of the labour hoarding phenomenon in enterprises, as it may indicate its occurrence and determine its significance at the level of enterprises. This method is described with methodological simplicity, strong theoretical establishment, although it entails interpretative limitations.

Research conducted under the paper is focused on the identification of the labour hoarding phenomenon in enterprises in Central and Eastern European countries. The basic question to which one tried to answer concerned the occurrence of labour hoarding in enterprises and the direction of changes. The conducted studies of domestic and foreign literature and research review allowed for the conceptualisation of detailed research hypotheses. The first of them concerned a similar scheme of employment adjustments to changes in production volume in Central and Eastern European countries. This paper also verifies the hypothesis of high interchangeability of production and labour productivity and of negative effects of the 2008 financial crisis on possibilities of these adjustments in domestic economies. Aggregated

quarterly data on the value of real Gross National Product and quarterly data on productivity as a measure of the use of labour factor were applied for empirical determination of a level of labour hoarding. Empirical research covered the period from 1998 to 2016. The source of information on the value of real GDP and labour productivity in analysed countries was constituted by Eurostat.

The study includes three parts. In the first part of the paper, the essence of labour hoarding is specified based on domestic and foreign literature and it consists in non-immediate adjustment of employment in enterprises to changing production. Discussion concerns also the reasons for which companies decide on labour hoarding. The second part is about issues connected with the measurement of the labour hoarding phenomenon and characterises sources of information and data. The last part includes the identification and research of labour hoarding in enterprises in Central and Eastern European countries from 1998 to 2016.

2. Literature Review

The concept of labour hoarding appeared in 1960s, although economists had discussed that issue in theory and practice already in the interwar period (Stone, 1923; Clark, 1923). Empirical proof of procyclicality of labour productivity constituted a vital discovery for an interest in the labour hoarding mechanism as a method of employment adjustments to production (Hultgren, 1960; Kendrick and Pech, 1961). Despite its contradiction with previous theoretical assumptions, which stated that short-term demand fluctuations caused increase or decrease in labour input with relatively permanent capital input (Mitchell, 1922; Berridge, 1922), that concept was quickly gaining followers. A generally accepted view of immediate response of employment to changes in production excluded the possibility of procyclicality of productivity and was contrary to empirical research. So, the labour hoarding theory became a proposal to solve a riddle of procyclicality of labour productivity.

The labour hoarding concept is based on the optimisation of companies' decision over a long time period towards fixed costs of staff employment, dismissal, and training. These costs in enterprises maximising their long-term profit should be optimised also in reference to a long time period. Such an approach to the issue of costs of employment, dismissal and training may cause labour hoarding during short-term decreases in production. Short-term decrease in production does not have to lead to reduced volume of employment. A response of enterprises to changes in the production volume can be conditioned by many factors, e.g. legal solutions of the labour market, technological progress. Also, the enterprise's financial situation determines the strength of its response. Enterprises of strong financial position shall be more willing to labour hoarding than enterprises characterised with adverse financial indicators (Bernanke and Parkinson, 1991).

Expectations concerning duration of the downturn period also constitute an important factor deciding on the enterprise's willingness to hoard employees. If the situation is

expected to improve shortly, enterprises do not decide on dismissals. When there is a real risk that production shall be decreased for a long time, enterprises conduct quick employment adjustments and dismiss their employees. Regardless of a motive, the enterprise's non-immediate response concerning employment adjustments results in reduced labour productivity. Therefore, in enterprises short-term production changes may lead to reduced labour productivity, i.e. the situation when production and labour productivity decrease simultaneously. Research at the level of enterprises has proved that productivity of employees increases more quickly when production reaches potential values and decreases more quickly during reduced demand for enterprises' products (Pissarides, 1991; Strzelecki *et al.*, 2009; Dietz *et al.*, 2010; Radlińska *et al.*, 2020).

The starting point of the labour hoarding theory at the micro level is constituted by the fact that labour hoarding is a response of some enterprises to the issue of fixed costs of staff employment, dismissal and training in the context of profit maximisation. Labour hoarding is an economic practice where enterprises hoard more employees during recession than it is technically necessary. Enterprises have an inclination for employee segmentation and a diversified tendency to their hoarding. According to the labour market segmentation theory, low skilled employees are more prone to dismissal, as enterprises hoard employees with unique skills (Pissarides, 1991).

Employers have a natural aversion to dismissal of trained employees, although there is no certain perspective to use them in full. Such an action is conditioned by the enterprise's estimation of a level of costs related to reduced employment and risk of dismissal of trained employees under the conditions of reduced production and risk of their unavailability when production starts to increase. Long-term policy of cost minimisation may, thus, require decrease in production even when labour productivity per employee is decreasing, which may result in an increase in employment per production unit appearing in the recession period. Hence the observation that in modern enterprises labour should be treated as a fixed production factor in a short time, at least in reference to selected employees.

Labour hoarding at the micro level is not the only possible solution considered by enterprises under the conditions of changing production. Sometimes decrease in production may constitute an impulse for enterprises to reduce unnecessary employment or improve work organisation.

It is also worth to emphasise that the labour hoarding phenomenon was sometimes a characteristic of enterprises' functioning in selected countries. In post-socialist countries labour hoarding in the first years of transformation resulted from overstaffing inherited from the period of centrally planned economy and constituted a transitional result of systemic changes (Boeri and Garibaldi, 2006). Introduction of market economies involved, among others, decisions of enterprises on adjusting the employment volume to the production volume and gradually reduced initial overstaffing. However, transformational processes are completed and now also in

these countries labour hoarding results from enterprises' decisions within the scope of employment and production.

Globally, the labour hoarding concept has become a part of economics mainstream, characterised in the context of relations between production fluctuations and labour productivity in economy. In model considerations, labour hoarding is treated as a part of labour demand (Ehrenberg and Smith, 2012) and, as assumed, consideration of costs of employment, dismissal and training of employees should lead to gentler adjustment of employment to changes in production than it would result from models omitting costs of staff hoarding. In the period of recovery, enterprises considering costs of employment, dismissal and training of employees do not hire so many additional employees as it would result from increase in production.

For the same reason, in the period of downturn, they decrease a number of dismissals towards decrease in production more slowly (Nickell, 1986). As a result, in the macroeconomic approach labour hoarding leads to procyclicality of labour productivity. Introduction of the possibility of hourly labour adjustments for enterprises constituted a significant modification of labour market models considering costs of staff employment, dismissal, and training (Ehrenberg and Smith, 2012). In this approach, enterprises respond more gently to decreases in production. Change in a number of worked hours is a cheaper way than change in employment volume under the conditions of production fluctuation. Introduction of hourly adjustments to the model resulted also in the delay of adjustments (Ehrenberg and Smith, 2012).

Appearance of labour hoarding in economy may also cause reduced labour productivity and its procyclical nature. Reduced labour productivity is a natural consequence of decrease in production and simultaneous appearance of labour hoarding. That is why labour productivity decreases during recession and increases during recovery. Labour hoarding is the most important (Burnside *et al.*, 1993), but not the only reason for procyclicality of labour productivity. The literature on the subject includes several competitive explanations of this phenomenon, including usually technological progress, imperfect competition (Basu and Fernald, 2001), and repositions of employees inside enterprises (Fay and Medoff, 1985).

Measurement of the labour hoarding phenomenon raises many difficulties, both at the level of enterprises and national economies. Survey of enterprises directly identifies labour hoarding at the microeconomic level. Its biggest advantage is constituted by direct identification of employment adjustments to changes in production volume, which result from a decision on labour hoarding in enterprises. The very ambiguity of the term and its hypothetical and subjective nature open to doubt, as it is difficult to precisely estimate e.g. how much employment would decrease in an enterprise at the current production level or how much an enterprise should pay to employees for production at the current level.

However, a well-constructed tool for measuring (survey) may largely limit or eliminate these doubts. Another difficulty in the measurement of the labour hoarding phenomenon is constituted by the frequency of conducted surveys. It is hard to unambiguously define an optimal frequency of survey (year, quarter, month). To ensure credibility of results, large sample size is also needed, which in turn is related to survey costliness. It should be emphasised that enterprise surveys constitute the best method to measure labour hoarding, however it is connected with defects and costs. Institutions researching the labour market conduct a series of enterprise surveys, analysing various aspects of their activity. Usually they are individual, so it is difficult to compare their findings. In Poland, regular surveys of enterprises are conducted by NBP (since 2001), however they do not aim at the identification of the labour hoarding phenomenon and their findings are officially announced in the form of reports. Therefore, they can be applied only within a limited scope for the identification and analysis of the labour hoarding phenomenon.

Another method of measuring labour hoarding in enterprises is constituted by the analysis of aggregated data concerning production and labour productivity. Observation of periodic fluctuations of these values allows for the determination of the labour hoarding level. Identification of the labour hoarding phenomenon is conducted based on the assumption that the stronger the positive relation of the dynamics of real GDP and dynamics of labour productivity, the weaker the employment adjustment to economic fluctuations. Due to this situation, labour hoarding appears in enterprises in periods of business stagnation, while small positive changes in employment - during economic recovery. Selection of a periodic component of changes in production and labour productivity constitutes a significant issue before the commencement of measuring the labour hoarding phenomenon at the macroeconomic level.

An advantage of measuring labour hoarding based on macroeconomic information is the relatively easy access to data and relative methodological simplicity of research, as well as significant comparability in time and possibility of comparisons among countries. The applied measuring method is also strongly established in economic theories of labour market. However, application of macroeconomic data may hamper the separation of factors related only to labour hoarding, thus hampering the interpretation of research results, as it includes factors not related to labour hoarding but providing with similar effects.

Both approaches to the measurement of labour hoarding in enterprises have advantages and disadvantages. Survey supporters emphasise that acquisition of reliable aggregated data on labour hoarding is difficult, as a level of aggregation distorts important information on production, employment, and wages. The fact that surveys reflect only some scrap of reality in specific time is provided as a large limitation of surveys. That is why in scientific research the phenomenon is often measured with use of two methods at the same time (Pissarides, 1991; Strzelecki *et al.*, 2009; Dietz *et al.*, 2010; Radlińska *et al.*, 2020), and conclusions formulated based

on them are useful both from the point of view of labour resource and employment policy in enterprises.

3. Research Methods

The empirical research aimed at the identification of labour hoarding in enterprises in Central and Eastern European countries from 1996 to 2016. It tried to answer the basic question concerning the occurrence of labour hoarding in enterprises and the direction of its changes. In particular, one verified assumption concerning a similar scheme of employment adjustments to changes in production volume in enterprises in Central and Eastern European countries and high interchangeability of production and labour productivity. In addition, it was assumed that the 2008 financial crisis adversely affected the possibilities of those adjustments.

Macroeconomic data, i.e. volume of production and information on a level of use of labour input during business cycle - labour productivity, were applied for the identification of labour hoarding. The measure of real Gross Domestic Product (GDP), which is the widest measure of a country's business activity, was applied in research to show production volume. The measure of employment productivity (LPpP) and hourly productivity (LPpH) was used to estimate a level of use of labour input. While calculating employment productivity, production volume was calculated per one employee, while hourly productivity was calculated as quotient of production volume in economy and a number of worked hours (Oulton, 2020). Labour hoarding is related to a situation when a number of employees does not change or changes more slowly than changes in production. Leaving employees in an enterprise entails a change in effort put by employees into work or a correction of working hours.

The approach applied to the measurement of labour hoarding is considerable simplification because it omits the issues of explaining macroeconomic and structural considerations of occurrence and course of the phenomenon. However, selection of a measuring method is justified with the paper volume and requires the use of simplifications while developing the research procedure. The issue of labour productivity measurement is also simplified in the paper. Literature provides various measures of productivity, while measures of employment and hourly productivity constitute the simplest type of indicators of labour resource use in an enterprise (Lankauskiene, 2014). Despite significant methodological simplicity, the author emphasises that such an approach to the issue of labour productivity serves the main research purpose.

Eurostat constituted the source of data on the GDP value and labour productivity LPpP and LPpH. Data concerning the GDP value were expressed in prices as of 2010, while labour employment productivity LPpP and labour hourly productivity LPpH was indexed 2010=100. All applied measures had quarterly frequency. The assumed research time covered the period from the first quarter of 1996 to the fourth quarter of 2016. In case of data for Poland, that period was reduced due to the lack of available

data and covered time from the first quarter of 2002 to the fourth quarter of 2016. The territorial range of research covered the identification and analysis of labour hoarding in countries defined by OECD and the World Bank as Central and Eastern European, i.e. Czech Republic, Hungary, Poland, Slovakia, and Slovenia. An additional premise of the territorial range of research is constituted by shared historical and social roots of analysed countries, similar path of transition from centrally planned economy to market economy.

Conclusions from the analysis of a relation of dynamics of changes in real GDP and dynamics of employment and hourly productivity were applied for the identification and assessment of the direction of changes in labour hoarding. To this end one applied a traditional analysis of cross-correlation, as well as a recursive method of determining correlation coefficients. Classic correlation coefficients are useful to define general relations connecting variables. These coefficients do not indicate the direction of causality of these relations. Recursive (rolling) calculation of correlation coefficients allows for the answer to a question whether analysed dependence is stable in time and whether its strength is subject to changes. This is some kind of a solution to limitation of the Pearson correlation coefficient related to the lack of presentation of paths of convergence of analysed variables. Such a method of determining correlation coefficients consists in so-called sample rolling by moving the time window (Ulrichs, 2014; Beck and Grodzicki, 2014). In scientific research, apart from the application of time window to sample rolling, an expanding sample is also used (Adamowicz *et al.*, 2009). Taking into account the accomplishment of the main purpose of this paper, at the assessment of dynamics of real GDP and dynamics of real productivity in Central and Eastern European countries one used the method of rolling correlation analysis with moving window 12 quarters wide.

Analysis and assessment of a relation of the dynamics of real value of the Gross Domestic Product with the dynamics of real employment and hourly productivity must be preceded with the separation of a periodic component from time series of researched variables. The literature mentions many methods of decomposition of time series, e.g. Phase Average Trend (PAT), deterministic polynomial trend, Beveridge-Nelsen decomposition, or Structural Time Series Model (STS) (Canova, 1998; Ulrichs, 2014). One of the methods to decompose time series consists in their filtration, i.e. use of filters transmitting harmonic components of specific frequencies. The asymmetric Hodrick-Prescott filter (HP) method (Hodrick and Prescott, 1997) is regarded as the most common method of decomposition with use of filtration.

However, in this research the Christiano-Fitzgerald (CF) (Christiano and Fitzgerald, 1999) filter is applied to separate a periodic component from time series. It results from the fact that mechanical application of the HP filter may lead to the occurrence of apparent cycles. An additional premise of the applied filter is its dissymmetry. Prior to the commencement of separation of the periodic component CF, time series of the dynamics of real GDP and dynamics of labour productivity LPpP, LPpH time series were cleared from seasonal fluctuations with the Census X-12 ARIMA procedure.

Time series of the dynamics of Gross National Product and productivity prepared in such a way were subject to further analyses.

4. Empirical Results

Correlation of the dynamics of real GDP and dynamics of real employment and hourly productivity in Central and Eastern European countries from 1996 to 2016 was positive-high, in the case of correlation of the dynamics of real GDP and dynamics of real employment productivity and positive-moderate, in the case of correlation of the dynamics of real GDP and dynamics of real hourly productivity. It concerns both seasonally adjusted data and data cleared with the CF filter (Table 1). Generally, linear correlation coefficients between the dynamics of real GDP and dynamics of employment productivity in all analysed countries were higher than correlation coefficients for the relation of dynamics of GDP and dynamics of hourly productivity. This indicates that in enterprises in Central and Eastern European countries the labour hoarding phenomenon occurs, while they use labour hourly adjustment more often than employee dismissal.

Table 1. Correlation between the dynamics of GDP ($dPKB$) and dynamics of labour productivity per employee ($dLPpP$) and dynamics of labour productivity per working hour ($dLPpH$) in Central and Eastern European countries from 1996 to 2016

(seasonal adjusted data)			(seasonal adjusted and filtered CF data)		
Country	$dPKB$ vs. $dLPpP$	$dPKB$ vs. $dLPpH$	Country	$dPKB$ vs. $dLPpP$	$dPKB$ vs. $dLPpH$
Czech Republic	0,8906	0,0574	Czech Republic	0,8698	0,5795
Hungary	0,8138	0,4191	Hungary	0,8761	0,7872
Poland*	0,6130*	0,4888*	Poland*	0,6847*	0,5881*
Slovakia	0,9210	0,6400	Slovakia	0,8437	0,7587
Slovenia	0,8940	0,3117	Slovenia	0,8965	0,6627

* *Note:* data 2002-2016

Source: own calculations based on EUROSTAT data.

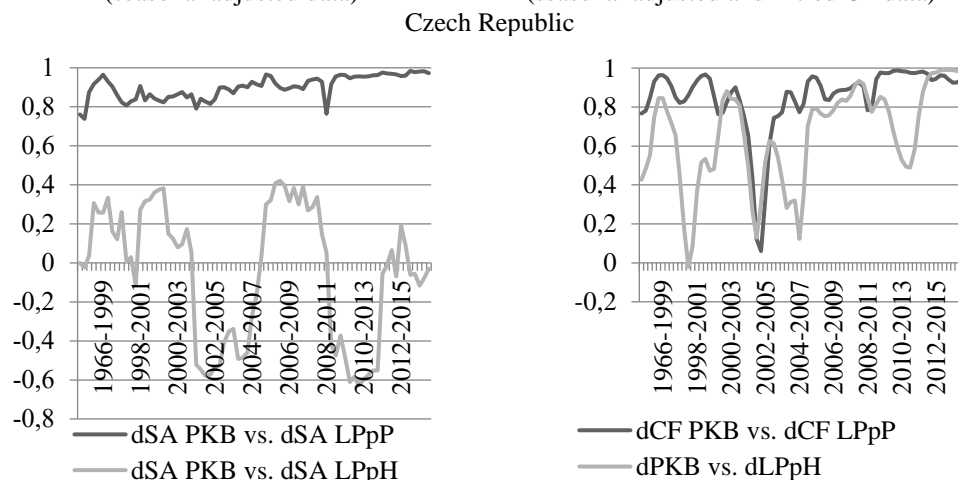
Pearson linear correlation coefficients between the change in productivity of real GDP and change in employment productivity (seasonally adjusted data) for the analysed period varied from 0.61 in Poland to 0.92 in Slovakia. In the case of CF filtered series the correlation of GDP dynamics and dynamics of labour employment productivity reached similar values: minimal value of 0.68 in Poland and maximal value of 0.89 in Slovenia. Correlation coefficients between the dynamics of GDP and change in hourly productivity were significantly lower and met values for seasonally-adjusted data from 0.05 in Czech Republic to 0.64 in Slovakia, and for filtered data CF values were from 0.57 in Czech Republic to 0.78 in Hungary.

Therefore, dynamics of real GDP and employment and hourly productivity, both while analysing seasonally adjusted series and cleared from the trend with the CF filter, indicated high or moderate procyclicality for the tested period. Made data corrections, i.e. seasonal adjustment and series clearance from the trend with the CF filter, did not significantly affect the direction and strength of adjustments of changes in employment productivity, but they significantly affected the strength of correlation between the dynamics of GDP value and change in hourly productivity. Indicators cleared from the trend are higher. Based on this high significance of long-term trends in the process of changes in GDP and labour productivity may be proved.

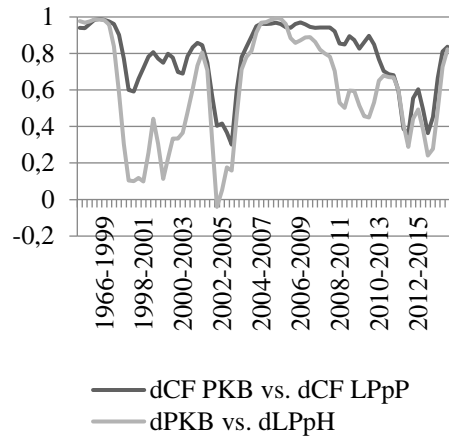
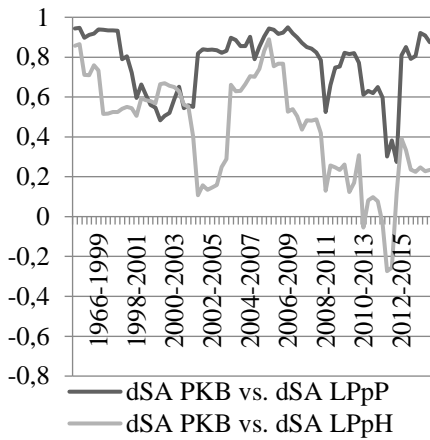
Despite considerable methodological simplification, estimated procyclicality of changes in employment productivity and hourly productivity constitutes grounds to form a conclusion that labour hoarding occurred in enterprises in the analysed period in Central and Eastern European countries. Higher procyclicality causes smaller adjustment of employment to decrease production volume. This phenomenon is observed in all analysed countries. Poland, where all correlation coefficients were at a relatively lower level, is an exception. However, Poland's situation can be explained with a limitation arising from shortened time series of tested variables, which could have affected the value of estimations. Here it should also be emphasised that labour hoarding can be one, but not the only explanation of procyclicality of fluctuations in labour productivity (Basu and Fernald, 2001).

In the next step of research, one tried to assess interchangeability of changes in GDP values and changes in employment productivity and in hourly productivity, as well as symmetry of fluctuations of analysed variables in Central and Eastern European countries from 1996 to 2016. Rolling correlation coefficients with moving window 12 quarters wide were applied to research interchangeability and symmetry. Figure 1 presents results of rolling correlation coefficients.

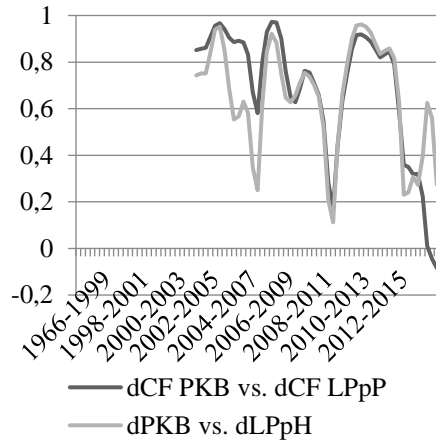
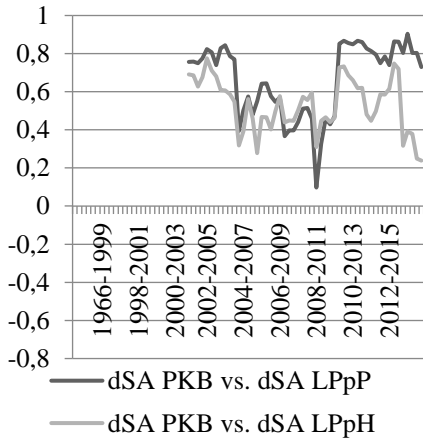
Figure 1. *Procyclicality of labour productivity (rolling correlations)*
 (seasonal adjusted data) (seasonal adjusted and filtered CF data)



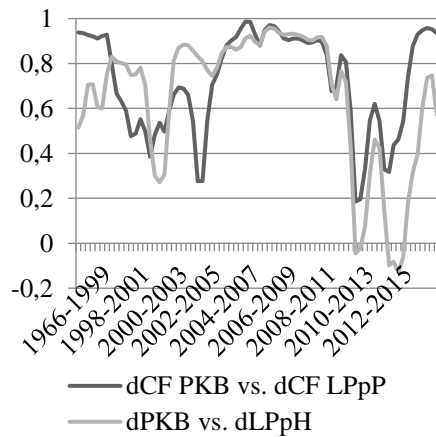
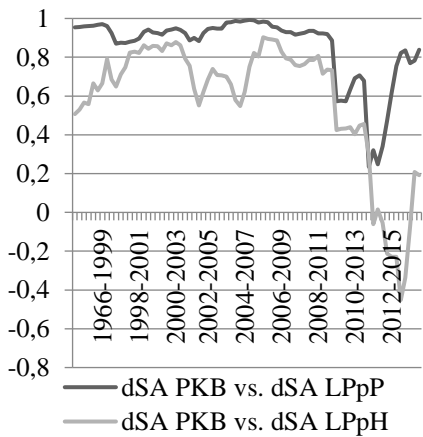
Hungary



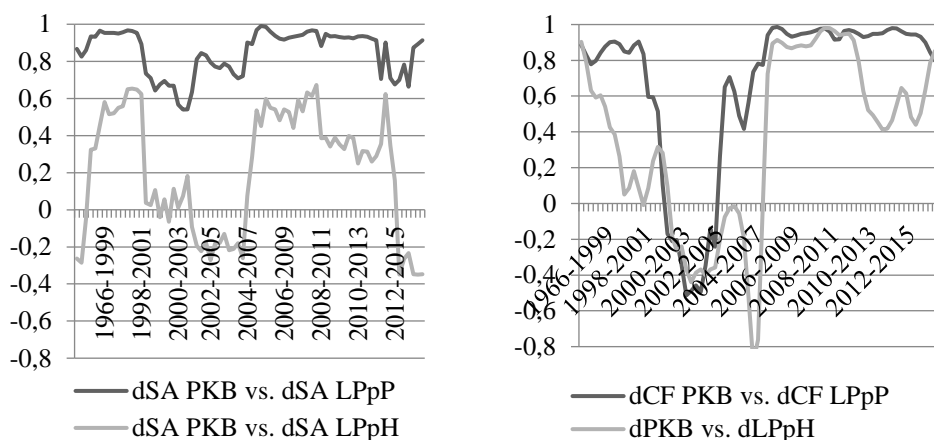
Poland



Slovakia



Slovenia



Source: Own calculations based on EUROSTAT data.

Interchangeability of fluctuations of the GDP value and the dynamics of employment productivity in Central and Eastern European countries from 1996 to 2016 was strong. High level of rolling correlation coefficients proves high level of interchangeability of GDP and employment productivity, which may indicate the occurrence of permanent labour hoarding in enterprises. Central and Eastern European countries have noted turning points in their history, which also affected the labour market situation and the mechanism of adjustments of a number of employees to the production volume.

Significant decrease in rolling correlation coefficient was observed in the years 1998-2000, 2002-2005, and 2008-2015. The first period concerned employment adjustments resulting from systemic changes in analysed economies, as a period of political transformation in each analysed country was connected with reduction of an ineffective part of labour resource. Introduction of market economies resulted in the optimisation of enterprises' decisions, also in the area of employment, which in turn entailed reduced procyclicality of labour productivity. Adjustments of a number of employees to production volume in that period were the largest in Slovakia and Hungary. The second period of lower rolling correlation coefficients concerned the accession of Central and Eastern European countries to the European Union - all analysed countries accessed the European Union in 2004.

Reduced procyclicality of the dynamics of employment productivity may testify to organisational changes in enterprises within the scope of employment. While preparing for increased competition after the accession to the European Union, enterprises introduced organisational changes. This situation is observed mainly in Slovenian, Hungarian and Czech economies. Lower values of rolling correlation coefficients were noted also in the years 2008-2015. The 2008 financial crisis was the reason for those changes, as economic downturn caused decisions on reduced employment being made in enterprises. That effect was observed firstly in the Polish

economy, then in Slovakia and Hungary. Economies of Slovenia and Czech Republic reacted later, and adjustment concerned mainly working time.

In reference to all analysed countries, lower interchangeability characterises the dynamics of GDP and hourly productivity. Central and Eastern European countries were described with high fluctuations of hourly productivity, which indicated that enterprises in those countries adjusted working hours to changing production in the researched period. Lower values of rolling correlation coefficients fall to the periods of 1998-2000, 2002-2005 and 2008-2015, i.e. periods of lower employment productivity, while these fluctuations are stronger. This indicates the labour hoarding phenomenon connected with major adjustments of working hours. In Slovenia and Slovakia, one observed period when the dynamics of hourly productivity indicated an anti-periodic character against changes in GDP. It may result from historical roots of these economies, as they origin from economies with strong social grounds.

5. Conclusions

Enterprises function in a dynamically changing environment and changes in trends cause the necessity of taking corrective actions inside them. Labour hoarding is one of possible decisions made by enterprises in a period of short-term changes in production. In periods of short-term decreases in production, enterprises decide to hoard employees. However, this practice concerns usually highly skilled employees, which is related to the costs of their dismissal, reemployment, and training, as well as to the risk of them not willing to be reemployed in periods of economic recovery.

Apart from employee segmentation, a tendency towards labour hoarding in enterprises depends e.g. on financial condition of an enterprise and on expectations concerning duration of economic downturn. Enterprises in a good situation are more willing to hoard employees than enterprises in a poor financial situation. In addition, enterprises are willing to hoard labour when they expect quick return of the production's upward trend. Lower level of labour hoarding in an enterprise may result from the necessity of introducing organisational changes, which are socially easier to be accepted under the conditions of economic downturn. It is observed that enterprises, while deciding on labour hoarding, use the adjustment mechanism in the area of working hours.

From the macroeconomic perspective, enterprises' decisions on labour hoarding affect directly labour productivity. In economies where enterprises decide on labour hoarding, procyclical character of labour productivity is observed. However, use of GDP account and labour productivity at the determination of a size of labour hoarding phenomenon may be related to its overestimation. Procyclical character of labour productivity may result from other reasons than labour hoarding, e.g. technological progress, increased competition. Partially, the labour hoarding phenomenon may be explained through the inclusion of employee working time in analyses. Under the conditions of economic downturn and identified labour hoarding, there are possible situations when reduced production volume results in small decrease in labour hourly

productivity or, in extreme cases, its increase. Hourly productivity research indicates frequent use of hourly adjustments of labour hourly corrections by enterprises in periods of economic downturn.

The labour hoarding phenomenon is characteristic for the most of world economies, as enterprises are naturally afraid of losing their highly skilled employees, for whom they incurred training-related costs. The labour hoarding level depends also on the applied government policy within the scope of job protection. In addition, there are countries where labour hoarding is historically conditioned. Central and Eastern European countries, due to socialist roots of their economies, are at particular risk of this phenomenon and so they constitute an interesting area of research within this scope.

Results of the empirical research allowed to answer the posed questions, whether the labour hoarding phenomenon in Central and Eastern European countries occurred, what the direction of its changes was, and whether employment after the 2008 financial crisis was adjusted. Based on the analysis of the dynamics of GDP and of labour productivity per employee and per working hour, a conclusion can be drawn that enterprises in Central and Eastern European countries hoard labour resource during short-term production changes, however during economic downturn they apply adjustments in the area of working hours towards the hoarded labour. This observation is confirmed by analysis and assessment of a level of the Pearson linear correlation coefficients. On this basis the hypothesis concerning the identification of labour hoarding in enterprises in Central and Eastern European countries was positively verified. This conclusion conditions the necessity of assessing interchangeability of changes in production and in labour productivity.

In reference to employment productivity, there is observed high interchangeability, while hourly productivity is characterised with lower interchangeability. Rolling correlation coefficients between the dynamics of GDP and dynamics of labour employment productivity were characterised with lower changeability. Large fluctuations of rolling correlation coefficients are observed between the dynamics of GDP and dynamics of hourly productivity.

The 2008 financial crisis affected stronger adjustment of employment to decreasing production. Uncertainty resulting from disturbance on the international market caused the decrease in production volume in the years 2008-2015 in most Central and Eastern European countries and the necessity of staff dismissal. In addition, all countries adjusted working hours to changes in production. That observation allowed for a positive answer to the previously posed question. The 2008 crisis negatively affected the strength of adjustments. Reaction concerned both adjustments of employment and of working hours. Moreover, in the history of Central and Eastern European countries there were observed periods of higher adjustment of employment to changes in production volume. Basically, in all analysed countries those periods concerned events characteristic for all analysed economies. The first period 1998-2000

constitutes the post-transformation time, when marketisation of market processes forced enterprises to apply adjustments of employment volume to production changes. The second period 2002-2005 concerns the accession of Central and Eastern European countries to the European Union - all analysed countries accessed the European Union in 2004. That fact caused a response in the area of employment in all economies. Reorganisation of resource management methods in enterprises caused the reduction of employment.

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