Seasonality of Employment in Poland and a Selected Countries of the European Union

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Abstract

Every economy is characterised by its variability over time. This variability may concern long, medium and short period of time. Scientific research usually concerns long- and medium-term changes, while changes occurring in economies in short periods of time are excluded or removed from analyses. This procedure seems to be unjustified, as only consideration of all fluctuations, including short-term, allows for full characterisation of researched phenomena. Similarly, phenomena on the labour market are subject to variability over time, while their short-term research seems to be particularly important. It results from the fact that variables of the labour market, i.e. employment, unemployment, remuneration, concern not only economic, but mainly social aspects.

This paper aims at the analysis of diversity of seasonality of a number of employees in Poland and in selected countries of the European Union. One attempted to determine the value and trend of changes in the seasonality of employment and their distribution throughout a year. Analyses concerned the comparison of seasonal fluctuations of employment estimated for Poland with seasonal fluctuations of employment in selected EU countries, i.e. a group of highly developed European countries (France, Germany and Great Britain) and a group of countries of Central and Eastern Europe (Bulgaria, Slovakia, Slovenia, Romania, and Lithuania). The study uses quarterly data on a number of employees in Poland and in selected EU countries for the period from the first quarter of 2008 to the fourth quarter of 2016 from EUROSTAT resources. The CENSUS X12 procedure based on seasonal ARIMA models was applied for the selection of a seasonal component. The obtained results indicate that the seasonality of employment in Poland and in selected EU countries was low. In a group of Western European countries, the seasonality of employment was characterised with lower average annual level than Poland. An average annual seasonality of employment in countries of Central and Eastern Europe was higher than the seasonality estimated for Poland. Distribution of fluctuations of seasonal employment throughout a year in Poland and in selected EU countries was similar in both analysed groups of countries. Peak to peak value of the seasonality of employment constituted a differentiating feature. Western European countries and Poland were characterised by a lower amplitude of fluctuations of the seasonality of employment throughout a year than countries of Central and Eastern Europe.

Keywords: employment, seasonality, labour market, EU countries

Introduction

Every economy is characterised by its variability. This variability may be analysed in various periods of time, i.e. long, medium and short. In economic analyses the fluctuations of economic phenomena constitute a frequent subject of research. However, usually they are analysed in the context of long-term and cyclical changes, while short-term changes are omitted or eliminated from analyses. Exclusion of short-term fluctuations from research seems to be unjustified, as they may constitute an important component of the analysed phenomenon [1].

Analysis of the seasonality of employment in Poland and in selected countries of the European Union constituted the main issue of conducted research. Therefore, this paper aims at the analysis and assessment of diversity of seasonality of a number of employees in Poland and in selected countries of the European Union.

A significant question to which one attempted to answer was whether in Poland and selected EU countries the seasonality of employment is present. If yes, what is its level and trend of changes, and what is its distribution throughout a year? In addition, one tried to distinguish the formula of seasonality of employment valid in two selected groups of European economies, i.e. in a group of Western European countries and in a group of Central and Eastern European countries. It was assumed that in Poland and Western European countries the seasonality of employment is lower than seasonality in countries of Central and Eastern Europe. In empirical research the data on quarterly employment collected by EUROSTAT for the period from the first quarter of 2008 to the fourth quarter of 2016 were applied. A seasonal component was selected with use of the CENSUS X-12 ARIMA procedure.

Introduction to the issues of seasonality of the labour market

Seasonality constitutes an issue that may concern both entire economy and its particular markets or sectors.

Labour market belongs to the markets on which short-term (seasonal) changes in their particular categories constitute a natural phenomenon. Usually, seasonality on the labour market is analysed in the context of changes in employment and unemployment. Although it should be emphasised that short-term changes concern also other variables characterising the labour market, e.g. remuneration.

Seasonality on the labour market means regular, repetitive over time, throughout a calendar year, economic and social changes in categories. A reason for short-term changes may concern natural and institutional factors.

Natural conditions include e.g. regular climatic changes related to the occurrence of seasons, periods of higher and lower temperatures, rain and snowfall, more sunny hours throughout a day. These conditions affect peripheral regions [2] to a greater degree. Institutional aspects of seasonality on the labour market depend on religious, ethical, cultural and social factors valid in society and economy. Seasonal changes can be relatively easily foreseen, as they appear in specific periods of a year with great regularity. Despite that their limitation is still hampered.

From the point of view of the labour market, seasonality constitutes a negative phenomenon, manifested mainly with reduction of employment or remuneration in specific periods of a year, which has been broadly described in the source literature [3, 4]. Results of research concerning the variability of labour markets in selected countries confirm that in particular countries they are characterised by diverse distribution of seasonal fluctuations of basic categories of the labour market throughout a year and with a different value of monthly deviations [5, 6].

Method and data sources

The main purpose of research is constituted by the verification whether in Poland and in selected EU countries the seasonality of employment is present. If yes, what is its level and trend of changes, and what is its distribution throughout a year? In addition, one tried to distinguish the formula of seasonality of employment in two selected groups of European economies, i.e. in a group of Western European countries and in a group of Central and Eastern European countries. The group of Western European countries includes states in the western part of Europe, being members of the European Union for at least 40 years, characterised by the highest share of GDP in the GDP of entire European Union (from 15.0% to 21.1%). These countries include: France, Germany, and Great Britain. The group of Central and Eastern European countries includes economies located in Central and Eastern Europe, which membership in the European Union is relatively short (year of accession 2004 and 2007) and characterised by low share of GDP in the GDP of entire European Union (from 0.3% to 1.1%). These countries include: Slovakia, Slovenia, Romania, Bulgaria, and Lithuania.

In the research of seasonality, the selection of research methodology is significant. It may be measured with use of e.g. dynamic models where the role of dependent variable is played by time. Time does not constitute a reason for the phenomenon, but it is rather a set of variables forming the phenomenon. Main, periodical and incidental reasons are generally responsible for the time course of phenomena. Determination of a value of variables related to their causes is called the decomposition of a time series, which consists in the selection from an initial series (Yt) of components: trend-cycle (Tt), irregular component (It), effect of a various number of working days (Dt), holiday effect (Et), and seasonal component (St) [7]. This procedure may be written in the following formula:

$$Yt = Tt \blacksquare St \blacksquare It \blacksquare Et \blacksquare Dt$$

where:

$\blacksquare$ – depending on the considered multiplicative or additive model it means a multiplication or addition sign, accordingly.

Among many methods of decomposition of a time series, methods based on procedures TRAMO/SEATS and CENSUS X-12 ARIMA [8] are usually applied. The seasonal component (St) selected in such a way was subject to tests of statistical significance and further analyses, e.g. analyses of an average annual level of seasonality or an average monthly distribution of seasonality throughout a year.

Research concerning the seasonality of employment in Poland and in selected EU countries was conducted based on quarterly data, from the first quarter of 2008 to the fourth quarter of 2016, 36 observations in total.

Collected data constituted a sufficient set of observations to conduct the planned analyses. For the research purposes, data on a number of employees in Poland and in selected countries of the European Union were collected, i.e. France, Germany, Great Britain, Bulgaria, Slovakia, Slovenia, Romania, Lithuania. Information on employment originated from the research of the European Union workforce (EU-LFS). According to the EUROSTAT definition, a person employed in economy is the person in work relationship on a full-time and part-time basis at the age of 15 and older.

The course of employment in Poland and in selected countries of the European Union from 2008 to 2016 causes the necessity of application of a multiplicative model to the decomposition of a time series. The seasonal component was selected with use of the CENSUS X-12 ARIMA procedure, while applying Eviews 9.0 software.

The research procedure was planned according to the following scheme:
- Stage 1. Analysis of an average annual seasonality of employment in Poland and in selected countries of the European Union from 2008 to 2016.
- Stage 2. Analysis of an average monthly seasonality of employment in Poland and in selected countries of the European Union from 2008 to 2016 throughout a year.

Research results

Analysis of the seasonality of employment in Poland and selected countries of the European Union was preceded with the characteristics of a long-term trend of changes in employment. Based on the analysis of annual data on a number of employees from 2008 to 2016, it was stated that employment in Poland was regularly increasing, starting from the first quarter of 2010. Just like in France, Germany and Great Britain. In Central and Eastern European countries an annual number of employees was declining on a period to period basis. An exception was constituted by the labour market in Slovakia, where employment was characterised by the similar course as in Poland and in Western European countries.

While analysing quarterly data on a number of employees in Poland and in selected EU countries, it was noticed that the course of a number of employees was characterised by minor, but relatively regular short-term changes in all analysed countries.

Analysis of an average annual seasonality of employment in Poland and in selected countries of the European Union from 2008 to 2016

The first stage of the analysis of seasonality of employment in Poland and in EU countries was constituted by the selection of a seasonal component from a time series and verification of its statistical significance.

The selected seasonal component was verified with regard to statistical significance with use of the Friedman Test, Kruskal-Wallis Test and mobile seasonality test. Estimated seasonal fluctuations of a number of employees in Poland and selected countries of the European Union were statistically significant. Tab. 1 presents tests of significance of a seasonal component.

Tab. 1 Tests of significance of a seasonal component and seasonal model

Countries	Statistical significance tests		
	Friedman	Kruskal-Wallis	mobile seasonality test
Poland	28,26[a]	33,30[b]	---
Germany	11,35[a]	27,57[b]	---
France	10,91[a]	32,32[b]	---
Great Britain	3,37[a]	28,44[b]	0,05[c]
Bulgaria	108,12[a]	31,51[b]	---
Slovkia	11,90[a]	23,28[b]	2,53[b]
Slovenia	46,94[a]	26,82[b]	---
Romania	151,53[a]	34,20[b]	7,33[b]
Lithuania	39,11[a]	27,98[b]	6,79[b]

means [a] significance at the level of 0.1%   [b] significance at the level of 1%
   [c] significance at the level of 5%   --- no evidence of mobile seasonality at the level of significance of 5%

Source: own calculations based on EUROSTAT data [@: http://ec.europa.eu/eurostat/data/database]

Average annual seasonality of a number of employees in Poland from 2008 to 2016 was relatively low. It did not exceed 1% in the entire period of the analysis. In addition, in 2016 in comparison to 2008 an average annual level of the seasonality of employment in Poland decreased.

While analysing the level of average annual seasonality of a number of employees in selected EU countries, it may be noticed that in a group of Western European countries, i.e. Germany, France and Great Britain, seasonality of employment was characterised by a lower level than the seasonality of employment in Central and Eastern European countries. In addition, trend of changes is also different. An average annual seasonality of employment in countries of Western Europe is characterised by a small decreasing trend, while in Central and Eastern European countries the dynamics of changes is greater. Such a situation may constitute the basis for claiming that it is right that a level and course of an average annual seasonality of employment depends on the level of a country's economic development. The higher the level of the country's economic development, the higher the stability on its labour market and the lower the level of seasonal employment.

Seasonality of employment in Poland shows a similar course and dynamics of changes as the seasonality of employment in Western European countries (Fig. 1).

Fig. 1. Average annual seasonal fluctuations of a number of employees in Poland and in selected countries of the European Union from 2008 to 2016

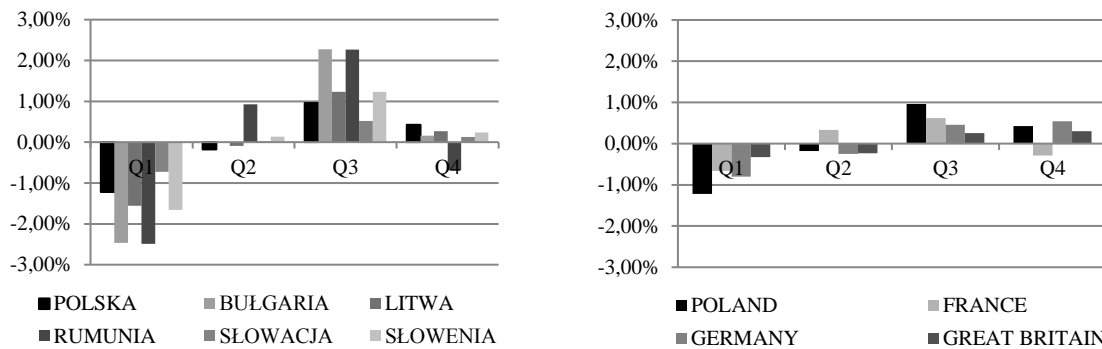*Source: own calculations based on EUROSTAT data [@: http://ec.europa.eu/eurostat/data/database]*
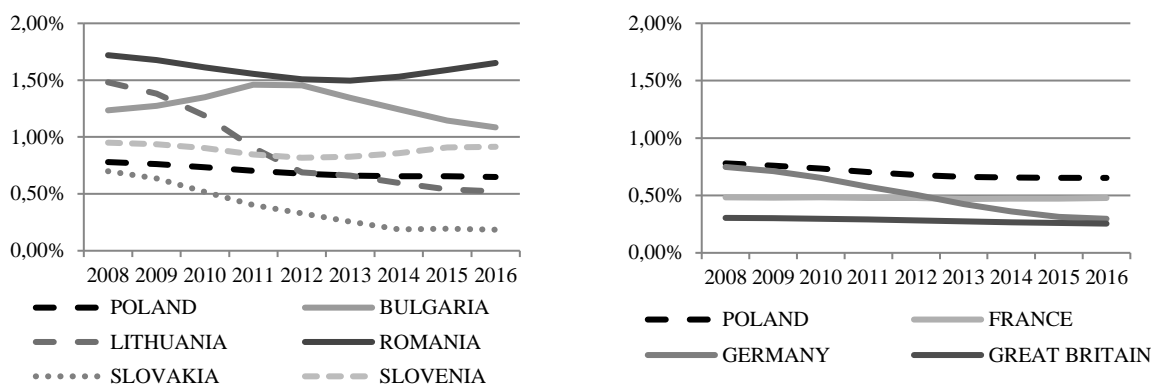
Analysis of an average monthly seasonality of employment in Poland and in selected countries of the European Union from 2008 to 2016 throughout a year

The second stage of research was constituted by the analysis of distribution of seasonal fluctuations of a number of employees throughout a year. Seasonal fluctuations throughout a year in Poland created one annual cycle with a decline of seasonal employment in the two first quarters of a year and with an increase of the seasonality of employment in the last two quarters of a year. This situation may result from the fact that the increase in production occurs mainly at the end of the second quarter. Therefore, it should be expected that an increase in demand for seasonal employment shall occur only after the second quarter, where previous labour force is fully used.

Distribution of the seasonality of employment throughout a year in analysed EU countries was characterised by a similar course of the seasonality of employment. In all countries a decrease in the seasonality of employment occurred in the two first quarters of a year and an increase in seasonality – in the third and fourth quarter. Labour markets of France and Romania constituted exceptions. Larger differences among groups of countries are observed in an amplitude of fluctuations of the seasonality of employment. In a group of Western European countries, the amplitude of fluctuations of the seasonality of a number of employees was relatively low and came in Germany to 1.34%, in France to 1.29%, and in Great Britain to 0.63%, while in a group of Central and Eastern European countries it was described with a relatively high amplitude of fluctuations.

The highest peak to peak value was noted in Romania (4.76%) and Bulgaria (4.74%), while the lowest – in Slovakia (1.25%).

While analysing the course and amplitude of an average monthly seasonality of employment in Poland and in selected EU countries, it may be observed that the seasonality of employment in Poland is characterised by a similar course as the seasonality in both groups of countries. The amplitude of fluctuations of the seasonality of employment in Poland indicates the similarity with the amplitude of Western European countries and is lower than the amplitude for Central and Eastern European countries (Fig. 2).

Fig. 2. Distribution of seasonal fluctuations of a number of employees throughout a year in Poland and in selected countries of the European Union from 2008 to 2016

Source: own calculations based on EUROSTAT data [@: http://ec.europa.eu/eurostat/data/database]

Results of the analysis of average annual and monthly seasonal fluctuations of employment indicate that the level of economic development of countries may affect the value of short-term fluctuations of employment.

The higher the level of development of a given country, the lower the short-term fluctuations, both average annual and monthly. However, the country's level of economic growth does not affect the distribution of fluctuations of the seasonality of employment throughout a year. In general, all tested countries, i.e. countries of Western Europe and of Central and Eastern Europe, were characterised by one annual cycle, with reduced seasonality of employment in the two first quarters of a year and with increased seasonality in the third and fourth quarter.

Conclusion

The conducted analysis constituted an attempt to emphasise the significance of analyses of seasonality in research concerning the activity of labour markets in Poland and in selected EU countries. The analysed empirical material allowed for the formulation of the conclusions below. Firstly, the labour market in Poland and in selected EU countries was characterised by a generally low level of fluctuations of seasonal employment.

The second observation concerns the distribution of the seasonality of employment. In Poland there occurs an annual cycle of the seasonality of employment, with reduced seasonality of employment in the first and second quarter of a year and higher seasonal fluctuations in the third and fourth quarter of a year. Poland noted low peak to peak values of the seasonality of employment.

While comparing the seasonality of employment among groups of countries, significant differences were observed among them. Western European countries were described with a low level of average annual seasonality of employment. One annual cycle, with reduced seasonality in the two first quarters and increased seasonality in the two last quarters, and with a low amplitude of fluctuations. Central and Eastern European countries noted higher levels of average annual seasonality. Seasonality of employment was characterised by one annual cycle, with reduced seasonality in the two first quarters and increased seasonality in the two last quarters, and with a relatively high amplitude of fluctuations. Seasonality of employment in Poland, both average annual and average monthly levels, was characterised by a similar level, distribution throughout a year and an amplitude of fluctuations to the seasonality of employment estimated for a group of Western European countries.

Reasons for this state of affairs may be found in a different level of social and economic development of countries, which shall constitute a direction of future research for the authors.

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