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Periodisation of Poland's economy 2007–2019

Abstract: In each country, in the economy observed over long periods of time, usually we can find some developmental phases due to socioeconomic changes, globalization, political decisions, and unexpected events. The identification of such phases, their duration, turning points in the trends of macroeconomic indicators, and some other early signals comprise interesting goals for research. The aim of this paper is to find homogeneous phases in the economic development of Poland from 2007–2019. Eight monthly variables were used, including data on labour markets, salaries, inflation, manufacturing, retail sales, exports, and the overall business climate. This multidimensional time-series dataset was partitioned using cluster analysis methods, namely Ward's agglomerative method and k-means. Seven sub-periods have been found and they are illustrated by segmented trends and displayed as models and graphs. Economic interpretation of the developments in the phases is explained and interpreted below. Looking at the periods that have been found, one can consider the quality of economic and political decisions, both within the world in general and the European economic situation. This paper presents original periodisation of Poland's economy and is based on real monthly data with the use of a clustering approach to multidimensional time series.

Key words: cluster analysis; multidimentional time series; periodisation; Poland's economy

INTRODUCTION

Since 1989, the economy of Poland has been especially interesting to researchers in times of political and economic transformation, during Mazowiecki's government and the so called Balcerowicz Plan (Wellisz, Kierzkowski, Okolski, 2013; Slay, 2014). In our analysis, we focus on the period that is almost 20 years later, and whereby the situation is totally different; in particular, Poland's becoming a member of the European Union, and its economy seemingly on a clear developmental path. Generally, economic processes have some kind of continuity, even in the world economy, where there were some single

political and economic events or decisions with a strong impact that started a new period or even an "era." The identification of homogeneous sub-periods and – their duration, turning-points in trends of macroeconomic indicators, some early signals – are all interesting goals for research. In this paper, we use cluster analysis for the periodisation of Poland's macroeconomic development. These methods are used in their non-fuzzy versions, but the borders between phases should be treated rather as soft ones. The aim of the paper is to identify the homogeneous phases in the development of Poland's economy, from 2007–2019. The analysis is based on eight macroeconomic variables characterizing labour market, wages, inflation, production volume, detailed domestic sales, export, and economic climate. They form multidimensional time series which is partitioned by cluster analysis method.

Literature review

The term "periodisation" – as the partition of time periods into sub-periods, phases or epochs – is typically used in the context of human development, art history, literature, geology or sports (in training planning). In accounting, periodisation means the assignment of economic events to time periods. In general, the sub-periods are defined by some events considered as important for the analysed phenomenon. In economic history, the identification and analysis of some events and processes allow for partitioning of development time, i.e., periodisation. Baten (2019) points out that periodisation of economic history is based both on conventionalism (partitions are somehow contractual) and realism (there is a logic in history, and periodisation is not formal but substantive). In economics, researchers are interested mainly in finding phases of economic development. Grabiński (1975) defined periodisation as "partition of ordered time moments or periods for which data is collected (…) into a priori undefined number of separable and exhaustive subsets containing periods similar in terms of their features (i.e., variables) and different from periods in other subsets.." A similar definition can be found in a paper by Grabiński and Zając (1975). Some other methods for identification of developmental phases were proposed by Grabiński (1975, 1978), Bazarnik (1981), Guzik and Hadasik (1988), and have been summarized by E. Sobczak (1997).Some examples of successful periodisation of economic processes include:
   Some examples of successful periodisation of economic processes include:
 – periodisation of economic object development using cluster analysis in temporal space (Grabiński, 1975),
 – periodisation of foreign trade structures in some countries (Sobczak, 1997),
 – periodisation of the political economy (Terreblanche, Nattrass, 1990),
 – periodisation of industrialization stages and strategies (Di John, 2021),
 – periodisation of EU regions in their innovativeness and forecasts (Markowska, 2013),
 – periodisation of structural changes in socioeconomic development of homogeneous groups of countries (Wydymus, 1986),
 – periodisation and forecasting of natural movement of populations (Grabiński, Zając, 1977),
 – periodisation of world economic recessions (Piech, 2012).

Data

We use eight variables from the list published by Statistics Poland (Central Statistical Office) in Macroeconomic Data Bank (BDM) – downloaded file "Selected monthly macroeconomic indicators," accessed on February 14, 2020:

The variables include:
- *Employment* – Average paid employment in an enterprise sector in thousands,[1]
- *Unemployment* – Registered unemployment rate in % (end of the period),[2]
- *Salaries* – Average monthly nominal gross wages and salaries in the enterprise sector in PLN1,
- *Inflation* – Price indices of consumer goods and services (corresponding period of the previous year = 100),
- *Manufacturing* – Total sold production of industry (corresponding period of the previous year = 100)1,
- *Sales* – Retail sales of goods in constant prices (corresponding period of the previous year = 100),
- *Export* – Total export in current prizes, in million PLN,
- *Business* – General business climate indicator in manufacturing.

Of course, some important macroeconomic indices are missing, such as GDP, but they are not reported on a monthly basis. There were only four months with missing data from 2007–2019. In one of the missing months (December 2019), we estimated the value of exports using exponential smoothing. For the other three missing values (two of which were inflation and one in manufacturing) we calculate averages using data from adjacent periods.

Method

Data has been standardized using arithmetic averages and standard deviations in order to make it possible to calculate the distance matrix between time points. The taxonomic task (Sokołowski, 1983) considered in this paper can be defined as [T, Zy], which means that we are clustering time points T (the reason that this is called periodisation) of one object y (Poland's economy) described by Z variables (explained above). The number of clusters (periods) has been established by Ward's agglomerative method. The increase of agglomerative distance (see fig. 1) and the dendrogram (see fig. 2) suggest six or four groups of time units (months) in the development of the Polish economy.

With the criterion of the first important increase in agglomerative distance we decide that six groups are appropriate. The final partition has been obtained by the k-means method.

[1] The data covers economic entities in which the number of employees exceeds 9.

[2] Data are compiled taking into account employed persons on private farms in agriculture estimated in years 2000–2002 (I–XII 2002 – the denominator) using the results of the Agricultural Census 1996, since I 2002 (I–XII 2002 – the numerator) to XI 2010 – of the Population and Housing Census 2002 as well as the Agricultural Census 2002, and since XII 2010 – of the Agricultural Census 2010.

Figure 1. The Relative Increase of the Agglomerative Distance in Ward's Method
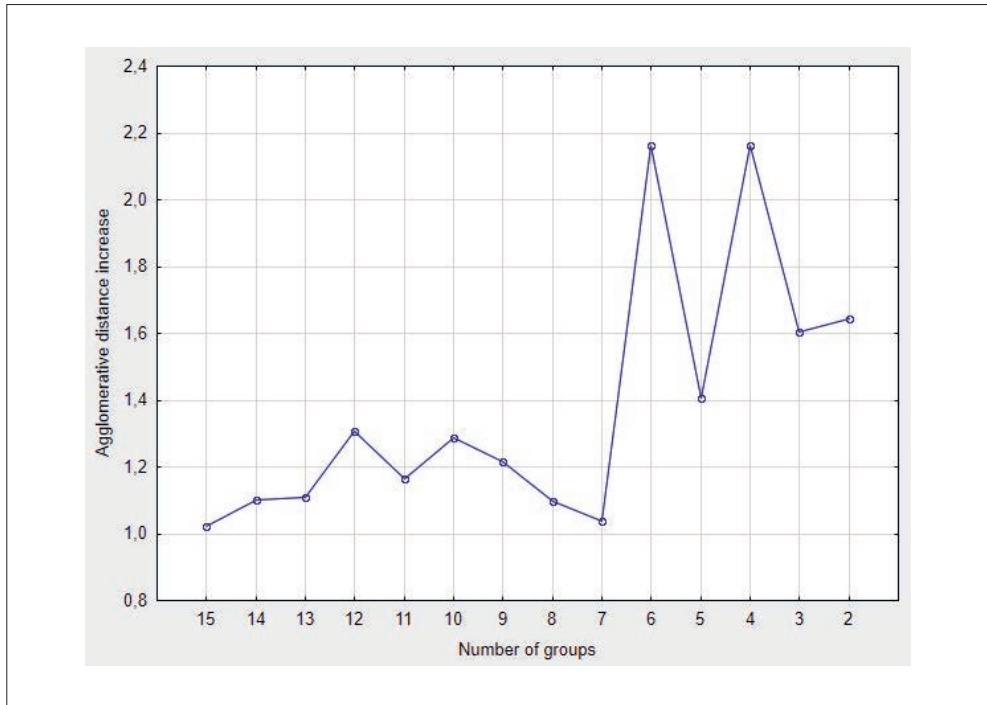
Source: own calculations

Figure 2. Ward's Dendrogram for the Periodisation of Poland's Economy 2007–2019
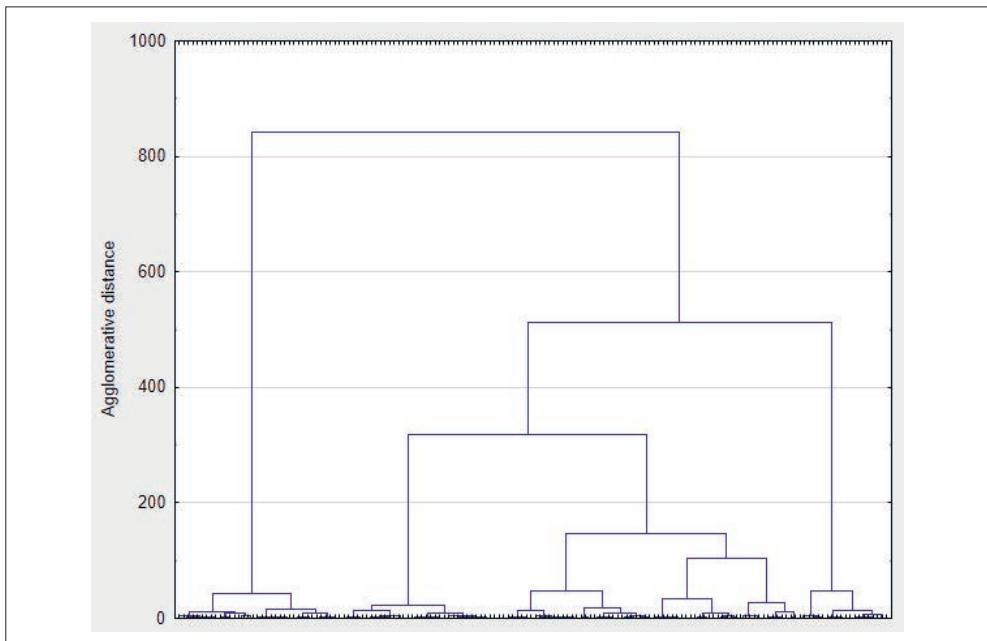
Source: own calculations

Results

The results are given in Table 1. Even if there was no restriction on time continuity imposed, the clustering procedure produced groups which are very compact in time. There are only four months separated from the main body of the cluster, and group 2 has two separate parts. So, after a small adjustment dividing group 2 into two periods and forcing four months to groups where there are their neighbours, we find the final periodisation, which is presented in Table 2.

Table 1. Crude Periodisation Results

Year/Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2007	1	1	1	1	1	1	1	1	1	1	1	1
2008	1	1	1	1	1	1	1	2	3	2	2	2
2009	2	2	2	2	2	2	2	2	2	2	3	3
2010	3	3	3	3	3	3	3	3	3	3	3	3
2011	3	3	3	3	3	3	3	3	3	3	3	3
2012	3	3	3	3	3	3	3	2	2	3	2	2
2013	2	2	2	4	4	4	4	4	4	4	4	4
2014	4	4	4	4	4	4	4	4	4	4	4	4
2015	4	4	4	4	4	4	4	4	4	4	4	4
2016	4	4	4	4	4	4	4	4	4	4	4	4
2017	5	5	5	5	5	5	5	5	5	5	5	6
2018	5	5	5	5	5	5	5	5	6	6	6	6
2019	6	6	6	5	6	6	6	6	6	6	6	6

Source: own calculations

Table 2. Adjusted Periodisation Results

Year/Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2007	1	1	1	1	1	1	1	1	1	1	1	1
2008	1	1	1	1	1	1	1	2	2	2	2	2
2009	2	2	2	2	2	2	2	2	2	2	3	3
2010	3	3	3	3	3	3	3	3	3	3	3	3
2011	3	3	3	3	3	3	3	3	3	3	3	3
2012	3	3	3	3	3	3	3	4	4	4	4	4
2013	4	4	4	5	5	5	5	5	5	5	5	5
2014	5	5	5	5	5	5	5	5	5	5	5	5
2015	5	5	5	5	5	5	5	5	5	5	5	5
2016	5	5	5	5	5	5	5	5	5	5	5	5
2017	6	6	6	6	6	6	6	6	6	6	6	6
2018	6	6	6	6	6	6	6	6	7	7	7	7
2019	7	7	7	7	7	7	7	7	7	7	7	7

Source: own calculations

Table 3. Characteristics of the Periods in this Study

Variable	Period						
	01/07 – 07/08 (19 months)	08/08 – 10/09 (15 months)	11/09 – 07/12 (33 months)	08/12 – 03/13 (8 months)	04/13 – 12/16 (45 months)	01/17 – 08/18 (20 months)	09/18 – 12/19 (16 months)
Employment (thousands)	Increase 21.6 pm	Decrease 11.3 pm	Slowing down increase (5265 – 5529)	Decrease 4.1 pm	Accelerating increase (5478 – 5799)	Increase 16.8 pm	Slowing down increase (4772 – 5604)
Unemployment rate (%)	Slowing down decrease (15.1 – 9.2)	Slowing down increase (9.1 – 11.1)	Stability av. 12.3	Increase 0.3 pm	Decrease 0.1 pm	Slowing down decrease (8.5 – 5.8)	Accelerating decrease (5.7 – 5.2)
Salaries (PLN)	Increase 29.7 pm	Stability av. 3273	Increase 12.2 pm	Stability av. 3770	Increase 13.1 pm	Increase 27.5	Increase 29.0 pm
Consumer prices index	Increase 0.2 pm	Slowing down decrease (104.8 – 103.1)	Increase 0.1 pm	Decrease 0.4 pm	Downward jo-jo (100.8 / 98.4 / 100.8)	Stability av. 101.9	Accelerating increase (101.9 – 103.4)
Manufacturing index	Decrease 0.3 pm	Downward jo-jo (95.6 / 87.8 / 98.7)	Accelerating decrease (109,9 – 105.2)	Stability av. 110.7	Stability av. 103.7	Stability av. 106.6	Stability 104.3
Sales index	Accelerating decrease (116.3 – 110.4)	Decrease 0.4 pm	Upward jo-jo (103.9 / 113.6 / 103.4)	Stability av. 100.1	Accelerating increase (100.1 – 106.1)	Stability av. 107.1	Stability av. 105.4
Exports (million PLN)	Increase 224 pm	Stability av. 34407	Increase 501 pm	Stability av. 51065	Increase 361 pm	Increase 378 pm	Stability av. 84185
Business climate	Accelerating decrease (19.5 – 13.9)	Downward jo-jo (14.6 / (–17.7) / 0.8)	Accelerating decrease (1.1 – (-3.1))	Downward jo-jo ((-2.8) / (-14.3) / (-6.4))	Upward jo-jo ((-5.8) / 8.2 / (-2.6))	Increase 0.6 pm	Accelerating decrease (8.8 – (-4.9))

Abbreviations: pm – per month, av – average.

Remarks: Dynamic indices are calculated in reference to the same month of the previous year, and expressed in percentages. General business climate indicator is calculated as the average balance of monthly survey on current and expected business climate

Source: own calculationsSource: own calculations

In the development of Poland's economy over the 2007–2019 – time frame, seven periods should be considered:

1. January 2007 – July 2008 (19 months)
2. August 2008 – October 2009 (15 months)
3. November 2009 – July 2012 (33 months)
4. August 2012 – March 2013 (8 months)
5. April 2013 – December 2016 (45 months)
6. January 2017 – August 2018 (20 months)
7. September 2018 – December 2019 (16 months)

Cluster analysis finds groups of objects (time units in our case) that are similar with respect to the level of variables or their "structure" (that is, which variable assumes big values vs. those that assume small values). Though periodisation can be considered as an approximation by a multivariate step-function, we can still study not only the average level of the variables but also their possible trends within periods. As such, we have tried to fit the parabolic trend to variables within periods. The parameters (except the intercept) of an estimated trade have been tested against zero on significance level 0.10. Using a backward stepwise regression procedure, the non-significant time variables were eliminated. In Tables A1-A8, which are contained in the Appendix, the best trends are presented (P-values are in brackets, below the parameter estimates). Two goodness-of-fit measures are given: the coefficient of determination (R^2) and the standard error of the estimates (Se). The segmented trends are illustrated in figures A1–A8.In Table 3 we tried to summarize the description of all periods and variables.

If there are two numbers in brackets, then the first one represents the empirical value in the first period, and the second one is the value in the last period. "Decrease" or "Increase" means the linear trend, while "Slowing" and "Accelerating" are for the parabolic trend. The "jo-jo" effect occurs when time series goes up, and after reaching the local maximum, again down ("Upward jo-jo"), or the other way round ("Downward jo-jo"). In such cases we report the value in the first month of the period, the extreme value within the period, and the value in the last month (separated by slashes in the table).

Discussion

I – January 2007 – July 2008

Before the outbreak of the global financial crisis, an extremely strong fiscal impact was triggered in Poland. This fiscal impact was related to the proposals presented by the Deputy Prime Minister Zyta Gilowska, which consisted of the reduction of not only the number of Personal Income Tax brackets but also the lowering of them. Initially, there were three brackets (19%, 30%, and 40%) but after this fiscal action there were only two (18% and 32%). This activity was initiated after the period of rapid economic growth in the years 2006–2007 and was of a procyclical nature. At that time, the Polish economy was developing significantly above its potential GDP.

The global financial crisis was not expected at that time. It was about boosting domestic consumption as the factor of economic growth. As a result, the Polish economy was at the top phase of the business cycle when it occurred. An external shock hit when it was at a high level (GDP year-over-year growth was 7%). While the pace of this growth

dropped, the economy did not go into recession. It continued to develop, even though at a much slower pace (GDP growth fell to 3% -on a year-over-year basis).

In the aforementioned business cycle, the acceleration of growth was associated with Poland's joining the European Union, which occurred in May 2004. This resulted from a series of actions undertaken by the government and various enterprises in the period prior to joining the European Union. Among other things, the added flexibility to the labour market along with providing incentives to stimulate entrepreneurship led to the Polish economy's entering into a long-term trend of employment growth and a decline in the unemployment rate, despite the continued significant increase in labour resources, which resulted from the demographic fluctuations.

Consequently, high-growth dynamics were not accompanied by an increase in inflationary pressure. Inflation remained under control as the Monetary Policy Council pursued a restrictive (and later a moderately restrictive monetary policy, until 2004).

Poland joined the EU and its economy turned out to be competitive within this open common market. This resulted in a period of rapid growth in trade and exports for the Polish economy.

II – August 2008 – October 2009

It is rather difficult to consider this period as a separate one in terms of macroeconomic and institutional aspects. During this period, the effects of the global financial crisis had not yet been realized. The Polish economy appeared as a "green island" in the ocean of recession. The observed decline in employment could have resulted from the gradually increasing economic emigration, initially mainly to Great Britain and Ireland. It was possible to increase employment at the turn of 2006/2007, since the 2 + 5 rule was in force. More specifically, after two years, restrictions on the movement of workers between the old and new Member States were to be lifted, and after seven years they have to be lifted. It is estimated that two million workers left Polish labour market within a few years after the joining of the European Union. As a result, unemployment did not increase; if so, it was temporary, even though the GDP growth dynamics were dampening.

The stability of wages can, however, be explained by the fact that entrepreneurs were receiving external signals coming from the global market. Global sentiment was turning negative as uncertainty was intensifying along with the sense of insecurity. Exports remained at a stable level. The Polish economy was not highly internationalized at that time, meaning that the share of trade exchange in relation to its GDP was relatively low. Moreover, the temporary weakening of Polish currency – the zloty – helped to maintain the level of exports, along with the floating exchange rate regime that was taking effect in Polish monetary policy.

The Civic Platform political party won the elections in autumn of 2007. The Civic Platform – Polish People's Party coalition government was formed.

III – November 2009 – July 2012

During this period, which was characterized by the consequences of the worldwide global financial crisis, there was no record of a strong economic slump. The preparations for the European Football Championships organized in Poland and Ukraine in mid-2012 was the factor supporting the relatively high-growth dynamics. At that time, an extensive

program of public investments in infrastructure was launched, and reached up to 4% of GDP, which was at least twice as high compared to the European average. As a result, businesses could count on large profits.

During this period, a highly expansionary fiscal policy was observed. In 2009, the Civic Platform – Polish People's Party coalition government launched a very strong fiscal incentive attempting to prevent a sudden slowdown in economic growth dynamics. Consequently, the budget deficit increased from the level of 3% to almost 8% of GDP. The problem was supposed to be solved by dismantling the new (introduced in 1998) pension system and taking over, by the Social Insurance Fund, the state treasury bonds purchased by the Open Pension Funds. From an accounting perspective, the deficit was reduced at the expense of the state future increased obligations to the citizens.

As a result, wages in the construction industry increased, and this sector was booming. Consequently, a shortage of workers in other sectors transpired. Throughout the entire period, inflation was kept low and did not pose any significant risk. Monetary policy was stable and adapted to the situation in the fiscal policy. There were fluctuations in consumption and sales. These dynamics, however, went into a decline after the European Football Championships were over.

Owing to this factor, the economic slowdown occurred later in this period. The demand for exports was maintained because the Polish economy turned out to be competitive and exporters managed to enter not only the EU markets but slowly started entering the non-European markets.

IV – August 2012 – December 2013

The strongest economic slowdown occurred during the period referenced above. A decline in employment/increase in the unemployment rate was recorded in this period. The dynamics of wages and inflation dropped. The Monetary Policy Council entered a monetary policy easing cycle, which was followed by deflation, that lasted several quarters. This was caused by external factors, so the reaction of the Monetary Policy Council remained moderate. Subsequently, the economic climate continued to deteriorate.

V – April 2013 – December 2016

Initially, the economic recovery was minimal, however, it began to accelerate in 2015 as the global economic prosperity was improving and our major economic partners had already entered the phase of economic growth recovery. The international environment turned into more favourable.

A large decline in unemployment was characteristic for this period. A rise in wages did not go along with labour productivity growth, however, it was noticeable and stimulated consumption. The monetary policy easing phase came to an end at the beginning of 2015. The National Bank of Poland reference interest rate was, at that point, historically the lowest, but positive in real terms.

The favourable external impulses were gradually joined by internal impulses and the Polish economy entered the phase of high economic growth, which was additionally stimulated by the increase in social spending launched by the government led by the Law and Justice political party (e.g., Family 500+ program).

VI – January 2017 – August 2018

In the period to follow, the Polish economy started to soar. The unemployment rate fell to 5%, i.e., the level of natural unemployment. At the same time, a period of deep demographic decline was experienced causing the situation on the labour market to change dramatically – the general shortage of employees was a fact. The situation was improved by economic immigration – the inflow of workers, predominantly from Ukraine and Belarus.

Wages rose quickly and clearly faster than the increase in labour productivity, which obviously caused the consumption to accelerate rapidly. Inflation remained moderate.

This period was characterized by an exceptional economic prosperity. Along with the favourable international environment, the impact of two favourable internal factors coincided: the course of the business cycle and entering the expansion phase, as well as strong fiscal stimulation resulting from the social program launched by the government.

VII – September 2018 – December 2019

It is correct that the latter period has been highlighted, because the Polish economy was slowing down since mid-2018. This was the effect of the domestic business cycle. At the same time, the effects of the first fiscal stimulation stage were fading away, among other reasons also because inflation started to accelerate slightly. The global economic situation was still in a very good shape. Therefore, the downturn was slow.

Starting from mid-2018, we were entering an election cycle spread over two years. Before the approaching elections (local government, European, parliamentary elections), the government launched new social spending programs (e.g., the 13th retirement pension) and significantly increased the minimum wage. It spoiled the macroeconomic environment but maintained economic growth.

The inflationary pressure was building up and it became necessary to increase the centrally and administratively regulated prices (e.g., electricity).

The GDP dynamics dropped from the maximum 5.5% level of GDP y/y to 3% level of GDP at the turn of 2019/2020. And this is where the pandemic came in.

Conclusions

One of the aims of this analysis was to check whether some methods of multidimensional analysis are suitable for the analysis of Polish economy development. This was evaluated by time cohesion of the obtained periods, and trends goodness-of-fit. Basic conclusions from the presented research are: 1. cluster analysis is a good method for periodisation of multidimensional economic time series; 2. the history of Poland's economy in 2007–2019 can be divided into 7 homogeneous phases; 3. macroeconomic variables characterizing Poland's economy in 2007–2019 reveal different paths of development, 4. dynamic effects of some activities from previous periods was not fully interpreted, e.g., investments related to Euro 2012 were partly not implemented on time and the (positive) effect of their implementation was prolonged. The obvious subject for future research is the evaluation of COVID-19 pandemic on economic situation in Poland. One can expect a separate phase in this context. The next two years (out of our analysis) seem to be totally different from the past. Another important factor in the Soviet invasion

on Ukraine, and its impact especially on energetic market, and in fact on all economic aspects in the world and Europe.

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APPENDIX

Table A1. Models for employment changes

Period	Intercept or average	Slope	$(time)^2$ coefficient	R^2	Se
01/07 – 07/08	5014.09 (0.0000)	21.62 (0.0000)	–	0.960	24.75
08/08 – 10/09	5418.70 (0.0000)	–11.25 (0.0000)	–	0.935	13.24
11/09 – 07/12	5205.30 (0.0000)	21.48 (0.0000)	–0.345 (0.0000)	0.919	29.15
08/12 – 03/13	5519.89 (0.0000)	–4.14 (0.0721)	–	0.349	12.32
04/13 – 12/16	5482.81 (0.0000)	–	0.16 (0.0000)	0.972	17.33
01/17 – 08/18	5915.21 (0.0000)	16.78 (0.0000)	–	0.903	32.52
09/18 – 12/19	6159.27 (0.0000)	41.32 (0.0000)	–1.74 (0.0008)	0.823	30.04

Source: own calculations

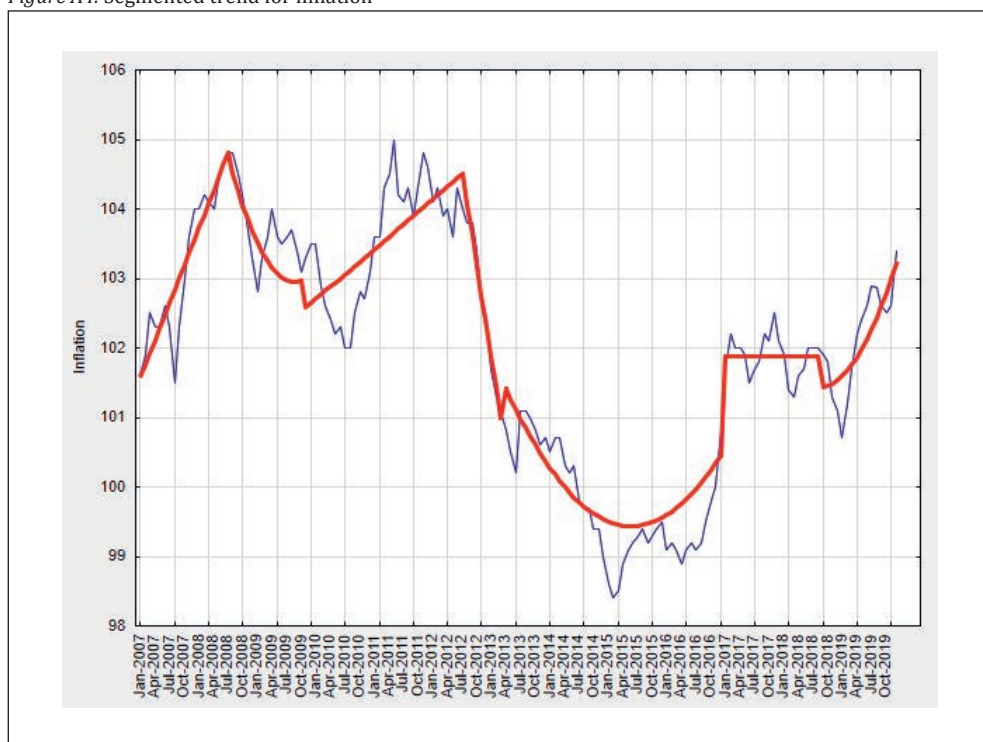*Figure A1.* Segmented trend for employment
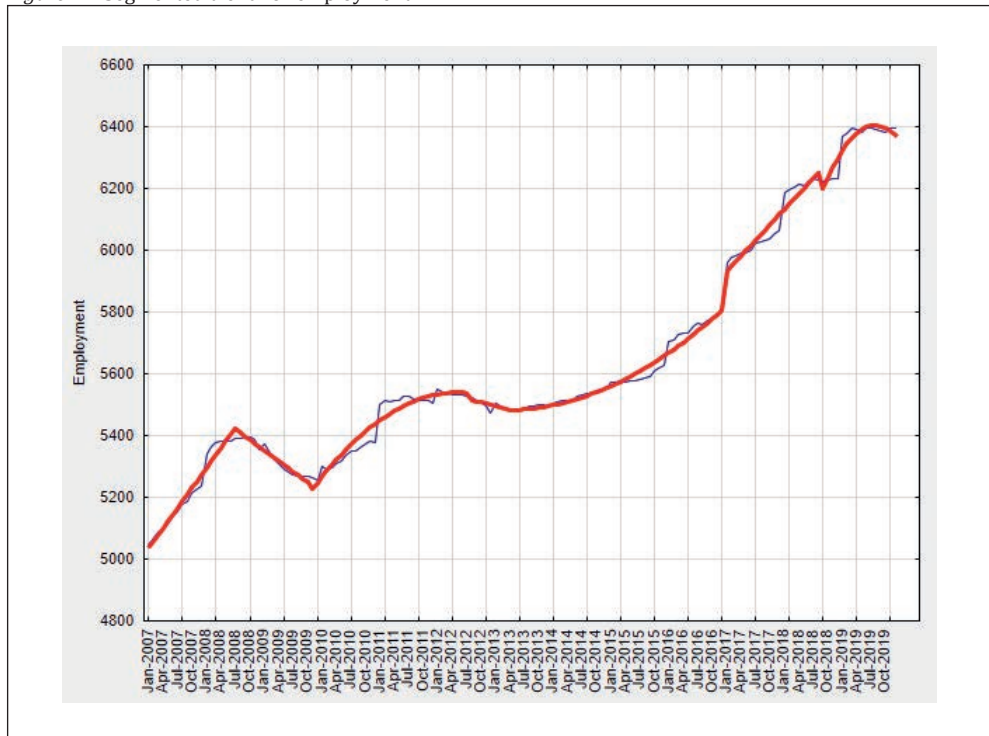
Source: own calculations

Table A2. Models for unemployment rate changes

Period	Intercept or average	Slope	(time)^2 coefficient	R^2	Se
01/07 – 07/08	15.331 (0.0000)	–0.463 (0.0000)	0.009 (0.0321)	0.936	0.43
08/08 – 10/09	8.154 (0.0000)	0.432 (0.0011)	–0.017 (0.0193)	0.794	0.40
11/09 – 07/12	12.348	–	–	–	0.66
08/12 – 03/13	11.764 (0.0000)	0.344 (0.0002)	–	0.898	0.28
04/13 – 12/16	14.241 (0.0000)	–0.136 (0.0000)	–	0.936	0.47
01/17 – 08/18	8.532 (0.0000)	–0.223 (0.0000)	0.005 (0.0242)	0.899	0.25
09/18 – 12/19	5.847 (0.0000)	–	–0.004 (0.0001)	0.676	0.21

Source: own calculations

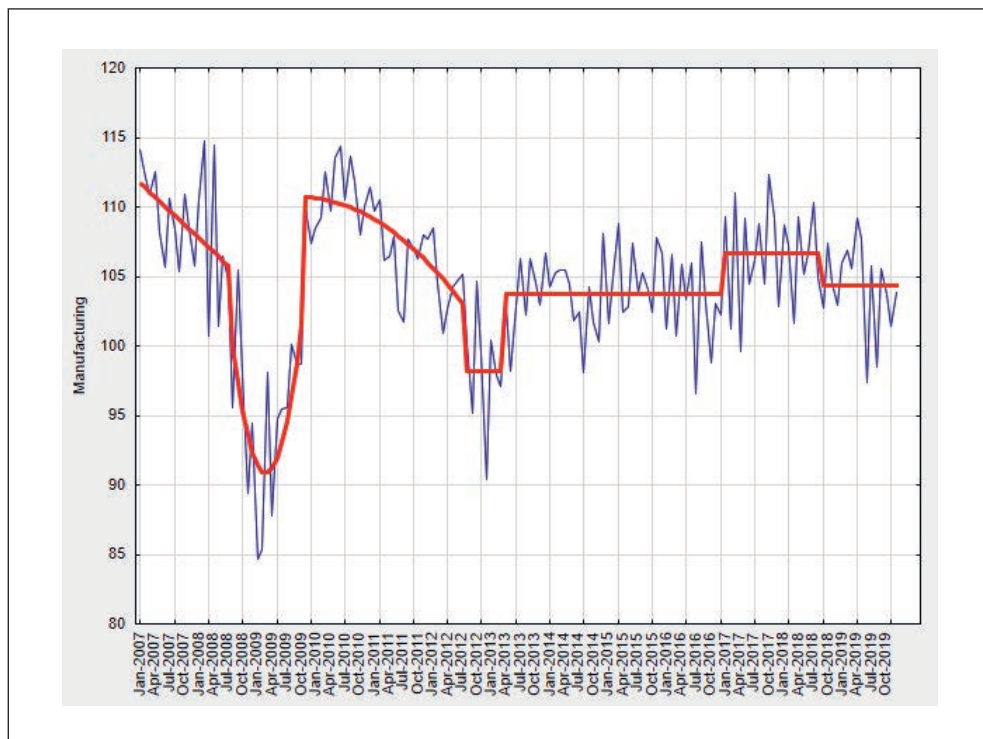*Figure A2.* Segmented trend for unemployment
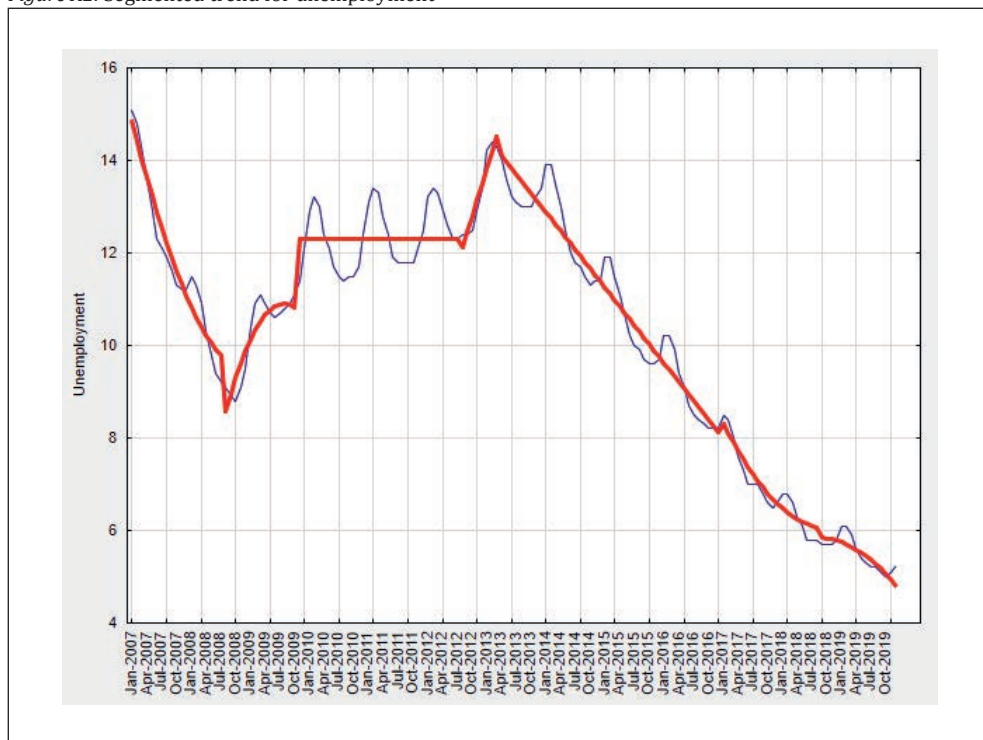
Source: own calculations

Table A3. Models for average salaries changes

Period	Intercept or average	Slope	(time)² coefficient	R²	Se
01/07 – 07/08	2671.97 (0.0000)	29.68 (0.0000)	–	0.827	75.94
08/08 – 10/09	3273.25	–	–	–	73.81
11/09 – 07/12	3347.60 (0.0000)	12.18 (0.0000)	–	0.471	122.64
08/12 – 03/13	3770.11	–	–	–	150.62
04/13 – 12/16	3760.91 (0.0000)	13.10 (0.0000)	–	0.665	121.37
01/17 – 08/18	4324.35 (0.0000)	27.48 (0.0000)	–	0.669	112.88
09/18 – 12/19	4864.25 (0.0000)	28.97 (0.0015)	–	0.493	135.41

Source: own calculations

Figure A3. Segmented trend for salaries
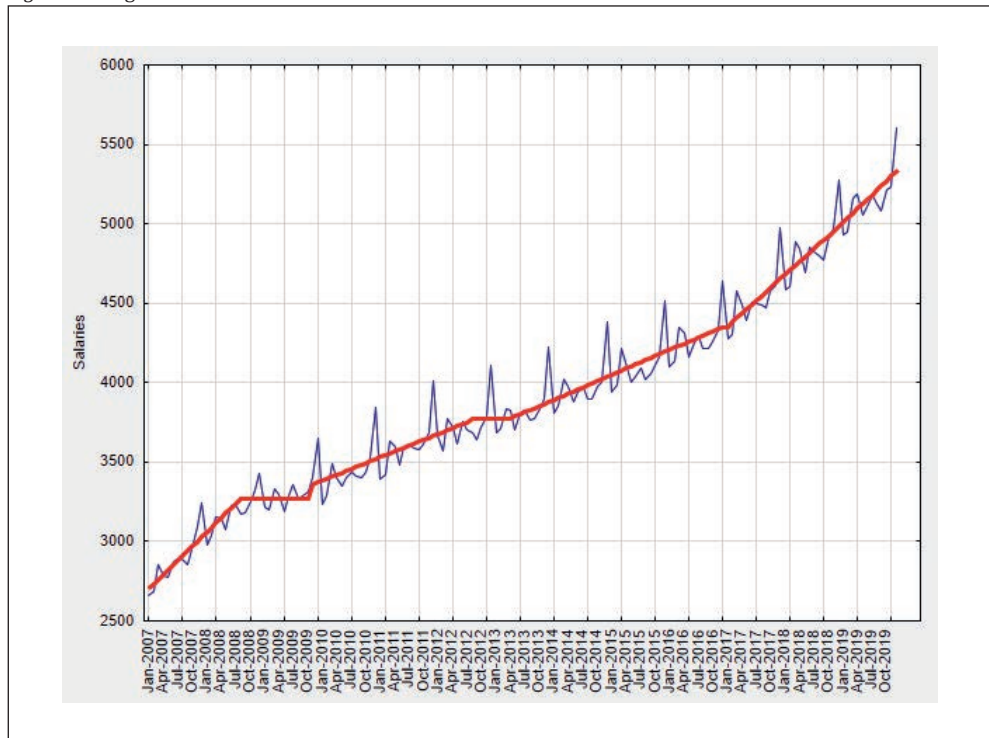
Source: own calculations

Table A4. Models for inflation changes

Period	Intercept or average	Slope	(time)² coefficient	R²	Se
01/07 – 07/08	101.39 (0.0000)	0.18 (0.0000)	–	0.834	0.44
08/08 – 10/09	104.77 (0.0000)	−0.27 (0.0251)	0.01 (0.0717)	0.401	0.40
11/09 – 07/12	102.52 (0.0000)	0.06 (0.0000)	–	0.451	0.64
08/12 – 03/13	104.51 (0.0000)	−0.44 (0.0000)	–	0.970	0.19
04/13 – 12/16	101.57 (0.0000)	−0.16 (0.0000)	0.003 (0.0000)	0.685	0.43
01/17 – 08/18	101.88	–	–	–	0.29
09/18 – 12/19	101.42 (0.0000)	–	0.007 (0.0001)	0.635	0.46

Source: own calculations

Figure A4. Segmented trend for inflation

Source: own calculations

Table A5. Models for manufacturing changes

Period	Intercept or average	Slope	(time)² coefficient	R²	Se
01/07 – 07/08	112.03 (0.0000)	−0.33 (0.0539)	–	0.154	3.79
08/08 – 10/09	102.79 (0.0000)	−3.09 (0.0303)	0.20 (0.0212)	0.274	4.91
11/09 – 07/12	110.70 (0.0000)	–	−0.007 (0.0000)	0.487	2.47
08/12 – 03/13	98.18	–	–	–	4.21
04/13 – 12/16	103.72	–	–	–	2.80
01/17 – 08/18	106.63	–	–	–	3.52
09/18 – 12/19	104.33	–	–	–	3.22

Source: own calculations

Figure A5. Segmented trend for manufacturing

Source: own calculations

Table A6. Models for changes in sales

Period	Intercept or average	Slope	(time)^2 coefficient	R^2	Se
01/07 – 07/08	115.75 (0.0000)	–	–0.01 (0.0445)	0.171	2.75
08/08 – 10/09	105.85 (0.0000)	–0.38 (0.0131)	–	0.341	2.21
11/09 – 07/12	98.57 (0.0000)	0.86 (0.0006)	-0.02 (0.0021)	0.326	2.95
08/12 – 03/13	100.08	–	–	–	1.95
04/13 – 12/16	103.38 (0.0000)	–	0.001 (0.0043)	0.156	1.79
01/17 – 08/18	107.06	–	–	–	1.34
09/18 – 12/19	105.43	–	–	–	2.24

Source: own calculations

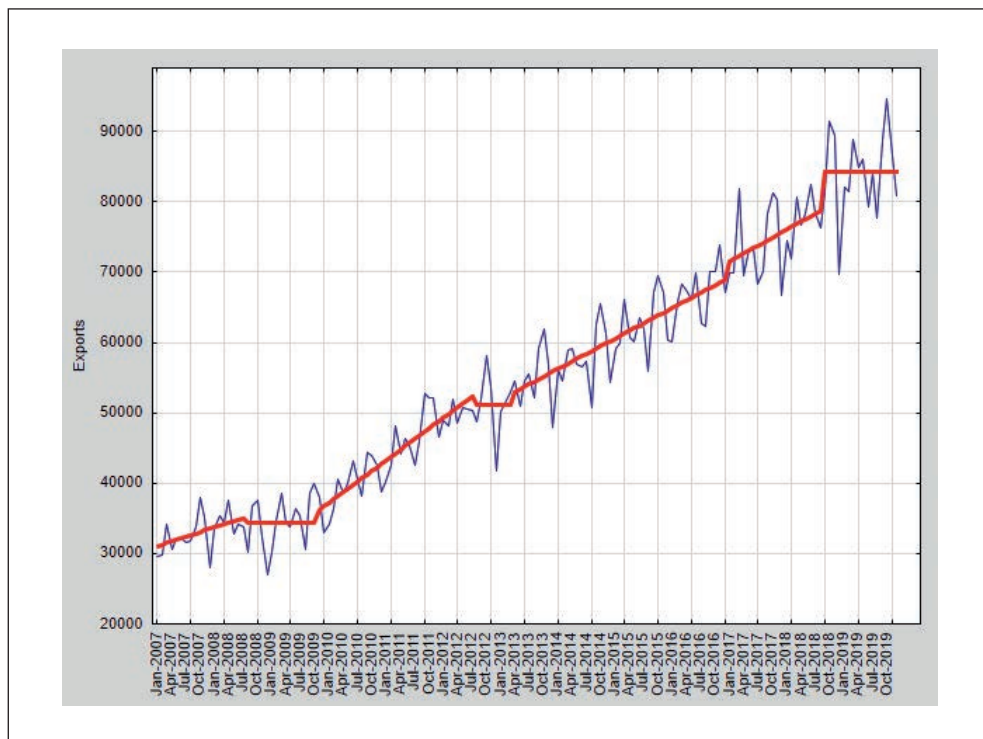*Figure A6.* Segmented trend for sales
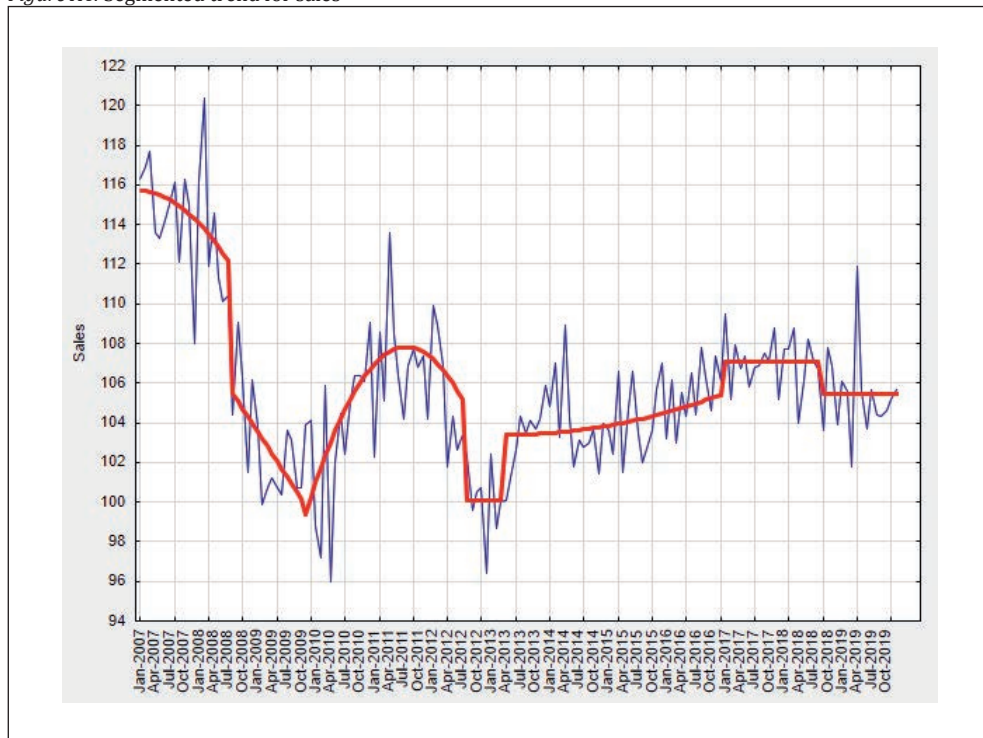
Source: own calculations

Table A7. Models for export changes

Period	Intercept or average	Slope	(time)^2 coefficient	R^2	Se
01/07 – 07/08	30815.60 (0.0000)	223.81 (0.0333)	–	0.195	2306.75
08/08 – 10/09	34406.63	–	–	–	3722.71
11/09 – 07/12	35734.33 (0.0000)	500.57 (0.0000)	–	0.773	2613.96
08/12 – 03/13	51064.93	–	–	–	4661.36
04/13 – 12/16	52607.63 (0.0000)	361.38 (0.0000)	–	0.617	3715.39
01/17 – 08/18	71120.64 (0.0000)	378.09 (0.0482)	–	0.155	4601.01
09/18 – 12/19	84185.26	–	–	–	6032.95

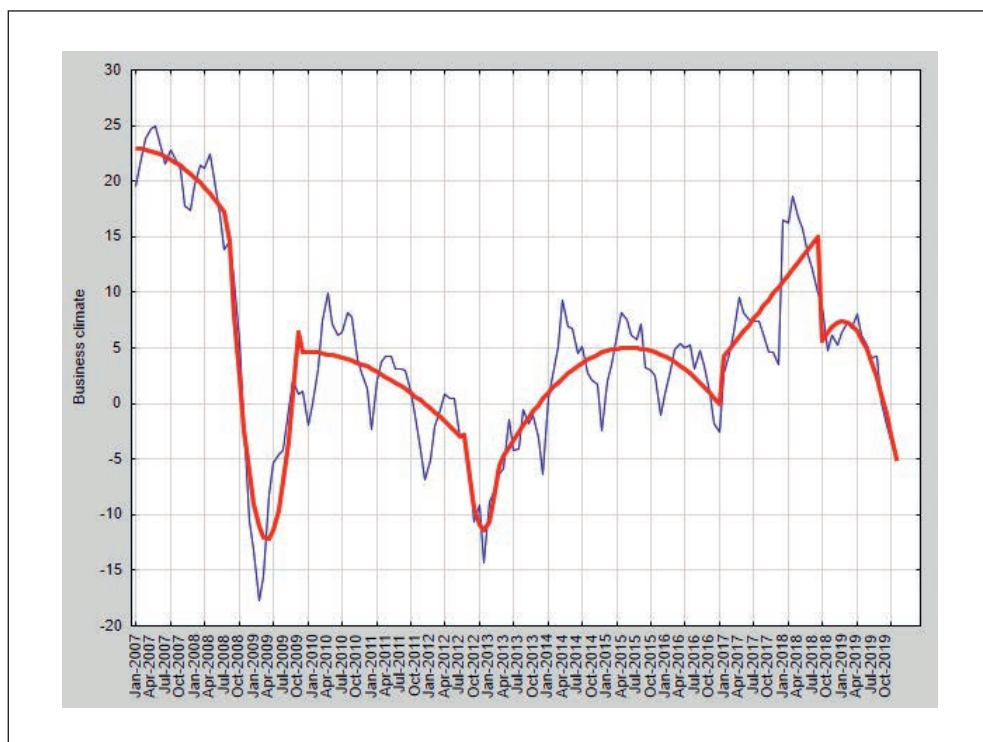Source: own calculations

Fig. A7. Segmented trend for exports

Source: own calculations

Table A8. Models for business climate changes

Period	Intercept or average	Slope	(time)^2 coefficient	R^2	Se
01/07 – 07/08	22.98 (0.0000)	–	–0.016 (0.0018)	0.412	2.16
08/08 – 10/09	22.14 (0.0001)	–7.95 (0.0000)	0.46 (0.0000)	0.768	4.47
11/09 – 07/12	4.68 (0.0000)	–	–0.007 (0.0002)	0.344	3.27
08/12 – 03/13	2.25 (0.4358)	–5.62 (0.0089)	0.58 (0.0109)	0.689	1.90
04/13 – 12/16	–5.53 (0.0002)	0.796 (0.0000)	–0.015 (0.0000)	0.444	2.91
01/17 – 08/18	3.72 (0.0549)	0.56 (0.0016)	–	0.401	3.90
09/18 – 12/19	4.69 (0.0019)	1.057 (0.0065)	–0.104 (0.0001)	0.884	1.41

Source: own calculations

Figure A8. Segmented trend for business climate

Source: own calculations

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