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SUMMARY OF

SCIENTIFIC AND TEACHING ACHIEVEMENTS

Olsztyn, 24 February 2016

1. **Name and surname: RAFAŁ WARŻAŁA**
2. **Diplomas and academic degrees held:**

   - Doctor of economic sciences obtained on 15 June 2005 from the Faculty of Economic Sciences and Management of the Nicolaus Copernicus University in Toruń. PhD dissertation entitled: ***The effect of foreign direct investments on regional development (as exemplified by the Province of Warmia and Mazury).*** Supervisor: dr hab. Janusz Heller, professor of the University of Warmia and Mazury in Olsztyn.
   - Master of Economics in the Academy of Economics in Cracow (currently Cracow University of Economics) 2000. Master's degree thesis entitled: ***Foreign direct investment as a factor of economic development and system transformation in Poland.*** Supervisor: prof. dr hab. Irena Pietrzyk.
   - Completed doctoral studies at the University of Warmia and Mazury in Olsztyn in 2000-2004.
   - Diploma of postgraduate studies from the Faculty of Sociology and Pedagogics of the University of Computer Science and Economics (WSIiE TWP) in Olsztyn in teaching education obtained in 2007.

3. **Information about previous employment in academic entities**
   - 2006 – to date: Faculty of Economic Sciences at the University of Warmia and Mazury in Olsztyn, assistant professor – primary workplace
   - 2007 – 2015: J. Rusiecki Higher School in Olsztyn, assistant professor – second workplace
   - 2003 – 2006: Faculty of Economic Sciences at the University of Warmia and Mazury in Olsztyn, research assistant
   - 2000 – 2003: Faculty of Economic Sciences at the University of Warmia and Mazury in Olsztyn, research assistant (half-time), doctoral student

4. **Presentation of academic development**

I have been pursuing my research work since 2001. A year before that, I defended my master's degree thesis at the Academy of Economics (currently the University of Economics) in Cracow, where I was born. The topic of my master's degree thesis was a consequence of the field of studies completed – international business and political relations and the specialisation in foreign trade.

In 2000, I moved to Olsztyn for personal reasons and started working in the then Department of Economics, the Faculty of Management of Administration. I was employed as a research assistant - doctoral student, which entailed conducting tutorials in micro- and macroeconomics and pursuing doctoral studies. I completed my doctoral studies in 2004, and in June 2005, in the Nicolaus Copernicus University in Toruń, I

defended my doctoral thesis entitled: *The effect on foreign direct investments on regional development (as exemplified by the Province of Warmia and Mazury).* It was, on one hand, an extension of my interests as a student, and on the other, an attempt to evaluate the role and importance of foreign direct investments for the development of the Warmia and Mazury region. My involvement in the subject matter of foreign direct investment resulted in two chapters in monographs edited by prof. Włodzimierz Karaszewski of the UMK in Toruń (a full list of publications is attached as a separate appendix). In 2006, I received the award of the Rector of the University of Warmia and Mazury in Olsztyn for achievements in the field of research.

My research interests expanded to also include issues concerning the diversification of regional development in Poland and related consequences. Significant disproportions in this regard could be already observed in the example of allocation of companies with foreign capital in Poland – a research problem of my doctoral thesis and subsequent publications. The analysis presented in the articles mentioned above revealed a significant advantage of locating foreign direct investments (FDI) in Poland for provinces of the highest economic development level, with the largest urban agglomerations, a large sales market, situated - apart from Mazowieckie - in western or south-western Poland, with well-developed social and technical structure (roads, airports) and significant intellectual resources. The vicinity of the south-western and the western border of Poland provides another very important location factor. Additionally, special economic zones located in the area have a positive effect on the above-specified regions.

With the first signals of an imminent period of economic crisis in Poland in 2008, what drew my attention was a divergence, both as regards the time and the degree of impact, of the effects of economic breakdown on Polish economy in general and on the region of Warmia and Mazury in particular. For these reasons, I started to search for an answer to the following questions posed:

- **Is the economic crisis reflected to the same extent on the scale of the entire country?**
- **What regularities can be observed in regional diversity as regards the "sensitivity" to the economic crisis in Poland?**

The questions were important inasmuch as the crisis resulted in an avalanche of studies and analyses concerning its causes, as well as its potential course at the national and supranational level (EU). On the other hand, there had been no research on this issue at the regional level. However, already the comparison of the course of business cycle fluctuations in the Province of Warmia and Mazury with the relevant course of the business cycle fluctuation for the entire country allowed me to evaluate the degree of differentiation of the business climate between areas differing in terms of development and GDP structure.

Undertaking the subject matter of the diagnostics of the business climate condition in the regional perspective also resulted from the emerging demand for this type of analysis from the representatives of regional authorities in the Province of Warmia and Mazury, i.e.

the Warmia and Mazury Provincial Administration Office. Upon the initiative of the Provincial Governor, a committee for economic analyses was appointed under my chairmanship. At the same time, in 2009-2015, I prepared and presented reports concerning the business climate conditions in Warmia and Mazury and a short-term forecast in this regard for the committee at quarterly intervals.

The analysis of the business climate requires, on one hand, theoretical background, and on the other, having at one's disposal an appropriately long series of time variables, significant for the observation of changes in the economic situation of the region. The need to obtain information of this type also resulted in the initiative to conduct a university course entitled: *business cycle theory*, within the programme of economics. Apart from previously conducted courses in macroeconomics and basics of economics, it is also possible to apply knowledge in this field to make an economic interpretation of changes in values representing the condition of business climate both for the entire country and for a specific region.

However, what is the most important from the perspective of analysing the business situation is the possibility to synthetically evaluate the business climate, resulting from multiple economic variables. The literature offers various tools for evaluation of the course of business cycle fluctuations. Each of them has both advantages and disadvantages. Due to a limited length of empirical series concerning regional economies, as well as the high labour consumption of survey research, I undertook an attempt to develop a so-called "regional business climate barometer" for the Province of Warmia and Mazury. The procedure of constructing, as well as related effects, were presented in a monograph entitled *Pomiar i prognozowanie koniunktury gospodarczej w ujęciu regionalnym na przykładzie województwa warmińsko-mazurskiego [Measurement and forecast of the business cycle in the regional perspective as exemplified by the Province of Warmia and Mazury]*.

The direct impulse for undertaking such a task was the growing role of regions in implementation of economic policy - implemented both at the national as well as the supranational level (EU programmes). An additional stimulus was the fact that Warmia and Mazury – as a province with its local government - did not have its own, quantitative indicator of the business outlook. The only method of measuring the business climate for Warmia and Mazury known to the author was a qualitative indicator, published independently by the Institute of Research on the Market Economy and the Central Statistical Office. Nevertheless, it is a method that significantly differs from the quantitative approach proposed in this work to examine the business climate in a regional perspective in Warmia and Mazury.

The original concept of the quantitative barometer of the business climate for Warmia and Mazury was also a response to expectations formulated by the Warmia and Mazury Provincial Administration Office in Olsztyn. They were related to the possibilities of providing a general diagnosis of the present business outlook in the region, as well as a short-term forecast of its changes. Therefore – apart from partial analyses, published in

quarterly reports concerning the condition of the business climate of the Province of Warmia and Mazury - I also carried out a synthetic measurement of business conditions in the region of Warmia and Mazury, applying the methods of the business cycle barometers of the business climate proposed in the above-mentioned monograph.

The literature concerning the method of examining the business cycle describes two main tools of a quantitative nature, used for evaluating the business outlook - econometric models and business climate indicators, also known as barometers. The method of econometric modelling, despite multiple advantages, such as e.g. the possibility to simulate the reaction of the model both to endogenous and exogenous factors, requires many restrictive, theoretical assumptions which significantly simplify the reality. They are based on a series of equations describing cause and effect relationships, characteristic for operation of individual markets. Additionally, the complex structure and a high level of mathematical sophistication, provide the opportunity to use this model for testing various hypotheses concerning the proper functioning of economy. In this context, econometric models have become particular universal tools for economic analyses. But this versatility is a feature that is most criticised by many economists. It results in using an increasing number of simplifying assumptions to explain a wider and wider scope of reality, which results in idealizing processes occurring in the economy. Therefore, the usefulness and utility value of such models becomes very limited.

The method of examining the condition of the business climate using the structure of synthetic indicators (barometers) is based to a significant extent on empirically confirmed cause-and-effect relationships. In view of the lack of cohesive theoretical background, the task of business climate indicators is not to explain the causes of the current conditions of the business climate. Their role is rather reduced to the ongoing evaluation of the business outlook and its short-term forecast. They can also provide information for the authorities concerning the optimal method for introducing specific measures in the economic policy of the country or the region.

Constructing and publishing synthetic business climate indicators, based on both quantity and quality variables, has been an issue of interest for public institutions such as statistical offices (the Central Statistical Office in Poland) and research institutions, which create them for macroeconomic analyses and in response to demand by business entities or regional and local authorities. A synthetic business climate indicator provides information which is easy to interpret and which concerns the current situation in the economy of the country or the region covered by the research. Therefore, current business climate indicators provide a specific showpiece of the investment attractiveness of the country or the region for potential investors - both national and foreign.

The beginnings of constructing regional and local business climate indicators dates back to the 1920s. They concerned mainly the evaluation of the business situation in individual regions (states) of the US economy. The interest in such indicators in European countries emerged after World War II as a result of integration processes, on the one hand, and the growing autonomy and empowerment of regions, on the other. In Poland, due to a

centralized system of economic planning functioning by the end of 1980s, there was no demand for those types of instruments for diagnosing the condition of economies of individual provinces. Although some attempts were undertaken to construct indicators for some provinces (e.g. Poznań), they did not gain a broader interest of the-then authorities. Only after a change in the business system in 1989 and, to a wider extent as a result of the administrative reform that entered into force as of 1999, did the need emerge to construct tools of this type for evaluating the economic situation in individual regions of Poland. Today, most provinces with local governments have at their disposal their own business climate indicators, which are systematically published in press and on the websites of the Provincial Governors' Offices[1]. These include, among others, Dolnośląskie, Małopolskie, Mazowieckie, Podkarpackie, Podlaskie and Zachodniopomorskie. Following the example of the above-mentioned regions of Poland, as well as many European regions, I considered that it was worth undertaking an attempt to build a barometer of a business climate fulfilling similar functions for one of the less developed regions of Poland, namely the Province of Warmia and Mazury.

For the purpose of quantifying the condition of business climate in Warmia and Mazury, I used the so-called synthetic indicators, presented, among others, in works by Anna Malina[2] and Aleksander Zeliaś[3]. The measures are used to describe, using one numerical value, the development status of a phenomenon whose description requires using of quite a large number of features.

Construction of the regional barometer of the business climate for Warmia and Mazury is based on aggregated data concerning the following macroeconomic values:

- number of unemployed persons registered in employment offices;
- number of job offers submitted to employment offices;
- dynamics of average remuneration in the sector of enterprises;
- dynamics of industrial production sold;
- retail sale dynamics;
- number of granted building permits;
- value of the IFO index reflecting the business climate in Germany[4];
- Pengab – a synthetic index measuring the climate in the banking sector.

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[1] Warżała R. (2012), *Pomiar i prognozowanie koniunktury gospodarczej w ujęciu regionalnym na przykładzie województwa warmińsko-mazurskiego [Measurement and forecast of the business cycle in the regional perspective as exemplified by the Warmia and Mazury Province].* Publishing House: University of Warmia and Mazury in Olsztyn, pp. 47-49.

[2] Malina A. (2004), *Wielowymiarowa analiza przestrzennego zróżnicowania struktury gospodarki Polski według województw* [*Multdimensional analysis of the spatial variation in the structure of the Polish economy by provinces*], Publishing House: Academy of Economics in Cracow, Cracow, p 38.

[3] Zeliaś A. (2000), *Taksonomiczna analiza przestrzennego zróżnicowania poziomu życia w Polsce w ujęciu dynamicznym* [*Taxonomic analysis of spatial living standards variation in Poland in a dynamic perspective*], Publishing House: Academy of Economics in Cracow, Cracow, p. 75.

[4] The industry of the Warmia and Mazury region, although low in terms of volume, is to a significant degree - as I previously proved in my PhD thesis - directed towards the German market. Therefore, it can justify the inclusion of such a component variable in the business climate barometer constructed.

Based on recommendations formulated in the literature[5] and in the procedure for determining the degree of correlations between single variables and a reference series, using a coefficient of cross-correlation , I classified the above component variables into coincident and leading ones in relation to the reference series[6].

The research procedure applied resulted in obtaining the following individual variables of the coincident indicator"

- number of unemployed persons registered in employment offices;
- dynamics of average remuneration in the sector of enterprises;
- dynamics of industrial production sold;
- dynamics of retail sale;

Likewise, in the result of the analysis of coefficient with cross-correlation, to construct the leading indicator, I used the values of such variables, as:

- number of job offers submitted in employment offices;
- number of granted building permits;
- value of the IFO business climate index;
- value of the Pengab index for the banking sector climate.

The results of my research obtained in the first monograph prove that attempts to construct quantitative business cycle indicators on the regional scale are possible. Values of business cycle indicators for Warmia and Mazury Province calculated for the period of 2005-2011 provide information consistent with expectations concerning the course of developmental processes of the region under analysis. The research methods applied also make it possible to construct barometers of business climate for other provinces, in order to observe differences in the scope of business climate variability between individual regions of Poland.

Apart from the barometer determining the current status of the business climate, as mentioned above, I have also built a version of an indicator anticipating business climate changes. The intention of the author was to construct a measure with the longest forecasting horizon possible. Nevertheless, its limited – as compared to national data - scope of variables made it possible to predict business climate changes four months in advance.

The above described procedure for constructing a business cycle barometer for the province of Warmia and Mazury is pioneering as regards the category of quantitative

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[5] One of the first economists who, in the 1930s, classified variables into leading, coincident and lagging, was Wesley Mitchell, followed by Arthur Burns and in 1950s Geoffrey Moore and Victor Zarnowitz. In the Polish economic literature, works in this field have been written by e.g. Krzysztof Stanek, Maria Drozdowicz-Bieć, Izabella Kudrycka, Ryszard Barczyk, Zygmunt Kowalczyk, Zbigniew Matkowski. Cf. Drozdowicz-Bieć M. (2012), *Cykle i wskaźniki koniunktury* [*Business Cycles and Indicators*], Publishing House: Poltext, Warsaw, pp. 76-100. Matkowski Z. (1997), Barometry koniunktury jako metoda oceny stanu gospodarki (w:) *Z prac nad syntetycznymi wskaźnikami koniunktury dla gospodarki polskiej* [*Business Cycle barometers as a method of economy state measurement* (in:) *From the work on the synthetic business indicators of the economic situation for the Polish economy*] Z. Matkowski (ed.), Prace i Materiały IRG SGH No. 45, Warsaw, pp. 66-80.

[6] In the analysis of business cycle of the province of Warmia and Mazury, a synthetic lagging indicator was not created.

indicators. A practical effect of the first monograph was therefore creation of an indicator of the business climate for the region of Warmia and Mazury, which confirms the theses formulated in the literature that the business cycle fluctuations in individual regions does not have to be (and in the case of the Warmia and Mazury region, is not) convergent with the course of the business climate fluctuations on the national scale. This can provide a significant supplement to the knowledge concerning the process of implementing economic policy, taking into account the specificity of business climate fluctuations in individual regions of Poland. If the aim of this policy is to maximise developmental activities, then it should take into account the various sensitivity of regions to business cycle fluctuations, which is reflected in the business climate indicator proposed in this work.

Business cycle barometers should be useful for a broad group of analysts examining economic processes implemented in the area of specific regions of Poland. Information concerning the current status of business climate improve the knowledge on the course of business processes, thus reducing the risk of economic misfortune.

Recipients of the business climate barometer analyses should include regional government authorities. One of the aims of the activity of regional authorities is to provide a friendly "climate" for doing business a specific area. In this context, current publication of synthetic information concerning the conditions of the business climate in the region should make the economic policy conducted on the local government level more credible. A regularly-published indicator plays in this regard a role of a market signal, showing that the condition of the economy in a given region is subject to continuous monitoring. This is also an expression of caring about the interests of potential investors, both domestic and foreign. Previous observations of Polish local governments indicate that they are attaching increasing importance to building a positive image of the areas they manage. Therefore, on the national scale there is a systematically growing interest in instruments which increase prestige and trust towards authorities and the region as a potential place for investment.

The conclusions drawn from my first monograph – concerning diversification of the current status of the business climate between the national area and one of its regions (Warmia and Mazury) – encouraged me to pose further questions related to the course of business cycle fluctuations in other provinces of the country. If the observation of discrepancies in the course of cyclical fluctuation observed in one case can be considered a regularity concerning all provinces, then it seems justified to ask about the adequacy of business policy conducted on the national and even supranational level (EU). It was this question that induced me to expand research conducted in the area of Warmia and Mazury to other provinces, which became the research subject of my second monograph, entitled: *Cykle koniunkturalne w polskich regionach. Studium teoretyczno-empiryczne [Business cycles in Polish regions. A theoretical and empirical study].*

5. Indication of a scholarly accomplishment resulting from Art. 16.2 of the Act on Academic Degrees and Academic Title and Degrees and Title in Arts of 14 March 2003 (Dz. U. No 65, item 595 as amended).

As a scholarly accomplishment in the meaning of the above mentioned Act which, in my opinion, significantly contributes to the development of economic sciences in the discipline of economics, I indicate the monograph, a work published as a whole:

Title of the scholarly accomplishment

Monograph *Cykle koniunkturalne w polskich regionach. Studium teoretyczno-empiryczne [Business cycles in Polish regions. A theoretical and empirical study].* Wydawnictwo Uniwersytetu Warmińsko-Mazurskiego in Olsztyn (308 pages)

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Reviewers:

1. Prof. dr hab. Hanna Godlewska-Majkowska
2. Prof. dr hab. Wacław Jarmołowicz

In the above-indicated monograph, an original scientific achievement, in my belief, consists in conducting the first, complex analysis of the course of business cycle fluctuation in the regional perspective in Poland, with an evaluation of the relationship between the morphological structure of regional cycles and the economic structure of individual regions of Poland.

6. **Presentation of the scientific objective of the monograph: *"Cykle koniunkturalne w polskich regionach. Studium teoretyczno-empiryczne" [Business cycles in Polish regions. A theoretical and empirical study]* and the achieved results, with indication of their practical application**

The first academic aim of the above-mentioned monograph was identification of the phenomenon of business cycle fluctuations in the regional perspective and a search for differences in their morphological structure. The second academic aim was an evaluation of the nature and the degree of the relationship between cyclical fluctuations and the economic structure of the regions.

The monograph entitled: *Cykle koniunkturalne w polskich regionach. Studium teoretyczno-empiryczne* is a continuation of my research concerning variability of the business cycle and its conditions in the regional perspective. Research questions formulated in the first monograph, concerning discrepancies between the morphology of cyclical fluctuations of one of the poorest regions of Poland (Warmia and Mazury) and changes in the level of economic activity for Poland – have been extended in this publication across all regions of the country.

The nature of the subject of research in the above-mentioned monograph concerned empirical verification of two theses formulated in the literature. The first thesis is the view proposed by Michael Niemira and Philip Klein, that a higher level of regional development should be accompanied with a higher "resistance" to business cycle fluctuations. In turn, less-developed regions usually experience more violent changes in their business cycle.

The second research task was to provide an answer to the following question: whether the level of convergence of regional business cycles increases or decreases in time? In this regard, the literature of the subject offers two contradicting theoretical concepts.

The first is the view of Paul Krugman that economic integration means an increase in the regional concentration of industrial activity which, in turn, leads to sector or even regional shocks, therefore increasing the probability of asymmetric shocks and divergent business cycles[7].

According to the other concept, economic integration leads to symmetric changes in economic values, resulting in more synchronised business cycles, both on the national and the regional scale[8].

The following general research hypotheses have been used to achieve the above mentioned aims:

1) the system of 16 provinces existing for several years in Poland provides the possibility of conducting research concerning the course of business climate fluctuations in the regional perspective;
2) there are specific, although not explicit, relationships between the course and the structure of regional and national business cycles;
3) the morphological features of business cycle fluctuations in Poland on a regional level are varied.

In order to verify the assumed research hypotheses, I carried out detailed empirical research on the morphology of business cycles in the regional arrangement in Poland and grouped provinces according to similarity of their economic structures, to analyse the specificity of the morphological structure of cycles to the particular economic structure of the provinces. I examined the variability of the time series for industrial production, construction and assembly industry production, retail sales and employment[9].

For the analysis of the morphological features of cycles, I used the currently applied methods for analysing business cycle fluctuations.

To eliminate the seasonality factor and accidental fluctuations from the time series, I used the TRAMO/SEATS method. This is the method recommended by international statistical organizations, among others, by EUROSTAT. To estimate the cyclical factor from empirical data previously seasonally adjusted with the use of the TRAMO/SEATS method,

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[7] Krugman P. (1991), *Increasing returns and economic geography*, "Journal of Political Economy", Vol. 99 pp. 488-498.

[8] Artis, M., Zhang W. (1997), *International Business Cycles and the ERM: Is There a European Business Cycle?*, "International Journal of Finance and Economics", vol. 2(1), p. 14; Barrios S., Lucio J. (2003), *Economic Integration and Regional Business Cycles: Evidence from the Iberian Regions*, "Oxford Bulletin of Economics and Statistics", Vol. 65(4), p. 512; Beine M., Candelon B., Sekkat K. (2003), *EMU membership and business cycle phases in Europe: Markov-swiching VAR analysis*, "Journal of Economic Integration", No. 18, p. 229; Marelli E. (2007), *Specialisation and Convergence of European Regions*, "The European Journal of Comparative Economics", vol. 4 No 2, p. 176.

[9] For provinces, it is not possible to examine the course of the fluctuation of the gross regional product, due to the low frequency of publications (only annual), as well as the time lag of publications by the Central Statistical Office (2 years). For this reason, the literature also admits analyses of individual variables, as components of the gross regional product.

I applied one of the most frequently used tools in contemporary research of a cyclical nature – the band pass filter proposed by Lawrence J. Christiano and Terry J. Fitzgerald (CF). This filter makes it possible to obtain an output time series which consists of the same number of observations as the input series. It is important if the time series are relatively short, which also concerns regional research in Poland. Additionally, the CF filter makes it possible to limit the analysis only to the scope of business cycle fluctuations, and additionally takes into account estimations of whether a decomposed time series is stationary or not, which is a desirable feature from the point of view of the quality of estimation[10].

Turning points were detected (from previously estimated cyclical factor) on the basis of the Gerhard Bry and Charlotte Boschan procedure, which is well-known in the literature. The thus-obtained series of cyclical fluctuations were subjected to morphological analysis, using measures of variability and asymmetry. In order to determine the degree of cycle synchronisation, I measured the level of simultaneous correlation and cross-correlations and analysed the changes in values of correlation coefficients over time. The research on divergence was supplemented with an analysis using the spectral measures: coherence ratio and phase shift. I confronted the obtained results with the actual course of variables representing cyclical fluctuations, using a graphical analysis.

To analyse the similarities of economic structures of provinces, I used a multi-dimensional comparative analysis and, in particular, the indicators of similarity of structures. In order to arrange economic structures in terms of their economic development, I applied the so-called synthetic indicators.

The research carried out confirmed the possibility of identifying the course of business cycle fluctuations in the regional perspective, which allowed me to positively verify the first hypothesis. Despite the short research period, covering the years 2000-2014 (September), it was possible to distinguish at least three full business cycles (and in some cases, even more) for individual regions. It is significant insofar as it makes it possible to later observe certain regularities occurring in the future in the courses of regional cycles, which could also be verified in subsequent turns of the business cycles. Previous research of the author conducted in 2005-2011 did not provide for such a possibility.

In the light of the results obtained, it can be claimed that processes observed in regions of European states also occur in the regions of our country. The observed cases included both an increase in synchronisation, as well as an increase in the level of desynchronization of cyclical fluctuations. At the same time, those processes do not reveal one single pattern. They concern both poor and rich regions, with diversified structures of GDP and various

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[10] This feature of the CF filter is emphasized in the literature and determines its usefulness for research on business cycle identification. Cf. Skrzypczyński P. (2010), *Metody spektralne w analizie cyklu koniunkturalnego gospodarki polskiej* [*Spectral methods in the analysis of the Polish business cycles*], NBP "Materiały i Studia" No 252, p. 200; Wośko Z. (2009), *Czy filtry liniowe są przydatnym narzędziem badania koniunktury? Analiza spektralna na przykładzie ankietowych wskaźników koniunktury* (w:) *Koniunktura gospodarcza. Od bańki internetowej do kryzysu subprime* [*Are the line filters a useful tool to study the business cycles fluctuations? Spectral analysis on the example of economic sentiment indicators* (in:) *Business Cycles. Since the dotcom boom to the subprime crisis*], J. Czech-Rogosz, J. Pietrucha and R. Żelazny (eds), Publishing House: C.H. Beck, Warsaw, p. 98.

geographic locations. Nevertheless, it is also possible to indicate several regularities which have also been observed in EU-member states.

One of them is a visible increase in the cyclical divergence of regions located in the direct vicinity of third states. In the case of Poland, this concerns the western provinces of the country to the largest degree. At the same time, it can be regarded as a natural consequence resulting from larger, in comparison to other regions, significance of relations between the provinces of western Poland and the German economy. There is also a group of regions featuring a growing synchronisation in relation to the national cycle. These are mainly regions of central Poland and the province of Pomorskie. Other regions demonstrated varied tendencies in the convergence of cyclical fluctuations. At the same time, what draws attention is the specificity of the course of cyclical fluctuations in one of the provinces of eastern Poland - Podlaskie, which just like western provinces, demonstrated a growing desynchronization of fluctuations with the national cycle.

A general conclusion that can be formulated from an overall evaluation of the course of business cycle fluctuations in Polish regions in 2000-2014 is that this course is not uniform and is subject to three main conditions, namely:

a) the level of regional development specified by the status of the economic structure;
b) geographical location;
c) type of the examined variable.

These factors to a significant extent determine the shape and morphological structure of cycles and affect the occurrence of turning points in time.

The subject of analysis in this work was the level of adjustment of industrial production variability in individual regions to the course of the analogue time series on the national scale. Even on the basis of an analysis of coherence coefficient, it could be observed how much the individual regions are varied in terms of adjustment to the reference series. The highest level of adjustment was found in such provinces as: Śląskie (0.87), Mazowieckie (0.72), Wielkopolskie (0.71), Kujawsko-Pomorskie (0.69), Pomorskie (0.68) and Małopolskie (0.60). Since these are regions with a relatively large share in the Polish GDP, they have a significant share in determining Polish national business cycle fluctuations. A significant degree of adjustment was also found for Dolnośląskie, Zachodniopomorskie, Podkarpackie and Świętokrzyskie provinces. On the other hand, provinces of the so-called Eastern Wall (Warmia-Mazury, Podlaskie, Lubelskie) and Łódzkie, Opolskie and Lubuskie revealed a lower level of adjustment to the reference series in this regard. As it was also demonstrated in the research, regions of eastern Poland are characterized by a low level of industrialization and a higher share of agriculture in GDP (except for Podkarpackie), which determines their dissimilarity, while other regions situated in the western part of Poland and the Łódzkie Province have a relatively poorly diversified structure of regional economy, depending on the demand for goods of a specific branch. Those features can determine the adjustment to the reference series, which is lower than in other regions.

The level of convergence of regional business cycle with the reference cycle (entire Poland) is not constant in time. The analysis of changes to the degree of synchronicity of

regional fluctuations in 2000-2014 using recursive correlations made it possible to divide the provinces into four groups. The first of them are regions whose cycles synchronicity with the national reference series are constantly growing in time. They include Łódzkie, Małopolskie and Pomorskie provinces. The second, and at the same time the most numerous group, is formed by provinces whose business cycles demonstrates, year after year, an increasing dissimilarity with the national cycle of Poland. These are: Dolnośląskie, Lubuskie, Opolskie, Podlaskie, Śląskie and Wielkopolskie. The third group includes those regions which until a certain period (2009-2010) demonstrated a decrease in the level of cyclical convergence, and then recorded a growing trend in this regard. These are the following provinces: Kujawsko-Pomorskie, Lubelskie, Mazowieckie, Warmia-Mazury and Zachodniopomorskie. The last, fourth group consists of regions which initially demonstrated a growing (in time) convergence of cycle, after which the tendency reversed. This group includes: Podkarpackie and Świętokrzyskie Provinces.

Evaluating the changes in the degree of synchronisation of regional cycles with the national cycle, it can be concluded that in not all regions was there an increase of divergence observed in the course of fluctuations. There was also no single trend that was common for all provinces in the changes in the level of cyclical convergence. Changes in particular regions are related mainly to their location, while a clear relationship occurs between regions situated in the western part of Poland and a decrease in the level of synchronisation of regional fluctuations with the national cycle. In this regard, Podkarpackie and Świętokrzyskie Provinces also demonstrated a decrease in the level of convergence with the national cycle in the latest period. What can be quite surprising is a decreasing trend of synchronicity for one of provinces, of the so-called Eastern Wall, namely, the Podlaskie Province. The specificity of this region results from the share of agriculture in GDP, which is higher than average in Poland and from the presence of the so-called clusters of agricultural-food industry in its area, which makes them more sensitive to shocks in agriculture, and not to fluctuations of production in general. Branches related to agricultural production have their own cycles which, due to their specificity, do not always have to be convergent with the industrial production cycle.

In verifying the hypothesis concerning relationship between the level of the development of the region and its sensitivity to changes of the business climate, the results obtained were not explicit. The highest amplitudes of business cycle fluctuations and accompanying high values of standard deviations were found for a time series for industry in the following provinces: Dolnośląskie, Lubelskie, Śląskie, Pomorskie, Świętokrzyskie, Małopolskie and Kujawsko-Pomorskie. With reference to construction cycles, the highest variability was found for fluctuations in Mazowieckie, Podlaskie, Lubelskie, Opolskie, Świętokrzyskie and Zachodniopomorskie. A similar feature concerning the course of retail sales was shared by: Lubuskie, Opolskie, Podlaskie, Pomorskie, Śląskie, Świętokrzyskie, Warmia-Mazury and Zachodniopomorskie. In turn, in case of fluctuations of employment, the highest variability in this regard was shown by: Łódzkie, Lubelskie, Opolskie, Śląskie, Świętokrzyskie and Zachodniopomorskie. As results from the above list, a high level of

development of the region does not always, and not in each case, determine the lower sensitivity to business cycle changes. The above findings do not provide a basis to clearly positively verify the views of Michael Niemira and Philip Klein.

In turn, the lowest variability of the course of fluctuations in industry was shown by the following provinces: Łódzkie, Mazowieckie, Podkarpackie, Podlaskie and Wielkopolskie. With reference to the construction , these were the following regions: Dolnośląskie, Małopolskie, Śląskie and Wielkopolskie. As regards variability of retail sales, the lowest fluctuations were demonstrated by Dolnośląskie, Kujawsko-Pomorskie, Łódzkie, Lubelskie, Małopolskie, Mazowieckie, Podkarpackie and Wielkopolskie. For changes in employment, the lowest fluctuations were in: Dolnośląskie, Małopolskie, Mazowieckie, Podlaskie, Pomorskie and Wielkopolskie. The above lists of provinces showing the lowest levels of variability of fluctuations confirm the observations formulated above that this division is not clear with regard to the developmental level achieved. The two groups include provinces both of the highest level of development in Poland, as well as those with relatively the lowest level of development.

The examined regions also demonstrate a varied sensitivity to "shocks" occurring in the economy, both those positive (e.g. joining the EU), and negative (crisis of 2008-2013). Analysing the values of the amplitude of cyclical fluctuations of industrial production, in spite of infrequent departures, a correlation between the level of development of the region and the degree of susceptibility to the above-mentioned disturbances in business equilibrium could be observed. Regions of a high economic potential, with a varied production structure and a high technological level of produced goods, demonstrate a higher sensitivity to business cycle fluctuations. This is also confirmed by the analysis of cycle morphology in the regional perspective. The obtained values of standard deviation, as well as the data concerning the average amplitude of phases and cycles, were lower for provinces of a higher level of development. A relation between the location of the region and its convergence with the reference cycle, i.e. total industrial production of Poland, is also visible.

The research described in the monograph, apart from the analysis of morphology of business cycle fluctuations in regions, also included evaluation of regional diversification of business structures in terms of gross domestic product produced, both in terms of demand and supply. It was aimed, on one hand, at distinguishing groups of provinces characterized by the largest similarity in terms of the regional GDP structure and, on the other - their arrangement in order from the most- to the least-developed business structures. A research aim, in this case, was to look for similarities in the GDP structure among provinces and arrange them in terms of the developed structure - from the highest to the lowest degree of development[11]. The analysis confirmed the existence of significant structural disproportions among the provinces.

[11] The structures that were characterized by the highest relative share of services (or private sector) and, at the same time the lowest share of agriculture (or a public sector), in the regional gross product were considered to be the highest-developed ones.

An important conclusion derived from this stage of research on economies of provinces - both on the demand and the supply side - is that there is no single, simple relation between a developed structure of the regional gross domestic product and the level of development of the region measured by the value of GDP per capita.

The case of the Mazowieckie Province confirms the above conclusion as regards the results of examining the similarity of regional structures. The Mazowieckie Province, being a leader in the level of development (measured by the value of GDP per capita), reveals at the same time the higher share of agriculture in GDP than such provinces as Małopolskie, Pomorskie or Podkarpackie. Other regions that demonstrate a higher than all-Poland average share of agriculture and which belong to the group of regions of above-average development level include: Wielkopolskie, Lubuskie, Opolskie, Łódzkie and Zachodniopomorskie. Eastern Poland regions (except for Podkarpackie) with traditionally a higher than average share of agriculture in the GDP structure, occupy the last positions in the ranking. At the same time, this can be attributed to two factors, i.e. a branch structure of industry which generates higher added value and a relatively higher share of market-type services. Regions of Western, North-Western and Southern Poland, with more competitive branches of industry in their structure are ranked higher. This also leads to the conclusion that a share of agriculture that is higher than the average share in the GDP structure of the country does not preclude the region from achieving a relatively high level of development. The factor that, in the author's opinion, can determine the position in the ranking in relation to the level of development is the level of innovation and, at the same time, competitiveness of industry within a regional specialisation[12]. Regions which have in their structure industry branches characterized by innovation and, therefore, a higher added value, reveal a higher level of GDP per capita.

Contributions of the author to the development of the scientific discipline

Empirical research concerning the morphology of regional business cycles in Poland carried out in the second monograph proved (in the opinion of the author) the thesis that the course of business cycle fluctuations in Polish regions is not uniform, and consequently, there is no identical pattern of business cycle variability in the Polish economy considered from the regional perspective. Therefore, a conclusion can be formulated that the course of cyclical fluctuations in Poland in general is, in a sense, an average of the cyclical variability of individual regions of the country. Although the time series gathered are relatively short - for the standards of business cycle research - but in the opinion of the author they are long enough for recognizing differences in the morphological structure of the time series of regional variables analysed in the work.

The differences in the morphological structure of regional cycles identified in the discussed monograph (i.e. the divergence of business cycle fluctuations) raise an important

[12] Warżała R. (2015), *Specialization and business cycles fluctuations of Polish regions,* "Managerial Economics", Vol. 16, No. 2, pp. 175-188.

and currently valid issue – namely, development in conditions of a so-called "optimum currency area". Although this issue is a subject of analyses usually at the level of national states participating in a common currency area, as shown in the monograph - it can be also observed within the country and its individual regions. In this meaning - as results from the analysis of the literature - an important condition for proper functioning of the optimal currency area is a high level of convergence of cyclical fluctuations[13]. In case of its absence, we can talk about certain costs of common stabilisation policy of the state and their minimalization is limited, on the one hand, by individualisation of some instruments of fiscal policy, implemented on the regional level (differences in local taxes, presence or lack of the so-called special economic zones) and, on the other, by the very fact that the operation of a common currency area can lead to monopolization of economies of regions and, in effect, to an increase in sensitivity to the so-called sector shocks. In conditions of desynchronization of cyclical fluctuations, as proven in the literature, higher fiscal transfers should occur. But their scale and, above all, effectiveness, depends on a precise and reliable diagnosis of the condition of the regional economy. The more precisely the image of business activity in individual regions can be mapped, the higher the chances are that interventions in economic processes will improve their results and provide more efficient management[14].

A practical effect of the regional research on business cycle could be appropriate actions undertaken by regional local government authorities. However, information concerning changes in business cycle fluctuations in regions should, first of all, provide the basis for conducting effective and adequate economic policy, implemented at the regional level, as well as for its evaluation. If processes of developmental divergence and desynchronization of regional fluctuations intensify, this will also mean an increase in the importance of economic policy implemented at the regional level, taking into account the specificity of the cyclical nature of development of those areas. Thus, the research in the course of cyclical fluctuation in the regional perspective will become increasingly more important. This may give rise to continue the research initiated by the author on business climate in regions to provide additional significant information concerning the general condition of the business cycle in the country.

In one of his articles, Paul Krugman also puts forward a thesis on the relationship between the level of region specialization and its sensitivity to business climate fluctuations[15]. This issue was the subject of my research described in an article entitled *Specialization and business cycles fluctuations of Polish regions*[16]. The obtained results indicate that the level of specialization was generally reduced in Polish regions within the

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[13] Barczyk R., Lubiński M. (2009), *Dylematy stabilizowania koniunktury* [*Dilemmas of business cycles stabilizing*], Publishing House: Poznań University of Economics and Business, Poznań, p. 230.

[14] Adamowicz E. (2013), *Badania koniunktury. Fakty. Użyteczność* [*Business cycles survey. Facts, Utility*], Publishing House: Warsaw School of Economics, Warsaw, p. 109.

[15] Krugman P. (1993), *Lessons of Massachusetts for EMU*, (In:) Torres, F., Giavazzi, F. (eds.) *Adjustment and Growth in the European Monetary Union*, CEPR and Cambridge University Press, pp. 242-244.

[16] Warżała R. (2015), Specialization and business cycles fluctuations of Polish regions, "Managerial Economics", Vol. 16(2), pp. 175-188.

examined period, with the exception of the Mazowieckie Province. On the other hand, the most specialized provinces included: Lubelskie, Podkarpackie, Podlaskie and Świętokrzyskie. In some regions (Opolskie, Warmia-Mazury and Wielkopolskie), the level of specialization was only subject to slight changes in the examined period. Referring both the level of specialization and its changes to the "sensitivity" of Polish regions to business cycle changes, it can be claimed that, apart from some exceptions, there is a relationship between the examined phenomena. Those regions which demonstrated a lower range of specialization and at the same time had a more varied production structure, demonstrated a smoother course of business cycle fluctuations. This was confirmed in separated cyclical fluctuations by measuring such morphological features as amplitude and length of phases and cycles, fluctuation intensity and asymmetry of cycles in favour of growth phases.

In my future research work, I would like to continue the study of the business climate in the regional perspective, as a systematic approach is important in research of this type. In Western European countries, monitoring the status of regional business climates has a much longer tradition. Only an appropriately long time series of empirical data allow us to distinguish many business cycles, which makes it possible to systematically observe regularities and changes occurring in the morphological structure of the regional cycles. This also provides the possibility of secondary verification of the conclusions verified on the basis of a time bracket covering slightly more than a dozen years, which was the subject of my research described in the habilitation monograph.

My academic and research achievements from the period after I obtained the degree of doctor of economic sciences (by 2015) include 34 peer-reviewed papers and 16 non-peer-reviewed works in the form of reports concerning the status of the business climate in the Warmia-Mazury Province and analyses commissioned by the Ministry of State Treasury. Publications in journals with an impact factor from the list published by the Ministry of Science and Higher Education include 25 items (of which 23 are individual publications), published in Polish national and foreign journals or scientific volumes, such as: Ekonomista, Wiadomości Statystyczne, Studia Regionalne i Lokalne, Samorząd Terytorialny, Studia Ekonomiczne PAN, Equilibrium, Barometr Regionalny, Olsztyn Economic Journal, Managerial Economics, European Scientific Journal, Prace i materiały Instytutu Rozwoju Gospodarczego SGH w Warszawie, Zeszyty Naukowe Akademii Ekonomicznej im. O. Langego we Wrocławiu, Zeszyty Naukowe Uniwersytetu Szczecińskiego. Five of the peer-reviewed papers were published in English. Additionally, I am the sole author of two monothematic monographs and an author of four chapters in monographs (in three of them as the sole author). The total number of citations according to *Google Scholar* is 31, and Hirsch index is 3. My research achievements after obtaining a PhD degree are synthetically presented in Table 1.

Table 1

Academic achievements after obtaining a PhD degree in 2006-2015

Type of original publication	number	Points according to the Ministry of Science and Higher Education
Author's monographs	2	45
Chapters in monographs	4	18
Articles reviewed in Polish	21	137
Articles reviewed in English	5	48
Conference proceedings	2	2
Analyses, reports, expert opinions	16	16
TOTAL	**50**	**266**

7. Participation in academic placements and conferences

I also put my research observations concerning regional business cycles under discussion as a part of my research and teaching placement in the University of Sassari in Italy. The stay was the effect of an invitation by Prof. Marco Vannini, an employee of the Department of Economics and Business University of Sassari. The subject of lectures and discussions was the issue of dualisation of development in international and intra-national perspective, using the example of the Italian region - the Sardinia Island. This island, as a region, is similar to Warmia and Mazury in terms of its economic structure. Thus - like Warmia and Mazury – it significantly differs in terms of the level of development and therefore the scope of ""sensitivity" to the course of business cycle fluctuations from the rest of the Italian economy. What is important is that both regions share an above-average share of services, in particular of tourism, which – due to the seasonal nature of the tourist demand – additionally strengthens amplitudes of business cycle fluctuations in both regions. A measurable result of cooperation with the University in Sassari is a co-authored article entitled *"Convergence of business cycles in less developed regions with the rest area of country – the case of Warmia and Mazury and Sardinia"*. The article is currently at the stage of editorial review. Cooperation with this Italian university is also continued as regards planning a common research conference concerning divergence in the level of development and the course of cyclical fluctuation in the regional perspective. Additionally, in the prepared application for financing the research entitled *"Examination of the business climate variability in regional perspective in Poland"* I intend to include Prof. Marco Vannini to enhance our research team with international experience.

Additionally, I put the verification of the conducted research described in publications under discussion by participating in national and international conferences and research seminars. Since 2005, I have participated in eight conferences and academic seminars, where I presented my papers. The conferences were organized by higher education and research institutions (a detailed list of conferences is attached in the Appendix).

8. List of didactic achievements

My teaching experience is related to pursuing the profession of an academic teacher at the University of Warmia and Mazury in Olsztyn since 2000. My teaching activity can be presented on the following levels:

a) Teaching activity - conducting didactic classes

Since 2000, I have been conducting tutorials in micro- and macroeconomics at the Faculty of Economic Sciences of the University of Warmia and Mazury in Olsztyn in the programme of Economics. Since 2006, i.e. from the moment I was employed as an assistant professor, I have been giving lectures and conducting tutorials in the following subjects: macroeconomics and business cycles.

b) Conducting M.A. and B.A. seminars and supervising diploma papers

In 2006-2015, I conducted diploma seminars for first- and second-degree studies students. In the above-mentioned period, I supervised about 100 (M.A. and B.A.) diploma theses. Additionally, in 2010, I was the year tutor for the first year of part-time studies in the programme of Economics at the Faculty of Economic Sciences UWM in Olsztyn, for which I received the Rector's award for achievements in the field of administration.

c) Improvement of the students' education process

In the period of implementing the new National Framework of Qualifications in the Faculty of Economic Sciences, I was responsible for developing syllabuses in the subject of Macroeconomics, in the programmes of: Economics and Management. In 2005-2011, my organizational duties also included holding the function of a supervisor of the Scientific Research Circle of Macroeconomics and co-organizer of annual seminars of research circles. Numerous meetings and discussions with students concerning issues in macroeconomic issues resulted in annual participation of the members of our circle in international seminars of research circles, organized by the University of Warmia and Mazury. A measurable effect of this participation are the publications of students and awards given by the members of jury. Members of our research circle also participated in seminars organized by other research centres in Poland. I also delivered lectures at the invitation of the Polish Economic Society, Olsztyn Branch. In 2013-2015 I was a co-organizer of the Olsztyn Days of Science and Art during which I also delivered lectures and conducted workshops. For this activity, in 2015 I received the UWM Rector's award for achievements in the field of administration.