A Sectoral Economic Situation Barometer in Regional Dimension: A Theoretical and Empirical Study

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Abstract

This article aims to propose the construction of a regional barometer of the sectoral economic situation. The study focuses on economic variables that represent specific sectors of voivodeship's economy and their cyclical adjustment as component variables of the regional barometer of the sectoral economic situation. As a result of the research, variables with the properties of simultaneous and leading variables were distinguished to assess the state of the economic situation in individual sectors of the regional economy. The results indicated that fluctuations in economic activity in the regions are generally not consistent with changes in the economic situation of the country as a whole. Each region, being a separate administrative unit of the country and having a distinct economic structure, development level, and geographical location, has its own business cycle for each sector.

Keywords

region, business cycle, economic situation barometer, synthetic indicator, sector

Introduction

The economy is a system comprising several sectors and branches; industry, food processing, furniture, chemistry, energy, trade, logistics services, new technologies, and the arms industry are examples of sectors that determine the development of individual regions of Poland. The results of the study indicate that virtually all sectors show individual features and regularities in the situation of changes in economic activity (that is, changes in the business cycle) (Adamowicz & Klimkowska, 2020; Lubiński, 2004; Warżała, 2016).

This article aims to propose the construction of a synthetic, universal tool for assessing the economic situation in sectors, both for the economy of the country as a whole and for the regional dimension.

In line with the above objective, the research hypothesis is as follows: building an individual sectoral barometer of industry-specific economic situations will enable the monitoring of changes in individual sectors' economic situations within the regional economy.

The exploration of this topic is based on the fact that, as demonstrated in prior research, regions demonstrate varying sensitivity to nationally occurring economic changes (see Camacho, Pacce & Ulloa, 2018; Gong & Kim, 2018; Montoya & de Haan, 2007; Omoshoro-Jones & Bonga-Bonga, 2020; Park & Hewings, 2012; Wang, Sun & Peng, 2023; Warżała, 2016). As such, it is essential to monitor this process from a regional perspective and consider the sectoral specificity of these areas. Capturing the dynamics of these changes will allow regional authorities to respond to the specific problems of individual sectors.

Literature Review

Business cycles are such a complex phenomenon that no proposed methods of analysing the economic situation can be regarded as a source of full knowledge about the state of the economy. At the same time, the state of the economic situation impacts the economic conditions of enterprises and households. Hence, the possibility of predicting impending changes in the economic situation is of interest to both direct participants in the market game (i.e. enterprises in a specific

sector) and public institutions performing regulatory functions in the economy. Previous literature on the subject has primarily divided methods of studying the economic situation into quantitative and qualitative (Adamowicz, 2013; Gabisch & Lorenz, 2013). Quantitative methods, which include indicator and econometric methods, are based on data published by statistical offices and other institutions that collect partial information on the state of the economy (e.g. labour offices; Parsons, 1916). On their basis, the so-called business cycle barometers serve to empirically verify more extensive econometric models describing the mutual dependencies between the economic values important for business cycle analyses (Barczyk, 1997; Kowalewski, 2005). Qualitative methods of assessing the economic state include the business cycle test and the expert methods. Business cycle tests are based on survey research and are the most common method of assessing and forecasting the economy, both in general economic and sectoral terms. The advantage of these methods is the ease and speed of obtaining the expected results on the economic state. Despite the undoubted advantages of these methods, they also have certain limitations in terms of their use for assessing the situation within the business cycle (Hübner et al., 1994).

Within qualitative methods of business cycle analysis, expert surveys constitute a separate category. Here, the research subjects are individuals who deal with market research in terms of the state of the economy and assess the current and future condition of the economy based on that research. The opinions they formulate constitute the basis for coordinating economic policy (Kowalewski, 2005).

The economic cycle test was first used in the United States of America (USA) as a forecasting tool before World War II. At that time, it was used to examine consumer intentions, allowing for forecasting trade in goods. After World War II, the scope of its application was expanded to examine the general economic cycle within both the USA and Western European countries. This applies equally to both regional and sectoral studies (Drozdowicz-Bieć, 2012; Kowalczyk, 1982).

One of the first centres for analysing Europe's economic cycle is the *German Institut für Wirtschaftsforschung* (IFO) in Munich, which has been involved in the study of individual sectors of the economy since 1950. The analyses conducted by the IFO have covered the main sectors of the German economy (i.e. industry, construction, and wholesale and retail trade). Due to the share of the German economy in the European Union (EU), changes in the level of this indicator significantly impact the general situation of EU member states.

The second synthetic qualitative indicator used in the EU countries is the economic sentiment indicator, which has been published by the EEC (currently the European Commission) since 1982. Built on the IFO index methodology, this index reflects the opinions of economic entities regarding their current and future economic situations (Klein & Nerb, 1985). In Poland, the Institute of Economic Development of the Warsaw School of Economics (IRG SGH) conducts research on the economic situation using the business cycle test method; this institute began researching the economic situation in 1986. Research is conducted both at the national level and in five separate macroregions (Gorzelak & Zimny, 2012). In terms of sectors, the economic state is examined in industry, construction, retail trade, agriculture, and banking.

Since 1992, the Central Statistical Office has conducted research on the economic situation at the national and regional levels in areas such as industry, construction, trade, and services. The first to be introduced was the study of the economic situation in industry; a year later, the study of the economic situation in construction was launched, and then in trade. In 1999, questions concerning enterprises' investment activities were separated from the study of the economic situation in industry and construction into a distinct survey. The last one, which was conducted in 2003, was a study of the economic situation in services.

Quantitative methods constitute the second – aside from qualitative methods – group of methods for studying the economic situation in both regional and sectoral approaches. They are recognised as the basic group of research methods by the European Commission, OECD, and CIRET, and include econometric models, indicator methods (economic situation barometers), and balance sheet and accounting methods.

Economic situation barometers are appropriately compiled synthetic indicators that reflect changes in the economic situation. They can be created for the needs of a specific branch of the

economy or present the economic state in more general terms (Matkowski, 1997), as well as the world economy (Abberger et al., 2020).

Economic situation indicators are among the least complicated and oldest methods of assessing the state of the economic situation. Their primary purpose is to be able to identify specific economic values that belong to one of three variable types (leading, simultaneous, and lagging variables), depending on their properties in relation to the so-called reference cycle.

The results obtained from the study allow for the construction of the so-called one-dimensional indices in the form of composite indicators of the economic situation. Changes in economic activity, which are reflected in fluctuations in industrial production, wage levels, and expenditures, are usually characterised by a certain delay in relation to leading economic indicators, including the number of building permits granted, the number of concluded construction contracts, the size of production and trade orders, trade turnover, and the number of bankrupt and newly established enterprises (Drozdowicz-Bieć, 2006). These relations, which are systematic and permanent, can be considered a regularity of cyclical development. Thus, they can be considered a basis for assessing the current and future economic situations. While the primary purpose of constructing barometers is to assess the directions of changes in the economic situation and predict future turning points, an appropriately constructed indicator also enables the assessment of other morphological features of the cycle. These include such cycle properties as analysis of the scope of changes in the economic situation, relations between the intensity of the growth and decline phases, the intensity of changes in the cycle, and the length of individual phases (Drozdowicz-Bieć, 2006).

For the substantive and formal correctness of the construction of a specific economic situation barometer, the selection of appropriate diagnostic variables is critical. The literature indicates two of the most important features from this perspective: representativeness and significance (Drozdowicz-Bieć, 2006). Representativeness means that a specific variable demonstrates changes in the studied phenomenon in the sector of study and that a specific time interval is maintained there, which is necessary to formulate conclusions regarding the state of the economy. Significance consists of considering diagnostic variables that are of key character in assessing the economy in a sectoral approach on a given market.

There are other barometers of economic conditions in the literature, but these are not calibrated to measure any area or sector. This stems from the fact that each region has its own specific economic structure, which must be considered when building a barometer. The availability of statistical data also holds a crucial role here. They must be published systematically, with the same frequency, and according to a uniform method. The Warmia and Mazury region is a peripheral region of the EU; moreover, due to its economic structure and level of development, it belongs to a group of so-called problem regions. These arguments alone mean that the construction of a barometer for such regions must consider their specificity (see Warżała, 2016).

The fundamental condition for the applicability of economic situation barometers is to have sufficiently long, uniform time series, allowing for the extraction of specific morphological features of subsequent economic cycles. This means that all indicators that are important in assessing the economy, show irregular features, or are subject to methodological changes during the research must be eliminated, regardless of their economic significance (Abberger et al., 2014). In practice, this means that to build an economic situation barometer based on quantitative data, data from the Central Statistical Office (or its regional branches) and potentially information from certain institutions (tax offices, municipal offices, employment agencies, industry institutions) are taken into consideration.

Given that in the case of administrative units, such as voivodeships, quantitative data regarding the scale of orders both in industry and trade are not published, qualitative data were used. To prepare forecast business indicators, both in industry and retail trade, the methodology developed by IRG SGH was used (Dudek & Zając, 2012).

Research Methodology

This study employed a multi-stage procedure for selecting simultaneous and leading variables in individual economic sectors. In the first step, potential time series representing changes in the

economic situation in individual sectors were preselected according to the analyses of the existing literature on the topic and the availability of statistical data from a regional perspective (Ulrichs, 2013). Following this, the selected variables were subjected to detailed statistical analysis (it was assumed that a variable was considered to correlate to the reference series if the correlation coefficient exceeded 0.5, the coherence coefficient also exceeded 0.5, and the concordance coefficient exceeded 70%). It was also assumed that the variable was leading/lagging in relation to the reference series if the lead/lag exceeded one month. In the next stage of the study, the selected series were subjected to further analysis from the perspective of the potential for application and the quality of the obtained synthetic indicator. For this purpose, recursive correlation coefficients were examined, and the variables that were not characterised by constant lead in time – regardless of the sample length – were excluded. Finally, the study identified the variables that represented business sentiment indicators for specific industries from a regional perspective. While the variable studies were conducted in the Warmia and Mazury region, the procedure described above can also be applied to other regions of the country.

The study utilised aggregated data on the following economic macro-values, which were published monthly, to construct sectoral economic sentiment indices in the Warmian-Masurian Voivodeship:

– Dynamics of industrial production sold;
– Industrial processing – expected production;
– Industrial processing – new orders in industry;
– Dynamics of construction and assembly production;
– Construction – value of the order portfolio;
– Construction – number of building permits granted or notifications with a construction project;
– Dynamics of retail sales;
– Retail trade – changes in expected orders from suppliers;
– Retail trade – changes in expected demand;
– Economic sentiment indicator in the German economy – IFO;
– Number of non-subsidised job offers.

In order to determine the nature of the variable in relation to the reference series (simultaneous or leading variable), the study measured the correlation of the above-mentioned variables illustrating changes in individual industries with their corresponding reference series. Table 1 presents the results of the basic statistics of the above-mentioned time series.

The next step in constructing a sectoral business cycle indicator is to eliminate the seasonal component from the empirical time series data. The TRAMO/SEATS procedure is the most popular method for decomposing time series (Grudkowska & Paśnicka, 2007). In the next stage, a procedure was undertaken to estimate cyclical fluctuations from previously deseasonalised empirical data using the Hodrick-Prescott filter (Hodrick & Prescott, 1997).

As a result of the analysis, variables were selected based on their classification as either leading or simultaneous in relation to business cycle fluctuations in the three sectors studied: industry, construction, and trade. The basis for constructing the simultaneous indicator in the individual sectors was as follows: for industry – the dynamics of industrial production sold; for construction – the dynamics of construction and assembly production; and for trade – the dynamics of retail sales.

The time series analysis, presented in Table 1, identified the variables with properties leading to the state of the economic situation, which included: for industry – the value of new orders in industry (four-month lead); for construction – the value of the order portfolio and the number of building permits or notifications with a building design granted (three-month lead); and for trade – changes in expected orders from suppliers and changes in expected demand (four-month lead).

Finally, after statistical verification, the following were used to assess the current economic situation in the three key sectors of the Warmia and Mazury economy: for industry – the dynamics of sold industrial production; for construction – the dynamics of construction and assembly production; and for trade – the dynamics of retail sales. In terms of leading variables, the following were used: for industry – the value of new orders in industry; for construction – the number of building permits or notifications with a building design granted; and for trade – changes in expected orders from suppliers. The findings of the research procedure described above, along with an interpretation

of their components, are presented below. Although they are focused on the Warmia and Mazury region, the procedure itself can be applied in other regions of the country, using appropriate data.

Table 1. Basic statistics of the examined time series in relation to the reference series

Time series	Coherence coefficient	Average Shift	Cross-correlation		
			r0	rmax	tmax(1)
Reference series – industrial production sold					
Industrial processing – new orders in industry	0.58	0.80	0.58	0.80	4
Industrial processing – expected production	0.38	0.68	0.61	0.78	3
The German economic climate indicator – IFO	0.17	0.47	0.27	0.38	2
Reference series – construction and assembly production					
Construction – value of the order portfolio	0.56	0.63	0.24	0.75	4
Construction – number of building permits granted or notifications with a building project	0.48	0.21	0.29	0.48	3
The German economic climate indicator – IFO	0.15	0.35	0.23	0.23	0
Reference series – retail trade					
Retail – changes in expected supplier orders	0.64	0.31	0.34	0.71	4
Trade – changes in expected demand	0.56	0.26	0.32	0.62	4
The German economic climate indicator – IFO	0.29	0.30	0.38	0.38	0
Number of unsubsidised job offers	0.22	0.66	0.27	0.35	1

Explanations: + (-) values indicate lead (lag) expressed in months in relation to the reference series.
Source: own research.

Research Results

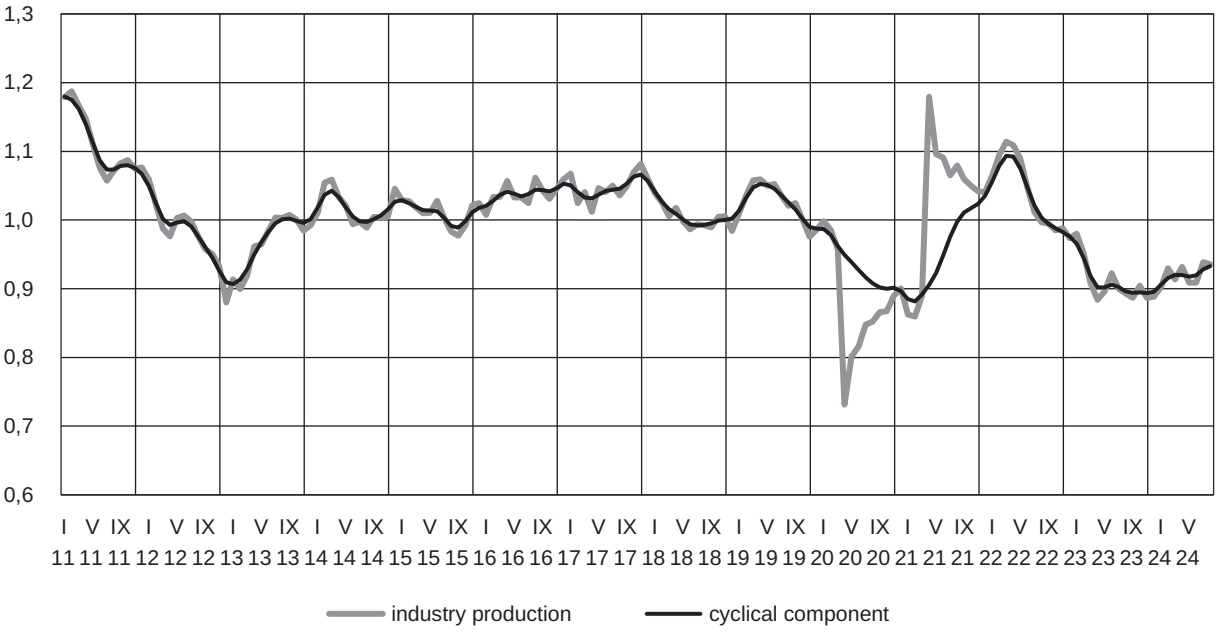

Figure 1. Current indicator of the economic situation in the Warmia and Mazury industry

Source: own study.

From the analysis of the course of the volatility of the economic situation in industry between 2011 and 2024, two of the largest periods of industrial production collapse can be observed in the years 2012–2013 and 2019–2021. The first of these periods is the aftermath of the so-called financial crisis, caused by the loss of solvency and, thus, credibility of the Greek government. Consequently, many European banks – creditors of the Greek government – found themselves in a state of financial liquidity collapse. The financial sector crisis quickly spread to the real economy, causing a deterioration in the operating conditions of enterprises and a decrease in demand on the market.

As a consequence of this combination of events, there was a decline in sales and, consequently, a deterioration in the general economic conditions in the Polish economy and its individual regions, including Warmia and Mazury. It was felt most by those industries that were largely export-oriented, such as furniture, rubber products, and, to a lesser extent, agri-food. This translated into several percent declines in sales. The second period of the greatest recession in Warmia and Mazury's economy was the years 2019–2021, i.e. the period of the COVID-19 pandemic, along with the period of slowdown in demand immediately preceding it (from Q2 2019). The pandemic period can be classified as a demand-supply shock. The lockdowns that occurred at the time translated into a drastic reduction in the activity of economies in all industries. This is illustrated by the vertical line of decline in industrial production, beginning in March 2020.

Figure 2. Prognostic indicator – value of new orders in the Warmia and Mazury industry

Source: own study.

An important indicator from the perspective of implementing countercyclical policy is information on forecasts regarding the direction of changes in the economy. In the case of industrial production, such an indicator is the value of new orders in industry, which indicates changes in the expected demand for industrial goods. Figure 2 presents the course of variability of the above indicator. Although the above indicator is a presentation of qualitative research, it can be read both in the convention of the direction of changes (i.e. an increase or decrease in economic activity) and the intensity of changes. As in the case of the current indicator, the largest decreases concerned the years 2012–2013 and 2021–2022. Moreover, a downward trend in the scale of new orders was revealed, which was visible from 2015 until the outbreak of the COVID-19 pandemic. This can be related to the increase in uncertainty among enterprises, which has been signalled in other studies on the economic situation. Changes in economic activity in the construction sector occurred at a slightly different pace compared to industry. The course of the construction market depends to a greater extent on the state's policy, both in terms of infrastructure construction and housing construction. The availability of credits is also crucial, and is related to the stance of the monetary policy pursued. The construction cycles distinguished using the procedure described above are presented in Figure 3.

The analysis of the course of the economic situation in the construction sector identified four lower and five upper turning points. In contrast to industry, the period of 2012–2013 was relatively mild, although the dynamics of construction production were low at that time. In mid-2015, a local peak of the economic situation in this sector was noted, followed by a decline, with the lowest dynamics occurring in mid-2016. This state of affairs arose from the unstable situation in the financial markets, which translated into a decline in activity, particularly in infrastructure and service construction. Smaller declines concerned individual construction. This was also linked to

the announcement of the launch of the ‘Mieszkanie Plus’ housing programme, which was awaited by the market, and the effects of which were far from expectations. The following years brought a rebound in the construction market caused by a general increase in the economic situation, expressed primarily through faster GDP growth.

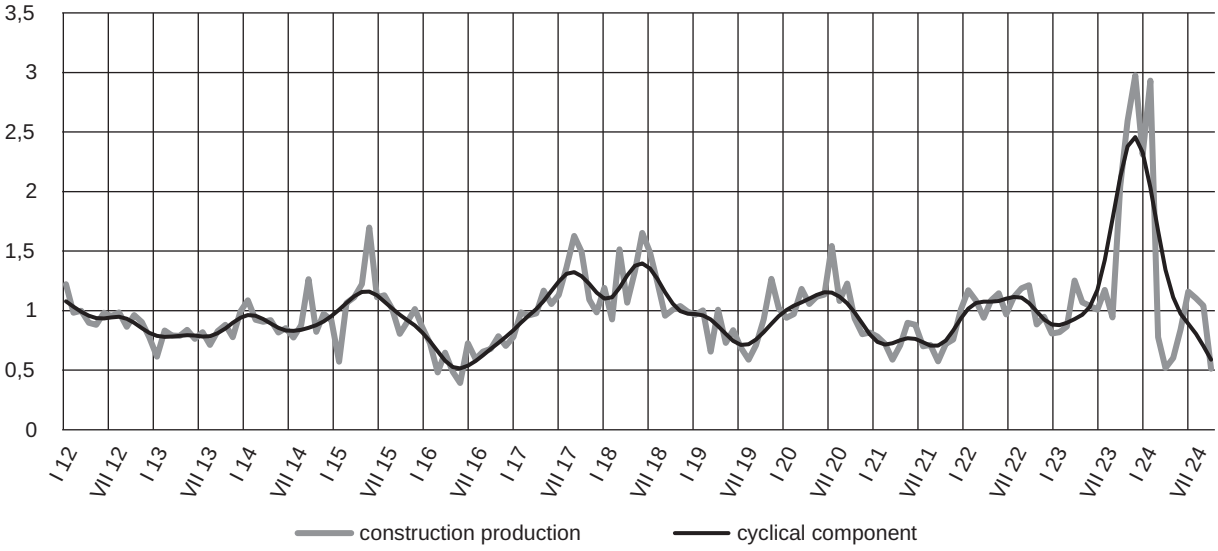

Figure 3. Current indicator of the construction market situation in the Warmia and Mazury region

Source: own study.

The pandemic had a moderate impact on the construction sector. After the initial economic freeze, which had only a slight effect on this sector, the effects of epidemiological restrictions had an increasingly significant impact on construction. This was particularly true for the construction of large commercial, manufacturing, and service facilities. This issue arose from the spread of the pandemic and the need to isolate individual workers, making construction work difficult and, at times, completely paralysed.

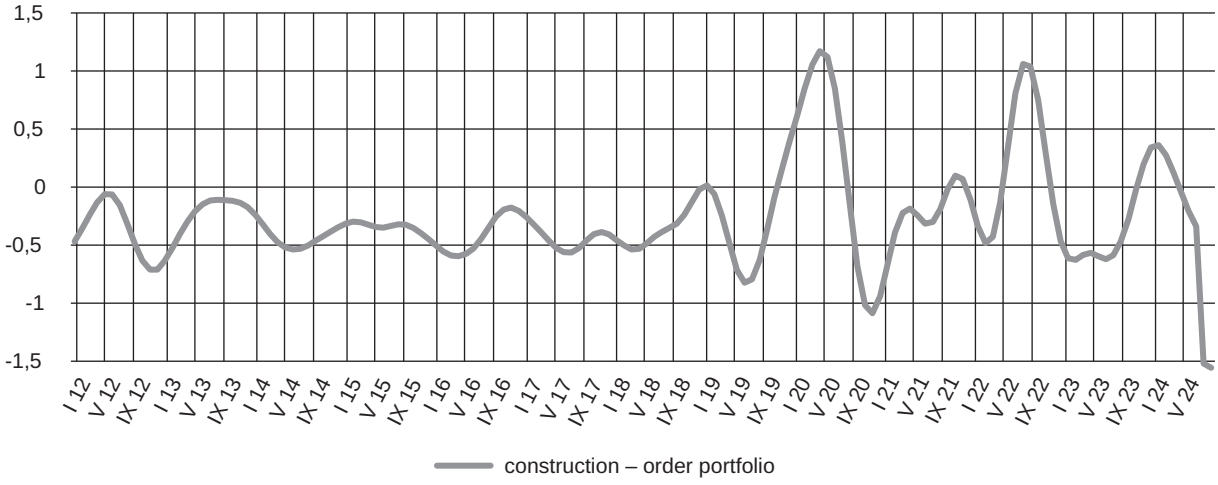

Figure 4. Forecasting indicator – value of new orders in construction of the Warmia and Mazury region

Source: own study.

With reference to changes of a prognostic nature in the construction sector (presented in Figure 4), it should be noted that they are presented by a qualitative economic situation indicator, representing the value of new orders in the construction industry in Warmia and Mazury. Similarly to forecasts in industry, here it is necessary to refer to changes in both the directions and the intensity of changes in the economic situation. The greater volatility of this component of the economic

situation in comparison to the value of new orders in industry (Figure 2) is noteworthy here. The most pessimistic forecasts in this area occurred in the years 2012 and 2013 and during the pandemic (H2 2020 and H1 2022). Another decline stemmed from economic instability related to the outbreak of the war in Ukraine, which contributed to inflation growth (also as a result of protective measures during the pandemic), as a result of which the National Bank of Poland (NBP) monetary policy was tightened.

In relation to the course of the variability of the economic situation in Warmia and Mazury's retail trade, the lower amplitude of fluctuations is noticeable compared to the variability in industry, particularly in construction. Consumption – because this is what changes in trade are essentially about – exhibits greater resistance to changes in economic activity, due to its nature and importance in the functioning of households.

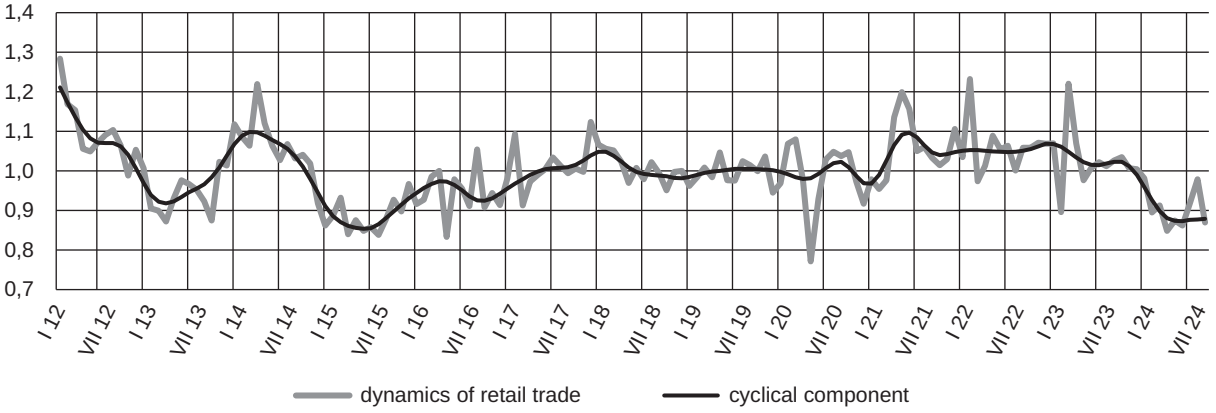

Figure 5. Current indicator of the economic situation in the trade sector of the Warmia and Mazury region

Source: own study.

In the period under review, four declines in consumption dynamics were witnessed. The first concerns 2013, a period marked by the previously discussed financial crisis. The second decline in trade occurred in 2015, similar to construction. The relatively small decline in consumption dynamics in Warmia and Mazury during the pandemic may be somewhat surprising; it was short but rather deep and was followed by a rebound and stabilisation of consumption. However, a short-term consumption increase caused by the effects of the conflict in Ukraine is also noticeable in the indicator value. The significant influx of war refugees caused a shift and increase in consumer demand related to Poland.

Figure 6. Forecasting indicator – value of new orders in trade in the Warmia and Mazury region

Source: own study.

When analysing the changes in the forecast indicator presented in Figure 6 in regard to consumption levels, it should be noted that they are presented by a qualitative indicator of the economic

situation, representing the value of new orders in the retail trade of the Warmian-Masurian region. The results presented in the Figure reflect the dynamics of changes in the scale of orders in the retail trade. Moreover, the changes observed on the basis of the qualitative indicator demonstrate a high volatility level in comparison to the current indicator. This, in turn, suggests a high level of volatility in the expected orders from suppliers. Attention is drawn to the significant increase in the level of orders in mid-2022, associated with a sudden influx of refugees from Ukraine. After this period, a decrease in the scale of orders from suppliers was observed. This may be attributed to the deterioration of the general economic situation – which was accompanied by an increase in inflation – the energy crisis, and the ongoing conflict in Ukraine, which has indirectly impacted the level of consumer optimism in the country.

Conclusions

Studying the industry situation from a regional perspective is both possible and necessary in a practical sense. Each region has its own economic structure, making it somewhat unique. Hence, it cannot be unequivocally stated that every economic crisis affects individual regions and the industries that operate within them to the same extent. Changes occurring in the same industries for the country as a whole and individual regions do not have to be consistent in terms of the course over time. Moreover, as existing literature has demonstrated, each region that is an administrative element of countries and has a different economic structure, development level, and specific geographical location also has its own business cycle.

This study demonstrates the practical application of the industry situation barometer for the Warmia and Mazury region. However, its structure and methodology enable the diagnostic tool and short-term forecast to be used in individual economic sectors, including other regions. Thus, it is, in fact, a practical tool for assessing the economic situation in individual industries, allowing interested entities to monitor the situation on an ongoing basis.

The results defining the current state of a region's industry situation, alongside its short-term forecast, may also be of interest to regional authorities. Combined with the growing autonomy of individual regions, responding to the situation in accordance with the principle of subsidiarity promotes a more adequate, precise impact of public (regional) authorities on economic activity changes within specific industries operating on a regional scale, particularly those with relatively high economic variability.

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