

THE IMPACT OF CHANGES IN THE EMPLOYMENT STRUCTURE ON MACROECONOMICS INDICATORS IN POLAND IN 2009-2024

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Purpose: The aim of this article is to assess the impact of changes in the employment structure on key macroeconomic indicators in Poland over the period 2009-2024.

Design/methodology/approach: The study is based on econometric models estimated using the classical ordinary least squares method, employing annual data from Statistics Poland (GUS), Eurostat and the National Bank of Poland (NBP) for the years 2009-2024. The analysis examines the influence of sectoral employment shares on major macroeconomic variables such as GDP, CPI inflation, average monthly wages, the unemployment rate, the NBP reference rate, and the trade balance.

Findings: The results indicate that an increase in employment shares in high-productivity sectors (including sectors 1, 3, 9, and 10) supported GDP growth and higher average wages. In contrast, sectors characterised by low cost elasticity or limited productivity had a dampening effect on economic growth or contributed to inflationary pressures. The CPI inflation models showed that employment in sectors 1, 7, and 15 increased inflationary pressure, whereas sector 13 had a disinflationary effect. Changes in employment shares in sectors 8, 9, and 16 contributed to a decline in the unemployment rate, while the impact on the trade balance varied depending on cost structures and the trade characteristics of each sector.

Research limitations/implications: The analysis is limited to data for Poland, which restricts the generalisability of the findings to other countries.

Practical implications: The conclusions may be useful for public institutions in designing employment strategies, education policies, and policies supporting digitalisation and innovation. The sectoral structure of employment emerges as a crucial factor determining macroeconomic stability.

Social implications: Sectoral shifts affect living standards, wages, employment stability, and price levels. The results may support public debate on labour market transformation, regional disparities, and the need for skill adaptation in the context of digitalisation and automation.

Originality/value: The article provides a comprehensive analysis of sectoral shifts in employment and their simultaneous impact on multiple key macroeconomic indicators. It identifies the sectors most important for Poland's economic stability and highlights directions for economic policy based on econometric modelling results.

Keywords: employment structure; macroeconomic indicators; developmental tendency models; inflation; GDP g.

Category of the paper: Research paper.

1. Introduction

Employment structure is a main element of the functioning of the economy, and its changes reflect the transformation, modernization, and cyclical processes occurring both in the labor market and across the real economy (Niewiadomska, 2010). In Poland, the years 2009-2024 were a period of exceptionally dynamic transformation, encompassing the consequences of the global financial crisis, the gradual recovery of economic potential, the rapid growth of service sectors, and the disruptions resulting from the COVID-19 pandemic and strong inflationary pressures in 2021-2023. These changes had a direct impact on basic macroeconomic indicators, such as CPI inflation, unemployment rate and the level of economic activity of the population.

Analyzing the relationship between changes in employment structure and macroeconomic indicators allows for a better understanding of the mechanisms underlying the contemporary Polish economy. An increase in employment in certain sectors can reinforce inflationary pressures through demand and cost effects, while the development of other sectors can contribute to lower unemployment or stabilize prices. These relationships are particularly important in the context of technological change, digitalization, and the growing role of knowledge-intensive sectors in the economic structure.

Monitoring macroeconomic indicators is crucial both for the government in planning fiscal and monetary policy and for investors in making financial decisions. The study's results can be a valuable source of knowledge for economic policymakers, labor market institutions, and macroeconomic forecasters. They allow for an understanding of how structural changes in employment impact economic development and what labor market policies can foster macroeconomic balance in Poland.

Many researchers also emphasize the benefits of structural changes not only for economic growth, but also for society and the natural environment (Cyrek, 2024; Bondarev, Greiner, 2022; Kong et al., 2024).

The aim of this article is to examine the impact of changes in the employment structure on key macroeconomic indicators in Poland in the years 2009-2024, with particular emphasis on economic growth, labor market conditions, as well as identifying changes in the strength and direction of these relationships during periods of economic shocks. The study focuses on identifying causal relationships between the progressing tertiarization of the economy and such measures as the growth rate of Gross Domestic Product (GDP), the unemployment rate, the level of labor productivity, and wage dispersion.

The study employs econometric methods, including linear models (development trend models) based on parameter estimation using the classical ordinary least squares (OLS) method, allowing for the identification of both the direction and the strength of relationships between the analyzed variables. The analysis seeks to address the following research questions:

- how did the employment structure in Poland change in the years 2009–2024?
- did changes in the employment structure have a significant impact on selected macroeconomic indicators in Poland?
- which segments of the labor market contributed most strongly to increasing inflationary pressure, and which had a stabilizing potential or supported improvements in labor market conditions?

The achievement of the research objective and answers to the above questions led to the formulation of the following research hypotheses:

H1: Changes in the employment structure in Poland in the years 2009-2024 had a significant impact on economic growth measured by GDP.

H2: An increase in the share of employment in sectors with higher productivity was associated with a decline in unemployment and an increase in labor productivity.

The study covered selected macroeconomic indicators for Poland and employment shares in 17 sectors in Poland between 2009 and 2024. Data came from the Central Statistical Office's BDL (Local Data Banking Data) and EuroStat. The study considered the following macroeconomic indicators: GDP per capita, average monthly gross wages, CPI inflation, registered unemployment rate, reference rate, trade balance, industrial production, and retail sales.

Employment shares came from the following sectors: Legal and accounting activities (S1), Services to buildings and landscape activities (S2), Public administration and defence; compulsory social security (S3), Education (S4), Human health activities (S5), Residential care activities (S6), Crop and animal production, hunting and related service activities (S7), Manufacture of fabricated metal products, except machinery and equipment (S8), Construction of buildings (S9), Specialised construction activities (S10), Wholesale and retail trade and repair of motor vehicles and motorcycles (S11), Wholesale trade, except of motor vehicles and motorcycles (S12), Retail trade, except of motor vehicles and motorcycles (S13), Land transport and transport via pipelines (S14), Food and beverage service activities (S15), Computer programming, consultancy and related activities (S16), Financial service activities, except insurance and pension funding (S17).

The GRETL program and an Excel spreadsheet were used to perform the necessary calculations.

2. Employment structure and economic processes

The relationship between employment structure and macroeconomic processes is widely analyzed in the economic literature, both theoretically and empirically. Classical approaches to structural change in the economy were pioneered by Fisher (1939), Clark (1940), and Kuznets (1966), who argued that employment shifts from agricultural to industrial and service sectors are a natural element of long-term economic development. These studies emphasize that these changes affect not only productivity levels but also macroeconomic stability, price dynamics, and labor market equilibrium.

Mortensen and Pissarides (1994) emphasize the role of structural matching between labor supply and demand from economic sectors. Their empirical research shows that changes in employment structure can lead to structural unemployment or, conversely - to its reduction if employment in expanding sectors increases. The main result of this article is that the unemployment rate depends on the balance between the rate of job creation and the rate of job destruction. Both processes are influenced by factors such as productivity, unemployment benefit levels, employment costs, production technologies, and demand and supply shocks. Their models help explain why unemployment increases during recessions (increased job destruction) and why it does not immediately decline after an economic recovery (lags in matching processes).

Baumol (1967) introduced the concept of unbalanced growth, showing that different sectors of the economy grow at different rates. "Dynamic" sectors (e.g., industry) have high productivity, while "stagnant" sectors (e.g., low-capital-intensity services) grow more slowly. This imbalance leads to employment shifts, rising costs in services, and potential inflationary pressures. Baumol argues that structural changes are a natural part of economic development and must be taken into account in economic policy planning.

Ngai and Pissarides (2007) present a formal multisectoral model that describes how economic development leads to employment shifts between sectors. In the model, the share of agriculture declines, the share of industry increases, and later the share of services increases. These shifts result from differences in sectoral productivity and consumer preferences. The study shows that structural changes can influence economic growth, wage dynamics, and inflationary pressures.

Cost-determination models of inflation indicate that sectoral changes in employment can influence wage pressures, especially in industries with high labor intensity or limited supply elasticity (Layard, Nickell, Jackman, 2005). Research by the OECD (2020) and the International Monetary Fund (IMF, 2021) shows that shifts in employment toward service sectors are often associated with higher price dynamics due to the greater role of cost factors and imperfect competition. In turn, sectoral shifts toward more productive industries can have a disinflationary effect through technological effects and efficiency improvements (Bils, Chang, 2000).

In the Polish labor market, researchers point to the increasing employment in the service sector of the economy, the growing importance of knowledge-intensive sectors, and the changing structure of labor demand influenced by automation and digitization. Empirical studies indicate that sectoral changes in Poland between 2010 and 2020 had a significant impact on the decline in unemployment and stabilization of the labor market, although they could also have contributed to increased inflationary pressure in sectors with low cost elasticity (Balcerowicz-Szkutnik, 2016; Kotlorz, Skórska, 2013; NBP, 2020).

3. Employment structure in Poland in 2009-2024

Changes in the employment structure in Poland in the years 2009-2024 were characterized by a progressive increase in employment in the service sector and a decrease in employment in agriculture (Balcerowicz-Szkutnik, 2016), which had a significant positive impact on key macroeconomic indicators such as GDP, labor productivity and unemployment rate.

Between 2009 and 2024, employment rates in Poland showed a significant, steady upward trend (Fig. 1). Despite global economic fluctuations (pandemic, war in Ukraine), the Polish labor market demonstrated considerable resilience: employment rates increased, while the unemployment rate decreased. According to data from the Central Statistical Office (GUS), the female employment rate increased from approximately 51% in 2009 to approximately 67% in 2024, indicating not only the country's improving economic situation but also the growing professional activity of Polish women. The male employment rate also increased, remaining significantly higher than the female employment rate. This is a consistent trend in the Polish labor market – men constitute the majority of employed people in Poland. During the analyzed period, the gap between the male and female employment rates decreased from 11.9 percentage points in 2009 to 10.6 percentage points in 2024, with the largest differences of 13.6 percentage points and 13.8 percentage points recorded in 2019 and 2020, respectively.

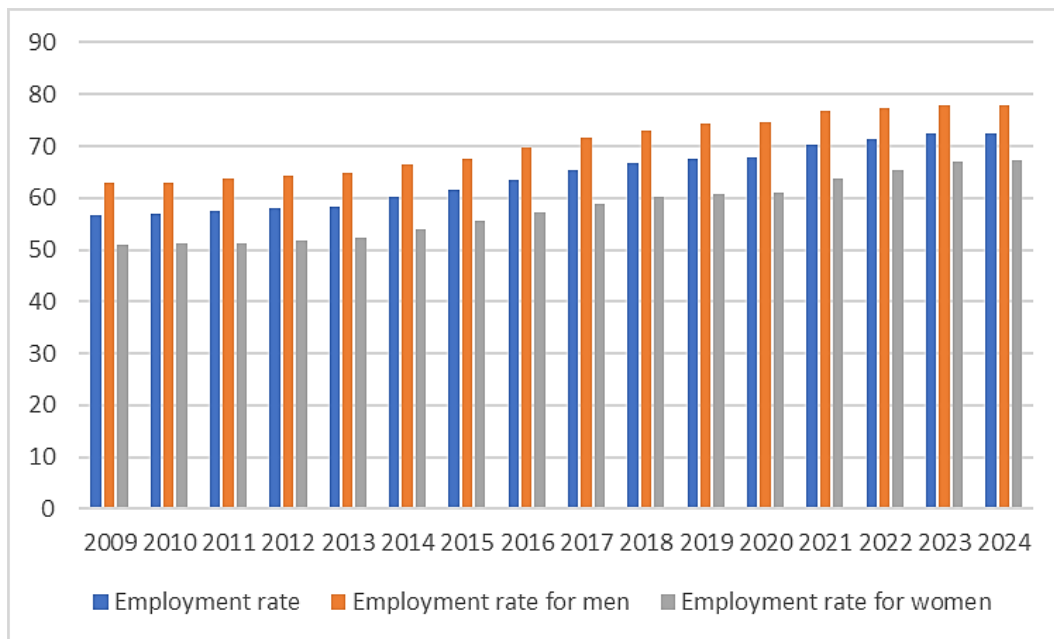


Figure 1. Employment rates in Poland in 2009-2024.

Detailed employment shares in Poland in individual sectors according to the EuroStat classification in the years 2009-2024 are presented in Figure 2.

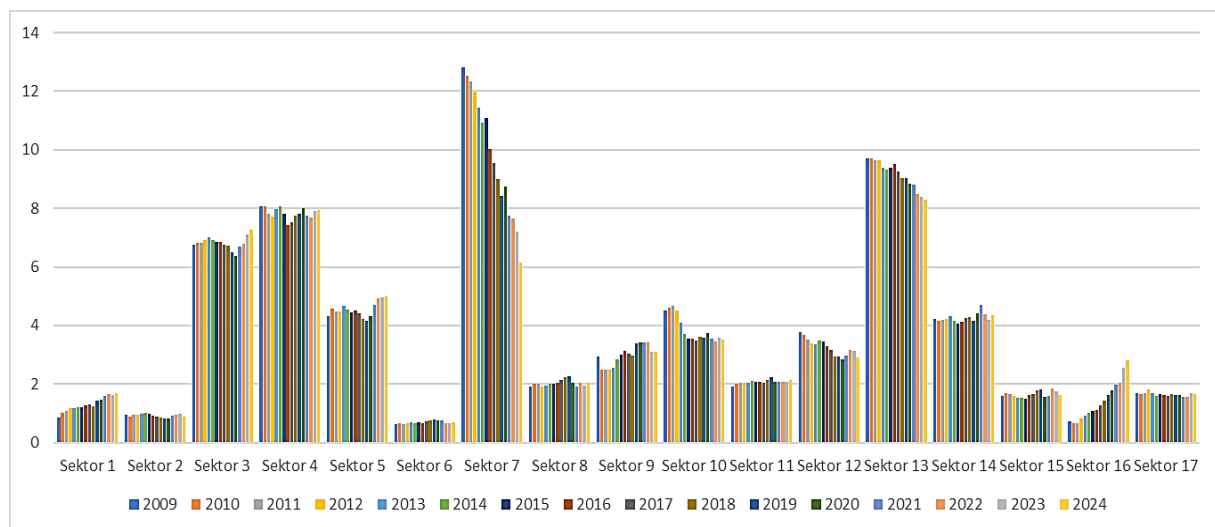


Figure 2. Employment shares in sectors in Poland in 2009-2024.

Despite a persistent downward trend during the period under review, the largest employment shares were recorded in sector 7 (Crop and animal production, hunting, and related service activities) between 2009 and 2017, followed by sector 13 (Retail trade, except for motor vehicles and motorcycles) between 2018 and 2024. The dominance of sector 7 in the initial period of the study shows that agriculture was and still is (ranked 4th in 2024) a significant employer. The shift in leadership in 2018 to the retail sector is the result of ongoing mechanization and increased productivity in agriculture, which is shifting the workforce to other sectors of the economy. The dominant position of sector 13 confirms that Poland has become a consumer- and service-oriented economy. The largest employment shares were

recorded in sectors 4 (Education), 3 (Public administration and defense; compulsory social security), 5 (Human health activities), 14 (Land transport and transport via pipelines), and 10 (Specialized construction activities). The consistently high employment levels in sectors 3, 4, and 5 indicate extensive public and social services. A significant increase in employment was recorded in sector 16 (Computer programming, consultancy, and related activities), from 0.71% in 2009 to 2.81% in 2024. The dynamic development of the IT industry in Poland demonstrates that this sector has become a driving force for the economy and service exports. Sector 1 (Legal and accounting activities) also saw a steady increase in employment, indicating the growing bureaucracy associated with legal regulations and reporting requirements.

4. Macroeconomic indicators of Poland in 2009-2024

The main macroeconomic indicators describe the state and dynamics of the national economy, and their analysis allows for the assessment of its condition and development potential. Between 2009 and 2024, Poland experienced significant economic growth, characterized by steady GDP growth (with the exception of the pandemic year of 2020), a decline in unemployment to record lows, and periods of elevated inflation, particularly in 2022-2024. Figure 3 presents the dynamics of GDP and selected macroeconomic indicators. Due to the scale of the values, a secondary axis (right-hand side of the chart) was used for the indicators unemployment rate, reference rate, and average monthly earnings.

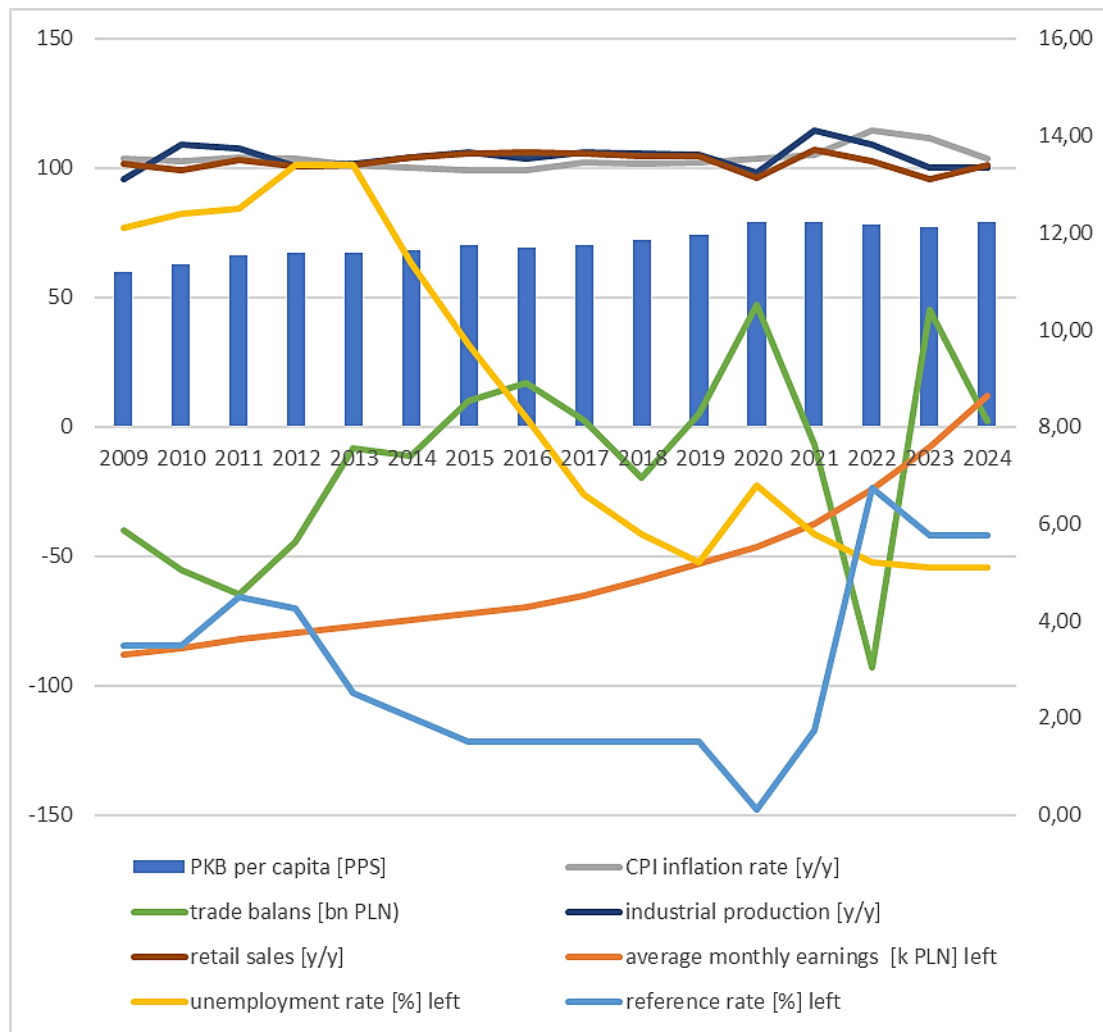


Figure 3. Macroeconomic indicators of Poland in 2009-2024.

Based on the data presented in Figure 1, it can be seen that GDP per capita in PPS (Polish Public Procurement Standards) steadily increased during the period under review. The impressive GDP growth, from 60% of the EU average in 2009 to nearly 80% of the EU average, indicates a real increase in the affluence of Polish society and its catching up with the EU average. The average annual CPI in Poland between 2009 and 2024 was characterized by significant fluctuations. Deflation was recorded in 2015 and 2016, leading to a decline in the overall price level. In subsequent years, inflation gradually increased, reaching a peak of 14.4% in 2022, driven by global factors such as the Covid-19 pandemic, the war in Ukraine, and the energy crisis. In 2024, the price growth rate slowed, reaching an average annual CPI of 3.6%. Between 2009 and 2024, the largest increase (260.31%) was recorded in the average monthly salary. This value increased from PLN 3,315.38 in 2009 to PLN 8,630.27. The highest wage growth, driven by high inflation and the labor market situation, was recorded between 2022 and 2024, reaching a year-on-year growth rate of 11.7%-13.6%. The unemployment rate experienced the largest downward trend during the period under review. This indicator dropped from 11.5% in 2009, peaking at 13.8% in 2013, to 5.1% in 2024. According to Eurostat data, in 2024, Poland had the lowest unemployment rate in the EU. In the first years of the period

under review, Poland recorded a negative trade balance. Since 2015, it has periodically recorded a trade surplus, which has been crucial for economic development. However, in 2022, the trade balance sharply deteriorated, mainly due to high prices of imported energy resources. In 2023-2024, a positive balance was restored, confirming the resilience of Polish exports. From 2009 to 2024, both industrial production and retail sales in Poland showed an upward trend. After declines in both in 2009, a period of stable and strong growth was observed (2010-2019), with retail sales often growing faster than GDP. In 2020, there was a slowdown due to the Covid-19 pandemic. In 2021, industrial production recorded record growth (14.7%). 2023 saw a slight decline in production, while retail sales slowed significantly due to high inflation affecting consumer purchasing power. However, data from 2024 indicate a return to moderate growth in both macroeconomic indicators. The National Bank of Poland (NBP) reference rate changed significantly between 2009 and 2024, reflecting the country's economic situation and the decisions of the Monetary Policy Council (MPC). After the global financial crisis, interest rates remained relatively low at 3.5%, gradually rising to 4.5% in 2010-2011. A series of interest rate cuts occurred between 2012 and 2015. In 2015, the reference rate reached a historic low of 1.5% and remained at that level until March 2020. In response to the pandemic-induced crisis, the Monetary Policy Council (MPC) cut interest rates three times, bringing the reference rate to a record low of 0.1% in May 2020. In 2021-2022, amid rising inflation, a cycle of interest rate increases occurred. The reference rate rose to 6.75% and remained at that level until September 2023, when the National Bank of Poland (NBP) lowered it by 0.75 percentage points and then by 0.25 percentage points.

5. Models of Developmental Tendency

Models of developmental tendency are one of the main classes of econometric models used to describe changes in a dependent variable using an explanatory variable, which is time. These models are also used for forecasting economic phenomena described by time series. Generally, a trend model can be written as (Cieślak, 2011):

$$y_t = f(t) + \varepsilon_t, \text{ (additive model)} \quad (1)$$

$$y_t = f(t) \cdot \varepsilon_t, \text{ (multiplicative model)} \quad (2)$$

where:

y_t is the forecasted variable at time t ,

$f(t)$ is a time function that analytically describes the given phenomenon,

ε_t is a random variable for which the expected value is 0 (additive model) or 1 (multiplicative model), and its variance is finite,

$t = 1, 2, \dots, n$.

The analytical form of the trend function can be chosen in various ways and can take different forms depending on the nature of the forecasted variable. For this purpose, a graphical analysis of the time series is performed, and based on it, the nature of the regularities of changes in the phenomenon under study is determined. The choice of the appropriate analytical form of the trend function is a matter of intuition and the researcher's economic knowledge (Stanisz, 1993).

In the next stage, the model is verified. The selection of an appropriate model consistent with empirical data is made based on: the coefficient of determination, the assessment of the significance of the model's structural parameters (t-Student test), the autocorrelation of model residuals (Lagrange multiplier test), the heteroscedasticity of model residuals (White's test), and the normality of the distribution of residuals (Jarque-Bera test). In the final stage, the verified model of developmental tendency is used for prediction, which involves extrapolating the trend function (Cieślak, 2011).

6. The impact of employment on macroeconomic indicators

For selected macroeconomic indicators, development trend models were constructed in the form of:

$$Y_t = \alpha_0 + \sum_{i=1}^{17} \alpha_i X_{i,t}$$

where:

Y_t - macroeconomic indicator,

$X_{i,t}$ - share of employment in the i-th sector,

α_i - structural parameters of the model.

Based on time series of selected macroeconomic indicators and employment shares in selected sectors for the 2009-2024 period, the following development trend models were derived. The models were positively verified in terms of the significance of structural parameters, assessment of the model fit, normality of the random component distribution, homoscedasticity of residuals, and first-order autocorrelation.

The econometric model describing the impact of changes in the employment structure on the value of GDP in the years 2009-2024 is as follow:

$$Y_{PKB} = 71,82 + 19,97X_1 + 3,48X_7 - 13,14X_{12} \mp 6,81X_{16} - 16,98X_{17}, R^2 = 0,9822$$

Changes in the employment share in sector 1 had the greatest impact on GDP growth. A 1 percentage point increase in the employment share in sector 1 resulted in a 19.97 PPS increase in GDP, *ceteris paribus*. An increase in the employment share in sector 16 (GDP increase by 6.81 PPS) and in sector 7 (GDP increase by 3.48 PPS) also had a positive impact on GDP, however, the impact of sector 1 was much stronger than that of sectors 16 and 7. The employment shares in sectors 12 and 17 had a negative impact on GDP during the analyzed period, with a 1 percentage point increase in the employment share in sector 17 resulting in a 16.98 PPS decrease in GDP, while in sector 12 it resulted in a 13.14 PPS decrease in GDP. The above model explains 98.22% of the variability in GDP, which indicates a very good fit.

The model describing the impact of changes in employment shares on the CPI inflation rate is expressed by the formula:

$$Y_{CPI} = 127,30 + 18,13X_1 + 4,78X_7 - 14,57X_{13} + 23,62X_{15}, R^2 = 0,8357$$

The above model indicates that changes in the employment shares in sectors 1, 7, 13, and 15 have a significant impact on the CPI inflation rate. Changes in the employment shares in sectors 1, 7, and 15 have a pro-inflationary effect, with employment in sector 15 having the strongest impact. A 1 percentage point increase in the employment share in sector 15 increases the CPI by 23.62 points. Conversely, changes in employment in sector 13 by 1 percentage point have a counterinflationary effect, lowering the CPI while the employment share increases by 14.57 points.

Average monthly earnings model for characters:

$$Y_{earnings} = 1517,97 + 2023,96X_3 - 424,06X_7 + 1018,48X_9 + 1054,36X_{10} - 1451,51X_{13}, R^2 = 0,9893$$

The model was characterized by the largest number of sectors in which the employment share had a statistically significant impact on the value of the dependent variable. Based on the above model, it can be concluded that during the analyzed period, average monthly wages increased with the increase in the employment share in sectors 3, 10, and 9, and decreased with the increase in employment in sectors 13 and 7. Sector 3 had the largest positive impact on average wages: an increase in the employment share in this sector resulted in a PLN 2,023.96 increase in wages, followed by an increase in employment in sector 10 by PLN 1,054.36, and in sector 9 by PLN 1,018.48. The increase in the employment share in sectors 7 and 13 had a negative impact on the value of the average monthly wage.

The reference rate model of the form

$$Y_{reference\ rate} = 0,3344 - 0,3136X_6 - 0,0212X_{13} + 0,0678X_{15}, R^2 = 0,8155$$

indicates that changes in employment in sector 6 had the greatest impact on the change in the reference rate. A 1 percentage point increase in employment in this sector contributed to a 0.3136 percentage point decrease in reference rates. Similarly, an increase in employment in sector 13 resulted in a 0.0212 percentage point decrease in reference rates. Changes in sector 15 were positively correlated with the reference rate. A 1 percentage point increase in employment in sector 15 contributed to a 0.0678 percentage point increase in reference rates.

The model describing changes in the unemployment rate is of the form:

$$Y_{unemployment\ rate} = 1,44 - 0,10X_8 - 0,04X_9 - 0,03X_{16}, R^2 = 0,9455$$

Based on the above model, it can be seen that a 1% increase in the employment shares in sectors 8, 9, and 16, respectively, leads to a reduction in the unemployment rate by 0.10 percentage points, 0.04 percentage points, and 0.03 percentage points, respectively, which is a positive phenomenon in the labor market. This unemployment model is consistent with economic intuition: increased employment in productive sectors of the economy, especially professional services and IT, contributes to an improvement in the overall labor market situation and a reduction in unemployment. Of the variables included in this model, sector X8 has the greatest potential for labor absorption and unemployment reduction.

The model below describes the impact of employment shares in selected sectors on the trade balance in the period under consideration

$$Y_{balance} = 80114X_7 - 109955X_{10} - 179694X_{12} + 166543X_{13} + 268410X_{16}, R^2 = 0,7465$$

In this model, the constant is close to 0, meaning that the trade balance is modeled entirely by the percentage shares of employment in individual sectors. Employment growth in sectors 7, 13, and 16 improved the trade balance by PLN 80,114,000, PLN 166,543,000, and PLN 268,410,000, respectively. Employment growth in sectors 10 and 12, on the other hand, has a negative impact on the trade balance—they support imports and reduce exports. The balance model clearly indicates a dichotomy in the Polish economy: knowledge-based and export-oriented services (IT) and traditional sectors (agriculture, trade) generate surpluses, while sectors X10 and X12 are likely highly dependent on imports (e.g., energy-intensive industries or those requiring imported machinery). The IT sector is a key driver of the positive trade balance in the period under review,

7. Summary and Discussion

This article presents an empirical assessment of the impact of changes in the employment structure across sectors on Poland's macroeconomic indicators in the years 2009-2024. The conducted study complements the classical approach based solely on macroeconomic aggregates. The results obtained are significant both from a cognitive and an applied perspective. For the most part, they confirm the proposed research hypotheses, particularly that changes in the employment structure have a significant impact on macroeconomic processes in Poland, including economic growth and the labor market. The study demonstrates that not only the level of employment, but also the sectoral employment structure, affects economic growth and labor market conditions.

In Poland, between 2009 and 2024, the employment share in agriculture (sector 7) systematically declined and significantly affected most macroeconomic indicators. Another clear trend was the steady increase in employment in the IT sector (sector 16) as well as consistently high employment shares in service sectors such as trade, finance, education, and healthcare (sectors 3, 4, 5, 7, 10, 13, 14). During the analysed period, the Polish economy became more diversified, less dependent on agriculture, with a strong trade and services sector and a rapidly growing segment of modern technologies and professional services.

The econometric analysis for Poland in 2009–2024 shows that changes in the employment structure had a significant impact on key macroeconomic indicators. An increase in employment shares in highly productive sectors (e.g., sector 1 for GDP, sectors 3 and 10 for wages) supported economic growth and higher earnings, while rising employment in less productive or cost-intensive sectors had a dampening or pro-inflationary effect.

The CPI inflation models indicated that employment in sectors 1, 7, and 15 exerted upward pressure on prices, whereas sector 13 had a disinflationary effect. Sectoral shifts in sectors 8, 9, and 16 contributed to reducing the unemployment rate, while the impact on the trade balance depended on sector-specific characteristics—employment growth in some industries improved the balance, while in others it deteriorated it.

The results obtained are consistent with the findings of other studies, which confirm the development of the service sector and knowledge-intensive sectors and their role in generating economic growth (Balcerowicz-Szkutnik, 2016; Klimczyk, 2008). Similar results, although not directly related to the Polish economy, were obtained by Sahadevan (2020), who found a unidirectional relationship running from structural changes to economic growth, and by Soni and Subrahmanya, whose studies confirmed unidirectional causality from industrial growth to GDP growth and from the growth of services to GDP growth. In contrast, Dietrich (2009) concluded that there are varied patterns of interaction—both from economic growth to structural changes and in the opposite direction—for seven OECD countries.

The results highlight the importance of monitoring the employment structure as a factor determining economic development, price dynamics, and labor market conditions, while also indicating the need for a balanced sectoral policy. The study could be extended to other EU countries to verify whether the observed relationships are universal or specific to the Polish economy. Furthermore, an international comparative analysis could be conducted to evaluate Poland in the context of other European countries.

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