

# Banking Sector as a Long-Term Catalyst for Economic Growth in Poland

Paweł Węgrzyn, PhD

SGH Warsaw School of Economics, Department of Economic Geography, Niepodległości Avenue 162, 02-554 Warsaw, Poland, pwegrz@sgh.waw.pl, ORCID 0000-0001-8963-2765

---

## Abstract

This study investigates the banking sector's influence on Poland's economic growth from Q4 2010 to Q1 2023. Employing the Autoregressive Distributed Lag (ARDL) model with an Error Correction Mechanism (ECM) and Granger causality, the relationship between the banking sector and economic development in Poland is explored. The model includes macroeconomic control variables such as inflation, interest rates, the domestic demand to GDP ratio, the general business climate index in the industry, and a dummy variable to account for the economic impacts of the COVID-19 pandemic and the Ukraine conflict. Findings show an inverse relationship between the bank assets to GDP ratio and GDP growth in the short run. At the same time, a positive correlation is observed in the long run, underlining the banking sector's essential role in Poland's economic progression. Additional banking variables like Return on Assets (ROA), Non-Performing Loans (NPL), and the ratio of equity to assets were analysed. However, only the bank assets to GDP ratio exhibited a statistically significant positive long-term effect on Poland's GDP. This research offers crucial insights into the complex interplay between the banking sector and economic growth in Poland, with particular emphasis on recent geopolitical and pandemic events.

*Keywords: Banking Sector Assets; Economic Growth; Poland; ARDL ECM; Granger causality*

*JEL classification: C58, E60, G21, O11, O16*

---

## 1. Introduction

Economic growth - usually measured by Gross Domestic Product (GDP) - remains at the forefront of global academic discourse, attracting the interest of economists worldwide. The literature considers factors that are thought to have either a direct or indirect influence on this growth. One factor that has consistently emerged in economic discussions is the development of the financial market. Its importance is particularly pronounced in the era of growing financialisation (Remlein, Roška, 2018; Karwowski, Shabani, Stockhammer, 2020; Santos, 2023). In Poland, almost three-quarters of the financial sector's assets are represented by banks' assets (KNF, 2023), which underlines the dominant role banks play in the country's financial landscape. This paper, therefore,

focuses on this dominant segment of the financial market and examines its potential influence on Poland's economic growth. In this study, I attempt to provide a holistic understanding of the relationship between Poland's banking sector and economic growth. In addition to a thorough understanding of the theoretical relationship between the banking sector and economic growth, the complexity of this relationship requires a rigorous analytical approach. The Autoregressive Distributed Lag (ARDL) model provides insights into the long-run and short-run relationships between variables, where used error correction helps to decipher deviations and adjustments back to equilibrium. By using this model, this paper aims to provide a comprehensive understanding of how the banking sector has driven or, at times, hindered Poland's economic development. This research contributes to the academic understanding of Poland's economic narrative and provides valuable insights for policymakers. By identifying the strengths and potential vulnerabilities of the banking sector's impact on economic growth, strategies can be formulated to ensure continued prosperity and resilience in the face of current challenges facing the banks in Poland, such as Swiss franc-denominated mortgages.

## 2. Literature Review

Both modern and less recent (Greenwood, Jovanovic, 1990; Bencivenga, Smith, 1993; King, Levine, 1993; Levine, Loayza, Beck, 2000) studies mostly confirm the positive impact of the financial development – including banking sector development – on economic growth. Banks play a multifaceted role in any economy. The main transmission channel of economic growth is credit distribution. Banks, being financial institutions, significantly influence economic growth in every country. Through the granting of credit, these institutions encourage financial market participants to incur liabilities and consume them. In particular, loans to the non-financial sector (households and businesses) are essential to economic development. This applies not only to investment loans to businesses but also to consumer loans, which stimulate domestic demand, a major component of Poland's GDP. On the other hand, a significant share of non-performing loans, often leading to financial and economic crises, can threaten economic patterning (Folwarski, 2016). Moreover, banks provide the infrastructure necessary for financial transactions such as payments, transfers and foreign exchange market operations. An efficient payment system is essential to the functioning of a modern economy.

Numerous studies confirm the relationship between the banking sector and economic growth. Afonso and Blanco-Arana (2022) results based on data from OECD/EU countries in 1990-2016 show, that the banking sector has a significant and positive impact on economic growth. In their random effect model and generalised method of moments (GMM), authors included such financial variables as domestic credit and market capitalisation. Other control determinants were included, such as inflation, unemployment rates and expenditure on education. Some other research using vector autoregression (VAR) models provides empirical evidence of a positive relationship between financial and banking inclusion (access and ability of individuals and firms to use a wide range of affordable financial services) and economic growth, with a negative relationship between inequality and poverty. The same research provides evidence of a significant positive impact of socio-economic growth on financial inclusion (Erlando, Riyanto, Masakazu, 2020).

Econometric models examining the relationship between the banking sector and economic growth have used such variables as credit non-performing loans, banking credits, and bank capital to assets ratio (Próchniak, Wasiak, 2017). Regarding Próchniak and Wasiak's results, the financial system size significantly impacts economic growth (GDP dynamics). However, this relationship is not linear and can give different short- and long-term results. In another study that examined determinants of GDP growth in seven countries that are not members of the Basel Committee of Banking Supervision (including Poland), authors identified five crucial independent variables, including bank capital to assets, bank liquidity reserves to bank assets, interest rates, inflation, bank non-performing loans (NPL). Most importantly, only bank capital to assets was a statistically significant variable, positively impacting GDP growth in these countries from 1990-2019 (Batrancea, Rathnaswamy, Batrancea, 2022). According to Uddin et al. (2012) studies the banking sector was associated with poverty alleviation in the long run by providing credits for small and medium enterprises (SMEs). Nevertheless, Matei's (2020) results show that the banking sector positively impacts economic growth only in the short term, where the long-term impact stays unclear, thus requiring additional studies. As a result, there are no conclusive research results on whether the bank affects economic growth in the short or long term. My research findings will fill this research gap.

Some authors have attempted to analyse the impact of banks during the crisis, suggesting that it is reasonable to conduct two models, covering the "normal" and crisis time. Thus in crisis, banks are vulnerable to macroeconomic shocks, which can indirectly and negatively impact economic growth (Ijaz *et al.*, 2020). It is precious to consider that, as Korzeb and Niedziółka (2020) studies emphasise, the largest banks operating in Poland are resilient in the context of the crisis triggered by the COVID-19 pandemic. Taking this into account, in my research Taking that into account, I tried to separate the impact of banks on GDP changes in times of prosperity from that which takes place during crises and uncertainty in the market - by introducing into the model a dummy variable representing the period of crisis.

Focusing on the relationship between the banking sector and economic growth in Poland, Bukowski and Kraczkowski (2021) conducted a model with four variables. M3 monetary aggregate and other control variables explained GDP, including gross investments, exports and population. Research results show that the M3 monetary aggregate has a significant positive impact on GDP. Also, export and population have a positive impact on GDP. Other results also indicate that banks can enhance economic growth in Poland (Škare, Sinković, Porada-Rochoń, 2019). The authors used the variable share of credit in GDP for this research, representing the banking sector. Nevertheless, in the context of Poland, it is also worth noting that domestic banks have a significant - one of the highest in all EU countries - share of government bonds on their balance sheets (Węgrzyn, Topczewska, 2023). This implies another potential channel for banks to influence economic growth through indirect financing of public investment. Taking this into account, in the analysis, the primary variable representing the banking sector will not be the value of loans granted but bank assets (as % of GDP).

In addition to the potential impact of the banking sector, many other that must be considered in the context of economic growth represented by GDP change or GDP per

capita (Nizam *et al.*, 2020). The control macroeconomic variables in economic growth modelling constitute the inflation rate, unemployment rate, investments or population (Matei, 2020; Nizam *et al.*, 2020). In Nizam *et al.* (2020) research, inflation had a significant negative impact on GDP, where unemployment was not a statistically significant variable. A negative inflation impact on GDP may result from a strong correlation with interest rates, with interest rates - not included in the model. This provokes the idea of including both inflation and interest rates in future studies.. As Próchniak's (2011) research shows, in CEE countries, to analyse economic growth, it is reasonable to include such variables as, among others: inflation, interest rate and GDP structure.

### 3. Methodology

To conduct the quantitative research, I obtained general macroeconomic data and financial figures detailing the activities of the domestic banking sector. I used quarterly data from Q4 2010 to Q1 2023. First, it allowed for the inclusion of observations over a relatively long period, thus ensuring a comprehensive view of historical dynamics. Second, the chosen period encompassed recent events that had a profound impact on both the national banking sector and the Polish economy as a whole. In particular, this timeframe includes the aftermath of the COVID-19 pandemic and the war in Ukraine, which undeniably affected the country's economic landscape. By basing my research on this period, I aim to capture the resilience and adaptability of the Polish banking sector amidst significant global and regional challenges, thus providing a thorough analysis of its role within the broader economic framework. For this purpose, a dummy explanatory variable (CRISIS) will be introduced into the model to signal a period of increased tension in global markets due to COVID-19 and the war in Ukraine.

**Table 1: Macroeconomic and financial variables considered for use in models**

Data	Short	Description	Source
Gross Domestic Product (% change)	GDP	Percentage change in GDP at constant prices (change to the same period of the previous year)	The Central Statistical Office (GUS): <a href="https://stat.gov.pl/wskazniki-makroekonomiczne/">https://stat.gov.pl/wskazniki-makroekonomiczne/</a>
Consumer Price Index (%)	CPI	Change to the same period of the previous year	
Interest rate (%)	IR	The reference interest rate	
Industry general business climate index	IND	Index of the general business climate in the industry (end of the period)	
Domestic demand to GDP (%)	POPG	The ratio of domestic demand to GDP (in current prices)	
Crisis (0/1)	CRISIS	From Q1 2020 to Q1 2023, the variable value is set to 1 (before that, the value is set to 0).	

Banking sector assets to GDP (%)	BANKAG	Percentage of banking sector assets in Poland to GDP	Own calculation based on data from the Polish Financial Supervision Authority (KNF): <a href="https://www.knf.gov.pl/publikacje_i_opracowania/dane_statystyczne?&amp;pageNumber=1">https://www.knf.gov.pl/publikacje_i_opracowania/dane_statystyczne?&amp;pageNumber=1</a>
Return on assets (%)	ROA	The annualised return on assets in the banking sector	
Non-performing loans (%)	NPL	The ratio of impaired receivables to total receivables of non-financial entities (%)	
Banking sector equity to assets	ETA	The ratio of banking sector equity to banking sector assets (%)	

Source: Own elaboration

In order to determine the suitability of the variables presented in Table 1 for econometric modelling, I conducted a series of stationarity tests, including the Augmented Dickey-Fuller test (ADF), Phillips-Perron unit root test (PP test), and Kwiatkowski-Phillips-Schmidt-Shin test (KPSS). The results of these tests, presented in Table 2, confirmed that the variables needed to be differentiated before proceeding to the subsequent stages of the analysis. Following this transformation, at least one statistical test confirms the stationarity of particular variables.

**Table 2: Data stationarity test results (p-value)**

Name	Data before differentiation			First differences		
	ADF	PP	KPSS	ADF	PP	KPSS
GDP	0.010*	0.016*	0.100 .	0.012*	0.010**	0.100 .
CPI	0.958	0.990	0.025*	0.022*	0.010**	0.037*
IR	0.990	0.990	0.100 .	0.457	0.063 .	0.100 .
IND	0.928	0.290	0.770.	0.058.	0.010**	0.100 .
POPG	0.254	0.071 .	0.010*	0.383	0.010**	0.016*
BANKAG	0.939	0.237	0.010*	0.404	0.010**	0.100 .
ROA	0.963	0.939	0.990	0.115	0.010**	0.100 .
NPL	0.509	0.296	0.01**	0.029*	0.010**	0.100 .
ETA	0.792	0.941	0.018*	0.402	0.010**	0.089 .

Signif. codes: '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Source: Own elaboration in R

To identify long-term relationships between the used variables, the Johansen Trace Test, for cointegration examination, has been employed to discern relationships among the

variables (Johansen, 1988). Upon conducting the Johansen trace test to the dataset under consideration, I ascertained statistically significant outcomes. These findings underscore the existence of cointegration among the variables under scrutiny. On orders of cointegrations, I(1) test statistic registered a value of 156.73, which unequivocally surpasses the delineated critical thresholds at the 5% (90.39) and 1% (104.20) significance levels. It means that there exists a long-run equilibrium relationship that binds them together. Given the evidence of cointegration, it becomes pertinent to consider econometrics models that can adeptly capture these long-run relationships while simultaneously accounting for short-run dynamics. Given these considerations, it is imperative to employ models adept at addressing cointegration, such as the ARDL model complemented with error correction.

### 3.1 ARDL Model

The Autoregressive Distributed Lag (ARDL) approach in economic growth studies facilitates a detailed exploration of relationships across variables, capturing both their short- and long-run associations (Qamruzzaman, Wei, 2018; Kong *et al.*, 2021). Doing so ensures a comprehensive understanding of the intricate interplay between economic variables over different time horizons. The ARDL model provides a flexible framework that caters to variables integrated at different orders, eliminating the necessity for them to be co-integrated in the same order. This is an invaluable advantage when dealing with non-stationary data that might exhibit varying levels of integration (Pesaran, Shin, Smith, 2001). Thus, the ARDL model is often used to study the impact of banking sector variables on economic growth (Iheanacho, 2016; Kalim, Mushtaq, Arshed, 2016; Sekmen, 2021). The general equation of ARDL can be expressed as:

$$(1) \Delta Y_t = \alpha_0 + \sum_{i=1}^p \alpha_i \Delta Y_{t-i} + \sum_{j=1}^q \beta_j \Delta X_{t-i} + \gamma Y_{t-1} + \delta X_{t-1} + \varepsilon_t$$

Where:

- $\Delta Y_t$  and  $\Delta X_{t-1}$  represent the changes in the dependent and independent variables,
- $p$  and  $q$  are the respective lags for the dependent and independent variables,
- $\alpha_0, \alpha_i, \beta_j, \gamma$  and  $\delta$  are the parameters to be estimated,
- $\varepsilon_t$  represents the error term.

Furthermore, The error correction mechanism is valuable to research using the ARDL model and studies of the banking sector's impact on economic growth (Saleem, Sági, Setiawan, 2021). The error correction model (ECM) has been increasingly recognised for its robustness and flexibility in econometric analyses, particularly as an extension of the Autoregressive Distributed Lag (ARDL) approach. One of the primary strengths of the ECM lies in its ability to disentangle the short-term dynamics from the underlying long-term equilibrium relationships, providing insights into both transient shocks and enduring associations among economic variables. Furthermore, the ECM facilitates examining how economic systems adjust and converge to equilibrium following disturbances, shedding light on the stabilising mechanisms inherent in economies (Engle, Granger, 1987). The general formulation of ECM can be expressed as:

$$(2) \Delta Y_t = \gamma_0 + \sum_{i=1}^p \gamma_i \Delta X_{t-1} + \theta EC_{t-1} + \varepsilon_t$$

Where:

- $\Delta Y_t$  and  $\Delta X_{t-1}$  represent the changes in the dependent and independent variables,
- $\theta$  denotes the speed of adjustment back to equilibrium,
- $EC_{t-1}$  is the error correction term derived from the long-run relationship,

Finally, the ARDL models with error correction mechanism (ECM) used in my research can be expressed as (combined short-run and long-run equations):

$$(3) \text{Model 1: } \Delta GDP_t = \beta_0 + \sum_{i=1}^2 \beta_1^i \Delta IR_{t-i} + \sum_{i=1}^3 \beta_2^i \Delta CPI_{t-i} + \sum_{i=1}^4 \beta_3^i \Delta IND_{t-i} + \beta_4^1 \Delta POPG_{t-1} + \sum_{i=1}^4 \beta_5^i \Delta BANKAG_{t-i} + \beta_6^1 \Delta CRISIS_{t-1} + \theta (GDP_{t-1} - \alpha_0 - \alpha_1 IR_{t-1} - \alpha_2 CPI_{t-1} - \alpha_3 IND_{t-1} - \alpha_4 POPG_{t-1} - \alpha_5 BANKAG_{t-1} - \alpha_6 CRISIS_{t-1}) + \varepsilon_t$$

$$(4) \text{Model 2: } \Delta GDP_t = \beta_0 + \sum_{i=1}^2 \beta_1^i \Delta IR_{t-i} + \sum_{i=1}^3 \beta_2^i \Delta CPI_{t-i} + \sum_{i=1}^4 \beta_3^i \Delta IND_{t-i} + \beta_4^1 \Delta POPG_{t-1} + \sum_{i=1}^4 \beta_5^i \Delta BANKAG_{t-i} + \sum_{i=1}^4 \beta_6^i \Delta ROA_{t-i} + \beta_7^1 \Delta CRISIS_{t-1} + \theta (GDP_{t-1} - \alpha_0 - \alpha_1 IR_{t-1} - \alpha_2 CPI_{t-1} - \alpha_3 IND_{t-1} - \alpha_4 POPG_{t-1} - \alpha_5 BANKA_{t-1} - \alpha_6 ROA_{t-1} - \alpha_7 CRISIS_{t-1}) + \varepsilon_t$$

$$(5) \text{Model 3: } \Delta GDP_t = \beta_0 + \sum_{i=1}^2 \beta_1^i \Delta IR_{t-i} + \sum_{i=1}^3 \beta_2^i \Delta CPI_{t-i} + \sum_{i=1}^4 \beta_3^i \Delta IND_{t-i} + \beta_4^1 \Delta POPG_{t-1} + \sum_{i=1}^4 \beta_5^i \Delta BANKAG_{t-i} + \sum_{i=1}^4 \beta_6^i \Delta NPL_{t-i} + \beta_7^1 \Delta CRISIS_{t-1} + \theta (GDP_{t-1} - \alpha_0 - \alpha_1 IR_{t-1} - \alpha_2 CPI_{t-1} - \alpha_3 IND_{t-1} - \alpha_4 POPG_{t-1} - \alpha_5 BANKA_{t-1} - \alpha_6 NPL_{t-1} - \alpha_7 CRISIS_{t-1}) + \varepsilon_t$$

$$(6) \text{Model 4: } \Delta GDP_t = \beta_0 + \sum_{i=1}^2 \beta_1^i \Delta IR_{t-i} + \sum_{i=1}^3 \beta_2^i \Delta CPI_{t-i} + \sum_{i=1}^4 \beta_3^i \Delta IND_{t-i} + \beta_4^1 \Delta POPG_{t-1} + \sum_{i=1}^4 \beta_5^i \Delta BANKAG_{t-i} + \sum_{i=1}^4 \beta_6^i \Delta ETA_{t-i} + \beta_7^1 \Delta CRISIS_{t-1} + \theta (GDP_{t-1} - \alpha_0 - \alpha_1 IR_{t-1} - \alpha_2 CPI_{t-1} - \alpha_3 IND_{t-1} - \alpha_4 POPG_{t-1} - \alpha_5 BANKA_{t-1} - \alpha_6 ETA_{t-1} - \alpha_7 CRISIS_{t-1}) + \varepsilon_t$$

Where:

- the terms with  $\Delta$  capture the short-run dynamics,
- the terms inside the parentheses (associated with  $\theta$ ) represent the long-run relationship and its deviation from equilibrium (error correction mechanism).

For the used models, each variable's optimal lags ( $p$  and  $q$ ) were selected based on the economic regularities and the Akaike Information Criterion (AIC).

### 3.2 Granger causality

An additional dimension to the comprehensive analysis undertaken in this study is the application of Granger causality tests. Granger causality is not causality in the traditional philosophical sense but rather a predictive causality (Shojaie, Fox, 2022). In mathematical terms, if variable X Granger causes variable Y, the past values of X contain information that helps predict Y:

$$(7) Y_t = \alpha + \sum_{i=1}^n \beta_i Y_{t-i} + \sum_{i=1}^n \gamma_i X_{t-i} + \varepsilon_t,$$

In the context of this research, the Granger causality tests were utilised to ascertain if specific explanatory variables have predictive power over GDP. While ARDL ECM provides insights into the short-term dynamics and long-term equilibria, Granger causality underlines the immediacy of relationships. This layered approach enhances the research's robustness, ensuring that findings are statistically significant, economically meaningful, and validated across different testing methodologies.

#### 4. Results and Discussions

Based on comparisons from the four models obtained, it can be concluded that Model 1 has the highest Adjusted R-squared, suggesting that more than 81% of the explanatory variable (change in GDP) is explained by the model. Moreover, of all the banking variables used in the model, only BANKAG proves to be statistically significant in modelling economic growth. Nevertheless, I observed distinct short- and long-run effects in the model. In the immediate term, as reflected by d.1.BANKAG, there is a statistically significant negative association between banking assets (relative to GDP) and the GDP itself (Table 3). The coefficient estimate of -0.3469, significant at the highest level ( $p < 0.001$ ), suggests that a surge in banking assets might temporarily dampen GDP growth. However, this transient effect does not persist in the long run. As revealed by l.4.BANKAG, increased banking assets exhibit a strong positive correlation with GDP growth over extended periods, evidenced by a coefficient of 0.2977, significant at  $p < 0.001$ . This underlines the long-term beneficial influence of the banking sector on the economy. ROA, NPL and ETA were not statistically significant. This suggests that the level of bank profitability, the quality of loans, and the share of equity in assets do not affect economic growth. On the other hand, it is worth noting that during the analysed period - despite the market disruptions caused by COVID-19 and the war in Ukraine - there was no significant decline in NPL and equity to assets in banks in Poland. Therefore, it would be advisable to extend the horizon of the study to earlier periods in order to confirm the impact of ETA and NPL on economic growth since, according to economic theory, a stable banking system supports economic growth. Based on my results, we can only conclude that the level of NPL and ETA do not affect economic growth in a stable banking system. From a country's development perspective, it may not matter whether the ratio of non-performing loans is relatively high (or ETA is relatively low) as long as it does not cause imbalances in the entire system (Table 3).

**Table 3: ARDL models' estimated coefficients and significant**

Variable	Model 1	Model 2	Model 3	Model 4
(Intercept)	-103.72**	-101.30*	-111.12**	-115.94**
l.1.GDP (EC)	-0.8276***	-0.8337***	-0.7992***	-0.8307***
d.1.CPI	1.5247***	1.5710***	1.5127***	1.5031***
d.1.IR	-3.1555***	-3.1538***	-3.178***	-3.0448**



d.1.IND	0.1334**	0.1300**	0.1358**	0.1304**
d.1.POPG	0.1711	0.1891	0.0994	0.1631
<b>d.1.BANKAG</b>	<b>-0.3469***</b>	<b>-0.3339**</b>	<b>-0.3748***</b>	<b>-0.3590***</b>
<b>d.1.ROA</b>	-	<b>0.5825</b>	-	-
<b>d.1.NPL</b>	-	-	<b>-0.2588</b>	-
<b>d.1. ETA</b>	-	-	-	<b>0.3911</b>
l.3.CPI	0.5929**	0.5524*	0.6570**	0.5944**
l.2.IR	-2.1174***	-2.0550***	-2.1534***	-2.0339***
l.4.IND	-0.0670.	-0.0664	-0.0550	-0.0644
l.1.POPG	1.1347***	1.1358***	1.0202***	1.1619***
<b>l.4.BANKAG</b>	<b>0.2977**</b>	<b>0.2818**</b>	<b>0.3195**</b>	<b>0.31773**</b>
<b>l.4.ROA</b>	-	<b>-0.4837</b>	-	-
<b>l.4.NPL</b>	-	-	<b>0.4075</b>	-
<b>l.4.ETA</b>	-	-	-	<b>0.3470</b>
l.1.CRISIS	-4.5247***	-4.5566***	-4.4281**	-4.0623*
Multiple R-squared	0.8612	0.8627	0.8657	0.8625
Adjusted R-squared	0.8107	0.8007	0.805	0.8004

Signif. codes: '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Source: Own elaboration in R

It is worth noting that the other macroeconomic control variables behaved in line with economic intuition. For example, an increase in interest rates - both in the short and long term proved to have a significant negative impact on GDP growth. Conversely, inflation proved to be a growth-promoting factor (among other things, as an incentive for investment). In the short term, the industrial climate index also positively affected GDP growth. In the long term, GDP growth was also positively affected by the contribution of domestic demand. Notably, the dummy variable of the crisis reflected well the period of market perturbations, statistically significantly and negatively affecting economic growth. Additionally, the error correction (EC) coefficient is negative and statistically significant in all the considered models. This suggests a convergence towards long-term equilibrium, wherein deviations from the equilibrium relationship are corrected over time.

I conducted a series of diagnostic tests for model diagnostics to assess its robustness and reliability. The results of these tests confirm their stability, normal distribution of residuals, lack of autocorrelation, homoskedasticity of variance and cointegration (except

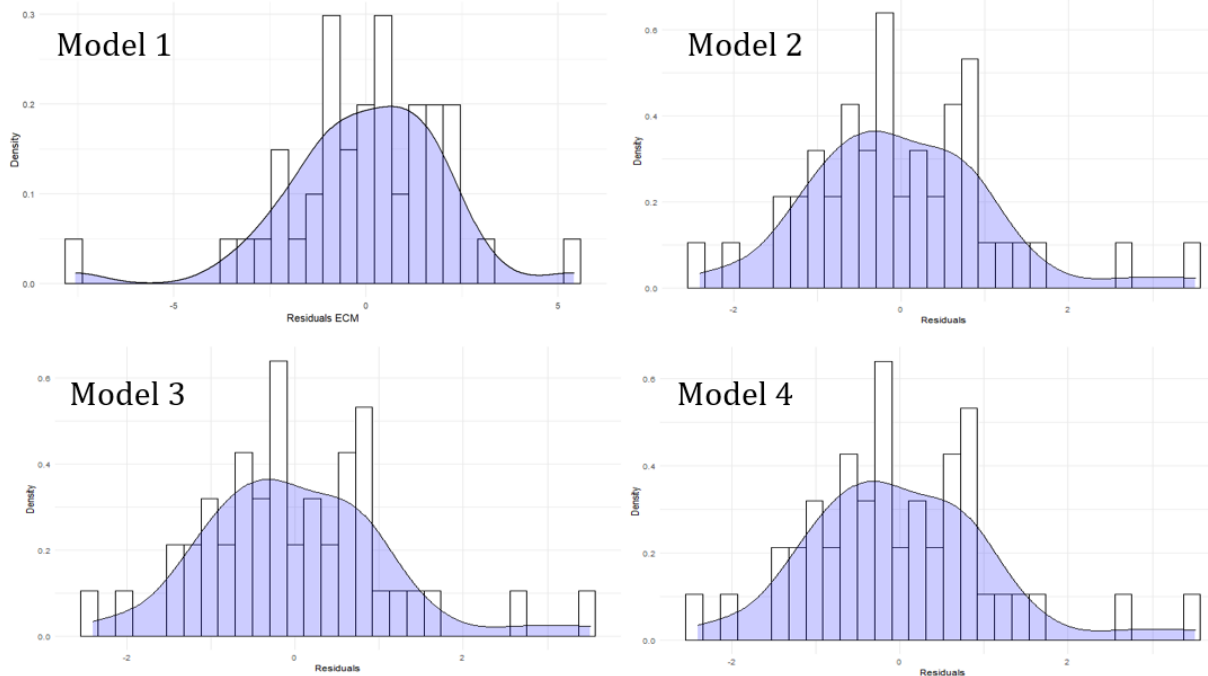
for model 3). Detailed results of the diagnostic tests performed are presented in Table 4. In addition, Figure 1 presents the distributions of the residuals of all the models tested.

**Table 4: ARDL models' diagnostics tests (p-value) and AIC&BIC values**

Tests	Model 1	Model 2	Model 3	Model 4
Model F-statistic	<0.001***	<0.001***	<0.001***	<0.001***
Breusch-Godfrey LM test (autocorrelation)	0.837	0.630	0.518	0.865
Shapiro-Wilk test (normality)	0.5783	0.6474	0.5819	0.5779
Breusch-Pagan (homoscedasticity)	0.7297	0.2592	0.4872	0.6803
Pesaran, Shin and Smith (cointegration)	3.8918	6.3246	3.5065	5.3617
	(F-value)	(F-value)	(F-value)	(F-value)
	3.781	3.708	3.708	3.708
	(5% critical)	(5% critical)	(5% critical)	(5% critical)
AIC criterium	166.655	170.129	169.125	170.196
BIC criterium	192.256	199.387	198.383	199.454

Signif. codes: '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

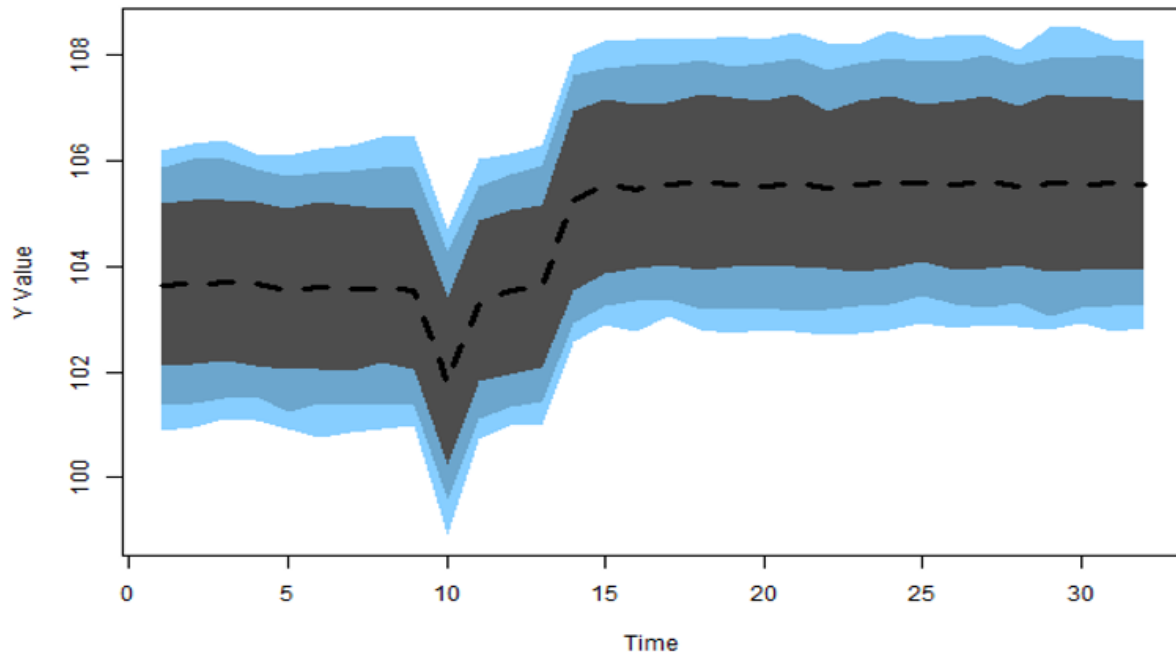
Source: Own elaboration in R



**Figure 1: Histograms from ARDL models' residuals**

Source: Own elaboration in R

Regarding Model I, which among several banking variables used only the share of banking sector assets to GDP, and which best explained economic growth, an analysis of the response of economic growth to a shock from a 1% increase in sector assets was also conducted. As can be seen in Figure 2, in such a situation, economic growth suffers, returning to the level before the shock in the next quarter (due to the operation of the error correction mechanism) and growing in the long term, which is due to the positive impact of banks - among other things, through the provision of financing - on the economy.



**Figure 2: Simulate the response of BANKAG shock to GDP growth**

Source: Own elaboration in R

The final step of my analysis entailed employing the Granger Causality Test. Likewise, in the case of previous econometrics models, the same lag level was used for this exercise. As the test's results show (Table 5), for BANKAG, the Granger causality tests indicate that past values of these variables significantly forecast future GDP growth, as evidenced by the p-value of 0.025. However, the data does not support the reverse causality, where GDP growth causes growth in the banking sector. These results underline an assertion that rather than economic growth driving the expansion of the banking sector, it is the other way around. The banking sector in Poland acts as a critical catalyst, stimulating and supporting broader economic growth. Furthermore, as the ARDL ECM model shows, the banking sector ROA failed to influence GDP in the short and long run significantly. This initial finding might suggest that the banking sector's return on assets does not directly or immediately affect the broader economic performance. However, a deeper investigation employing the Granger causality test painted a more nuanced picture. This test revealed that ROA from the banking sector does cause fluctuations in GDP at a lag of 4 periods. This apparent contradiction between the ARDL and Granger causality results can be understood in the context of their methodological distinctions. While the ARDL model captures long-term equilibrium relationships, encompassing both short and long-run dynamics, the Granger causality is more attuned to detecting the predictive capacity of a variable based on its specific lagged values. Thus, even if the banking sector's ROA

does not exert a pronounced equilibrium effect on GDP within the ARDL framework, its past values still presage short-term GDP variations. This insight implies that, while the banking sector's profitability might not play a pivotal role in shaping the economy's long-term trajectory, it could be instrumental in forecasting economic growth.

**Table 5: Testing Granger Causality for GDP and independent variables**

Variable	Variables cause GDP		GDP causes variables	
	t-value (F)	p.value	t-value (F)	p.value
CPI	4.272	0.011*	1.0834	0.367
IR	2.241	0.119	3.976	0.026*
IND	0.780	0.154	1.712	0.169
POPG	0.551	0.462	2.902	0.095.
BANKAG	3.144	0.025*	1.447	0.239
ROA	8.596	<0.01***	1.764	0.158
NPL	0.3855	0.818	1.077	0.382
ETA	1.017	0.411	0.668	0.618

Signif. codes: '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Source: Own elaboration in R

In summary, the banking sector's development is not a mere reflection or byproduct of the broader Polish economy's performance. Instead, the sector can be treated as a driving force, channelling resources, supporting investments, and fostering growth, confirming its pivotal role in Poland's economy.

## 5. Conclusion

My research results show that the banking sector is an active influencer of economic growth trajectories in Poland. Nevertheless, unlike the study by Batrancea, Rathnaswamy and Batrancea (2022), the results of my research suggest that the only variable representing the banking sector with a significant impact on GDP growth is the share of bank assets in GDP (BANKAG). The variable representing the share of bank capital in GDP was found to be insignificant in my study, as well as ROA or NPL variables. However, this may be due to the different time horizons (including the need for more consideration of the 2007-2009 financial crisis) in my research. Theoretically, a sudden surge in bank assets can cause short-term disturbances (captured by the ARDL ECM) - such as potential overheating or increased financial fragility. However, as markets adjust, the banking sector can use these assets to boost economic growth. Moreover, the Granger causality

test reinforced the view that banking sector growth is a precursor to broader economic growth rather than a mere consequence of it. This points to the need for policies that further strengthen the banking sector, recognising its central role as a catalyst for the nation's economic progress.

While the study provides valuable insights, it is reasonable to extend the findings in several ways to provide an even deeper understanding of the banking sector's activities on economic growth. First, given the potentially negative short-term impact of bank expansion on GDP growth and the positive long-term relationship between bank assets growth and GDP growth, it might be helpful to look more closely at the resilience and stability of the banking sector as determinants of economic prosperity. Second, future studies could delve deeper into how external shocks or global events affect the relationship between the banking sector and economic growth. This would provide policymakers with a more nuanced understanding of how to deal with such challenges. Third, regarding Próchniak's (2011) study on CEE countries, there are more macroeconomic determinants of economic growth, especially in investments, human capital, international trade, economic structure, public finance or population. Finally, there is potential to extend my research through comparative analysis with other economies. While the current study focused on Poland, comparing these findings with similar regional economies could be instructive. Such comparative studies can provide richer insights into similarities and differences, leading to more tailored policy recommendations.

## References

- Afonso, A., Blanco-Arana, M.C. (2022) 'Financial and economic development in the context of the global 2008-09 financial crisis', *International Economics*, 169, pp. 30–42. Available at: <https://doi.org/10.1016/j.inteco.2021.11.006>.
- Batrancea, L., Rathnaswamy, M.K., Batrancea, I. (2022) 'A Panel Data Analysis on Determinants of Economic Growth in Seven Non-BCBS Countries', *Journal of the Knowledge Economy*, 13(2), pp. 1651–1665. Available at: <https://doi.org/10.1007/s13132-021-00785-y>.
- Bencivenga, V.R., Smith, B.D. (1993) 'Some consequences of credit rationing in an endogenous growth model', *Journal of Economic Dynamics and Control*, 17(1–2), pp. 97–122.
- Bukowski, S.I., Kraczkowski, M. (2021) 'The impact of the banking sector on economic growth in Poland? an econometric analysis', *Central European Review of Economics & Finance*, 34(3), pp. 5–12. Available at: <https://doi.org/10.24136/ceref.2021.009>.
- Engle, R.F., Granger, C.W.J. (1987) 'Cointegration and Error Correction: Representation, Estimation, and Testing', *Econometrica*, 55(2), p. 251. Available at: <https://doi.org/10.2307/1913236>.
- Erlando, A., Riyanto, F.D., Masakazu, S. (2020) 'Financial inclusion, economic growth, and poverty alleviation: evidence from eastern Indonesia', *Heliyon*, 6(10), p. e05235. Available at: <https://doi.org/10.1016/j.heliyon.2020.e05235>.
- Folwarski, M. (2016) 'The impact of bank credit on economic growth in Poland', *Journal of Financial Management and Accounting*, 4(3), pp. 5–14. Available at: <https://www.ceeol.com/search/article-detail?id=493657>.

- Greenwood, J., Jovanovic, B. (1990) 'Financial development, growth, and the distribution of income', *Journal of political Economy*, 98(5, Part 1), pp. 1076–1107.
- Iheanacho, E. (2016) 'The Impact of Financial Development on Economic Growth in Nigeria: An ARDL Analysis', *Economies*, 4(4), p. 26. Available at: <https://doi.org/10.3390/economies4040026>.
- Ijaz, S. *et al.* (2020) 'Linking Bank Competition, Financial Stability, and Economic Growth', *Journal of Business Economics and Management*, 21(1), pp. 200–221. Available at: <https://doi.org/10.3846/jbem.2020.11761>.
- Johansen, S. (1988) 'Statistical analysis of cointegration vectors', *Journal of Economic Dynamics and Control*, 12(2–3), pp. 231–254. Available at: [https://doi.org/10.1016/0165-1889\(88\)90041-3](https://doi.org/10.1016/0165-1889(88)90041-3).
- Kalim, R., Mushtaq, A., Arshed, N. (2016) 'Islamic Banking and Economic Growth: A Case of Pakistan', *Islamic Banking and Finance Review*, 03, pp. 29–43. Available at: <https://doi.org/10.32350/ibfr.2016.03.03>.
- Karwowski, E., Shabani, M., Stockhammer, E. (2020) 'Dimensions and Determinants of Financialisation: Comparing OECD Countries since 1997', *New Political Economy*, 25(6), pp. 957–977. Available at: <https://doi.org/10.1080/13563467.2019.1664446>.
- King, R.G., Levine, R. (1993) 'Finance and growth: Schumpeter might be right', *The quarterly journal of economics*, 108(3), pp. 717–737.
- KNF (2023) 'Sprawozdanie z działalności Urzędu Komisji Nadzoru Finansowego oraz Komisji Nadzoru Finansowego w 2022 roku'. Available at: [https://www.knf.gov.pl/knf/pl/komponenty/img/Sprawozdanie\\_z\\_dzialalnosci\\_UKNF\\_oraz\\_KNF\\_w\\_2022\\_roku\\_82836.pdf](https://www.knf.gov.pl/knf/pl/komponenty/img/Sprawozdanie_z_dzialalnosci_UKNF_oraz_KNF_w_2022_roku_82836.pdf) (Accessed: 16 August 2023).
- Kong, Q. *et al.* (2021) 'Trade openness and economic growth quality of China: Empirical analysis using ARDL model', *Finance Research Letters*, 38, p. 101488. Available at: <https://doi.org/10.1016/j.frl.2020.101488>.
- Korzeb, Z., Niedziółka, P. (2020) 'Resistance of commercial banks to the crisis caused by the COVID-19 pandemic: the case of Poland', *equilibrium*, 15(2), pp. 205–234. Available at: <https://doi.org/10.24136/eq.2020.010>.
- Levine, R., Loayza, N., Beck, T. (2000) 'Financial intermediation and growth: Causality and causes', *Journal of monetary Economics*, 46(1), pp. 31–77.
- Matei, I. (2020) 'Is financial development good for economic growth? Empirical insights from emerging European countries', *Quantitative Finance and Economics*, 4(4), pp. 653–678. Available at: <https://doi.org/10.3934/QFE.2020030>.
- Nizam, R. *et al.* (2020) 'Financial inclusiveness and economic growth: new evidence using a threshold regression analysis', *Economic Research-Ekonomska Istraživanja*, 33(1), pp. 1465–1484. Available at: <https://doi.org/10.1080/1331677X.2020.1748508>.
- Pesaran, M.H., Shin, Y., Smith, R.J. (2001) 'Bounds testing approaches to the analysis of level relationships', *Journal of Applied Econometrics*, 16(3), pp. 289–326. Available at: <https://doi.org/10.1002/jae.616>.
- Próchniak, M. (2011) 'Determinants of economic growth in Central and Eastern Europe: the global crisis perspective', *Post-Communist Economies*, 23(4), pp. 449–468. Available at: <https://doi.org/10.1080/14631377.2011.622566>.

- Prochniak, M., Wasiak, K. (2017) 'The impact of the financial system on economic growth in the context of the global crisis: empirical evidence for the EU and OECD countries', *Empirica*, 44(2), pp. 295–337. Available at: <https://doi.org/10.1007/s10663-016-9323-9>.
- Qamruzzaman, Md., Wei, J. (2018) 'Financial Innovation, Stock Market Development, and Economic Growth: An Application of ARDL Model', *International Journal of Financial Studies*, 6(3), p. 69. Available at: <https://doi.org/10.3390/ijfs6030069>.
- Remlein, M., Roška, V. (2018) 'The Financialisation in the Activity of Listed Companies in Poland and Croatia', *International Journal of Public Administration, Management and Economic Development*, 3(2), pp. 9–17. Available at: <https://www.ijpamed.eu/index.php/journal/article/view/61>.
- Saleem, A., Sági, J., Setiawan, B. (2021) 'Islamic Financial Depth, Financial Intermediation, and Sustainable Economic Growth: ARDL Approach', *Economies*, 9(2), p. 49. Available at: <https://doi.org/10.3390/economies9020049>.
- Santos, A.C. (2023) 'Conceptualising state financialisation: from the core to the periphery', *New Political Economy*, 28(1), pp. 142–154. Available at: <https://doi.org/10.1080/13563467.2022.2084520>.
- Sekmen, T. (2021) 'Islamic Banking and Economic Growth in the Dual Banking System', *Optimum Ekonomi ve Yönetim Bilimleri Dergisi*, 8(1), pp. 183–196. Available at: <https://doi.org/10.17541/optimum.821478>.
- Shojaie, A., Fox, E.B. (2022) 'Granger Causality: A Review and Recent Advances', *Annual Review of Statistics and Its Application*, 9(1), pp. 289–319. Available at: <https://doi.org/10.1146/annurev-statistics-040120-010930>.
- Škare, M., Sinković, D., Porada-Rochoń, M. (2019) 'FINANCIAL DEVELOPMENT AND ECONOMIC GROWTH IN POLAND 1990-2018', *Technological and Economic Development of Economy*, 25(2), pp. 103–133. Available at: <https://doi.org/10.3846/tede.2019.7925>.
- Uddin, G.S., Kyophilavong, P., Sydee, N. (2012) 'The casual nexus of banking sector development and poverty reduction in Bangladesh', *International Journal of Economics and Financial Issues*, 2(3), pp. 304–311.
- Węgrzyn, P., Topczewska, A. (2023) 'Związek między wojną w Ukrainie a kształtowaniem się relacji depozytów do kredytów w bankach w Polsce', *Bank i Kredyt*, 54(2), pp. 129–152. Available at: [https://bankikredyt.nbp.pl/content/2023/02/BIK\\_02\\_2023\\_02.pdf](https://bankikredyt.nbp.pl/content/2023/02/BIK_02_2023_02.pdf).