EMPIRICAL INVESTIGATION ON ECONOMIC GROWTH IN THE EUROPEAN UNION AND THE EURO AREA

VOICU (IONIŢĂ) ALINA MELANIA
PHD CANDIDATE, BABEŞ-BOLYAI UNIVERSITY CLUJ-NAPOCA
DEPARTMENT OF ECONOMICS AND BUSINESS ADMINISTRATION, ROMANIA
e-mail: alina1v@yahoo.com

BĂTRÂNCEA LARISSA
PROFESSOR, BABEŞ-BOLYAI UNIVERSITY CLUJ-NAPOCA
DEPARTMENT OF BUSINESS, ROMANIA
e-mail: larissa.batrancea@ubbcluj.ro

Abstract

The phenomenon of economic growth has become a top priority for many nations around the world, including the members of the European Union and the Euro Area. This article examines the impact of bank nonperforming loans on long-term economic growth for the period 2008–2023. Our econometric models estimated with panel least squares, panel dynamic least squares, panel fully modified ordinary least squares and panel generalized method of moments (first difference) indicated a strong relationship between GDP growth rate and bank nonperforming loans across all models. Moreover, during the time span 2008–2012, the members of the Euro Area registered a stronger impact of the predictor than EU members. The study stresses the importance of economic growth research endeavors and lists avenues for future research.

Keywords: *economic growth, bank nonperforming loans, GDP growth rate, European Union, Euro Area*

JEL Classification: F43, G21, O47

1. Introduction

The phenomenon of economic growth [1]-[2]-[3]-[4] captures the evolution of a country's capacity to produce goods and services. Economies around the world are constantly focused on growth since it can foster development and can facilitate better living standards for citizens and business environments for entrepreneurs [5]-[6]-[7]. Though constant economic increases are highly sought after by national and regional authorities (in the case of regional unions), disruptive factors may hinder the positive trend of economic growth [8]-[9]-[10].

At the same time, it is true that national economies cannot grow indefinitely and they tend to plateau once reaching a certain level. The extant literature acknowledges the influence of numerous factors, among which bank loans play a particular role. On the one hand, bank loans are crucial for economic growth because they provide businesses and individual consumers with capital for investment or consumption. On the other hand, when bank loans default to a greater extent, banking institutions lose capital and have the tendency to restrict lending and mitigate default risk.

Studies on the determinants of economic growth have been constantly reported in the literature [11]-[12]-[13]-[14] because this phenomenon and the measures to incentivize it have been on the agendas of national and international bodies around the world [15]-[16]-[17].

Our study explores how economic growth changes under the impact of nonperforming loans granted by banking institutions during the period 2008–2023 for countries belonging to the European Union and for members of the Euro Area. We are also interested in potential differences between EU members and Euro Area members concerning the impact of bank nonperforming loans.

Variables of interest were retrieved from reliable data sources such as the International Monetary Fund and the World Bank.

The methodology of analysis is complex and comprises various panel data estimators, such as the following: ordinary least squares; dynamic ordinary least squares; fully modified ordinary least squares; generalised method of moments with first difference. All econometric estimations were conducted with EViews version 12.

The manuscript is structured as follows. Section 2 describes the variables of interest, general form of econometric models, research hypothesis, methods used to estimate outcomes. Section 3 details the empirical results. Section 4 presents concluding remarks, study limitations and avenues of future research.

2. Research method

The World Bank database and the International Monetary Fund database provided the values for our variables of interest, namely gross domestic product growth rate (GDP) and bank nonperforming loans to total gross loans (NPL). Both indicators were measured in percentage points. GDP is defined as the overall income generated via the production of goods and services meant for final consumption within an economy during the accounting period. Nonperforming loans are those that: have exceeded by 90 days or more the maturity date; are regarded as less likely to be paid in full, hence banks can make use of collaterals that secured such loans.

We analyzed the impact of nonperforming loans on economic growth measured by gross domestic product growth rate during three distinct periods: the crisis interval (2008–2012); the after-crisis interval (2013–2023); the overall period (2008–2023). We focused on these time spans to identify whether the relationship between economic growth and bank loans changed under the influence of the global financial crisis and its aftermath. For that matter, the increasing value of nonperforming loans was one of the symptoms of the crisis and a metric that increased considerably in the aftermath, because of economic recession [18]-[19].

EViews version 12 served as statistical workhorse for econometric analyses.

We examined the relationship with panel data regression analysis and estimated results with different methods (for robustness check): panel least squares; panel fully modified ordinary least squares (FMOLS); panel dynamic ordinary least squares (DOLS); panel generalized method of moments (GMM) – first difference. For GMM models, the set of predictors also included the dependent variable lagged by one, namely $GDP(-1)$.

The research hypothesis that we tested for the three periods was:

Hypothesis: A change in nonperforming loans determines a significant change in GDP.

In other words, we expect a negative relationship between the two indicators: with every increase in the amount of nonperforming loans, the level of economic growth would mitigate.

All econometric models had the following format:

$$\boldsymbol{GDP_{it} = a_0 + a_1 NPL_{it} + \delta_i + \theta_t + \varepsilon_{it}} \qquad (1)$$

where,

- a_0 denotes the intercept;
- a_1 denotes the coefficient of the predictor;
- i denotes the EU countries (with values from 1 to 27);
- t denotes the period of time analyzed;
- δ_i denotes the fixed effects that account for time-invariant country-specific factors;
- θ_t denotes the fixed effects that account for the global financial crisis;
- ε_{it} denotes the error term.

3. Empirical results

Table 1 presents the descriptive statistics for the EU countries and the Euro Area during the entire period of analysis.

Table 1. Descriptive statistics (2008–2023)

	EU Countries		Euro Area	
	NPL	GDP	NPL	GDP
Mean	6.9581	1.6603	1.5175	7.2609
Median	4.0842	1.9545	1.7912	4.0458
Maximum	47.7479	24.6156	24.6156	47.7479
Minimum	0.1456	–16.0400	–16.0400	0.1456
Std. Dev.	7.8141	4.1170	4.4088	8.5227
Skewness	2.5701	–0.2188	–0.1224	2.4885
Kurtosis	10.9214	7.1075	7.0115	9.8184
Jarque-Bera	1389.574	307.1314	215.3570	834.3574
Probability	0.0000	0.0000	0.0000	0.0000
Observations	374	432	320	281

Source: Authors' computations.

According to the Jarque-Bera test, both predictor and outcome had non-normal distributions at the significance level of 0.1%.

We also determined the same statistics for the periods 2008–2012 and 2013–2023, as indicated in Tables 2–3.

Table 2. Descriptive statistics (2008–2012)

	EU Countries		Euro Area	
	NPL	GDP	NPL	GDP
Mean	–0.1575	6.9210	–0.5011	6.7139
Median	0.6955	5.0012	0.4371	4.9417
Maximum	9.3075	22.2897	7.6069	22.2897
Minimum	–16.0400	0.1456	–16.0400	0.1456
Std. Dev.	4.2274	5.4769	4.3942	5.6183
Skewness	–1.0317	1.1257	–1.1361	1.2239
Kurtosis	5.1086	3.3983	5.0728	3.6949
Jarque-Bera	48.9583	26.1358	39.4149	24.8197
Probability	0.0000	0.0000	0.0000	0.0000
Observations	135	120	100	92

Source: Authors' computations.

Table 3. Descriptive statistics (2013–2023)

	EU Countries		Euro Area	
	NPL	GDP	NPL	GDP
Mean	2.4866	6.9757	2.4351	7.5272
Median	2.3954	3.6727	2.2765	3.5003
Maximum	24.6156	47.7479	24.6156	47.7479
Minimum	–10.9401	0.2132	–10.9401	0.2132
Std. Dev.	3.7945	8.7127	4.1083	9.6273
Skewness	0.4318	2.6003	0.5417	2.4012
Kurtosis	8.1072	10.1636	7.7778	8.5431
Jarque-Bera	332.0078	829.3398	220.0125	423.5878
Probability	0.0000	0.0000	0.0000	0.0000

Observations	297	254	220	189

Source: Authors' computations.

Again, the results of the Jarque-Bera test suggest that variable distributions were non-normal.

Table 4 examines the connection between economic growth and nonperforming loans for the period 2008–2023.

Table 4. Empirical estimations across the entire period (2008–2023)

	EU countries model (M1)		**Euro Area model (M2)**	
	Estimation method: *Panel Least Squares*	Estimation method: *GMM first difference*	Estimation method: *Panel Dynamic Ordinary Least Squares (DOLS)*	Estimation method: *GMM first difference*
GDP(-1)	-	–0.0438*** (–3.6236)	-	–0.0231 (–1.5505)
C	2.3393*** (6.7371)	-	-	-
NPL	–0.0805* (–1.6129)	–0.0978*** (–4.9934)	–0.0758* (–0.0897)	–0.0370** (–2.2559)
R^2	0.6597	-	0.1326	-
Adjusted R^2	0.6177	-	0.0659	-
F-statistic	15.6976	-	-	-
Prob(*F*-statistic)	0.0000	-	-	-
Hansen *J*-statistic	-	19.8150	-	18.0103
Prob(*J*-statistic)	-	0.3433	-	0.3882
AR(1)	-	0.0010	-	0.0008
AR(2)	-	0.7175	-	0.8851
Observations	374	243	281	239

Note: We indicated robust *t*-statistics in parentheses. The symbols ***, **, * indicate statistical significance at the 0.1%, 1% and 5% levels. The White test rejected the null hypothesis of heteroscedasticity. The validity of the GMM estimator was confirmed for AR(2) since no second-order serial correlation was identified. Moreover, the Hansen *J*-statistic test of over-identifying restrictions did not reach significance, which confirmed the validity of the econometric models.

In the case of the *EU country sample* (model M1), the panel least squares analysis showed that the impact of nonperforming loans on GDP was statistically significant and in line with our hypothesis. The econometric model explained 61.77% of the variance in GDP ($F = 15.69, p < 0.001$). As expected, for a 1% increase in NPL, economic growth measured via GDP would decrease by 0.08%. The generalised method of moments estimator served as robustness check and confirmed the results. In the case of the *Euro Area* (model M2), the influence of NPL was statistically significant, with model M2 explaining 6.59% of the variance in GDP. Therefore, if NPL increased by one unit, the level of economic growth would mitigate by 0.08%. The GMM estimator yielded similar results and supported the research hypothesis.

Overall, across the entire European Union, the level of economic growth was considerably impacted by the amount of nonperforming loans since the entire region experienced a contagion effect after the crisis. These results were also reported by the Euro Area economies.

Table 5. Empirical estimations for the period 2008–2012

	EU countries model (M3)		**Euro Area model (M4)**	
	Estimation method:	Estimation method:	Estimation method:	Estimation method:

	Panel Least Squares	*Panel Dynamic Ordinary Least Squares (DOLS)*	*Panel Least Squares*	*Panel Dynamic Ordinary Least Squares (DOLS)*
C	3.5419*** (17.5776)	-	2.5861*** (2.3015)	-
NPL	–0.1188*** (–4.1121)	–0.2629*** (–2.7541)	–0.4737*** (–2.8301)	–0.3084*** (–2.5498)
R^2	0.7443	0.2301	0.6614	0.2219
Adjusted R^2	0.7019	0.0149	0.5401	0.0028
F-statistic	17.5444	-	5.4532	-
Prob(*F*-statistic)	0.0000	-	0.0000	-
Observations	254	120	92	92

Note: We indicated robust *t*-statistics in parentheses. The symbol *** indicated statistical significance at the 1% level.

Table 5 presents the empirical results concerning the link analyzed during the period 2008–2012 (immediately after the crisis). For *EU members* (model M3), in line with our expectations, the GDP was significantly influenced by bank nonperforming loans. This time, the econometric model explained 70.19% of the variance in GDP ($F = 17.54, p < 0.001$). Hence, should NPL improve by one unit, GDP would mitigate by 0.12 units. The panel dynamic ordinary least squares estimation yielded similar results and supported the research hypothesis. For the *Euro Area* members (model M4), results followed the same trend ($F = 5.45, p < 0.001$), yet this time the influence of NPL was stronger. If the level of NPL increased by 1%, economic growth rate would decrease by 0.47% (which is considerable). The panel DOLS estimation supported the previous results.

In our view, the influence of bank nonperforming loans on GDP was much higher in the case of countries belonging to the Euro Area as compared to the entire European Union because of the structural characteristics of the monetary union and pre-crisis imbalances. Countries outside the Euro Area used other levers to harness the negative impact of the crisis (e.g., more flexible fiscal responses, autonomous monetary policies, the capacity to adjust interest rates or stabilize banking systems).

Table 6. Empirical estimations across the period 2013–2023

	EU countries model (M5)		**Euro Area model (M6)**	
	Estimation method: *Panel Least Squares*	Estimation method: *Panel Fully Modified Ordinary Least Squares (FMOLS)*	Estimation method: *Panel Least Squares*	Estimation method: *Panel Dynamic Ordinary Least Squares (DOLS)*
C	3.6651*** (21.3839)	-	3.5846*** (14.5335)	-
NPL	–0.1365*** (–5.5535)	–0.0799** (–2.0893)	–0.1229*** (–3.7534)	–0.1405*** (–3.5965)
R^2	0.2305	0.2279	0.7364	0.2536
Adjusted R^2	0.1386	0.1270	0.6883	0.1647
F-statistic	2.5074	-	15.3141	-
Prob(*F*-statistic)	0.0000	-	0.0000	-
Observations	254	226	189	189

Note: We indicated robust *t*-statistics in parentheses. The symbol *** indicated statistical significance at the 1% level.

Table 6 presents the results for the period after the crisis (2013–2023). In the case of *EU countries* (model M5), again we found the same expected negative connection, with M5 explaining 13.86% of the variance in GDP ($F = 2.51, p < 0.001$). When NPL improved by one unit, economic growth would decrease by 0.14 units. The model estimated with panel FMOLS supported these results and the research hypothesis. In the case of *Euro Area countries* (model M6), the influence of bank

nonperforming loans on GDP was negative and significant ($F = 15.31, p < 0.001$). This time, the model explained 68.83% of the variance in the phenomenon. Therefore, should NPL mitigate by one unit, economic growth would improve by 0.12 units. The DOLS robustness check served its purpose and supported our research hypothesis.

The influence of bank loans on economic growth is slightly stronger for all EU countries as compared to the Euro Area.

4. Concluding remarks

The present study explores the impact of bank nonperforming loans on economic growth proxied by gross domestic product growth rate across the European Union and the Euro Area. The period of analysis spanned from 2008 to 2023 and considered other two subperiods (2008–2012; 2013–2023), since we accounted for the 2008 crisis and its aftermath. The variables of interest were retrieved from public reliable databases such as World Bank and International Monetary Fund.

Our methodology of analysis was complex and included various estimation methods applicable to panel data, with some serving as robustness checks. Empirical results supported our research hypothesis and showed that bank nonperforming loans triggered significant mitigations in the level of economic growth. Across the entire period and the time span 2013–2023, the impact of nonperforming loans was stronger in the case of EU member states. For the period 2008–2012, the countries in the Euro Area displayed stronger responses to the changes in bank nonperforming loans.

The study is subject to some limitations. First, the phenomenon of economic growth was investigated through the lens of nonperforming loans from the banking systems. Future studies could examine the phenomenon across EU countries and the Euro Area from the perspective of other predictors signaled in the literature. In addition, the predictor did not register values for all years and countries in the analyzed period. Upcoming research could focus on different indicators that are fully represented with values for the entire period considered.

All in all, research endeavors on economic growth are relevant since they paint the picture of national progress in time. These studies can emphasize important factors that make or break such progress, which is greatly coveted by state authorities around the world.

5. Bibliography

[1] **Cervelló-Royo, R., Devece, C., & Lull, J.J.** (2025). Analysis of economic growth through the context conditions that allow entrepreneurship. *Review of Managerial Science, 19*, 2081–2103.

[2] **Koç, Ş., Uctu, R., Essop, H., & Marcan, E.** (2025). The impact of innovation on economic growth: A dynamic panel data analysis using system GMM approach. *International Journal of Innovation Studies*.

[3] **Haider, A., Jabeen, S., Rankaduwa, W., & Shaheen, F.** (2023). The nexus between employment and economic growth: A cross-country analysis. *Sustainability*, *15*(15), 11955.

[4] **Xue, X., Reed, W.R., & van Aert, R.C.M.** (2024). Social capital and economic growth: A meta-analysis. *Journal of Economic Surveys*, *39*(4), 1395–1432.

[5] **Hickel, J., & Sullivan, D.** (2024). How much growth is required to achieve good lives for all? Insights from needs-based analysis. *World Development Perspectives*, *35*, 100612.

[6] **Doran, J., McCarthy, N., & O'Connor, M.** (2018). The role of entrepreneurship in stimulating economic growth in developed and developing countries. *Cogent Economics & Finance*, *6*(1), 1442093.

[7] **Kim, J., Castillejos-Petalcorin, C., Jinjarak, Y., Park, D., Quising, P., & Tian, S.** (2022). Entrepreneurship and economic growth. A cross-sectional analysis perspective. *ADB Economics Working Paper Series* No. 672.

[8] **Mauro, P.** (1995). Corruption and growth. *The Quarterly Journal of Economics*, *110*(3), 681–712.

[9] **Acemoglu, D., Johnson, S., & Robinson, J.A.** (2001). The colonial origins of comparative development: An empirical investigation. *American Economic Review, 91*(5), 1369–1401.

[10] **Burke, M., Hsiang, S.M., & Miguel, E.** (2015). Global non-linear effect of temperature on economic production. *Nature, 527*, 235–239.

[11] **Batrancea, L.M., Balcı, M.A., Akgüller, Ö., Gaban, L.** (2022). What drives economic growth across European countries? A multimodal approach. *Mathematics, 10*(19), 3660.

[12] **Stojkov, A., Veljanovski, M., & Warin, T.** (2024). European integration and economic growth in emerging Europe: The role of institutions and policy factors. *Post-Communist Economies, 36*(7), 778–800.

[13] **Nikas, C.** (Ed.) (2020). *Economic growth in the European Union. Analyzing SME and investment policies*. Springer.

[14] **Pellegrini, G., Terribile, F., Tarola, O., Muccigrosso, T., & Busillo, F.** (2013). Measuring the effects of European Regional Policy on economic growth: A regression discontinuity approach. *Papers in Regional Science, 92*(1), 217–234.

[15] **OECD** (2025). *Investing in climate for growth and development. The case for enhanced NDCs*. Paris: OECD Publishing.

[16] **World Bank** (2025). Global economy set for weakest run since 2008 outside of recessions. Available online at: https://www.worldbank.org/en/news/press-release/2025/06/10/global-economic-prospects-june-2025-press-release (Accessed November 12, 2025).

[17] **International Monetary Fund** (2025). *World economic outlook: A critical juncture amid policy shifts*. Washington, DC: International Monetary Fund.

[18] **Ofria, F., & Mucciardi, M.** (2022). Government failures and non-performing loans in European countries: A spatial approach. *Journal of Economic Studies, 49*(5), 876–887.

[19] **Ari, A., Chen, S., & Ratnovski, L.** (2021). The dynamics of non-performing loans during banking crises: A new database with post-COVID-19 implications. *Journal of Banking and Finance, 133*, 106140.