INVESTIGATING THE INFLUENCE OF THE SHADOW ECONOMY ON NON-PERFORMING LOANS IN EUROPEAN ECONOMIES: A PANEL GMM ANALYSIS

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Abstract

In this paper, we use panel data containing all EU27 countries from the 2010 to 2022 period to investigate the impact exhibited by the shadow economy on the level of NPLs. Based on a Panel GMM approach we reveal a negative connection, indicating that Countries with larger informal sectors often exhibit lower reported NPLs, possibly due to less stringent oversight. Additionally, economic growth correlates negatively with NPLs, while rising unemployment is associated with increased NPL levels. However, factors like inflation, political stability, and government debt did not show significant correlations with NPLs in our analysis. The topic holds significant relevance for both macro-stability policymakers and commercial banks aiming to understand how changes in fiscal and budgetary conditions impact the quality of credit portfolios.

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1. Introduction

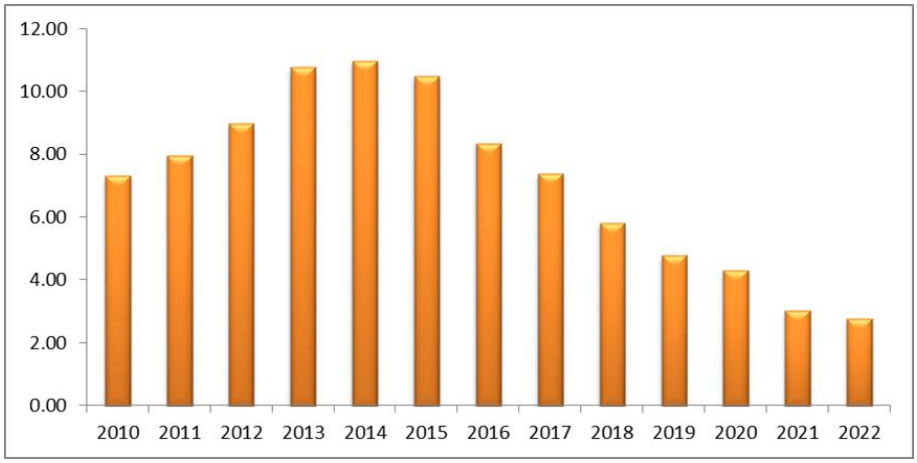
Non-performing loans (NPLs) are a key indicator for the financial industry since they are loans that borrowers have not been able to return within an allotted period. On the other hand, repeated occurrences of these unpaid debts can put pressure on financial institutions, which may reduce their ability to lend money and undermine investor trust. The origins of non-performing loans are complex and frequently linked to economic downturns, unclear credit conditions, or inadequate due diligence on the part of lending institutions. Furthermore, a higher-than-average percentage of non-performing loans highlights systemic weaknesses in the financial sector. Therefore, a thorough analysis of the fundamental causes and variables influencing NPLs is important.

The NPLs evolution in Europe has changed significantly in recent years, and this has had a significant impact on the financial scene, showing a steady decrease from 7.32% in 2010 to a significantly lower 2.78% by the end of 2022 (see Figure 1). Not only does this indicate a significant increase in the quality of loans, but it also highlights improved asset quality for banks that operate in the Eurozone.

In light of the global financial crisis that emerged at the beginning of this time, this pattern is particularly notable. The global economy saw turbulent times in the years that followed 2008, and the Eurozone was no different. NPLs experienced notable increases during this crisis in numerous European nations, primarily driven by the severe economic upheavals that rendered many loans uncollectible.

Figure 1

The evolution of NPLs in the European Union (%)



Source: author representation based on The Global Economy data

Thus, the drop in NPLs starting in 2010 can be seen as evidence of the financial sector's adaptability and strength inside the Eurozone. It represents a time of recovery and stabilization during which financial institutions likely implemented strict risk management procedures and carefully planned steps to address the shortcomings shown by the crisis. In addition, the following ten years were not without difficulties, with the global pandemic in 2020 presenting previously unseen risks to financial stability. However, the response mechanisms used during the pandemic were more organized and proactive than those used in the wake of the financial crisis. Rapid action was taken by governments throughout the Eurozone to enact a wide range of policies, such as substantial fiscal stimulus packages, short-term payment moratoriums, and targeted assistance for faltering companies. These interventions played a pivotal role in safeguarding the financial well-being of individuals and businesses alike, thereby mitigating the adverse impact on loan repayment capacities and subsequently reducing the incidence of defaults.

In light of these developments, understanding the intricate dynamics between the shadow economy and NPLs becomes crucial. As the Eurozone navigates the complexities of post-crisis recovery and pandemic-induced challenges, a nuanced exploration of this

relationship can offer invaluable insights for policymakers, regulators, and financial institutions.

This paper seeks to delve into this pressing issue, employing a Panel Generalized Method of Moments (GMM) analysis on a panel of EU27 countries during the 2010-2022 period. The negative correlation between the shadow economy and NPLs suggests that in countries with larger informal sectors, there's likely reduced oversight, leading to less rigorous NPL reporting. Furthermore, banks in these economies may adopt conservative lending practices, resulting in fewer NPLs.

The paper progresses as follows: Section 2 details the research design, Section 3 offers the literature review, Section 4 presents the results, and Section 5 concludes.

2. Literature review

Recently, an expanding body of research has delved into the factors influencing NPLs, employing various samples and econometric methods. These investigations highlight two primary categories of variables affecting the NPL rate: factors related to banks and broader macroeconomic conditions.

Several papers, including Salas and Saurina (2002), Louzis et al. (2012), Alhassan et al. (2014), and Reddy (2015), have posited that larger banks, with their enhanced capabilities for thorough loan screening, are better positioned to mitigate loan losses compared to their smaller counterparts. However, a contrasting viewpoint emerges from studies like Stern and Feldman (2004), who contend that the "too big to fail" status of larger banks incentivizes riskier lending behaviours, absolving them from the repercussions of their lending decisions. Foos et al. (2010) further advance that banks relaxing credit standards to meet loan growth targets may witness heightened NPLs. This aligns with the notion that less profitable banks, possibly due to suboptimal management as theorized by Berger and DeYoung (1997) and Louzis et al. (2012), might exhibit elevated NPL rates. Along the same line of argument, Ghosh (2015) notes that highly profitable banks tend to avoid high-risk ventures, implying a negative correlation between profitability and NPLs. Additionally, García-Marco and Robles-Fernández (2008) underscore the relationship between past profitability and future NPL rates, indicating that banks with a history of underperformance might curtail lending activities following elevated NPL levels. Beyond these factors, studies have also explored variables

like bank capitalization (Klein, 2013; Ghosh, 2015; Louzis et al., 2012; Macit, 2012; Makri et al., 2014), credit growth (Foos et al., 2010; Boudriga et al., 2010; Naili and Lahrichi, 2022), and ownership structure (Dong et al., 2014; Louzis et al., 2012; Naili and Lahrichi, 2022) as potential influencers of NPL trends, although findings remain inconclusive.

In addition, several studies highlight the impact of macroeconomic conditions on NPLs. During economic upturns, individuals and firms typically have the means to meet their financial obligations, resulting in lower NPLs (Louzis et al., 2012; Makri et al., 2014; Beck et al., 2015; and others). Conversely, economic downturns elevate the risk of loan defaults, leading to increased NPLs. This relationship is further emphasized by the consensus that rising unemployment rates correlate with higher NPL rates (Salas and Saurina, 2002; Ghosh, 2015; Dimitrios et al., 2016; Pop et al., 2018). Beyond growth and unemployment, other macroeconomic factors like inflation and government spending have been examined for their NPL implications. While some studies, such as Rinaldi and Sanchis-Arellano (2006) and Klein (2013), have shown that inflation reduces debt value, easing debt servicing and lowering NPLs, others, like Gulati et al. (2019), argue that real inflation strains borrowers' repayment capacities, deteriorating loan portfolios. Additionally, a decline in public finances, often marked by increased public debt and subsequent fiscal adjustments, can impact both individual and corporate repayment capacities. Empirical findings by Dimitrios et al. (2016), Louzis et al. (2012), Makri et al. (2014), and Naili and Lahrichi (2022) affirm the influence of public finance indicators, such as public debt and government expenditures, on NPL dynamics.

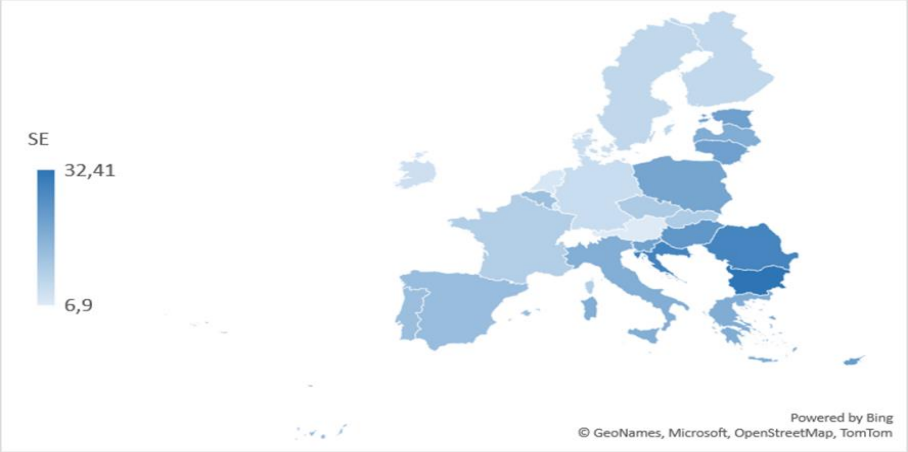
Despite the extensive research on various determinants influencing NPLs, notably macroeconomic factors like economic growth, unemployment, inflation, and public finance indicators, there remains a notable gap in the literature concerning the relationship between the shadow economy and NPL levels. While numerous studies have delved into the intricacies of NPL dynamics under different economic and financial conditions, the potential impact and interplay of the shadow economy on NPL rates have not been thoroughly explored.

3. Data description

We use a balanced panel comprising all EU27 countries during 2010 to 2022 period. The dependent variable is the level of NPLs. As control variables we use macroeconomic variables such as Economic Growth (EG), Inflation (INF), Unemployment (UNM), Political Stability (PSI), and Government Debt (GD) but also aggregate bank-related factors such as Bank assets (BA), Bank concentration (BCON), and Bank interest revenue (BIR), Credit-to-Deposits (CDR), Return on Assets (ROA). The key explanatory variable is the level of the shadow economy (SE) which is presented in Figure 2 across EU27.

Figure 2

Shadow economy in 2022 (%)



Source: author representation based on The Global Economy data

As we can see, high-income EU countries tend to exhibit relatively lower levels of shadow economies. These nations have well-established formal economies, characterized by robust regulatory frameworks, strong institutions, and high levels of tax compliance. In contrast, lower-income EU countries, such as Bulgaria, Romania, and Greece, frequently experience a more significant shadow economy. These nations often face economic challenges, including higher unemployment rates and lower average income levels, which can drive individuals and businesses towards informal economic activities. A detailed description of the variables used in the regression is presented in Table 1.

Table 1

Data description

Variables	Definition	Source
NPLs	Bank nonperforming loans to total gross loans are the value of nonperforming loans divided by the total value of the loan portfolio (including nonperforming loans before the deduction of specific loan-loss provisions).	The Global Economy
EG	Annual percentage growth rate of GDP at market prices based on constant local currency. Aggregates are based on constant 2015 prices, expressed in U.S. dollars. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products.	The Global Economy
INF	Inflation as measured by the consumer price index reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly.	The Global Economy
UNM	Unemployment refers to the share of the labor force that is without work but available for and seeking employment.	The Global Economy
PSI	The index of Political Stability and Absence of Violence/Terrorism measures perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including politically motivated violence and terrorism.	The Global Economy
GD	Debt is the entire stock of direct government fixed-term contractual obligations to others outstanding on a particular date. It includes domestic and foreign liabilities such as currency and money deposits, securities other than shares, and loans. It is the gross amount of government liabilities reduced by the amount of equity and financial derivatives held by the government.	The Global Economy
BA	Total assets held by deposit money banks as a share of GDP. Assets include claims on domestic real nonfinancial sector which includes central, state and local governments, nonfinancial public enterprises and private sector.	The Global Economy

Variables	Definition	Source
BCON	The ratio between the sum of assets held by the top three banks and their total level in the banking system	The Global Economy
BIR	Accounting value of bank's net interest revenue as a share of its average interest-bearing (total earning) assets.	The Global Economy
CDR	The financial resources provided to the private sector by domestic money banks as a share of total deposits.	The Global Economy
ROA	Commercial banks' pre-tax income to yearly averaged total assets.	The Global Economy
SE	The shadow economy as percent of total annual GDP. Detailed methodology of the estimations can be obtained from the following International Monetary Fund working paper by Leandro Medina and Friedrich Schneider (2018): Shadow Economies Around the World: What Did We Learn Over the Last 20 Years?	The Global Economy

Usually, panel data consists of observations over multiple time periods for multiple cross-sectional units (e.g., individuals, firms, countries). Unlike individual time series, panel data can account for both cross-sectional and time-series variations, providing more information and potentially improving the reliability of the results. Non-stationary data can lead to spurious regression, where variables that are not truly related appear to be so. Spurious regression can produce misleading results and interpretations. For this reason, we run the test proposed by Levin-Lin-Chu and report the results in Table 2.

Table 2

Levin-Lin-Chu test

Variable	Test	P-value	Variable	Test	P-value
NPLs	-1.9702	0.0244	BA	-3.4994	0.0002
EG	-2.5151	0.0059	BCON	-4.1218	0.0000
INF	-7.9027	0.0000	BIR	-3.8365	0.0001
UNM	-6.5673	0.0000	CDR	-5.9928	0.0000
PSI	-2.9593	0.0015	ROA	-6.1768	0.0000
GD	-3.5871	0.0002	SE	-3.8588	0.0001

As we can observe from our analysis, each of the variables that are part of the baseline specification demonstrates stationarity at the 5% significance level. This means that the data properties of these variables remain consistent over time within a certain confidence interval. Consequently, we can confidently state that there is no concern regarding the occurrence of a spurious regression, where unrelated variables might mistakenly appear to have a relationship.

4. Results

4.1. Causality analysis

Before estimating the regressions, we must take into account the endogeneity issues. Endogeneity can occur if there's a bidirectional causal relationship between NPLs and the shadow economy. For example, a high level of NPLs might incentivize more economic activities to shift into the shadow economy, or conversely, a large shadow economy could increase the risk of NPLs. In such cases, it's challenging to disentangle the cause-and-effect relationship. Also, if the shadow economy is measured with errors, it can introduce endogeneity. Measurement errors in the explanatory variable can lead to biased coefficient estimates and make it appear as though the shadow economy is correlated with NPLs due to the errors, rather than the true causal relationship. For this reason, we run a series of causality tests, which are reported in Table 3.

Table 3

Causality analysis

Test	Lags	Null hypothesis	Test value	Prob.
Dumitrescu-Hurlin Test	1	NPLs do not homogeneously cause SE	1.5049	0.7211
Dumitrescu-Hurlin Test	1	SE does not homogeneously cause NPLs	4.6688	0.0000
Dumitrescu-Hurlin Test	2	NPLs do not homogeneously cause SE	5.6530	0.0000
Dumitrescu-Hurlin Test	2	SE does not homogeneously cause NPLs	3,1294	0.0000
Granger causality test	1	NPLs do not Granger cause SE	1.5499	0.2141
Dumitrescu-Hurlin Test	1	SE does not Granger cause NPLs	1.0032	0.3173

Test	Lags	Null hypothesis	Test value	Prob.
Dumitrescu-Hurlin Test	2	NPLs do not Granger cause SE	1.1553	0.3165
Dumitrescu-Hurlin Test	2	SE does not Granger cause NPLs	3.8700	0.0220

The null hypothesis concerning the lack of causal linkage from the shadow economy (SE) to non-performing loans (NPLs) is rejected by three of the four trial tests. This observation implies a noteworthy and influential causal relationship, wherein the level of SE exerts a substantive impact on the level of NPLs. Moreover, our analysis also indicates a potential causal relationship from non-performing loans (NPLs) to the shadow economy (SE). These findings underscore the complexity of causality dynamics, pointing out the persistence of the reverse causality hypothesis within the context of our study.

4.2. Difference GMM

Over the past twenty years, there has been a notable surge in research using panel data within the realms of economics and finance. A significant challenge faced by researchers employing traditional panel data methods stems from potential endogeneity issues, which can arise from factors like overlooked variables, inaccuracies in measurements, and mutual causality. The methodologies introduced by Arellano and Bond (1991) and subsequently by Arellano and Bover (1995) in collaboration with Blundell and Bond (1998) have gained considerable traction. Their appeal lies in their adeptness at addressing prevalent scenarios such as: i) independent variables that aren't strictly exogenous, implying their association with prior and potentially ongoing errors; ii) consistent individual effects; or iii) variance and temporal dependencies within individuals, but not necessarily across the entire panel.

In Table 4 we report the estimation results. To avoid altering the results due to multicollinearity reasons, we include the bank-related factors separately in regressions. We can see that the coefficient associated with SE is statistically significant at a 1% level in all the specifications. Thus, in countries characterised by expansive shadow or informal economic sectors, there's a propensity for both individuals and enterprises to gravitate towards informal credit markets over conventional banking systems. These informal credit avenues frequently offer more adaptable terms and might not maintain as stringent records of non-performing loans. Furthermore, such countries

often exhibit diminished regulatory scrutiny and oversight concerning banking and loan operations. Consequently, the reported levels of NPLs may appear reduced, either due to banks exercising greater clemency in loan classifications or a potential laxity in diligence. Moreover, the prevalence of a substantial shadow economy can induce heightened risk aversion among banks and financial entities. This caution often steers them towards more cautious and secure lending strategies, thereby potentially diminishing the rates of NPL occurrences.

Table 4

Estimation results

Variable	Model 1	Model 2	Model 3	Model 4	Model 5
NPL (-1)	0.6101***	0.6618***	0.5240***	0.6293***	0.6350***
EG	-0.2508***	-0.2021***	-0.1112***	-0.2436***	-0.2058***
INF	0.2209**	0.1451*	0.0258	0.3051***	0.1201
UNM	1.2007***	0.9498***	0.9961***	1.3639***	0.9583***
PSI	-1.6655	-2.5646*	-0.7408	-1.6368	-2.6104
GD	-0.0143*	-0.0150*	0.0054	-0.0523***	-0.0108
BA	-0.0461***				
BCON		0.0227			
BIR			0.3511***		
CDR				-0.0531***	
ROA					0.0006
SE	-0.2631***	-0.1214*	-0.4112***	-0.2721***	-0.1462**
Wald Chi2	3433.36	3405.57	4049.56	3140.01	3435.13
Obs.	351	351	351	351	351

, **, * denote statistical significance at 10%, 5% and 1% level, respectively.*

As expected, we report a negative coefficient, which is statistically significant at a 10% level between the level of the NPLs and economic growth. Thus, as the economy expands, businesses tend to experience better sales, increased profits, and improved cash flows. This enables them to meet their financial obligations more effectively, reducing the likelihood of loan defaults. In addition, we report positive coefficients associated with the unemployment rate, which suggest that when unemployment rates rise, a significant portion of the population faces a loss of income or reduced earnings. This financial strain can make it challenging for individuals to meet their loan obligations, increasing the likelihood of defaults and contributing to higher NPLs. These results are well established in the literature focusing on the determinants of NPLs (Ghosh, 2015; Karadima and Louri, 2020). Furthermore, we fail to report statistically significant

results relating inflation, political stability or government debt to the level of NPLs.

5. Conclusions

Our thorough examination of the EU27 countries covering the years 2010–2022 reveals some important insights into the factors that contribute to non-performing loans (NPLs). A noteworthy discovery indicates a strong causative connection between NPLs and the extent of the shadow economy (SE). This association implies that countries with more significant informal or shadow economies have borrowers who are more likely to turn to informal loan markets, which may lessen the need for strict NPL reporting. This issue is further amplified in these countries by the lack of regulatory monitoring. Furthermore, it appears that the shadow economy is influenced in return since data suggests that non-performing loans (NPLs) have an impact on the shadow economy as well. This highlights the complex dynamics of bidirectional causality.

After further analysing the factors, our findings are consistent with the large body of literature already available on non-performing loans. Economic growth is shown to be a positive force and to be negatively correlated with non-performing loans. A growing economy helps companies become more financially stable, which makes it easier for them to repay loans. On the other hand, the correlation that exists between increasing rates of unemployment and higher non-performing loans highlights the financial burden that people bear when they lose their jobs. It's interesting to note that in our analysis, variables like government debt, inflation, and political stability—all contentious topics in previous research—did not show statistically significant connections with NPL levels, pointing to complex dynamics unique to each individual nation.

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