DETERMINANTS OF CORPORATE CREDIT GROWTH IN UKRAINE: THE APPLICATION OF BANK LENDING SURVEY DATA[1]

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Abstract This study investigates the determinants of corporate lending in Ukraine, with a focus on distinguishing between supply and demand factors. It uses a two-step process to build a credit standards index (CSI) based on disaggregated data from a Ukrainian bank lending survey (BLS). This paper describes the factors that are significant for corporate lending development in Ukraine. It contributes to the existing literature by developing a measure of corporate loan supply and analyzing its ability to explain corporate credit growth in Ukraine by using bank-level BLS data. First, a panel ordered logit model is used to transform categorical data into a continuous index that measures the likelihood of credit standard tightening. Second, the study examines how this index affects new corporate lending in both national and foreign currencies. It is found that the credit standard index is influenced by exchange rate movements (with depreciations leading to tighter standards), bank liquidity, and bank competition. It is also demonstrated that the CSI has a negative impact on corporate loans in national currency, with a more pronounced effect on smaller banks.

JEL Codes G22, E44, C33

Keywords supply and demand of corporate lending, bank lending survey data, bank lending standards

1. INTRODUCTION

Crisis events and their effects on the lending market are interesting due to the complex relationship mechanisms behind them. Pham et al. (2021) highlight the importance of exogenous shocks on bank lending. The researchers show that the military conflict with russia-backed separatists in Q1 2014 harmed Ukrainian banks. As a result, conflict-exposed banks generated higher levels of non-performing loans (NPLs) and issued fewer new loans to businesses following the onset of the crisis. These effects are observed more clearly in the local markets that are closer geographically to the conflict area. However, the 2014–2015 crisis was not the only cause of NPL accumulation, but rather a trigger. Vyshnevskyi and Sohn (2023) provide empirical evidence that the NPL problem in Ukraine was caused by related party lending and issues with the banks' capital adequacy. The Ukrainian lending market faced new crises in 2020 and 2022, the latter being triggered by russia's full-scale invasion. The war influenced both supply and demand for corporate loans (NBU, 2022). The decline in business activity decreased demand, and an unfavorable macroeconomic environment reduced the risk appetite of the banks, resulting in tighter lending conditions. This research offers insights into the factors that are significant for the development of corporate lending in Ukraine.

This study examines the determinants of corporate lending in Ukraine. It focuses on two main research questions: (i) What bank-level and macro factors influence proxy banks' decisions to change their lending standards for corporations? (ii) What are the effects of the factors in determining corporate lending in Ukraine, and specifically, what is the impact of corporate lending standards as a loan supply factor? To answer both questions, the author uses

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a two-step process to distinguish between the supply and demand factors of corporate lending.

In the first step, a panel ordered logit model is used to transform categorical survey data into a continuous credit standards index (CSI).[2] In this set-up, a higher index value indicates an increased likelihood of tightening corporate lending standards. The results show that faster economic growth, higher liquidity, and competition among banks lead to looser credit standards for Ukrainian businesses, whereas hryvnia depreciation and elevated interest rates lead to stricter bank requirements for borrowers.

Second, this paper explores the influence of the CSI on new corporate lending, while controlling for economic activity, interbank interest rates, deposit growth, liquidity, and the share of non-performing loans (NPLs). This study demonstrates that in six months the negative effect of tighter lending standards starts to have a bearing on the lower level of new hryvnia corporate lending. Small banks experience more pronounced effects than large banks. Moreover, small banks significantly affect domestic and foreign currency loans. This paper also ascertains the effect of economic activity on total assets, depending on the share of government securities, government bonds, and deposit certificates. GDP growth is found to be positively correlated with both domestic and foreign currency corporate lending, whereas new NPLs are negatively correlated with new corporate lending.

The remainder of this paper is organized as follows. The following sections provide a short description of the corporate lending market in Ukraine. Section 3 surveys the related literature. Sections 4 and 5 describe the bank lending survey data and methodology for this research, respectively. Section 6 presents results, and section 7 provides conclusions.

2. CORPORATE LENDING IN UKRAINE

Corporate lending penetration in Ukraine has been low for many years (see Figure 1). This raises the question of whether the reasons for the slow lending lie with demand or with supply factors; in particular, whether corporations have suppressed the demand for loans, or banks have reduced their willingness to lend. There are several preconditions for the latter, primarily the numerous episodes of crises in Ukraine that decreased the banks' risk appetites and led to the tightening of credit risk assessment approaches.

Prior to 2014, corporate lending was reasonably active, but mainly driven by flawed practices and improper motives. Banks lent extensively to related parties or companies owned by politically influential people, who usually have a low operating income (Pham et al., 2021; Vyshnevskyi and Sohn, 2023). Sometimes, there was no intention to repay the loans. Eventually, when the crisis hit, these loans became NPLs. Moreover, Vyshnevskyi and Sohn (2023) indicate that when NPL shocks occur, then banks may even increase related parties lending.

The russian annexation of Crimea and the war that followed in the Donbas region caused an economic crisis in 2014. Businesses located in occupied territories were directly hit. External shocks triggered turmoil and systemic imbalances that had accumulated during the previous years exploded into a financial crisis, thus reinforcing the disruption. Consequently, the share of NPLs in the total portfolio increased significantly from 16.3% in 2014 to 52.2% in 2018.

Figure 1. Corporate Loans to GDP Ratio

The 2014–2015 crisis was a turning point. Since then, the National Bank of Ukraine (NBU) has considerably improved its supervision and regulations based on international standards, including prudential requirements for credit risk assessments. Thus, the banks were required to revise their credit standards, primarily for corporate loans, and tighten them significantly to improve loan quality. An unfavorable macroeconomic environment suppressed corporate demand for lending. Therefore, the loans to GDP ratio gradually decreased from its peak of 50% in 2014 to approximately 14% in 2022 (Figure 1).

3. THE RELATED LITERATURE

One challenge related to modelling the loan supply is that many of its drivers, such as internal bank loan policies, are non-observable. Qualitative data from bank lending surveys can help extract information about these unobservable variables (Lown and Morgan, 2006; Bassett et al., 2014).

Ricci et al. (2023) reveal that the level of bank lending standards explains heightened bank lending growth during extended periods of easing of lending standards, and the lower growth seen after they are tightened. This insight offers a potential indicator for macroprudential policy, complementing existing metrics such as the credit-to-GDP gap. Through counterfactual analyses focused on business lending in the Netherlands, the authors illustrate the relevance of their survey-based instrument at the macro-level. The study links strong credit growth and softer lending standards to early-warning signs of financial crises and subsequent economic downturns.

Apergis and Chatziantoniou (2021) employ the Autoregressive Distributed Lag (ARDL) method to investigate the role of lending standards in real business cycles. Their research shows that lending conditions are a major factor in defining business cycles, with robust findings over a range of time periods and countries. The study highlights the growing importance of lending standards in explaining real GDP changes prior to the global financial crisis.

[2] Lending and credit standards are used interchangeably.

Filardo and Siklos (2020) contribute to the literature by investigating how shifting bank lending criteria affect economic activity, with an emphasis on global spillovers. They utilize global VARs and construct a cross-country dataset with senior lending officer surveys from 17 economies, focusing on eurozone members. The results show that lending standards – rather than interest rates – play a crucial role in understanding credit patterns. Pre-crisis credit booms were greatly impacted by easier lending standards. In Europe, this effect was greater than in the United States because of Europe's more bank-dependent financial system. The study also emphasizes how looser lending requirements reinforce the stimulatory effects of quantitative easing on the local and international markets. In general, credit conditions and the efficiency of the monetary transmission mechanism are greatly influenced by lending requirements.

Rodano et al. (2018) investigate the impact of segmentation on lending conditions in the Italian banking sector during boom-and-bust periods. In the boom, substandard and performing firms display a 4% interest rate spread threshold. During a financial crisis, banks tighten lending standards, favoring performing firms with 39% more financing than comparable substandard firms. In later years, differences in lending were reduced, and the interest rate spread increased. The study's threshold analysis shows that segmentation explains a larger part of the observed credit differential during the bust. During the crisis, the interest rate spread is close to zero, indicating adjustments due to restricting substandard firms' credit access. The study also shows a progressively larger negative impact of a downgrade on credit allocations during crises and recovery.

This study contributes to the existing literature by using bank-level lending survey (BLS) data to develop a measure of corporate loan supply, and analyzing its ability to explain corporate credit growth in Ukraine. Some well-established literature analyzes credit growth factors using BLS data, but most researchers use aggregated information (Lown and Morgan, 2006). Usually, BLS data is confidential and not available for public use at a disaggregated level. Previous studies have used qualitative data from surveys to separate the supply and demand factors of lending, for instance, in the Euro area (de Bondt et al., 2010; Ciccarelli et al., 2015; Ciccarelli et al., 2013) and the United States (Bassett et al., 2014). However, only a handful of studies have employed bank-level BLS. Wośko (2015) used panel data from the Senior Loan Officers Opinion Survey to model corporate, mortgage, and consumer loan growth in Poland. Pintaric (2016) used bank-level data to develop a credit growth model for Croatia, and found that demand and credit standards have statistically significant effects on the growth of specific loan types.

Hempell and Kok Sørensen (2010) employed a cross-country panel based on a confidential dataset from the Eurosystem's bank lending survey and found that bank lending activity was generally influenced by the ability and willingness of banks to provide loans, especially during the financial crisis. There is also evidence that supply side constraints have a detrimental effect on loan growth – even after adjusting for demand-side effects. Altavilla et al. (2019) derived a measure of loan supply shocks from proprietary bank-level data on credit criteria from the euro area. Using a Bayesian vector autoregressive model, they found that tighter credit standards, internal bank regulations, and loan approval standards result in a prolonged decline in the amount of credit.

This study also contributes to the literature by exploring the imbalances in the Ukrainian banking system. Banks with liquidity surpluses tend to invest in government securities. The study finds that banks with a high share of government securities are susceptible to crowding-out effects, which result in reduced corporate lending and a potential hindrance to economic growth. The crowding-out effect of lending through government debt has also been discussed extensively in a series of recent studies. For instance, Pinardon-Touati (2022) argued that due to constraints on bank credit supply and segmentation across banks, an increase in local government lending can lead to a reduction in aggregate corporate credit and disproportionately affect firms' borrowing from the same bank, potentially leading to an inefficient allocation of resources and lower overall output. This phenomenon has been widely studied from different perspectives in China (Huang et al, 2020) and Mexico (Morais et al., 2021).

4. BANK LENDING SURVEY DATA DESCRIPTION

The NBU has been conducting a quarterly bank lending survey since 2011. The survey aims to help the central bank and other stakeholders better understand lending market conditions and trends from the banks' perspective. It provides general assessments and forecasts of changes in lending standards and conditions for the corporate sector and households, as well as fluctuations in lending demand.

The main question of interest for the research extracted from BLS is on lending standards: "How did the standards for approval of corporate loan applications change within the past quarter?" Figure 2 illustrates that according to

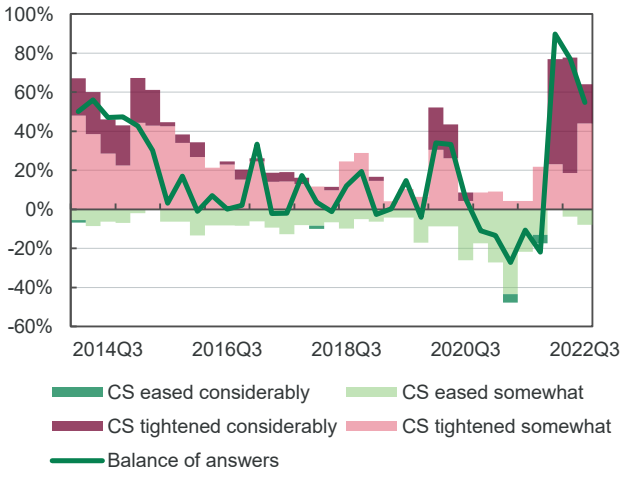

Figure 2. Distribution of BLS Answers for the Question: "How did the standards for approval of corporate loan applications change within the past quarter?"

Note: Background shows the share of answers in total (100%). The balance of answers[3] is weighted by the banks' net assets. A positive balance indicates a tightening of standards for the approval of loan applications.

[3] Balance of answers = 0.5*CS tightened considerably + 0.25*CS tightened somewhat + 0*CS remained unchanged – 0.25* CS eased somewhat – 0.5*CS eased considerably.

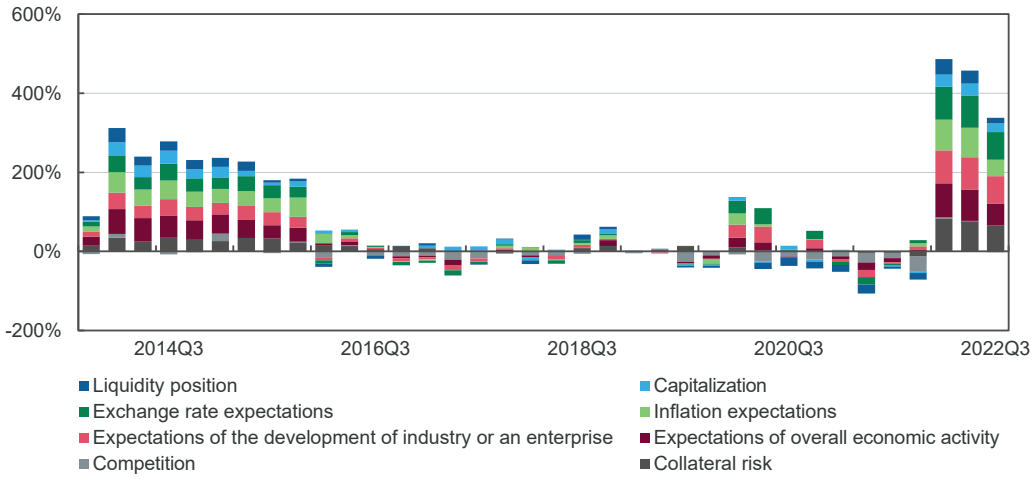

Figure 3. Factors Influencing Banks' Decisions to Change Credit Standards for Corporates According to BLS

the BLS responses, banks tightened their corporate credit standards (CS) in 2014–2015, 2020, and 2022 (all periods of economic crisis).

Economic, exchange rate and inflation expectations pushed banks to offer less favorable corporate lending conditions during crises (Figure 3). In normal times, better liquidity positions and competition encourage banks to loosen their standards. The study identifies proxies to quantitatively assess the factors that explain the decisions of banks to change their credit standards.

Only solvent banks provided BLS answers. Reliable quarterly data are available from Q4 2013 until Q3 2022. During 2015–2016, there was a decrease in the number of banks, and since 2020 the number of surveyed banks has dropped significantly. However, this reduction in respondents did not affect the representativeness of the data: the surveyed institutions have always represented more than 90% of net assets. The panel data are unbalanced, and include 56 banks and 1,249 observations.

5. METHODOLOGY

This study employs a two-step process similar to that described by Wośko (2015). First, categorical data from the BLS are transformed into a continuous CSI, which is a proxy for the supply of corporate loans. Second, we use the CSI to explain the evolution of new corporate lending.

In the first step, BLS answers regarding changes in corporate credit standards are used as a dependent variable. The answers come in five categories: "tightened considerably", "tightened somewhat", "remained unchanged", "eased somewhat" and "eased considerably". Fewer banks indicated that their lending standards eased or tightened considerably, thus, the five categories were combined into three: "eased", "unchanged", and "tightened". This allows for an increase in the number of observations in each remaining category and simplifies the estimation. As these answers are categorically ordered data, a panel ordered logit model, which explains the likelihood of a bank moving from one category to another, was employed.

The dependent variable takes values {1,0,-1} which represents the answers "tightened", "unchanged", and "eased" respectively.

The model for the first step is as follows:

$$z_{i,t} = \sum_q B^q X^q_{i,t}, \quad (1)$$

where $z_{i,t} = \log\left(\frac{P_{i,t}}{1-P_{i,t}}\right)$ is a logit transformation of the probability that bank i during quarter t decides to tighten its corporate standards, $X^q_{i,t}$ is the q^{th} control variable, and B^q is the respective coefficient. The following set of controls was used: regulatory capital adequacy ratio,[4] short-term liquidity ratio (ratio of assets to liabilities with the maturity of less than one year), real GDP growth, exchange rate change (positive values mean depreciation), interbank loan interest rates, and a dummy indicating whether BLS competition has led to tighter or looser credit standards. The fitted values from Model (1) are transformed into a CSI.

The fitted values from the ordered logit model are not limited and can take any real number. Higher fit values indicate an increased probability of tightening credit standards. The Model also estimates the cut-off points, allowing for the classification of the fitted values into categories. As there are three categories, the model produced two cutting points. For easier interpretation, the fitted values are rescaled to range from 0 to 100 using min-max normalization. These rescaled fitted values are used further as the CSI.

In the second step, the CSI is used as a measure of the supply side of corporate lending while controlling for macro variables and bank characteristics. An initial baseline model is then augmented with a series of interactions between the variables. All interactions are demeaned so that the main effects can be interpreted at the mean of the interacted variable.

The dependent variable in the second step represents corporate lending. In Ukraine, gross loans cannot be used because the share of NPLs is high owing to previous crises, and gross loan stock is significantly driven by NPL workouts. Net loans are a better proxy but depend on provisions that vary based on macro conditions. Hence, the volumes of new corporate loans were selected for all models. Separate models for national and foreign currency loans were estimated. To control for inflation and devaluation, the volumes of corporate loans provided during the quarter in national and foreign currencies were taken and then

[4] Descriptions of all the variables are provided in Table 5 (Appendix A).

adjusted to the cumulative change in inflation since 2007 and the exchange rate since 2014, when it became floating.[5]

The baseline model for the second step is the following panel fixed effects regression:

$$\log(\text{loans}_{i,t}) = \beta_0 + \beta_1 \text{CSI}_{i,t-2} + \\ + \textit{control variables} + FE + \epsilon_{i,t}, \quad (2)$$

where $\text{loans}_{t,i}$ are adjusted volumes of new corporate loans in bank *i* in period *t*. The control variables are the short-term liquidity ratio, real GDP growth, new deposit interest rates, new corporate loan interest rates, total deposit growth, the share of NPLs in the loan portfolio, and bank fixed effects (FE). The variable $\text{CSI}_{i,t-2}$ is the normalized values from the first-step model. An exploratory analysis suggests that the effect starts to be significant from the second lag.

Usually, smaller banks tend to be more flexible than larger banks, which allows them to have looser credit standards and to approve loan applications more quickly. Therefore, it was assumed that the effect of a change in credit standards could vary depending on bank size. *The first augmented* model includes the interaction of the CSI with bank size.

$$\log(\text{loans}_{i,t}) = \beta_0 + \beta_1 \text{CSI}_{i,t-2} + \beta_2 \text{size}_{i,t} + \beta_3 \text{CSI}_{i,t-2} \times \\ \times \text{size}_{i,t} + \textit{control variables} + FE + \epsilon_{i,t}, \quad (3)$$

where $\text{size}_{i,t}$ is the share of net assets of bank *i* in total net assets during period *t*.

Following the crisis in 2014–2015, corporate lending penetration was low, resulting in increased bank liquidity. In Ukraine, banks invest excess liquidity in government bonds and deposit certificates because of their low credit risk and attractive interest yields. Additionally, frequent crisis episodes have increased the government's demand for supplementary financial resources, prompting the banks to build up government security portfolios. An adverse macro environment creates preconditions for the crowding-out effect; therefore, it is tested whether and how this effect influences corporate lending during normal and bad times. Consequently, in the *second augmented* model, the effect of real GDP growth interaction on the share of government securities is explored, controlling for periods of positive and negative real GDP growth:

$$\log(\text{loans}_{i,t}) = \beta_0 + \beta_1 \text{CSI}_{i,t-2} + \beta_4 \text{share\_gov}_{i,t} + \beta_5 d_t \times \\ \times GR_t \times \text{share\_gov}_{i,t} + \textit{control variables} + FE + \epsilon_{i,t}, \quad (4)$$

where $\text{share\_gov}_{i,t}$ is the share of government bonds and deposit certificates in the total assets, GR_t is real GDP growth, and $d_{i,t}$ is a dummy variable controlling for the periods of positive and negative real GDP growth (1 if real GDP growth > 0, and 0 otherwise).

6. RESULTS

6.1. First Step

The results of the first step indicate that all the control variables, except for the capital adequacy ratio, are significant (Table 1). Faster economic growth and higher liquidity lead to the easing of credit standards, whereas elevated interbank loans interest rates and exchange rate depreciation stimulate tightening. According to the odds ratios, each additional percentage point in the interbank loan interest rate increases the probability of moving from easing credit standards to remaining unchanged, or from remaining unchanged to tightening, by 4.3%. An exchange rate depreciation of 1% increases the probability of such a move by 2.9%. In contrast, an increase of 1% in the short-term liquidity ratio increases the probability of banks loosening credit standards by 0.7%. If real GDP increases by 1%, the probability increases by 3.2%. Additionally, bank competition leads to looser credit standards. If the bank indicates in the BLS that bank competition eases credit standards, then there is a 93.3% probability that it will be in a category that loosens standards.[6]

To analyze the change in credit standards for the system the fitted values from the ordered logit model in the first step (Table 1, column 1) were aggregated. Aggregation (Figure 4) is conducted by averaging the fitted values and weighting them by each bank's net assets. The weighted average has a good ability to replicate aggregate BLS answers, but now it has clear drivers. The aggregate indicator signals that banks in Ukraine tightened their lending standards during episodes of economic crisis in 2014–2015 and in 2022. The model suggests that the banks generally did not ease their lending standards during most periods. Overall, the aggregated fitted values provide insight into the trends and patterns of lending standards in Ukraine over different periods, thus shedding light on the adjustments made by banks in response to economic conditions and external shocks.

Table 2 reveals that the accuracy of the model is 63.3%. The model has a poor ability to categorize banks that have eased or tightened their lending standards. It is assumed that this problem may be due to the uneven distribution of the BLS answers between categories. However, even if the model cannot clearly distinguish the change of the credit standards, it appears using survey responses as dummies imposes certain limitations. For instance, respondents signal only direction of credit standards change, but there is no scale. Therefore, the model is still useful since it can quantify the supply of corporate loans.

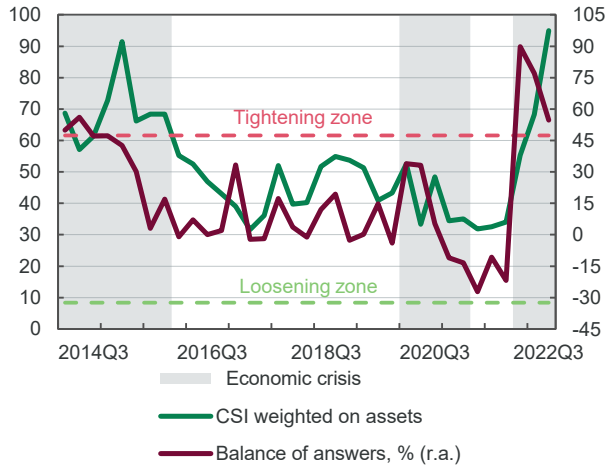

Figure 4. CSI Weighted by the Banks' Assets and Balance of Answers Regarding the Question about Corporate Lending Standards

[5] The exchange rate was fixed before 2014 in Ukraine.

[6] The following cutting points were also obtained: k1 = -0.4 and k2 = 3.6. Assume that p is fitted values. If p < -0.4, then the bank eased its corporate lending standards, if -0.4 < p < 3.6, then it left standards unchanged, and if p > 3.6, then the bank tightened its standards.

Using the fitted values from the model and estimated cut-off points, the decision to change credit standards is determined for each bank and every quarter. The results are compared with actual BLS answers (Figure 5). The estimated answers follow the main trends of the actual BLS answers.

Table 1. Results of the Ordered Logit Model in the First Stage

Variables	Ordered logit	Odds ratio	Pooled OLS
	(1)	(2)	(3)
Interbank loan interest rates	0.042* (0.017)	1.043* (0.017)	0.012** (0.004)
Capital adequacy ratio$_{t-1}$	-0.003 (0.003)	0.997 (0.003)	-0.000 (0.001)
Short term liquidity ratio$_{t-1}$	-0.007** (0.003)	0.993** (0.003)	-0.001* (0.001)
Real GDP growth$_{t-1}$	-0.032*** (0.010)	0.968*** (0.009)	-0.006** (0.002)
Exchange rate growth	0.029*** (0.006)	1.029*** (0.007)	0.007*** (0.002)
Dummy competition led to CS tightening	0.593 (0.349)	1.809 (0.631)	0.128 (0.082)
Dummy competition led to CS easing	-2.701*** (0.226)	0.067*** (0.015)	-0.607*** (0.045)
Constant			-0.006** (0.002)
Cutting point$_1$	-0.399 (0.802)	-0.399 (0.802)	
Cutting point$_2$	3.587*** (0.796)	3.587*** (0.796)	
Sigma	0.271* (0.119)	0.271* (0.119)	
Observations	1,174	1,174	1,174

Note: standard errors in parentheses; clustered on time.
*p < 0.05; ** p < 0.01; *** p < 0.001.

Table 2. Accuracy of the 1st Stage Model

	Eased	Unchanged	Tightened	Total
	(1)	(2)	(3)	(4)
BLS answers	127	754	368	1,249
BLS answers, % of total	10.1%	60.4%	29.5%	
Accuracy rate, % of right answers predicted by the model	11.8%	89.3%	27.7%	63.3%

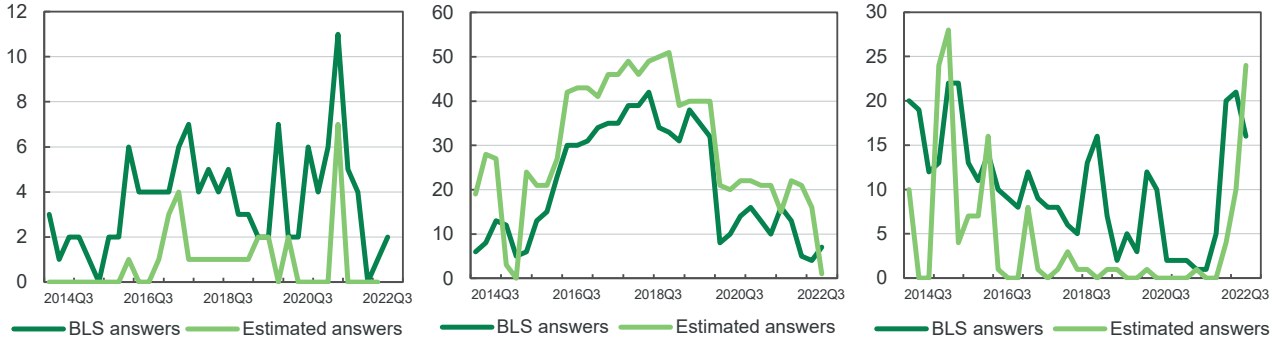

Figure 5. Number of Banks that Make Respective Decisions on Credit Standards According to the Estimated Model Results and Actual BLS Answers

6.2. Second Step

Table 3 presents the results of the analysis based on corporate lending in national currency (columns 1–4) and foreign currency (columns 5–8). Columns (1) and (5) present the baseline models without the CSI. Columns 2 and 6 use the answers from the BLS as dummy variables instead of the CSI. Two dummies are used – one that takes the value of 1 for banks that eased their credit standards, and the other that takes the value of 1 for banks that tightened their credit standards. Columns 3 and 7 present the CSI obtained in the first step. Finally, columns 4 and 8 contain both the CSI and the residuals obtained in step 1 (the residuals are orthogonal to the index). The residuals are computed from the OLS model in column 3 of Table 1.

The modeling results highlight several key relationships. Real GDP growth positively correlates with new corporate lending, thereby suggesting that higher GDP growth is associated with increased lending in both national and foreign currencies. For example, a 1% increase in real GDP is associated with a 1% increase in new corporate lending in the national currency and a 3% increase in foreign currency. Conversely, higher NPL levels negatively affect new corporate lending. For instance, a 1% increase in the share of NPLs is linked to an approximately 0.2% decrease in national currency lending and a 0.3% decrease in foreign currency lending.

The effect of the CSI is significant only for national currency loans. Specifically, an additional unit increase in the CSI decreases the volume of new corporate loans in the national currency by 0.7%, with the decrease starting to be material from the second quarter. Using dummy variables from the BLS, it is found that when banks indicate a decision to tighten their credit standards in the BLS, it leads to a 28.1% decrease in new corporate loans in foreign currency. However, when banks decide to ease their credit standards, new corporate loans in the national currency increase by 16.2%. Since the dummies are limited to two numbers and do not have magnitude, these effects have very wide confidence intervals of 95% and cannot be used in practice. To check for endogeneity, the residuals from the first-step OLS model (Table 1, column 3) were included in the CSI model. These residuals are orthogonal to the CSI. Thus, the insignificant coefficient of the residuals (Table 2, columns 4 and 8) indicates that only the credit standard component mediated by the variables included in the first step is significant for new corporate lending.

Table 4 presents the results of the augmented models for new corporate lending in national (columns 1 and 2) and foreign currencies (columns 3 and 4). In columns 1 and 3, the model includes an interaction term between the CSI and bank size. Columns 2 and 4 show the models with the interaction between real GDP growth and the share of government securities.

The results in Table 4 corroborate those in Table 3 and indicate that all of the interaction terms included in the benchmark models are significant. Additionally, given

Table 3. Results of Baseline Models

	National currency				Foreign currency			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ΔDeposit interest rates	-0.017 (0.014)	-0.016 (0.014)	-0.010 (0.013)	-0.010 (0.013)	-0.035 (0.023)	-0.032 (0.025)	-0.032 (0.023)	-0.032 (0.023)
ΔCorresponding currency loan interest rates	-0.021 (0.011)	-0.023 (0.013)	-0.021 (0.011)	-0.021 (0.011)	-0.107* (0.045)	-0.112* (0.048)	-0.066 (0.038)	-0.066 (0.038)
Log(NPL)	-0.210*** (0.032)	-0.220*** (0.032)	-0.240*** (0.030)	-0.240*** (0.030)	-0.290*** (0.050)	-0.290*** (0.051)	-0.320*** (0.058)	-0.320*** (0.059)
Short term liquidity ratio	0.002 (0.002)	0.001 (0.002)	0.001 (0.002)	0.001 (0.002)	0.004 (0.002)	0.003 (0.002)	0.003 (0.002)	0.003 (0.002)
Real GDP growth	0.020*** (0.003)	0.010*** (0.004)	0.010*** (0.004)	0.010*** (0.004)	0.030*** (0.007)	0.020** (0.007)	0.030*** (0.008)	0.030*** (0.009)
Deposits growth	-0.000 (0.001)	-0.000 (0.001)	0.000 (0.001)	0.000 (0.001)	0.002 (0.002)	0.002 (0.002)	0.002 (0.002)	0.002 (0.002)
CSI_{t-2}			-0.007*** (0.002)	-0.007*** (0.002)			-0.007 (0.004)	-0.007 (0.004)
BLS dummy indicating CS $tightening_{t-1}$		-0.082 (0.077)				-0.281* (0.114)		
BLS dummy indicating CS $easening_{t-1}$		0.162** (0.061)				0.048 (0.108)		
OLS residuals from 1^{st} $step_{t-2}$				0.004 (0.054)				0.000 (0.111)
Constant	-1.120*** (0.083)	-2.310*** (0.536)	-0.790*** (0.112)	-0.790*** (0.111)	-2.900*** (0.140)	-3.970*** (0.497)	-2.540*** (0.252)	-2.540*** (0.250)
Bank fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	956	956	905	905	927	927	878	878

Note: Standard errors in parentheses; clustered on time.
*p < 0.05; ** p < 0.01; *** p < 0.001.

Table 4. Results of Benchmark Models

	National currency		Foreign currency	
	(1)	(2)	(3)	(4)
ΔDeposit interest rates	-0.005 (0.013)	-0.008 (0.012)	-0.028 (0.023)	-0.027 (0.022)
ΔCorresponding currency loan interest rates	-0.021 (0.011)	-0.021 (0.011)	-0.066 (0.038)	-0.068 (0.037)
Log(NPL)	-0.242*** (0.029)	-0.249*** (0.033)	-0.308*** (0.056)	-0.331*** (0.059)
Short term liquidity ratio	0.001 (0.002)	0.001 (0.002)	0.003 (0.002)	0.003 (0.002)
Real GDP growth	0.016*** (0.004)	0.014** (0.004)	0.032*** (0.008)	0.030*** (0.008)
Deposits growth	0.000 (0.001)	0.001 (0.001)	0.002 (0.002)	0.002 (0.002)
CSI_{t-2}	-0.008*** (0.002)	-0.007*** (0.002)	-0.008* (0.004)	-0.007 (0.004)
Size of the bank	-0.097*** (0.017)		-0.085* (0.033)	
CSI_{t-2} × size of the bank	0.001*** (0.000)		0.001* (0.000)	
Share of gov. securities		-0.005 (0.007)		-0.003 (0.008)
Real GDP growth<0 × share of gov. securities		-0.001*** (0.000)		-0.001** (0.000)
Real GDP growth>0 × share of gov. securities		-0.000 (0.001)		0.002 (0.002)
Constant	-0.675*** (0.106)	-0.789*** (0.114)	-2.421*** (0.242)	-2.557*** (0.260)
Individual fixed effects	Yes	Yes	Yes	Yes
Observations	905	905	878	878

Note: Standard errors in parentheses; clustered on time.
*p < 0.05; ** p < 0.01; *** p < 0.001.

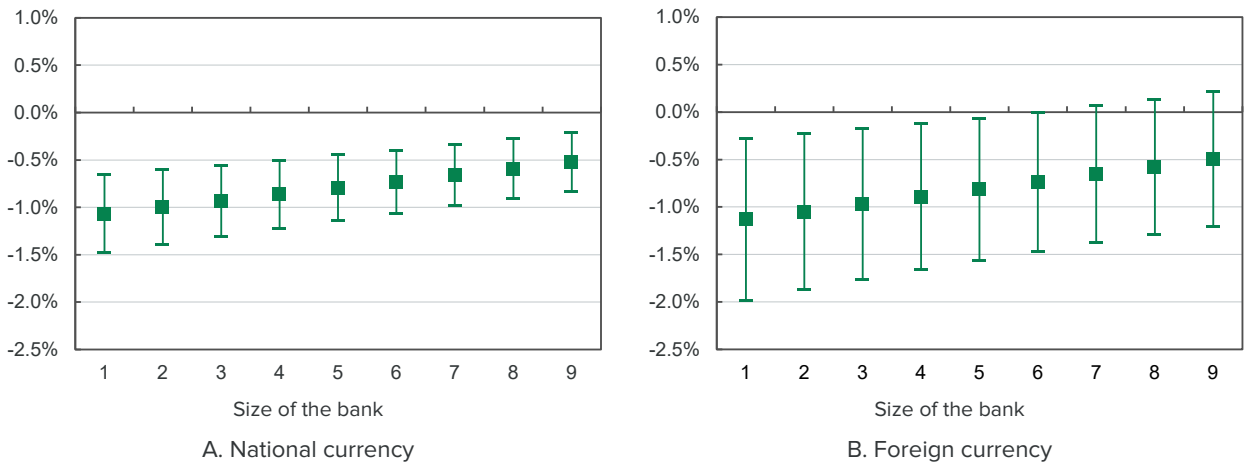

Figure 6. Marginal Effects of Tightening Credit Standards on New Corporate Lending, Depending on the Size of the Bank (Measured as a Bank's Share of Total Net Assets, %)

Note: whiskers indicate a 95% confidence interval.

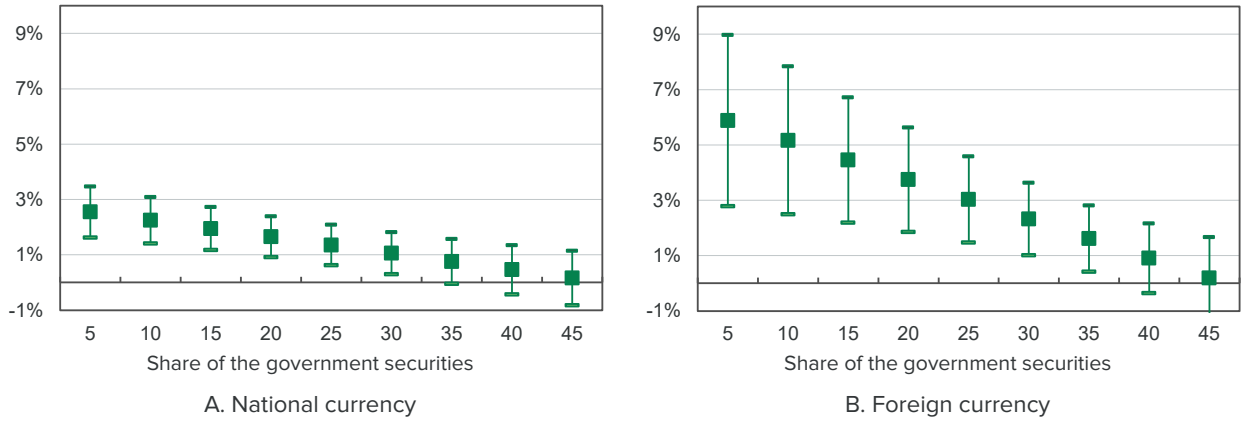

Figure 7. Marginal Effects of Real GDP Growth on New Corporate Lending Depending on the Share of Government Securities (Government Bonds and Deposit Certificates) in Total Assets

Note: whiskers indicate a 95% confidence interval.

the significant negative dependence between credit standard tightening and new corporate lending, I find that bank size matters, with the effect of a credit standards change being stronger for small banks. For small banks, the CSI has a negative impact on corporate loans in both national (Figure 6A) and foreign currencies (Figure 6B). An additional 1% increase in bank size enhances the CSI effect by 0.08% for foreign currency loans and by 0.07% for national currency loans.

From Table 4, we can conclude that the impact of real GDP growth interaction with the share of government securities is significant only during periods of negative real GDP growth. The positive correlation between GDP growth and new corporate lending is weaker for banks with a higher share of government securities in their assets (see Figure 7). During an economic decline, interest rates for risk-free assets increase. Therefore, having a high share of government securities in the portfolio provides banks with increased interest income and protects their ability to lend to corporations.

7. CONCLUSION

This study examined the determinants of Ukrainian banks' new corporate lending practices. The use of unbalanced panel data from the 4th quarter of 2013 to the 3rd quarter of 2022 shows that positive real GDP growth, bank competition, and higher liquidity lead to looser credit standards, whereas higher interest rates and exchange rate depreciation cause standards to tighten. Tightening credit standards decreases national currency corporate lending in half a year, and smaller banks experience a stronger effect in comparison with larger banks. A higher share of NPLs reduces loans in both national and foreign currencies. Real GDP growth positively correlates with new corporate loans in both national and foreign currencies. The effect of negative economic activity on loans in both national and foreign currencies is weaker for banks with a higher share of government securities.

Usually supply factors in corporate lending are latent and unobservable. The study helps to quantify the supply for business loans. Moreover, this paper explores the factors determining corporate lending development in Ukraine.

The study still has the potential to reveal more results through using other methodologies. Papers on credit growth determinants also implement time series models by applying aggregated data. However, the availability of data at the bank-level allows the use, for instance, of a local projection method, which produces comparable results.

REFERENCES

Altavilla, C., Darracq Pariès, M., Nicoletti, G. (2019). Loan supply, credit markets and the euro area financial crisis. Journal of Banking & Finance, 109, 105658. https://doi.org/10.1016/j.jbankfin.2019.105658

Apergis, N., Chatziantoniou, I. (2021). Credit supply conditions and business cycles: New evidence from bank lending survey data. Research in International Business and Finance, 55, 101332. https://doi.org/10.1016/j.ribaf.2020.101332

Bassett, W. F., Chosak, M. B., Driscoll, J. C., Zakrajšek, E. (2014). Changes in bank lending standards and the macroeconomy. Journal of Monetary Economics, 62, 23–40. https://doi.org/10.1016/j.jmoneco.2013.12.005

Ciccarelli, M., Maddaloni, A., Peydró, J.-L. (2013). Heterogeneous transmission mechanism: Monetary policy and financial fragility in the euro area. ECB Working Paper Series, 1527. Frankfurt am Main: European Central Bank. Retrieved from https://www.ecb.europa.eu/pub/pdf/scpwps/ecbwp1527.pdf

Ciccarelli, M., Maddaloni, A., Peydró, J.-L. (2015). Trusting the bankers: A new look at the credit channel of monetary policy. Review of Economic Dynamics,18(4), 979–1002. https://doi.org/10.1016/j.red.2014.11.002

de Bondt, G., Maddaloni, A., Peydró, J.-L., Scopel, S. (2010). The euro area bank lending survey matters: Empirical evidence for credit and output growth. ECB Working

Paper Series, 1130. Frankfurt am Main: European Central Bank. Retrieved from https://www.ecb.europa.eu//pub/pdf/scpwps/ecbwp1160.pdf

Filardo, A. J., Siklos, P. L. (2020). The cross-border credit channel and lending standards surveys. Journal of International Financial Markets, Institutions and Money, 67, 101206. https://doi.org/10.1016/j.intfin.2020.101206

Hempell, H. S., Kok Sørensen, C. (2010). The impact of supply constraints on bank lending in the euro area – crisis induced crunching? ECB Working Paper Series, 1262. Frankfurt am Main: European Central Bank. Retrieved from https://www.ecb.europa.eu/pub/pdf/scpwps/ecbwp1262.pdf

Huang, Y., Pagano, M., Panizza, U. (2020). Local crowding out in China. The Journal of Finance, 75(6), 2855–2898. https://doi.org/10.1111/jofi.12966

Lown, C. S., Morgan, D. P. (2006). The credit cycle and the business cycle: New findings using the loan officer opinion survey. Journal of Money, Credit and Banking, 38(6), 1575–1597. https://doi.org/10.1353/mcb.2006.0086

Morais, B., Perez-Estrada, J., Peydró, J.-L., Ruiz-Ortega, C. (2021). Expansionary austerity: Reallocating credit amid fiscal consolidation. CEPR Discussion Papers, 16511. Paris & London: Centre for Economic Policy Research. Retrieved from https://cepr.org/publications/dp16511

NBU (2022). Financial Stability Report, June 2022. Kyiv: National Bank of Ukraine. Retrieved from https://bank.gov.ua/admin_uploads/article/FSR_2022-H1_eng.pdf

Pham, T., Talavera, O., Tsapin, O. (2021). Shock contagion, asset quality and lending behaviour: The case of war in Eastern Ukraine. Kyklos, 74(2), 243–269. https://doi.org/10.1111/kykl.12261

Pinardon-Touati, N. (2022). The Crowding Out Effect of Local Government Debt: Micro- and Macro-Estimates. Retrieved from https://npinardontouati.github.io/files/JMP_PinardonTouati.pdf

Pintaric, M. (2016). What is the effect of credit standards and credit demand on loan growth? Evidence from the Croatian Bank Lending Survey. Comparative Economic Studies, 58(3), 335–358. https://doi.org/10.1057/s41294-016-0004-2

Ricci, L., Soggia, G., Trimarchi, L. (2023). The impact of bank lending standards on credit to firms'. Journal of Banking & Finance, 152, 106880. https://doi.org/10.1016/j.jbankfin.2023.106880

Rodano, G., Serrano-Velarde, N., Tarantino, E. (2018). Lending standards over the credit cycle'. The Review of Financial Studies, 31(8), 2943–2982. https://doi.org/10.1093/rfs/hhy023

Vyshnevskyi, I., Sohn, W. (2023). Nonperforming loans and related lending: Evidence from Ukraine. Emerging Markets Review, 57, 101069. https://doi.org/10.1016/j.ememar.2023.101069

Wośko, Z. (2015). Modelling credit growth in commercial banks with the use of data from Senior Loan Officers Opinion Survey. Warsaw: NBP Working Paper, 210. Narodowy Bank Polski. Retrieved from https://static.nbp.pl/publikacje/materialy-i-studia/210_en.pdf

APPENDIX A. TABLES

Table 5. Summary Statistics

Variable	Description	Data structure	Obs	Mean	Std.	Min	Max
Capital adequacy	Capital adequacy ratio, %	Bank-level	1,249	28.2	31.1	1.3	416.1
Liquidity	Short-term liquidity ratio, %	Bank-level	1,249	100.6	36.1	46.1	358.9
Inflation	CPI change, y-o-y, %	Macro	1,249	14.6	12.4	0.5	57.7
Exchange rate	Average exchange rate, UAH/USD	Macro	1,249	24.9	5.2	8.0	36.6
Economic activity	Real GDP growth, y-o-y, %	Macro	1,249	-1.9	10.5	-46.5	7.8
Interbank interest rates	Average quarterly interest rates on new interbank loans, %	Macro	1,249	13.7	4.4	5.4	23.3
Real corporate loans in foreign currency	Adjusted on exchange new corporate loans in foreign currency, bn. UAH	Bank-level	1,249	0.8	2.5	0.0	26.3
Real corporate loans in national currency	Adjusted on inflation new corporate loans in national currency, bn. UAH	Bank-level	1,249	2.2	4.8	0.0	38.6
Deposit interest rates	Quarterly averaged new deposits interest rates, %	Bank-level	1,249	9.9	3.6	0.0	22.0
National currency loan interest rates	Quarterly averaged new national currency loans interest rates, %	Bank-level	1,249	19.3	4.5	5.4	48.0
Foreign currency loan interest rates	Quarterly averaged new foreign currency loans interest rates, %	Bank-level	1,249	10.0	5.5	1.1	48.0
NPL level	Share of the non-performing loans in total portfolio, %	Bank-level	1,249	26.4	38.7	0.0	862.1
Deposits	Total deposits growth, y-o-y, %	Bank-level	1,249	22.1	45.9	-78.1	660.5
Share of government securities	Share of government bonds and deposit certificates in total assets, %	Bank-level	1,249	16.2	13.6	0.0	76.6
Size of bank	Share of the net assets in total, %	Bank-level	1,249	2.8	5.0	0.0	27.3
Dummy competition led to CS easing	1 if the bank indicated in the BLS that competition led to CS easing	Bank-level	1,249	0.1	0.2	0.0	1.0
Dummy competition led to CS tightening	1 if the bank indicated in the BLS that competition led to CS tightening	Bank-level	1,249	0.2	0.4	0.0	1.0

Note: The NBU ended the transition from a short-term liquidity ratio to more complex indicators (net stable funding ratio and liquidity coverage ratio (NSFR)) in 2022, and stopped calculating the short-term liquidity ratio. Therefore, the short-term liquidity ratio is approximated to the change in the NSFR during 2022.