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# Effects of Banking Sector Cleanup on Lending Conditions: Evidence from Ukraine

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# Effects of Banking Sector Cleanup on Lending Conditions: Evidence from Ukraine

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**Abstract**

This study investigates the causal effects of the banking sector cleanup on lending conditions. To overcome the banking crisis consequences of 2014–2016, the National Bank of Ukraine changed its regulation approach to strict intolerance towards financially weak and opaque banks and launched the development of the macroprudential regulation concept. As a result, a significant number of banks, accounting for approximately one-third of pre-crisis banking assets, were declared insolvent or withdrawn from the market for other reasons. We analyze bank-firm-loan level data merged with information from borrowers' financial statements. Examining a significant set of loan, bank, and borrower characteristics, we cannot conclude that lending conditions have definitely tightened since the cleanup of the banking sector. On the one hand, banks reduce large exposures in response to stricter regulatory requirements, primarily for lending to related parties, thereby decreasing the loan amount on average. On the other hand, loan interest rates decline due to monetary policy easing. As the risks for banks gradually decreased over time, interest spreads also narrowed, which was reflected in lower loan prices. At the same time, banks deteriorate lending conditions for loss-making firms: loan size significantly decreases compared to the whole sample of firms, and interest rates rise. Furthermore, bank requirements for financial performance of corporates become more stringent and generally do not ease to pre-policy levels over time. Finally, the results suggest that the crucial factors for corporate borrowers to receive a loan from a new bank after their bank closure are firm profitability at the time of a new match and loans quality in closed banks.

**Keywords:** banking sector cleanup, bank liquidations, lending conditions
**JEL Classification:** C21, C41, G21, G28

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# 1 Introduction

In 2014–2015, the Ukrainian banking sector experienced a systemic crisis induced by building up of large-scale structural imbalances and the absence of effective banking regulation, causing the emergence of a significant number of captive banks solely intended to finance their shareholders' businesses and serve the interests of business groups. State-owned banks lent excessively to companies belonging to politically exposed persons (nearly two-thirds of their credit portfolio). Consequently, during the crisis, the banking sector suffered from low liquidity and substantial maturity mismatches.[1]

To overcome the crisis consequences and relaunch the banking system, the National Bank of Ukraine (NBU) changed its regulation approach to strict intolerance towards financially weak and opaque banks and launched development of the macroprudential regulation concept. The new rules primarily focused on stronger requirements for credit risk assessment, lending to related parties, and disclosure of the banks' ownership structure. These measures have enhanced the banking sector's transparency, thereby solving a number of systemic problems. However, hidden problems were revealed that forced banks to recognize crisis-related costs, including complete recognizing impaired assets and making required provisions. As a result, the share of nonperforming loans increased to over half of all loans in 2017 (see Figure 1a). Some banks were unable to cover these losses with their capital. Ultimately, from early 2014, 90 banks, accounting for about a third of pre-crisis banking assets, were declared insolvent or withdrawn from the market for other reasons.

The large-scale reforms in the bank regulation and supervision field, accompanied by numerous license revocations from financially weak, opaque, and fraudulent banks, showed their effectiveness. The financial sector has become more transparent and stable, has weathered the coronavirus crisis without significant losses, and in the current conditions, banks continue to operate smoothly. Nevertheless, little is known about the possible negative impact of stricter regulation on lending standards.

We therefore hypothesize that tighter regulation exacerbated by the economic crisis aftermath may have strengthened lending standards due to the more conservative banks approach, thereby reducing lending supply. The loan portfolio dynamic in 2016–2019 was slow-moving, despite the growth in nominal gross domestic product (GDP), resulted in decreasing credit-to-GDP ratio (see Figure 1b). However, we believe that credit availability has gradually regularised.

This study aims to investigate the causal impact of the banking sector cleanup on bank lending conditions by examining changes in loan interest rates, amounts, and maturities. We also determine whether banks have tightened borrowers' financial performance requirements, specifically for non-profitable firms, and whether firms experienced a bank closure were able to receive loans from other banks, how quickly, and on what terms. Thus, this study is interested in whether credit availability has declined after the banking sector cleanup and if it has levelled off over time.

[1] Macroprudential Policy Strategy, National Bank of Ukraine.

Under the ongoing economic crisis, productive capacity of the Ukrainian economy has diminished substantially, and inflationary pressure remains high. In this context, financial institutions play a critical role for reconstruction and economic recovery, and bank loan financing is vital for capital-intensive industries and firms to provide rapid growth and generate export earnings. The credit availability to borrowers is currently more crucial than ever. Recently, banks have maintained generally accepted lending standards, and the corporate sector has become more transparent and profitable. Nevertheless, losses are inevitable; the destruction of production and transport infrastructure and the decline in domestic and foreign demand significantly affected borrowers' solvency. In response, banks are adjusting their lending standards when offering loans. In this regard, the study contributes to a deeper understanding of credit market trends, allowing to apply the most relevant tools to help banks continue and expand lending to support the Ukrainian economy financially.

Therefore, this study considers the following research questions:

(i) How have bank lending conditions changed following the cleanup of the banking sector? Have lending conditions levelled off over time?

(ii) How have banks changed firm performance requirements after the banking sector cleanup?

(iii) What factors influence a firm's ability to obtain a loan from a new bank after its bank was closed? How long did it take to obtain a new loan?

(iv) Have lending conditions changed for firms experienced a partner bank closure compared with those that did not?

We find that the loan amount on average decreases since banks reduce large exposures in response to stricter regulatory requirements, primarily for lending to related parties. At the same time, loan interest rates decline as a result of monetary policy easing. As the risks for banks gradually decreased, interest spreads also narrowed, which was reflected in lower loan prices. Furthermore, banks worsen lending conditions for loss-making firms, thereby beginning to reject them; the average loan size decreases significantly compared to the whole sample of firms, and interest rates for such firms become higher.

The results also suggest that bank requirements for borrowers' financial conditions become more stringent after the banking sector cleanup and generally do not level off over time.

We conclude that the crucial factors for corporate borrowers to receive a loan from a new bank after their bank closure are firm profitability at the time of a new match and the quality of loans in closed banks. In healthy banks (that never close), the chances of obtaining a loan for profitable borrowers increase considerably in contrast to weak banks (that further close), where the profitability factor is insignificant. The average time to receive a new loan from a healthy bank is two-fold higher than that from a weak bank.

Our analysis of firms that faced bank closures showed that their performance deteriorated after the banking sector cleanup compared to firms that did not experience

bank failures. Nevertheless, banks were willing to lend to such firms but in smaller amounts and at higher interest rates.

The remainder of this paper is organized as follows. Section 2 describes the related literature. Section 3 introduces the bank-firm-loan level and firm-level data. In Section 4, we evaluate the causal effects of the banking sector cleanup on lending conditions. In Section 5, we explore the changes in bank requirements for the financial stance of firms. In Section 6, we perform a duration analysis to examine the factors that influence a firm's ability to obtain a loan from a new bank after the previous bank closure. In Section 7, we analyze whether the loan amount, interest rate, maturity, and other financial requirements change for firms that experienced their bank closure compared to those that did not. Section 8 concludes.

# 2 Related literature

This study contributes to the growing literature on the implications of *bank failures*. We examine whether bank lending conditions and requirements for firm performance changed following the cleanup of the banking sector and if they levelled off over time. We also investigate whether lending conditions tightened for loss-making firms and firms that faced bank closures compared to those that did not.

Extensive literature suggests that bank failures cause considerable damage to the financial system and the real sector because of crucial role of banks in financial intermediation in any economy. Bank closures can affect the economy in several ways. Calomiris and Mason (2003) find evidence that the contraction of loan supply associated with bank distress explains substantial variation in state income growth. Ashcraft (2005) shows that the closings of bank subsidiaries lead to a significant decline in bank lending, and then permanently reduce the real country income. Kandrac (2014) suggests that bank failures cause lower income and compensation growth, higher poverty rates, and lower employment. Minamihashi (2011) shows that firms are forced to decrease their investments because of the cessation of lending by closed banks. Githinji-Muriithi (2017) observes that surviving banks may reduce lending due to increased uncertainty about the solvency of borrowers, forcing firms to invest less, and thereby reducing GDP. Contreras, Ghosh, and Hasan (2023) indicate that bank failures increase income inequality, explained by an overall reduction in lending to small businesses. Toussaint-Comeau, Wang, and Newberger (2020) examine the impact of bank closings on local areas and find a cumulative decline in aggregate small business lending in neighborhoods for up to three years.

This research expands the existing literature on *bank-borrower relationships* by studying the factors affecting ability of Ukrainian firms to obtain loans from new banks after the closure of their current banks. Michelangeli, Peydró, and Sette (2020) find that borrower and bank factors are equally material in causing and explaining loan acceptance, but borrower factors are more substantial for pricing. Moreover, banks that supply less credit accept riskier borrowers. Berger and Udell (1995) find that borrowers with longer banking relationships receive loans with lower interest rates and are less likely to pledge collateral. Ongena and Smith (2001) analyze the duration of bank relationships and find that firms are more likely to leave a bank as the relationship matures, whereas small, profitable, and highly leveraged

firms maintain shorter bank relationships, similar to firms with multiple bank relationships. Farinha and Santos (2002) show that most firms obtain loans for the first time from a single bank; however, shortly thereafter, some begin to borrow from several banks. Additionally, the longer the duration of a single relationship, the higher the likelihood that a firm will replace a single relationship with multiple relationships. Graham, Li, and Qiu (2008) suggest that loans initiated after restatement have significantly higher spreads, shorter maturities, a higher likelihood of being secured, and more covenant restrictions than those initiated before restatement.

Several studies focus on a firm's decision to *switch to a new bank*. Bonfim, Nogueira, and Ongena (2020) study the impact of bank branch closures on loan conditions. The authors find that firms that purposely switch banks receive new loans at lower interest rates; however, firms that transfer to other banks after the closure of a nearby branch do not receive such a discount. Ioannidou and Ongena (2010) show that a loan from a new bank has a significantly lower lending rate than a comparable new loan from the firm's current bank. The new bank first lowers the lending rate but eventually raises it sharply.

This paper also broadens the literature concerning *ineffective banking regulation* and *regulatory forbearance*. Brown and Dinç (2011) show that a government is less likely to close a failing bank if the banking system is not stable. Kang, Lowery, and Wardlaw (2014) conclude that delayed closures are driven by a desire to defer costs, aversion to closing the largest and smallest troubled banks, and political influence. Kletzer and Dekle (2005) provide a Japanese economy model with financial intermediation, wherein regulatory forbearance and a high corporate reliance on bank borrowing and public deposit insurance cause a permanent decline in economic growth and an endogenous banking crisis. Chari, Jain, and Kulkarni (2021) deliver evidence that forbearance measures during the global financial crisis incentivize banks to hide the quality of assets, and as a result the build-up of stressed assets in the system, that postpones costly bank recapitalization. Gropp, Ongena, Rocholl, and Saadi (2022) find that the states in the United States with less regulatory forbearance during the financial crisis demonstrate a better productivity growth path after the crisis, with more establishment entries, job creation, employment and wages, patents, and output growth.

This study contributes to the extensive empirical literature on the effects of the banking sector cleanup and the development of analytical tools for further analysis of credit availability and lending standards under the influence of structural changes in the banking sector.

# 3 Data description

In this study, we employ bank-firm-loan-level data merged with information on firm performance.

Bank-firm-loan data are derived from reporting form on bank exposures to counterparties, provided by banks monthly to the NBU, and cover the period from 2007 to 2021. Data on active operations with borrowers are reflected in this form if, as of the reporting date, the total amount of all bank claims, financial liabilities pro-

vided by the bank, and debt written off for one counterparty are UAH 2 million or more. The data contain information regarding the loan currency, amount, interest rate, maturity, loan quality, collateral, bank-firm affiliation, and other broad loan characteristics. We solely subset data on new loans for corporate borrowers in the national currency, as an object of our interest.

Firm-level data on firm performance are retrieved from annual balance sheets and reports on financial results between 2009 and 2020. We merge these data with bank-firm-loan level data by taking the values as of the beginning of the year and matching them on the firm's unique identifiers.

When analyzing lending conditions, we consider bank-firm-loan-level data for variables such as loan amount, interest rate, and maturity. To explore changes in firm performance, we use firm-level variables, such as a binary variable, if a firm is profitable or loss-making, leverage ratio, return on assets, and return on equity ratio. We consider the post-policy period starting from 2017Q2 because the primary measures to clean up the sector had been established by then.

The total number of observations in our database is 152,870 with 16,150 unique firms. When analyzing firm performance, the database is contracted to 68,066 records with 4,884 unique firms, as not all financial data on firms are available.

The loan, firm, and bank descriptive statistics before and after the cleanup of the banking sector are presented in Table 1. Most firms have single-bank relationships, that is, they obtain loans from only one bank. Before the cleanup of the banking sector, the share of these firms was 65%, and after implementing the policy, this increased to 73%. In our database, the share of firms affiliated with banks before the policy is 99%, while after is 1%. This is due to the fact that loans to related parties were mostly issued by later closed banks, as well as tighter regulation of lending to related parties after the cleanup of the banking sector. All loan characteristics of interest to us, except maturity, declined on average in the post-policy period. The bank size remains almost the same on average as before the policy period.

Table 2 shows the loan and firm descriptive statistics before and after the banking sector cleanup by firm size group. For micro-firms (revenue $<$ 2 million EUR), the loan amount was approximately halved, while for large corporations (revenue $>$ 50 million EUR), the loan size increased. Interest rates have decreased for all firms, but the trend continued: the smaller the firm, the higher its interest rate.

Descriptive statistics for the survival database within a firm group are presented in Table 6. The survival database includes loans to (a) firms received new loans from healthy banks (that never close), (b) firms received new loans from weak banks (that further close), and (c) firms that never match the new bank. The dataset comprises firms that have both single and multiple relationships with banks. In this database, the quality of loans in previously closed banks is a categorical variable, as data on the number of days past due are not available for all periods. This variable equals 1 if the number of days past due is less than 30 days, 2 if the number of days past due is from 31 to 90 days, and 3 if more than 91 days.

The entire database comprises 2,256 records with 468 new matches. Most firms did not receive new loans (80%). Firms that successfully matched a new bank received new loans from healthy banks (80%).

# 4 Banking sector cleanup effects on lending conditions

## 4.1 Empirical strategy

We begin our analysis by examining the lending conditions following the banking sector cleanup. Specifically, we are interested in whether credit availability has declined after banking sector reforms and stabilized over time, how banks changed lending conditions following structural changes in the banking sector, and how requirements vary depending on the borrower and bank performance. To explore the causality of tighter lending regulation, we compare the amount, interest rate, and maturity of the loans granted after the policy intervention period and those issued before that.

Thus, we face with a need to determine *treatment effects*, which are typically calculated by comparing the outcomes of a group of objects exposed to a factor whose influence is to be determined (*treatment group*) and those not exposed (*control group*). A related concern in this field is how to separate the effects of other confounding factors (*covariates*) influencing the outcome from the effect of the factor under study. There is always a high probability of being included in the treatment group such as objects with significant systematic differences from those in the control group, which does not allow the elimination of confounding effects that lead to a selection error in the estimates of the treatment effect (*selection bias*). If we assume that the objects are randomly distributed between groups (*random assignment*), both the observed and unobserved covariates are equally distributed in the treatment and control groups, ensuring an unbiased estimate of the treatment effect. In this context, matching methods are typically used (a) as a procedure to match similar treated and untreated objects on their covariates (Cameron & Trivedi, 2005) and (b) as a method to reduce bias in the estimates of the treatment effect (Stuart, 2010).

Following Bonfim et al. (2020) we employ *coarsened exact matching* to set the similarity of loans on various combinations of their characteristics and ensure the unbiased estimate of the policy effect. This method is most suitable for data with both continuous and categorical variables, primarily used in this study (Stuart, 2010). It is also significantly faster than other methods, which is preferable for large datasets (King & Nielsen, 2019). The basic intuition behind this matching method is as follows. Firstly, each variable is coarsened to reduce the level of data granularity, implying binning the numerical values and grouping the categorical values. Secondly, the coarsened data are matched by applying the exact matching method to find all covariates combinations with at least one control and one treatment record (*stratum*), whereas all unmatched records are discarded. Additionally, weights are calculated for each record to ensure that (a) the proportion of matched treatment and control records across the whole sample is maintained within each stratum after weighting and (b) the weighted number of records equals the number of unweighted records within the stratum.

Finally, the causal effect on the outcome of interest is evaluated using matched data. We estimate the treatment effect and its standard errors by fitting a regression model that incorporates the matching weights with the outcome as an independent

variable and the treatment and covariates as predictors. A linear regression model is employed for continuous outcomes, whereas a logistic regression model is used for binary outcomes. To estimate the average treatment effect on the treated, a g-computation is performed using clustered standard errors.

We select loans for the treatment and control groups, as shown in Figure 2. The sample includes 152,870 new loans with 16,150 unique firms. The treatment group comprises loans issued by banks from 2017Q1 to 2021. To construct the control and treatment groups, we explore a number of macroeconomic variables and bank, firm, and loan observable characteristics that may affect lending conditions in our analysis, and thus we match loans on them. A list of covariates tested within the different matching strategies is presented in Table 3.

We assign range intervals for continuous variables based on their historical distributions. We examine different matching strategies, starting with a minimal set of covariates and then expanding it to ensure a trade-off between the number of matches and distribution similarity of covariates across groups and to control the permanency of the effect for robustness. We perform $k$:1 matching, which pairs one treated loan to firm $i$ from bank $j$ with $k$ control loans. The quality of matching is examined by balancing statistics, such as the standardized mean difference, variance ratio, and empirical cumulative density function statistic. For robustness checks, we apply propensity score matching.

At the firm level, we match loans on size and ownership structure to make firms comparable in their key characteristics. Recall that lending conditions may vary significantly across firm size groups (see Table 2) and ownership types (see Figure 1c). We also match on firm's industry to capture sector variations in lending conditions. Among the observable bank characteristics that can affect lending conditions, we focus on bank size and ownership. Figure 1d shows the differences in interest rates across banks with different forms of ownership. Finally, we add the loan size and maturity to make loans similar in their key terms. When analyzing the policy causal effects on loan size and maturity, we exclude these variables from the covariates respectively.

As suggested by Bonfim et al. (2020), we feature various controls to consider aggregate shocks to ensure that loans are issued under similar macroeconomic conditions, such as key policy rate, real GDP growth, and the quarter wherein the loan is granted. However, matching specifications with these covariates yielded poor balance statistics; therefore, they were not included in the final matching model. We also looked at indicators of multiple firm-bank relationships and related parties that were not included in the final estimation for the same reason.

Lending conditions under study include the loan amount measured in thousands of EUR equivalent, the maturity measured in days, the nominal interest rate in percent, and the interest rate spread (difference between the nominal interest rate and the interbank rate) in percentage points. To answer the question of whether credit availability levels off over time, we compare the difference in characteristics of loans granted at different post-policy periods, such as 1–6 months, 7–12 months, and more than 12 months after the banking sector cleanup was completed. The first subsample is set by adding to observations from the pre-policy period loans issued in the first six months of the post-policy period. Similarly, the second and

third subsamples are constructed by adding to the records of the pre-policy period loans issued in the period from 7 to 12 months and more than 12 months after the cleanup of the banking sector, respectively. We also assess the impact of the banking sector cleanup on lending conditions for loss-making firms.

## 4.2 Results

Table 4 reports the results for the whole sample of firms (Panel A) and the subgroup of loss-making firms (Panel B). The first two columns provide estimates of the differences in lending conditions for a sample that includes the entire post-policy period based on a non-matched sample, that does not consider the internal and external effects of other than policy treatment, and the matched sample, respectively. Columns (3)–(5) show the results for three subsamples with different post-policy periods, as described above.

The estimates for the loan size difference have a negative sign and are significant at the 1% level for all samples. Thus, we conclude that the *loan amount* decreases in the post-policy period. The results indicate that the average loan size after policy intervention decreases by 15.4% for the sample of all firms compared to the average amount in the pre-policy period, with the largest drop in the first year. Meanwhile, in the first six months, the decrease is 41.6%, with a gradual leveling in the subsequent six months to 31.7%. For loans issued a year after the policy, the decline rate approaches the average level for the entire sample at approximately 15%. For unprofitable firms, the loan size falls down even more when compared with those of the entire sample, and amounts to almost 46%. At the same time, the results for such firms for the first 12 months after the policy intervention are statistically insignificant.

Thus, in the first months after the policy intervention, banks became more prudent to large exposures, and this trend continued; hence, the loan size on average decreased. This finding aligns with the actual consequences of a stricter regulation approach caused a significant decrease in lending by large amounts to related parties and a decline in the loan portfolio concentration.

Expectedly, the results suggest negative signs at *interest rates* and statistically significant estimates at the 1% level across all specifications in all periods. The regressions for matched and non-matched samples show similar effects, with interest rates on average falling gradually by 5.1 and 4.7 percentage points, respectively, while the pre-policy average is 19.9%. For non-profitable firms, the decline is almost identical in the full sample, although in the first six months of the post-policy period, banks raise rates by 4.27 percentage points. However, the rates for these companies are approaching the sector average over time.

Notably, interest rates declined due to monetary policy easing and the structural changes in the banking sector. Recall that the banking sector's relaunch included a transition to an inflation targeting regime at the beginning of 2016 to improve the efficiency of the monetary transmission mechanism. Since then, interest rate pass-through has developed significantly, and the role of the key policy rate has enhanced.

Since interest rate declines can also be driven by macroeconomic conditions, we

further examine *interest spreads*, defined as the difference between the loan interest rate and the interbank interest rate. For profitable firms, spreads also decrease (by 1.9 percentage points compared to the average value in the pre-policy period of 8.11 percentage points), while for unprofitable firms, a statistically significant result is found only for the first six months and has a positive sign.

For loss-making firms, there is no significant difference in the interest rate spreads before and after the policy in the long run, indicating that the spreads increase for non-profitable firms compared to the whole sample of firms, and then the interest rates for these firms become higher. Thus, loan pricing for loss-making firms is stricter than for the full sample. In contrast, both interest rates and spreads go up in the first six months after the policy intervention. Objectively, banks issued few loans during this short period after policy intervention, and to a certain extent, this affects the results obtained. Therefore, we did not draw significant conclusions based on these estimates.

Statistically insignificant estimates of maturity in the long run provide evidence that there is generally no difference in *loan maturity* between pre- and post-policy periods. At the same time, the results indicate that loan maturity in the first six months after policy intervention increases dramatically for the entire sample of firms and loss-making ones (by 22.7 and 34 months, respectively). In the subsequent six months, the indicator almost halved but remained high.

We explain this volatility as follows. As noted above, in the first months of the post-policy period, banks began to limit large exposures, and began to lend more for smaller amounts. The average loan maturity for small firms is much longer than that for large corporations since short-term loans are primarily loans to replenish the working capital of large companies. Thus, the share of loans with longer maturities increases during this period. In this context, the change in loan maturity is a derivative of the change in loan size.

Considering these results, we cannot conclude that lending conditions have been definitely tightened after the banking sector cleanup. On the one hand, banks limit large exposures in response to stronger regulatory requirements for lending to related parties; thus, on average, loan sizes decrease, that indicates in favor of stricter bank approach. On the other hand, interest rates and spreads decline. Interest rates go down because of the change in operational design of interest rate policy. Regarding the decrease in interest rate spreads, this indicates that risks have reduced over time, and banks could reflect this in loan pricing. At the same time, lending conditions have become more dependent on the financial performance of companies. Banks tighten lending conditions for loss-making firms, thereby starting to reject them; the loan size, on average, decreases significantly compared to the whole sample, and interest rates for those firms become higher.

# 5 Firm performance requirements after banking sector cleanup

A bank's decision to grant a loan is influenced by the borrower's performance, among other factors. In this section, we are interested in asking the question

whether the requirements for the financial stance of firms became higher after the banking sector cleanup, with a focus on firms' financial characteristics, such as profitability and indebtedness.

We define profitability as a binary variable indicating whether a firm is profitable or loss-making. We also consider the borrower's return on assets, measured as the ratio of the financial result before tax to total assets, and return on equity, defined as the ratio of the net financial result to total equity. Indebtedness is proxied by the leverage coefficient, measured as the debt-to-EBITDA (earnings before interest, taxes, depreciation, and amortization) ratio. Recall that firm-level data on firm performance are derived from annual balance sheets and reports on financial results for the period 2009–2020. To merge these data with the bank-firm-loan dataset, we take the values as of the beginning of the year.

We apply the methodological framework described in Section 4 to assess firm performance changes in the post-political period. Thus, we match loans on firm characteristics, such as industry, firm size, and ownership, to make firms comparable. At the bank level, we match on bank size and ownership. Finally, at the loan level, we match on loan size and maturity. Subsequently, causal effects are calculated as the average treatment effects on the treated. The total sample includes 68,066 new loans and 4,884 unique firms.

The regression results are presented in Table 5, which suggests that the risk ratios of profitability range from 1.064 to 1.098 and are significant at the 1% level across all subsamples, indicating that profitable firms have by 6.4–9.8% more chances to receive loans in the post-policy period than in the pre-policy period. This implies that banks have a greater preference for profitable firms when issuing loans compared to the period before the banking sector cleanup. This effect does not level over time. Furthermore, the leverage ratio decreases in the long run, while there is no difference during the first year after the policy intervention, as the estimates are insignificant. The return on assets ratio goes up, with the increase is much higher in the short term. The return on equity ratio declines in the long run. As the share of profitable firms increases, the return on assets rises, but at the same time, lower leverage leads to a fall in return on equity.

Thus, the results favor the hypothesis that the bank requirements for borrowers' financial performance become stricter after the banking sector cleanup and generally do not ease to the pre-policy level over time.

# 6 Firm's ability to obtain a new loan after bank closure

In this section, we examine the factors that influence a firm's ability to obtain a loan from a new bank after the previous serving bank is closed and the time taken to switch to a new bank using the methodology of *'survival' analysis* or duration models, following Brown and Dinç (2011).

We define the dependent variable as a binary indicator $MATCH_i$, which equals 1 if firm $i$ faced its previous bank closure receives a loan from a new bank, and 0 if firm $i$ never receives a new loan. The model considers duration of the spell, that is, the

time required for a firm to receive a loan from a new bank after its bank closure. For firms that never receive a new loan, we employ right censoring. We assume that the main determinants of a successful switch to a new bank are firm performance and loan quality in closed bank. Firm performance is defined by firm profitability, which equals 1 if a firm is profitable, and 0 if loss-making at time $t^* + k - 1$, where $t^*$ is the period of the bank closure and $k$ is the number of periods needed to receive a loan from a new bank. As data on the number of days past due on the loan are not available for the whole sample, we proxy the loan quality by a categorical variable which equals 1 if the number of days past due is less than 30 days, 2 if the number of days past due is from 31 to 90 days, and 3 if more than 91 days.

Among other firm characteristics, we consider firm size, return on equity ratio, leverage ratio, and variables, indicating whether a firm has multiple relationships with banks and whether the firm and bank are related parties. In our analysis, we focus on firms that have both single and multiple relationships with banks. Additionally, we split our survival database into two subsamples to explore matches with new weak (that further close) or healthy (that never close) banks.

We estimate the Cox proportional hazard model, which assumes that the covariates have a linear multiplication effect on the hazard function and that the effect remains the same across time. The hazard function $h(\cdot)$ represents the instantaneous rate at which firms match with new banks conditional on having survived to the current moment in time and is adopted as follows:

$$h(t|P, Q, X) = h_0(t) \exp[\alpha + \beta P + \gamma Q + \delta X], \tag{1}$$

where $h_0(t)$ is the baseline hazard function, $P$ is firm profitability, $Q$ is loan quality, $X$ is the set of control variables, $\alpha, \beta, \gamma, \delta$ are coefficients to be estimated.

According to the descriptive statistics of the survival database (see Table 6), the average time to receive a new loan[2] after previous bank closure from a healthy bank is 23 months, while that from a weak bank is approximately 11 months. For the entire sample of banks, the average duration of the spell is 21 months. The median survival time, which is the time corresponding to a survival probability of 0.5, for healthy and weak banks is 15.7 and 4.3 months, respectively.

Table 7 shows the estimation results for the entire sample of matches. The presented model provides the coefficients for categorical variables for the second and subsequent groups relative to the first group. For instance, profitable firms compared to loss-making firms. The model specifications in Columns (1) and (2) include firm profitability at time $t^* + k - 1$ as the main factor of the new match. The set of control variables contains firm size, return on assets, leverage, and indicator of firm-bank multiple relationships. In the second model, we also add an indicator of bank-firm related parties. Similarly, Columns (3) and (4) present the estimates for the models with loan quality as the key predictor of new matches. Finally, Columns (5) and (6) provide the estimation results of the models with both firm profitability and loan quality.

[2]We present a 'naïve' estimation of the duration of the spell, that is, the average time to receive a new loan across a sample, which includes firms that received new loans (without censored observations).

All models with the related parties indicator among covariates provide negative and statistically significant estimates for this variable. However, these models fail to meet the proportional hazards assumption, and thus, we do not rely on the results presented in Columns (2), (4), and (6). Looking at the descriptive statistics (see Table 1), the share of related parties in the pre-policy period was significant, but this share became negligible after the banking sector reforms. Hence, adding this variable distorts the sample and formally suggests that related parties are significantly less likely to obtain a new loan than unrelated parties.

Table 8 reports estimation results for matches with new healthy and weak banks.

We obtain positive and statistically significant estimates on firm profitability variable. The effect is substantial: firms, which are profitable at time of receiving new loan, have by 61 and 79% more chances for this match compared to loss-making firms according to estimates in Column (1) and (5) of Table 7 respectively. The results for healthy banks in Columns (1) and (3) of Table 8 also suggest statistically significant large effects of 80.9% and 106.7%, respectively. However, similar estimates for weak banks are statistically insignificant.

The coefficients on the loan quality with more than 91 days past due are negative and significant for the whole sample of banks. This implies that firms which had loans with more than 91 days past due in closed banks are by 55.3%[3] less likely to receive loans from new banks compared to those firms with less than 30 days past due (Column 3 in Table 7). The another model in Column (5) of Table 7 provides a very close estimate as well as estimates for weak and healthy banks (see Table 8).

We reveal that the coefficients on the leverage ratio are highly significant and close to zero across all samples and model specifications. Moreover, we observe that multiple firm-bank relationships significantly influence new matches, and this effect is much greater for weak banks. This implies that firms with multiple loans have more chances to receive new loans compared to those firms that have only one loan. Conversely, we do not find any evidence that firm size affects the possibility to receive new loans after bank closures. The regression results also suggest a large empirical effect of a higher return of assets ratio on new matches.

In light of the obtained results, we can conclude that the crucial factors for corporate borrowers to receive loans from a new bank after their bank closure are firm profitability at the time of a new match and loan quality in closed banks. The average time to receive a new loan from a healthy bank is two-fold higher than that from a weak bank. Both weak and healthy banks prefer firms that did not have loan defaults in their previously closed banks. At the same time, in healthy banks, the chances of obtaining a loan for profitable borrowers increase considerably, in contrast to weak banks, where the profitability factor turned out to be insignificant. We also find that return on assets and firm-bank multiple relationships are positively associated with the chances of new matches. However, we do not reveal any evidence of the empirical effect of firm size and leverage ratio.

[3]The effect is calculated as exp(-0.806) – 1 = 0.553, where -0.806 is the coefficient on variable of loan quality > 90 days past due from Column (3) of Table 7.

# 7 Lending conditions and financial requirements for firms that faced bank closures

Finally, we analyze whether the loan amount, interest rate, maturity, and financial requirements changed for firms experienced bank closure compared to those that did not, applying the methodology described in Section 4.

To construct the treatment group, we select firms that faced bank closures before 2017Q1, and then subset those new loans which were granted in the post-policy period. These firms are likely to be more financially stable, particularly as indicated by the results of the previous sections that companies with better performance were more likely to receive loans. For the control group, we choose the loans issued in the post-policy period to firms that did not experience bank closures. The principle of loan selection for each group is shown schematically in Figure 3. The sample included 71,130 new loans and 10,305 unique firms. Owing to the limitation of firm-level financial data, our dataset for estimating the impact on firm performance reduces to 28,829 records with 2,567 unique firms.

We then match loans on bank, firm, and loan observable characteristics similarly to the previous section, except bank size, since the matching model yields poor balance statistics with this variable. Finally, we evaluate the difference in lending conditions and financial performance of firms faced bank closures compared to those that did not by calculating the average treatment effect on the treated.

Table 9 reports the estimated effects. The coefficients on all variables except loan maturity are statistically significant. The risk ratio for profitability is 0.98,[4] proximate to one, indicating no difference in profitability between firms exposed to a bank closure and those not. As can be observed from Columns (6)–(8), other characteristics of the firms' financial stance that faced their bank closure deteriorate in the post-policy period as the leverage ratio increase by 1.05, and return on assets and return on equity ratios decline by 0.802 and 14.1 percentage points, respectively. At the same time, the lending conditions for these firms tightened: loan amounts decrease, and interest rates and spreads rise.

Overall, our analysis shows that the performance of firms that faced bank closure deteriorates in the post-policy period compared to firms that did not experience bank failure. Nevertheless, banks were willing to lend to such firms but in smaller amounts and at higher interest rates.

## 7.1 Changes in the lending standards of the banks that later closed in the post-policy period

Additionally, we explore whether the lending standards of banks that were later closed differed from those of others using the *difference-in-differences approach*. This method can be employed in the presence of two periods, before and after intervention, and two groups, treatment and control. In our case, the treatment group includes loans from banks that were ever closed and the control group encompasses

[4]The risk ratio is calculated as exp(-0.020) = 0.98, where -0.020 is the coefficient on profitability variable from Column (5) of Table 9.

loans from banks that were never closed. We consider two periods before the end of the banking sector cleanup policy and the post-policy period started in 2017Q2.

The model can be formally written as follows:

$$\begin{aligned} Y_{it} = \alpha + \beta_1 CLOSED_j + \beta_2 POLICY_t \\ +\delta(CLOSED_j \times POLICY_t) + \Phi X_{it} + \varepsilon_{it}, \end{aligned} \tag{2}$$

where $Y_{it}$ are the outcome of interest: loan amount, interest rates and spreads, maturity, and a binary variable if firm $i$ is profitable or loss-making in period $t-1$, leverage ratio, return on assets, and return on equity; $\alpha$ is constant; $CLOSED_j = 1$ if bank $j$ is ever closed; $POLICY_t = 1$ after the banking sector cleanup, that is, 2017Q2; $X_{it}$ is a vector of control variables; $\varepsilon_{it}$ is residuals.

We perform model estimation on the matched sample applying coarsened exact matching 1:1. We match loans on firm, bank, and loan characteristics described in Section 4 so that the treatment group includes all loans granted to firms after the period of the banking sector cleanup and the control group comprises loans issued before the policy is finished. We add to the model specification the matching variables as controls for any differences between the treatment and control groups that remain after the matching procedure.

The coefficients on variable $CLOSED_j$ indicate the lending standards of banks that closed later and those that did not in the pre-policy period. The estimates of $POLICY_t$ show how much the lending standards of the banks that never closed changed in the post-policy period. The coefficients on $CLOSED_j \times POLICY_t$ are the parameters, representing how much the lending standards of banks that were later closed have changed in the post-policy period, compared to what would happen to the same group if the policy intervention did not occur. If the coefficient on this parameter is zero, we can conclude that the policy has no effect.

First, we find no significant difference in the lending conditions of banks that closed later and those that did not in the pre-policy period as well as the financial stance of firms to which they issued loans, except for the leverage ratio. Second, we receive the estimates, which confirm the obtained results in Sections 4 and 5, as loans in never-closed banks comprise a large part of the sample. In the post-policy period, loan interest rates and spreads decrease, the share of profitable firms and, consequently, return on assets ratio increase, and the return on equity ratio declines as the leverage ratio declines. Third, the results suggest that in the post-policy period, only the leverage ratio and interest rate coefficients are significant, and both are positive. This favors the hypothesis that banks that later closed were willing to lend to firms with higher leverage in the post-policy period while raising the cost of credit. However, as our pseudo-panel is constructed using an equal number of closed banks in the pre- and post-policy periods and the number of closures in the post-policy period is not significant, we treat with caution the interpretation and use of the obtained estimates.

# 8 Conclusions

The results of this study do not clearly support the hypothesis of worsening credit conditions after the banking sector cleanup. We find that banks limit large exposures in response to stricter regulation, primarily of lending to related parties. However, loan interest rates have declined since inflation targeting regime was introduced.

Simultaneously, as the risks for banks gradually decreased over time, interest spreads also decreased, which was reflected in lower loan prices. In contrast, banks tighten the lending conditions for loss-making firms, thereby starting to reject them: the loan size on average decreases largely compared to the whole sample of firms, and interest rates for those firms become higher.

Meanwhile, the firm performance analysis shows that bank requirements for corporate borrowers' financial conditions become stricter after the banking sector cleanup and generally do not ease to the pre-policy level over time.

We reveal that the crucial factors for corporate borrowers to receive a loan from a new bank after their bank closure are firm profitability at the time of a new match and loan quality in closed banks. In healthy banks, the chances of obtaining a loan for profitable borrowers increase considerably in contrast to weak banks, where the profitability factor is insignificant. Both weak and healthy banks prefer firms that have not defaulted loans in their previously closed banks. Furthermore, higher return on assets and firm-bank multiple relationships increase the chances of new matches. However, we find no evidence of the empirical effect of firm size and leverage ratio. The average time to receive a new loan from a healthy bank is two-fold higher than that from a weak bank. Our analysis of firms that faced bank closure shows that their performance deteriorates in the post-policy period compared to firms that did not experience bank failure. Nevertheless, banks were willing to lend to such firms but in smaller amounts and at higher interest rates.

The study contributes relevant additions to the development of analytical tools for further analysis of the credit availability under the influence of various factors. The findings create the basis for extensive research into the influence of changes in the financial system and the macroeconomic environment on bank lending conditions. The focus of future research in this area could be extended to other lending conditions such as collateral, as well as to different groups of banks such as public and private, borrowers and types of loans. The results provide a deeper understanding of credit market trends, allowing the most relevant measures to be applied to help banks continue and expand lending to financially support the Ukrainian economy.

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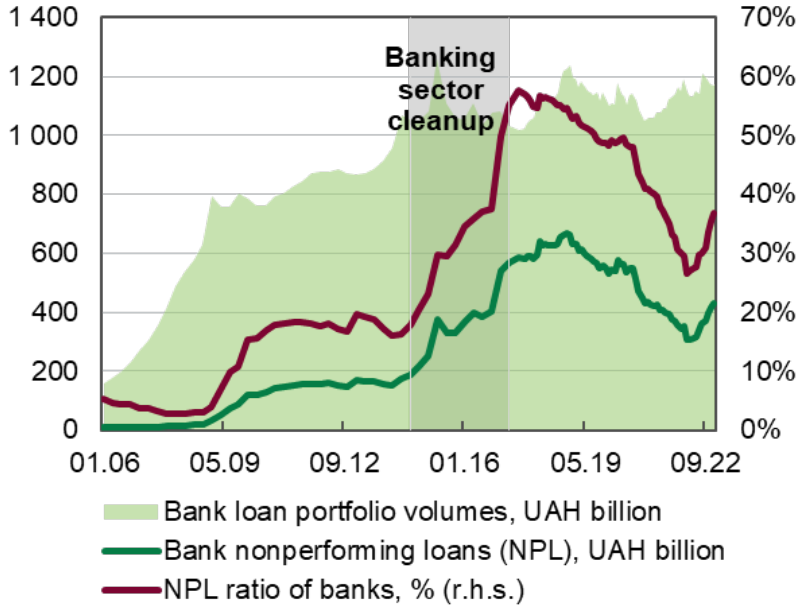
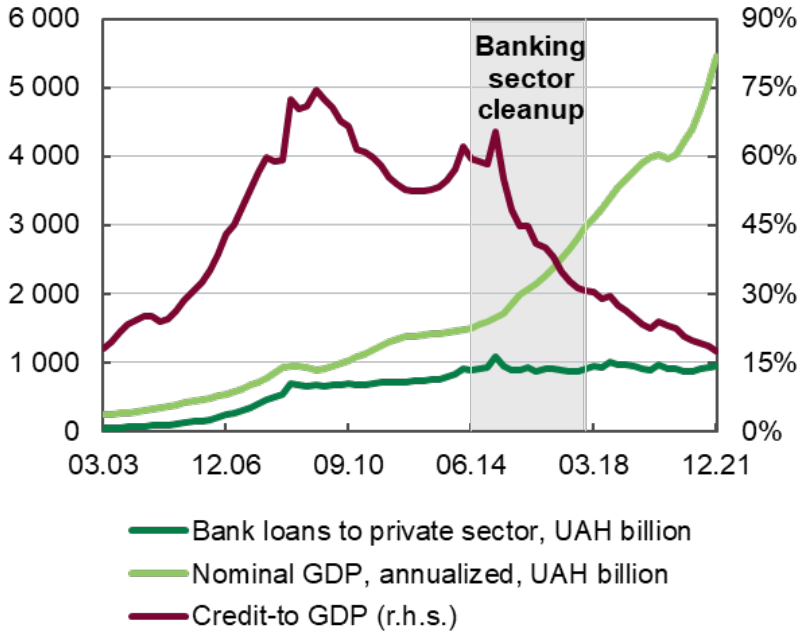
# Figures

**Figure 1.** Dynamics of selected variables before and after banking sector cleanup policy




(a) Time evolution of non-performing loans[5]



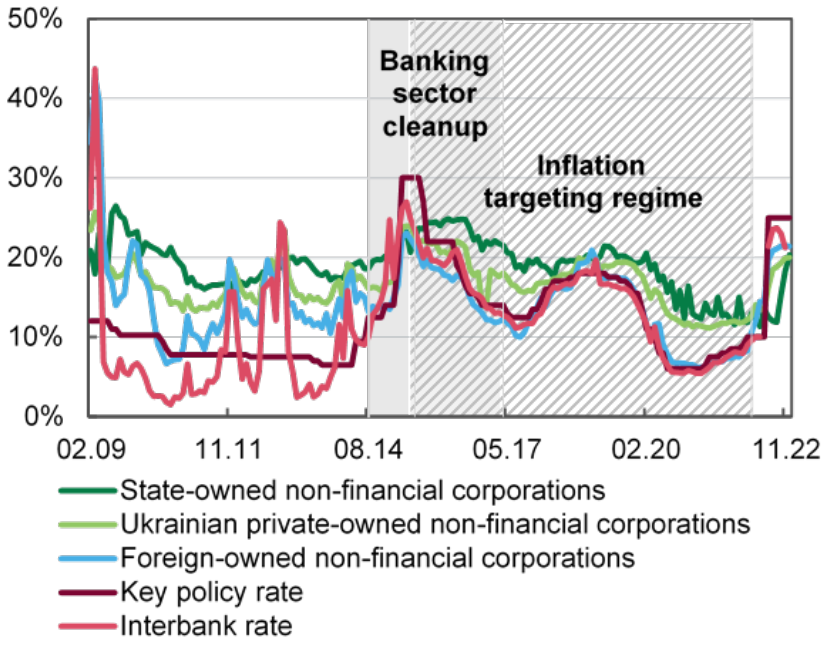

(b) Credit dynamics

[5]The definition of NPLs has changed in the methodology.

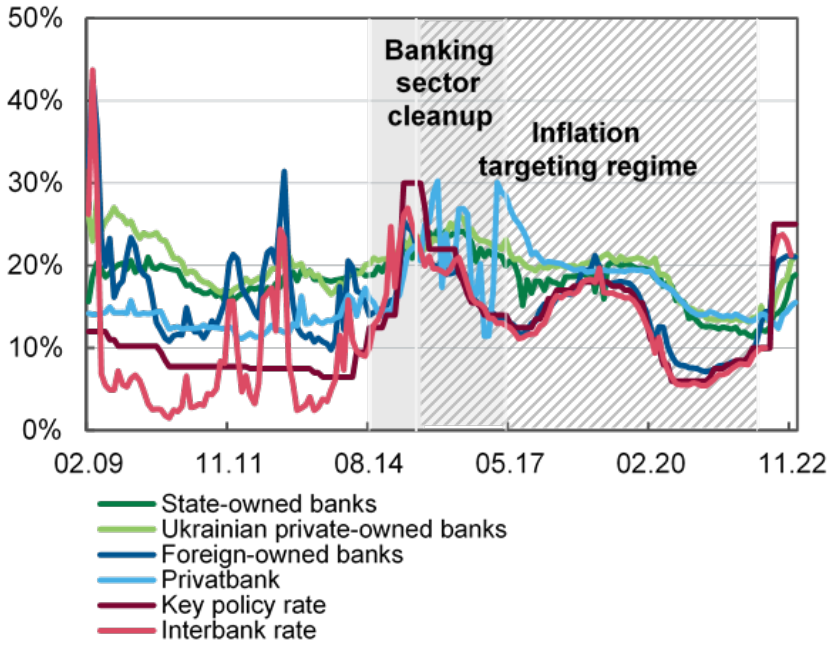
Starting from 1 February 2017, NPLs are the defaulted loans which are determined by the fact of payments on the asset past due 90+ days or the borrowers' inability to repay the debt without repossession of collateral.

From 1 January 2013, NPLs are determined as exposures with payments past due 90+ days; individual exposures past due 30+ days with low counterparty financial class.

Starting from 1 January 2001, "doubtful" or "bad" loans are loans for which debt service is at high risk (considering the borrower's financial condition and the collateral quality) and the likelihood of full repayment of the outstanding debt is low or practically negligible. Source: NBU




(c) Interest rates of new loans in national currency across non-financial corporations




(d) Interest rates of new loans to corporates in national currency across banks

**Figure 2.** Treatment and control groups for assessment of causal effects on the lending condition variables

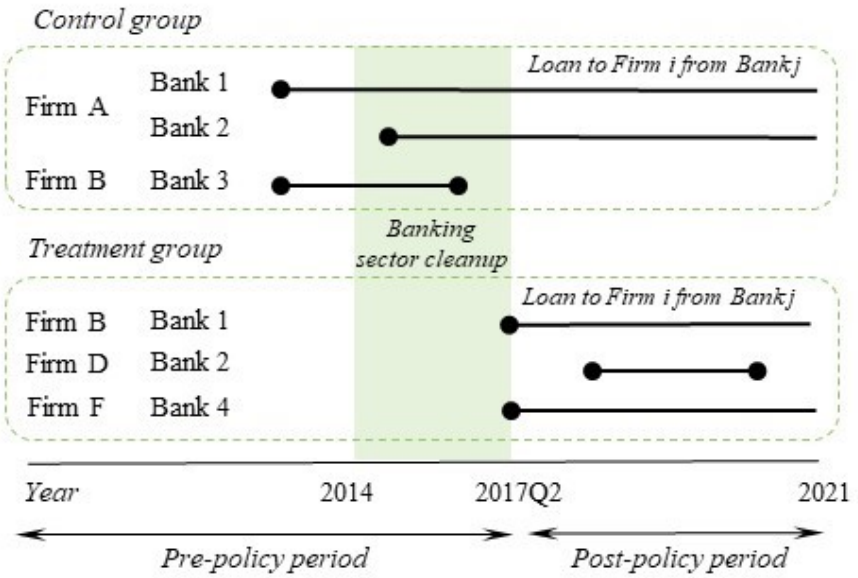
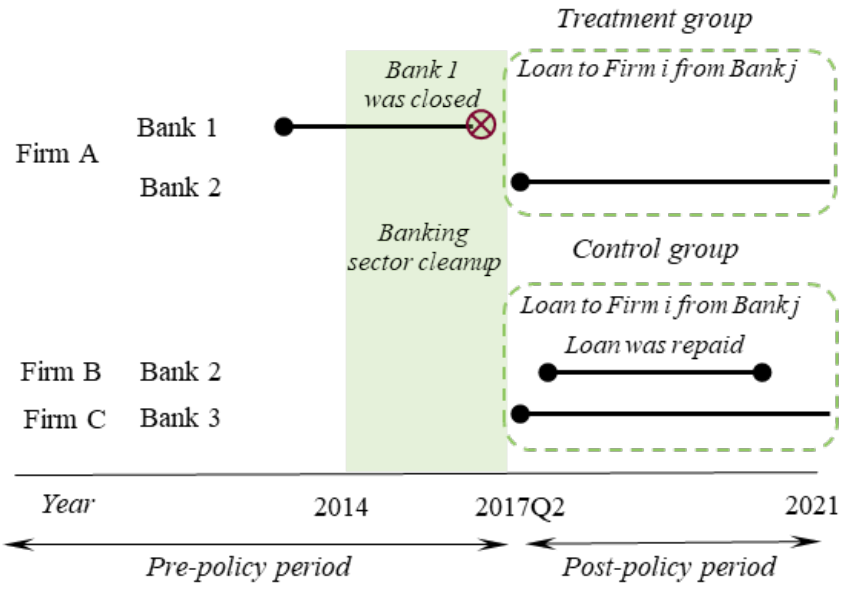



**Figure 3.** Treatment and control groups for firms that faced bank closures compared to those that did not



# Tables

**Table 1.** Descriptive statistics of firm, bank, and loan average characteristics

| | | N | Mean | SD | Median | Min | Max |
|---|---|---|---|---|---|---|---|
| *Panel A: Before banking sector cleanup* | | | | | | | |
| Loan | Amount, EUR thousand | 81,422 | 181.60 | 367.50 | 58.63 | 3.28 | 7,266.65 |
| Loan | Interest rate, % | 81,422 | 19.93 | 5.51 | 20.00 | 2.40 | 39.25 |
| Loan | Interest rate spread, p.p. | 81,380 | 8.11 | 6.14 | 7.81 | -30.21 | 34.17 |
| Loan | Maturity, days | 81,422 | 278.94 | 429.26 | 89.00 | 1.00 | 3,594.00 |
| Firm | Profitability | 39,360 | 0.84 | 0.37 | 1.00 | 0.00 | 1.00 |
| Firm | Leverage | 39,360 | 3.26 | 10.74 | 2.33 | -106.90 | 199.68 |
| Firm | Return on assets, % | 39,360 | 4.34 | 8.62 | 2.41 | -48.21 | 33.90 |
| Firm | Return on equity, % | 39,360 | 18.11 | 27.19 | 11.45 | -55.72 | 130.77 |
| Firm | Private/state-owned | 81,422 | 0.99 | 0.09 | 1.00 | 0.00 | 1.00 |
| Firm | Multiple relationships | 81,422 | 0.35 | 0.48 | 0.00 | 0.00 | 1.00 |
| Bank | Size | 81,422 | 21.22 | 1.11 | 21.54 | 15.43 | 24.01 |
| Bank-Firm | Related parties | 81,422 | 0.99 | 0.11 | 1.00 | 0.00 | 1.00 |
| Bank-Firm | Closed | 81,422 | 0.09 | 0.29 | 0.00 | 0.00 | 1.00 |
| *Panel B: After banking sector cleanup* | | | | | | | |
| Loan | Amount, EUR thousand | 71,448 | 128.29 | 266.40 | 56.56 | 3.92 | 3,428.46 |
| Loan | Interest rate, % | 71,448 | 15.27 | 4.06 | 14.00 | 2.50 | 39.00 |
| Loan | Interest rate spread, p.p. | 71,448 | 5.70 | 3.09 | 5.56 | -16.73 | 31.24 |
| Loan | Maturity, days | 71,448 | 396.47 | 484.58 | 180.00 | 1.00 | 3,471.00 |
| Firm | Profitability | 28,706 | 0.92 | 0.26 | 1.00 | 0.00 | 1.00 |
| Firm | Leverage | 28,706 | 2.24 | 6.16 | 1.99 | -117.88 | 167.99 |
| Firm | Return on assets, % | 28,706 | 4.94 | 6.69 | 2.61 | -45.93 | 34.05 |
| Firm | Return on equity, % | 28,706 | 16.73 | 22.50 | 11.42 | -52.25 | 130.59 |
| Firm | Private/state-owned | 71,448 | 1.00 | 0.06 | 1.00 | 0.00 | 1.00 |
| Firm | Multiple relationships | 71,448 | 0.27 | 0.44 | 0.00 | 0.00 | 1.00 |
| Bank | Size | 71,448 | 21.23 | 1.02 | 21.40 | 15.99 | 23.43 |
| Bank-Firm | Related parties | 71,448 | 0.01 | 0.09 | 0.00 | 0.00 | 1.00 |
| Bank-Firm | Closed | 71,448 | 0.00 | 0.07 | 0.00 | 0.00 | 1.00 |

*Notes:* Abbreviations: SD, standard deviation; Min, minimum; Max, maximum.

**Table 2.** Descriptive statistics of firm, bank, and loan average characteristics by firm size groups

| | | Firm size | | | |
|---|---|---|---|---|---|
| | | <2 mln EUR | 2–10 mln EUR | 10–50 mln EUR | >50 mln EUR |
| *Panel A: Before banking sector cleanup* | | | | | |
| Loan | Amount, EUR thousand | 155.18 | 104.15 | 149.99 | 377.90 |
| Loan | Interest rate, % | 21.20 | 20.61 | 20.01 | 17.81 |
| Loan | Interest rate spread, p.p. | 7.18 | 8.00 | 8.42 | 8.39 |
| Loan | Maturity, days | 606.59 | 280.64 | 188.27 | 201.02 |
| Firm | Leverage | 1.31 | 3.21 | 3.78 | 2.79 |
| Firm | Return on assets, % | 4.02 | 5.56 | 4.27 | 2.92 |
| Firm | Return on equity, % | 11.64 | 15.47 | 19.81 | 19.99 |
| *Panel B: After banking sector cleanup* | | | | | |
| Loan | Amount, EUR thousand | 73.96 | 102.00 | 134.21 | 467.07 |
| Loan | Interest rate, % | 15.54 | 15.26 | 15.12 | 14.42 |
| Loan | Interest rate spread, p.p. | 6.05 | 5.69 | 5.51 | 4.73 |
| Loan | Maturity, days | 596.69 | 370.20 | 188.22 | 188.79 |
| Firm | Leverage | 1.75 | 1.90 | 2.92 | 1.11 |
| Firm | Return on assets, % | 5.32 | 4.84 | 5.39 | 3.59 |
| Firm | Return on equity, % | 9.98 | 10.77 | 19.45 | 23.47 |

*Notes:* Firms are split by size following the definition in Article 55 of the Commercial Code of Ukraine.

**Table 3.** Matching variables

| Category | Matching variable | Values |
|---|---|---|
| Macro | Quarter | 2007Q4–2021Q4 |
| Macro | GDP growth | Continuous variable (assigned range interval) |
| Macro | Key policy rate | Continuous variable (assigned range interval) |
| Firm | Industry | Agriculture, construction, financial services, food and tobacco, information and communication, manufacturing, real estate, transporting and storage, wholesale retail and trade, and others; if unknown – not available |
| Firm | Size | = 1 if total revenue >50 million EUR, = 2 if 10–50 million EUR, = 3 if 2–10 million EUR, = 4 if <2 million EUR |
| Firm | Ownership | = 1 for private, = 0 for state-owned |
| Firm | Multiple bank relationships | = 1 for multiple, = 0 for single |
| Bank | Size | Logarithm of total net assets (assigned range intervals) |
| Bank | Ownership | = 1 for foreign-owned, = 2 for Ukrainian private-owned, = 3 for Privatbank,[6] = 4 for state-owned |
| Bank-firm | Related parties | = 1 for related parties, = 0 otherwise |
| Loan | Amount | Continuous variable (assigned range interval) |
| Loan | Maturity | Continuous variable (assigned range interval) |

*Notes:* The table lists all the variables tested for various matching strategies. Since macroeconomic variables do not demonstrate proper statistical metrics of balance, they are not included in the final matching models, as well as indicators of multiple relationships and related parties.
Firms are split by size following the definition in Article 55 of the Commercial Code of Ukraine.
Abbreviations: GDP, gross domestic product.

[6]Privatbank is one of the largest Ukrainian banks.

**Table 4.** Effects of banking sector cleanup policy on bank lending conditions

| | Without matching | All loans | <6 months | 7–12 months | >12 months |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| *Panel A: All firms* | | | | | |
| Loan size, EUR thousand | -53.318*** | -27.890*** | -75.550*** | -57.570*** | -27.020*** |
| | (1.662) | (7.739) | (23.430) | (17.010) | (7.741) |
| N observations | 152,870 | 152,870 | 82,094 | 82,379 | 151,241 |
| N observations matched | - | 146,615 | 76,953 | 77,235 | 144,989 |
| N firms | 16,150 | 15,604 | 8,161 | 8,304 | 15,441 |
| Interest rate, p.p. | -4.668*** | -5.097*** | -3.685*** | -3.293*** | -5.142*** |
| | (0.025) | (0.226) | (0.266) | (0.215) | (0.182) |
| Interest rate spread, p.p. | -2.403*** | -1.862*** | -1.720*** | -3.812*** | -1.836*** |
| | (0.025) | (0.253) | (0.394) | (0.322) | (0.251) |
| N observations | 152,870 | 152,870 | 82,094 | 82,379 | 151,241 |
| N observations matched | - | 135,787 | 68,263 | 68,541 | 134,193 |
| N firms | 16,150 | 14,903 | 7,709 | 7,849 | 14,747 |
| Maturity, days | 117.532*** | 12.120 | 681.200*** | 391.900*** | 0.4326 |
| | (2.337) | (16.890) | (28.970) | (40.480) | (17.060) |
| N observations | 152,870 | 152,870 | 82,094 | 82,379 | 151,241 |
| N observations matched | - | 148,738 | 78,731 | 79,015 | 147,128 |
| N firms | 16,150 | 15,559 | 8,116 | 8,258 | 15,405 |
| *Panel B: Loss-making firms* | | | | | |
| Loan size, EUR thousand | 9.833 | -83.390* | -109.500 | 170.300 | -85.800* |
| | (11.469) | (48.250) | (141.300) | (124.000) | (48.350) |
| N observations | 8,414 | 8,414 | 6,254 | 6,256 | 8,378 |
| N observations matched | - | 4,826 | 2,992 | 2,994 | 4,790 |
| N firms | 1,163 | 768 | 524 | 536 | 751 |
| Interest rate, p.p. | -5.507*** | -5.062*** | 4.270*** | 0.162 | -5.195*** |
| | (0.119) | (0.410) | (0.795) | (0.452) | (0.410) |
| Interest rate spread, p.p. | -1.782*** | -0.565 | 5.811*** | 0.800 | -0.638 |
| | (0.148) | (0.419) | (1.503) | (0.697) | (0.417) |
| N observations | 8,414 | 8,414 | 6,254 | 6,256 | 8,378 |
| N observations matched | - | 3,512 | 1,935 | 1,933 | 3,484 |
| N firms | 1,163 | 543 | 351 | 359 | 529 |
| Maturity, days | 1.611 | -7.106 | 1020.000*** | 521.000*** | -21.300 |
| | (9.756) | (19.480) | (44.430) | (52.270) | (18.610) |
| N observations | 8,414 | 8,414 | 6,254 | 6,256 | 8,378 |
| N observations matched | - | 5,115 | 3,270 | 3,272 | 5,081 |
| N firms | 1,163 | 787 | 545 | 556 | 771 |

*Notes:* ***, **, * indicate coefficient significance at the 1%, 5%, and 10% level respectively. Standard errors are shown in parentheses.

**Table 5.** Effects of banking sector cleanup policy on firm performance

| | Without matching | All loans | <6 months | 7–12 months | >12 months |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| *Panel A: All firms* | | | | | |
| Profitability | 1.086*** | 1.073*** | 1.064*** | 1.098*** | 1.072*** |
| Leverage | -1.022*** | -1.114*** | 0.916 | 0.655 | -1.162*** |
| | (0.071) | (0.335) | (0.820) | (0.509) | (0.342) |
| Return on assets, p. p. | 0.604*** | 0.702*** | 5.809*** | 2.504*** | 0.621** |
| | (0.061) | (0.255) | (0.577) | (0.579) | (0.261) |
| Return on equity, p. p. | -1.385*** | -2.713*** | 7.770*** | 2.568 | -2.902*** |
| | (0.197) | (0.960) | (1.556) | (1.602) | (0.977) |
| N observations | 68,066 | 68,066 | 39,644 | 39,759 | 67,383 |
| N observations matched | - | 54,899 | 28,885 | 28,986 | 54,250 |
| N firms | 4,884 | 4,133 | 2,822 | 2,875 | 4,065 |
| *Panel B: Loss-making firms* | | | | | |
| Leverage | -0.280 | 0.487 | 7.771*** | 2.104 | 0.404 |
| | (0.505) | (1.500) | (2.918) | (2.721) | (1.509) |
| Return on assets, p. p. | 2.605*** | 4.815*** | 5.217*** | 3.482*** | 4.822*** |
| | (0.193) | (0.898) | (1.832) | (1.124) | (0.902) |
| Return on equity, p. p. | -2.620** | -4.967 | -17.610* | -9.022* | -4.812 |
| | (1.103) | 6.013 | (9.434) | (4.812) | (6.100) |
| N observations | 8,414 | 8,414 | 6,254 | 6,256 | 8,378 |
| N observations matched | - | 3,512 | 1,935 | 1,933 | 3,484 |
| N firms | 1,163 | 543 | 351 | 359 | 529 |

*Notes:* Average risk ratios are presented for profitability.
***, **, * indicate coefficient significance at the 1%, 5%, and 10% level respectively. Standard errors are shown in parentheses.

**Table 6.** Descriptive statistics of firms received new loans after the serving bank closure

| | Mean | SD | Median | Min | Max |
|---|---|---|---|---|---|
| *Panel A: Firms received new loan from healthy bank* | | | | | |
| Receive new loan from healthy bank compared never receive | 0.18 | 0.38 | 0.00 | 0.00 | 1.00 |
| Days to receive new loan | 689.70 | 720.26 | 472.00 | 0.00 | 3851.00 |
| Profitability | 0.82 | 0.38 | 1.00 | 0.00 | 1.00 |
| Leverage | -7.61 | 141.21 | 1.25 | -2188.67 | 129.53 |
| Return on assets | 0.04 | 0.12 | 0.02 | -0.67 | 0.63 |
| Return on equity | 0.04 | 1.00 | 0.08 | -11.63 | 3.03 |
| Multiple relationships | 0.59 | 0.49 | 1.00 | 0.00 | 1.00 |
| Related parties | 0.36 | 0.48 | 0.00 | 0.00 | 1.00 |
| *Panel B: Firms received new loan from weak bank* | | | | | |
| Receive new loan from weak bank compared never receive | 0.04 | 0.20 | 0.00 | 0.00 | 1.00 |
| Days to receive new loan | 327.12 | 558.36 | 130.50 | 0.00 | 2863.00 |
| Profitability | 0.72 | 0.46 | 1.00 | 0.00 | 1.00 |
| Leverage | -38.18 | 277.75 | 1.67 | -1714.38 | 376.50 |
| Return on assets | 0.07 | 0.15 | 0.02 | -0.23 | 0.59 |
| Return on equity | -0.06 | 2.15 | 0.09 | -13.41 | 3.23 |
| Multiple relationships | 0.63 | 0.48 | 1.00 | 0.00 | 1.00 |
| Related parties | 0.80 | 0.40 | 1.00 | 0.00 | 1.00 |
| *Panel C: Firms that never match with new bank* | | | | | |
| Profitability | 0.57 | 0.50 | 1.00 | 0.00 | 1.00 |
| Leverage | -77.50 | 1084.72 | 1.52 | -17329.75 | 676.71 |
| Return on assets | -0.04 | 0.24 | 0.00 | -2.27 | 0.66 |
| Return on equity | 0.14 | 5.22 | 0.07 | -74.60 | 30.50 |
| Multiple relationships | 0.16 | 0.36 | 0.00 | 0.00 | 1.00 |
| Related parties | 0.95 | 0.21 | 1.00 | 0.00 | 1.00 |

*Notes:* We present a 'naïve' estimation of the spell duration, that is, the average time to receive a new loan across a sample, which includes firms that received new loans (without censored observations).

**Table 7.** Survival analysis: factors affecting firms to receive new loans after their bank closure

| | New loan | | | | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Firm profit $> 0$ at $t^* + k - 1$ | 0.583*** | 0.416*** | | | 0.477*** | 0.367** |
| | (0.181) | (0.159) | | | (0.184) | (0.162) |
| Loan quality 31–90 days past due | | | 0.194 | 0.228 | 0.235 | 0.273 |
| | | | (0.205) | (0.201) | (0.207) | (0.204) |
| Loan quality >90 days past due | | | -0.806*** | -0.570*** | -0.740*** | -0.521*** |
| | | | (0.180) | (0.161) | (0.182) | (0.163) |
| *Firm performance indicators:* | | | | | | |
| Return on assets | 0.267 | 0.255 | 1.010** | 0.804** | 0.373 | 0.307 |
| | (0.444) | (0.396) | (0.402) | (0.362) | (0.435) | (0.398) |
| Leverage | -0.001*** | -0.001*** | -0.001*** | -0.001*** | -0.001*** | -0.001*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| *Other controls:* | | | | | | |
| Firm size 10–50 mln EUR | 0.023 | 0.021 | 0.040 | 0.023 | 0.016 | 0.001 |
| | (0.183) | (0.163) | (0.180) | (0.164) | (0.182) | (0.166) |
| Firm size 2–10 mln EUR | -0.065 | -0.190 | -0.056 | -0.169 | -0.059 | -0.181 |
| | (0.188) | (0.163) | (0.190) | (0.167) | (0.190) | (0.169) |
| Firm size <2 mln EUR | -0.225 | -0.281 | -0.254 | -0.272 | -0.237 | -0.281 |
| | (0.218) | (0.184) | (0.223) | (0.188) | (0.220) | (0.188) |
| Multiple relationships | 0.899*** | 0.665*** | 0.945*** | 0.713*** | 0.903*** | 0.688*** |
| | (0.139) | (0.130) | (0.139) | (0.133) | (0.141) | (0.134) |
| Related parties | | -1.092 | | -1.036 | | -1.010 |
| | | (0.140) | | (0.142) | | (0.142) |
| N observations | 517 | 517 | 517 | 517 | 517 | 517 |
| N new loans | 277 | 277 | 277 | 277 | 277 | 277 |
| Concordance statistic | 0.660 | 0.685 | 0.677 | 0.693 | 0.679 | 0.695 |
| Proportional hazards assumption | Yes | No | Yes | No | Yes | No |
| Log L | -1,577.30 | -1,542.31 | -1,569.32 | -1,538.24 | -1,565.64 | -1,536.16 |
| AIC | 3,168.60 | 3,100.62 | 3,154.65 | 3,094.48 | 3,149.28 | 3,092.31 |
| Likelihood ratio test | Yes | Yes | Yes | Yes | Yes | Yes |
| Wald test | Yes | Yes | Yes | Yes | Yes | Yes |
| Score (logrank) test | Yes | Yes | Yes | Yes | Yes | Yes |

*Notes:* Coefficients are reported instead of hazard ratios. The intercept is estimated; however, it is not shown to preserve the place.
***, **, * indicate coefficient significance at the 1%, 5%, and 10% level respectively. Standard errors are shown in parentheses.
Abbreviations: AIC; Akaike information criterion.

**Table 8.** Survival analysis: factors affecting firms to receive new loans from weak and healthy banks after their bank closure

| | New loan from a healthy bank | | | New loan from a weak bank | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Firm profit $> 0$ at $t^* + k - 1$ | 0.726*** | | 0.593*** | 0.159 | | 0.110 |
| | (0.200) | | (0.204) | (0.465) | | (0.466) |
| Loan quality 31–90 days past due | | 0.181 | 0.218 | | 0.374 | 0.384 |
| | | (0.235) | (0.234) | | (0.420) | (0.419) |
| Loan quality >90 days past due | | -0.881*** | -0.793*** | | -0.765* | -0.755* |
| | | (0.199) | (0.202) | | (0.418) | (0.423) |
| *Firm performance indicators:* | | | | | | |
| Return on assets | 0.014 | 0.964** | 0.170 | 1.385 | 1.604* | 1.466 |
| | (0.448) | (0.431) | (0.448) | (0.954) | (0.851) | (1.030) |
| Leverage | -0.001*** | -0.001*** | -0.001*** | -0.001*** | -0.001*** | -0.001** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| *Other controls:* | | | | | | |
| Firm size 10–50 mln EUR | -0.059 | -0.020 | -0.050 | 0.579 | 0.603 | 0.599 |
| | (0.197) | (0.194) | (0.196) | (0.512) | (0.506) | (0.503) |
| Firm size 2–10 mln EUR | -0.086 | -0.064 | -0.070 | 0.012 | 0.021 | 0.025 |
| | (0.199) | (0.201) | (0.202) | (0.589) | (0.573) | (0.575) |
| Firm size <2 mln EUR | -0.391 | -0.396 | 0.380 | 0.518 | 0.457 | 0.470 |
| | (0.238) | (0.245) | (0.241) | (0.554) | (0.538) | (0.553) |
| Multiple relationships | 0.889*** | 0.942*** | 0.891*** | 1.492*** | 1.510*** | 1.503*** |
| | (0.148) | (0.148) | (0.150) | (0.387) | (0.386) | (0.390) |
| N observations | 476 | 476 | 476 | 281 | 281 | 281 |
| N new loans | 235 | 235 | 235 | 41 | 41 | 41 |
| Concordance statistic | 0.672 | 0.682 | 0.687 | 0.750 | 0.768 | 0.770 |
| Proportional hazards assumption | Yes | Yes | Yes | Yes | Yes | Yes |
| Log L | -1,328.89 | -1,322.78 | -1,318.12 | -208.27 | -205.74 | -205.71 |
| AIC | 2,671.77 | 2,661.55 | 2,654.24 | 430.54 | 427.48 | 429.42 |
| Likelihood ratio test | Yes | Yes | Yes | Yes | Yes | Yes |
| Wald test | Yes | Yes | Yes | Yes | Yes | Yes |
| Score (logrank) test | Yes | Yes | Yes | Yes | Yes | Yes |

*Notes:* Coefficients are reported instead of hazard ratios. The intercept is estimated; however, it is not shown to preserve the place.
***, **, * indicate coefficient significance at the 1%, 5%, and 10% level respectively. Standard errors are shown in parentheses.
Abbreviations: AIC; Akaike information criterion.

**Table 9.** Effects of banking sector cleanup policy on the lending conditions for firms that faced bank closures compared to those that did not

| | Loan size | Interest rate | Interest rate spread | Loan maturity | Profitability | Leverage | Return on assets | Return on equity |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Difference | -49.700*** | 0.558*** | 0.290*** | -4.320 | 0.980*** | 1.050*** | -0.802*** | -14.100*** |
| | (4.890) | (0.078) | (0.042) | (7.980) | - | (0.075) | (0.132) | (0.480) |
| N observations | 71,130 | 71,130 | 71,130 | 71,130 | 28,829 | 28,829 | 28,829 | 28,829 |
| N observations matched | 63,701 | 58,422 | 58,422 | 67,009 | 23,183 | 23,183 | 23,183 | 23,183 |
| N firms | 9,106 | 8,204 | 8,204 | 9,233 | 1,861 | 1,861 | 1,861 | 1,861 |

*Notes:* Loan size is measured in thousands of EUR equivalent; interest rate, spread, return on equity, and return on assets are measured in percentage points; and maturity is measured in days.
Average risk ratio is presented for profitability.
The coefficients on the variables represent the differences in lending conditions and financial requirements for firms that experienced bank closures compared to those that did not.