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Small Business Lending and Credit Risk: Granger causality Evidence

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Abstract

Because of their opaque nature, SMEs are overly reliant on bank lending. Therefore, we examine whether banks' credit supply to SMEs are affected by their financial conditions. To this end, we employ a *Granger causality* analysis to examine whether there is an indication of a significant direction of determination between SME lending and non-performing SME loans. The results reveal no bidirectional relationship between SME lending and NPL for the entire banking sector. For Islamic banks, however, we find two-way linkages between these two parameters: a negative causation is running both from SME lending to NPL growth and from NPL to SME lending. Given Islamic banks' deposit-oriented funding practices and their adherence to profit-and-loss sharing principles, this finding suggests the presence of heightened market discipline within the Islamic banking system.

JEL: G21, G28, G3
Keywords: Small business lending, Non-performing loans, Islamic banks.

1. Introduction

Banks are crucial for emerging countries, which are heavily bank-based, where the financial intermediation goes predominantly through the bank lending channel. Banks are particularly important for small and medium-sized enterprises (SMEs), which are, compared to their larger counterparts, informationally more opaque and have far fewer alternatives to externally finance their investments (e.g., Berger and Udell, 1998; Beck et al., 2008). However, SMEs' dependence on bank funding makes them especially vulnerable to the dynamics within the banking system. This vulnerability has become more pronounced with the outbreak of the 2007/2008 global financial crisis, and therefore has sparked renewed interest in understanding the credit relationship between banks and SMEs. In particular, the legacy of non-performing loans (NPL) stemming from the crisis and the associated resolution problems, which are not fully resolved yet, have become a serious drag on the growth of bank credit. Indeed, serious slowdowns in credit growth were experienced following the crisis, and credit sources have been dried up more rapidly for small firms than for large companies (OECD, 2012; ECB, 2013).

By using Turkey as a single country case study, our aim in this paper is to examine both the effect of credit growth on non-performing loans and the effect of non-performing loans on credit growth in the SME credit market. In doing so, we add to the literature in several important ways. First, the literature on the relationship between credit growth and credit risk at the bank-level is surprisingly sparse. Our approach involves the study of cross-sectional differences and hence moves beyond macroeconomic forces, with the latter affecting all banks in a similar way.[1] For example, Sinkey and Greenawalt (1991) show that the substantial cross-sectional variations in US banks' NPLs are not solely explained by macroeconomic factors, but are also fueled by banks' credit exposure. In addition, most of the existing studies have mainly focused on the one-way causal relationship between credit growth and NPL. A large portion of these studies have focused

[1] Studies that examined the link between credit growth and risk at the macroeconomic level include: Borio et al. (2001) and Schularick and Taylor (2012) for examining the boom-bust cycles in credit markets, and Keeton (1999) for examining the association between credit growth and losses at the aggregate US state-level data.

on exploring the bank-specific determinants of NPL. For instance, Jiménez and Saurina (2006) document for Spain a (lagged) positive relationship between rapid credit growth and NPLs. Similarly, Klein (2013) finds for Central, Eastern and South Eastern Europe (CESEE) that an expansion in bank lending is detrimental for the quality of the loan portfolio. Very few studies, however, have examined the relationship between bank credit and NPLs in the other direction. For a sample of Caribbean countries, Tracey and Leon (2011) find that increases in NPLs reduce bank lending. Likewise, the European Banking Coordination "Vienna" Initiative (2012) reports for CESEE that, in the immediate aftermath of the global financial crisis, increases in NPLs led to a reduction in bank lending. Closer to our study are Keeton (1999), Berger and Udell (2004) and Foos et al. (2010); all of which investigate the bi-directional relationship between loan growth and loan losses.

Second, we add to the literature by focusing on the credit market for SMEs, which corresponds to the largest number of corporate borrowers and, hence, have potentially the strongest impact on economic development. However, SME finance remains a considerable challenge because these firms are informationally more opaque and have access to fewer sources of finance, making them more bank-dependent than large firms (e.g., Petersen and Rajan, 1995). Further, the SME credit market has been more susceptible to market failures because of problems related to economies of scale, information asymmetries, and imperfect appropriation of returns. It is therefore important to have a clear picture on the interaction between banks' SME lending and problem loan management.

Third, an important feature of our work is to examine whether the relationship between NPL and credit growth differs between Islamic and conventional banks. Especially since the outbreak of the global financial crisis, interest in Islamic banking has gained momentum as a viable alternative to the conventional way of banking. The relative performance of Islamic banks to conventional banks proved to perform better in the lead-up to the crisis, and exhibited greater resilience during the crisis because of their fundamentals of risk-sharing, and avoidance of leveraged and speculative financial products (e.g., Čihák and Hesse, 2010; Hasan and Dridi, 2011; Beck et al., 2013). Further, given the importance of SMEs for economic development, there has been increased scrutiny on whether bank orientation (i.e. Islamic versus conventional banks) is an important determinant of credit supply (e.g., Shaban et al., 2014; Aysan et al., 2016). If Islamic banks

indeed behave more prudential than their conventional counterparts, then they should record a comparatively lower growth in NPL with increased bank lending. Likewise, if Islamic banks are more careful, then they should also reduce their lending more when they have higher NPL. We benefit from the Turkish banking system, in which Islamic banks operate alongside conventional banks, to test this conjecture.

We explore the relationship between growth in SME lending and non-performing SME loans in the Turkish credit market for SMEs. The test results for the whole banking system indicate in general that there is no *Granger causality* between lending growth and growth in NPLs. For Islamic banks, however, we find a bidirectional relationship between these two parameters: a negative causation is running both from lending growth to NPLs growth and from NPLs growth to lending growth. We relate this finding to the presence of heightened market discipline within the Islamic banking system, since Islamic banks operate in profit-and-loss sharing framework and, in addition, are heavily reliant of deposit-funding.

The rest of the paper is organized as follows: Section 2 outlines the rationale behind bank lending and NPL relationship, and provide explanations for why this relationship might be different for Islamic banks. Section 3 describes the data and the variables used in the study. Section 4 provides a brief discussion of the unit root tests, cointegration procedure and panel *Granger* causality tests. The empirical results obtained are also presented in this section. In Section 5 conclusions are provided.

2. Background and rationale

A prudent bank saddled with a high stock of NPL will likely focus on strengthening risk management practices and improving asset quality rather than providing increased credit intermediation (e.g., Bernanke and Blinder, 1988; Altunbas et al., 2010; Balgova et al., 2016). Improved asset quality, in its turn, will allow banks to pick up the credit business. By contrast, high

NPL tie up the bank's resources, reduce bank profitability and lead to higher funding costs – thereby diminishing the credit supply. Banks' reduced lending capacity will culminate in financial disintermediation, which will especially affect SMEs that are typically more dependent on bank financing. Especially within the European Union, the persistence of NPL has been recognized to be one of the major stumbling blocks for economy recovery after the global financial crisis (Mesnard et al., 2016). Resolution of NPL appears, therefore, crucial to support credit growth and restore the bank lending channel.

Islamic banks differ from their conventional counterparts in several ways (see Hassan and Aliyu, 2018; Narayan and Phan, 2019). The key difference between Islamic and conventional banks is that the former operate in compliance with the rules of *Shariah*, the legal code of Islam. The most distinguishing feature of the Islamic financial system is the prohibition of *riba*, i.e., the payment of a fixed or determinable interest on funds. The underlying reason for this is that no return should be served without proper risk-taking: Islamic banks can transfer investment losses to its profit-sharing investment account holders, which are viewed as partners in these investments. Aysan et al. (2015, 2017) argue that this feature makes Islamic banks especially susceptible to market discipline, and will therefore be more penalized by their depositors if they show more risky behavior. Furthermore, because of the scarcity of non-interest bearing instruments, Islamic banks are also more heavily reliant on deposit-funding, which leaves more room for market discipline.[2] On the assets side, the predilection of *Shariah*-compliant structures towards asset-backed investments suggests that there is some in-built capacity to prevent a loan from being default. For example, most of the credit exposure in Islamic banks happens through *Murabaha* financing, in which the bank purchases assets on behalf of the clients and sells these assets, usually in installments, to these clients at a cost that includes a disclosed margin. This reduces concerns about diversion of funds into unproductive projects or to a project other than the agreed one (Shaban et al., 2014; Aysan et al., 2016). Most lending in Islamic banks is directed to a specific project under the premises of utmost good faith. This leverages the position of soft information

[2] An increasing body of empirical studies suggests that deposit-funded banks fared better in the financial crisis than those more dependent on other funding sources. Banks with more deposits liabilities continued to extend credits, exhibited a better overall performance, and contained their risk exposure (e.g., Ivashina and Scharfstein, 2010; Demirguç-Kunt and Huizinga, 2010; Cornett et al. 2011).

in financial transactions, which benefits opaque small businesses. Islamic banks do not only have to comply with national legislations, but should also respect the Islamic law for conducting financial transactions. Since Islamic finance integrates ethical and moral values, it is likely that Islamic banks' pool of borrowers consists of a larger group of borrowers with more moral concerns. Hence, the average Islamic bank borrower should be more aware that violating other people's property rights puts the afterlife in heaven at risk. Baele et al. (2014) examine for Pakistan whether borrowers who choose to stick to one rule (i.e., avoiding the payment of interest) are more likely to follow the other rule (i.e., do not default) as well. The authors indeed find that an average Islamic bank borrower is more likely to follow the second rule by exhibiting more ethical behavior in terms of their probability of default.[3] In addition, the presence of a *Shariah* board as a monitoring body acts as an additional layer of governance besides the presence of board of directors (Mollah et al., 2017) which is not present in case of conventional banks. This due diligence has also positive repercussions on the relative performance of Islamic stocks (Narayan and Bannigidadmath, 2017). In addition, a trading strategy that is formed using information on price discovery, or the lead and lag relationship between any two markets, offers investors in Islamic banks a cushion against risk, i.e. profit maximization or loss minimization (Narayan et al., 2018) The literature has further documented that Islamic banks are better capitalized (Beck et al., 2013), more stable (Cihak and Hesse, 2010), more profitable (Mollah et al., 2017), less susceptible to bank runs (Farooq and Zaheer, 2015), and conduct less cyclical loan supply (Ibrahim, 2016).[4] For all these reasons, we expect that the credit-NPL relationship will be different between Islamic and conventional banks.

[3] In the case of default by the client, Islamic banks were historically not allowed to charge a penalty on the selling price. Contemporaneous Muslim jurists, however, approved that Islamic banks may impose penalty on delinquent borrowers if these additional receipts are used for charitable purposes.

[4] Further, support for Islamic intermediation is provided by Imam and Kpodar (2016) who find that Islamic banking is conducive for economic growth. Kumru and Sarntisart (2016) demonstrates that this finding is because of an improved allocation of aggregate level of savings since the presence of Islamic banking mitigates religious self-exclusion.

3. Sample description and data sources

Islamic banking in Turkey has taken off since the 1980s with the introduction of 'Special Finance Houses'. Despite being *Shariah*-compliant, such a euphemism was adopted to calm their Islamic image and to resonate with the ideological sensitivity of the secular establishment. However, shifts in subsequent governments' priorities have allowed Islamic banking to gradually acquire more legitimacy as financial intermediaries. Especially the enactment of the Banking Law No. 5411 in 2005 meant a major breakthrough in this respect, enabling Islamic banks to have the same privileges and status as conventional banks. This legislation transformed 'Special Finance Houses' into 'Participation Banks', and brought their regulation and supervision on par with conventional banks. The Turkish Islamic banking segment has since then witnessed a remarkable growth, but still only accounts for 5.5% of the Turkish banking system assets. However, it appears to be that Turkish Islamic banks are better able to mitigate the information asymmetries in small business lending, and thereby improve the capital allocation process. We refer to Aysan et al. (2016) who show that, compared to conventional banks, Islamic banks in Turkey assign a significantly higher portion of their loan portfolio to SME financing. Further, Turkish Islamic banks' commitment to SME lending has been praised by international organizations and can serve as an example for countries seeking to strengthen their SME sector (WB-IDB 2015).

From Table 1, we can see that Turkish SMEs play a similarly important role in the 'non-financial business economy' as SMEs in other European countries. A total of 2,431,916 SMEs constituted 99.8 percent of the number of enterprises, and provided 75.5% percent of employment and 53.9 percent of wages and salaries in 2013. Relative to their numbers in the total enterprise population, micro-businesses accounted for a smaller share of total value added compared to other size categories. Although they do not generate as much income as larger corporations, they are considered as being a critical component of the strength of local economies.

<INSERT TABLE 1 ABOUT HERE>

Our data come from various sources. The standard balance sheet information for conventional banks is derived from the Banks Association of Turkey, and that of Islamic banks is from the Participation Banks Association of Turkey. SME loans and the non-performing SME loans at the bank-level are provided by the Central Bank of the Republic of Turkey (CBRT). Our quarterly dataset comprises 31 conventional banks and 4 Islamic banks over the time period 2006Q4–2014Q2. The four Islamic banks are *Albaraka Turk*, *Bank Asya*, *Kuveyt Turk*, and *Turkiye Finans*. Table 2 shows the descriptive statistics of the variables used in our empirical analyses for both types of banks. The last column of the table indicates the results of a *t*-test for equality of means between Islamic and conventional banks for the considered variables. For the period 2006Q4-2014Q2, Islamic banks have higher volumes of lending to SME, but also higher volumes of non-performing SME loans. For both variables, the differences between Islamic and conventional banks are statistically significant. The mean quarterly nominal SME loan growth for conventional and Islamic banks were 5.23% and 7.86%, respectively. However, according to the displayed *t*-test results, no statistical significant difference between both sub-samples was found. The mean quarterly growth in non-performing SME loans (NPL) conventional banks amounted to 8.19%, while that of Islamic banks was higher and equaled 12.09%. Again, no statistical difference in loan growth is observed between both types of banks. Notice, however, that each of these two variables show a high degree of dispersion for both banking systems.

<INSERT TABLE 2 ABOUT HERE>

As for the control variables, Islamic banks record, on average, higher volumes of capital, deposit funding, and liquid assets. Islamic banks are also larger than their conventional counterparts. As for the first differences of control variables, Islamic banks do behave like conventional banks. The exception is the growth rate of bank capital for Islamic banks, which outperformed the group of conventional banks.

4. Econometric methodology and empirical results

Our estimation strategy is threefold. First, we conduct panel unit root tests to examine the stationarity properties of the underlying variables. Second, we test the cointegration relationship between the variables using the Pedroni (1999, 2004) panel cointegration test provided that the variables are found to be integrated of *I*(1). Finally, a panel *Granger* causality test is applied in a VECM framework to examine *Granger* short-run and long-run causality relationships between variables.

4.1. Panel unit root

Before proceeding with the estimations, we test the stationarity of the series using the Fisher type augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) panel unit root tests as proposed by Maddala and Wu (1999). Both of these tests do not require a balanced panel as do most tests. Fisher-type tests conduct the unit root tests for each panel individually, and then combine the p-values of N tests to obtain a single panel statistic. Table 3 documents the unit root test results in which NPL (i.e., the volume of non-performing SME loans) and SME loans (i.e. the volume of lending to SMEs) are the variables of interest for the *Granger* causality test. The other variables serve as control factors, representing other bank-specific characteristics that might influence the relationship between NPL and SME lending. Our results reveal that all the variables are integrated of order one, in that the null hypothesis of a panel unit root is not rejected for the levels of the series but is rejected at the 1% level for the first differenced series. We also perform a second generation unit root CIPS (Pesaran, 2007) because this test has the advantage that explicitly consider cross-section dependence in the data. Test results indicate that all the variables are *I*(0) in the first differences, but several variables are borderline in their levels, *I*(0)/ *I*(1).

<INSERT TABLE 3 ABOUT HERE>

Nevertheless, determining the integration properties of the variables through classic panel unit root tests could result in misinterpretations as they do not account for the possible presence of structural breaks (Narayan and Smyth, 2007). To examine whether the series are still non-stationary when structural breaks are accounted for, we employ the recently developed test by Narayan and Popp (2010) which allow for two structural breaks in the data series.[5] Table 4 presents the Narayan and Popp (2010) unit root test, which has a null hypothesis of a unit root in the series. When we allow for two breaks in the level and slope of a trending data series (model M2), we cannot reject the null of a unit root for 19 and 24 SME loans and NPL series, respectively. As for the control variables, we cannot reject the null of a unit root for 19, 18, 24 and 18 CAP, DEP, LIQ, and $SIZE$ series, respectively.[6]

<INSERT TABLE 4 ABOUT HERE>

Using the *Granger* causality framework which does not account for these structural breaks can give rise to misleading conclusions in the relationship between NPLs and credit growth. We follow the procedure adopted by Tsong and Lee (2011), Zhang et al. (2016) and Chen et al. (2018) to reconstruct new series of the variables under consideration as follows:

$$y_{it}^{a} = y_{it} - \sum_{b=1}^{m} \hat{\mu}_b I_{it}$$

Where y_{it}^{a} is the variable of bank i adjusted by the effect of possible structural breaks. I_{it} is an indicator function taking unity, if $t \geq T_b$ $(b = 1,2, \dots, m)$ and zero otherwise.

[5] Narayan and Popp (2013) compare Narayan and Popp (2010) (NP) test with the prominent tests of Lumsdaine and Papell (1997) and Lee and Strazicich (2003), and they find that the NP test has not only better size and power properties, but also identifies structural breaks more accurately.

[6] Please note that Table 4 presents only the banks of which the series had sufficient number of observations to conduct the Narayan and Popp (2010) test.

4.2. Panel cointegration

Once it is found from the unit root test that the variables are non-stationary, i.e., they are integrated of order one, then the next step is to apply cointegration analysis to examine whether a long-run cointegration relationship exists among those variables. In this study, we apply Pedroni's cointegration test methodology to allow for heterogeneity across individual members of the panel. Pedroni (1999, 2004) proposes two cointegration tests. The panel tests based on the "within-dimension" approach pool the autoregressive coefficients across members of the panel. The group tests are based on the "between-dimension" approach which simply averages the individually estimated coefficients for each member. We consider four test statistics, instead of all seven test statistics, because panel PP/ADF and group PP/ADF tests have better small-sample properties than the other tests, and hence, they are more reliable (Pedroni, 2004). Panel cointegration test results are presented in Table 5. We can infer that the test statistics in general reject the null of no cointegration for both Islamic and conventional banks and also for the full sample of banks. Hence, we conclude that for banks operating in Turkey SME, NPL, CAP, DEP, LIQ, and $SIZE$ are panel cointegrated.

<INSERT TABLE 5 ABOUT HERE>

4.3. Baseline panel causality test.

Having established a cointegration relationship, we estimate a panel-based error-correction model to test for *Granger* causality between small businesses lending and non-performing loans. This representation amounts to the following error correction model:

$$\Delta \mathrm{NPL}_{it} = \alpha_i + \sum_{j=1}^{q} \alpha_{1j} \Delta \mathrm{NPL}_{i,t-q} + \sum_{j=1}^{q} \alpha_{2j} \Delta \mathrm{SME}_{i,t-q} + \alpha_3 \varepsilon_{1i,t-1} + \mu_{1it} \quad (1)$$

$$\Delta \mathrm{SME}_{it} = \beta_i + \sum_{j=1}^{q} \beta_{1j} \Delta \mathrm{SME}_{i,t-q} + \sum_{j=1}^{q} \beta_{2j} \Delta \mathrm{NPL}_{i,t-q} + \beta_3 \varepsilon_{2i,t-1} + \mu_{2it} \quad (2)$$

with subscripts i and t denoting, respectively, an observation for bank i in quarter t. The variable ΔNPL is the growth rate in non-performing loans of the SME credits portfolio (overdue more than 90 days), and ΔSME represents the growth in credit towards SMEs. The one period lagged errors measure the speed of adjustment to equilibrium and are derived from the potential long run models: $\mathrm{NPL_{it}} = \lambda_{1\mathrm{i}} + \lambda_{2\mathrm{i}}\mathrm{SME} + \varepsilon_{1\mathrm{it}}$ and $\mathrm{SME_{it}} = \delta_{1\mathrm{i}} + \delta_{2\mathrm{i}}\mathrm{NPL} + \varepsilon_{2\mathrm{it}}$.[7] We add bank-specific fixed effects (α_i and β_i) to control for unobserved bank heterogeneity. The disturbances μ_{1it} and μ_{2it} are assumed to be independently distributed across banks with a zero mean. We perform a fixed-effects model with lagged dependent variables, since, as in the case here, the Nickell (1981) bias becomes small for large *T*. We further refer to Judson and Owen (1999), who recommend the use of the fixed effects estimator in unbalanced panels with $T \geq 30$.

Using the specification in Eqs. (1) and (2) allows us to test for both short and long run causality. Specifally, in the short run, if the sum of coefficients $\sum_{j=1}^{q} \alpha_{2j}$ is significantly different from zero, then SME lending does *Granger*-cause non-performing SME loans in Eq. (1). If, however, $\sum_{j=1}^{q} \alpha_{2j} = 0$, then SME lending does not *Granger*-cause NPL. Similarly, in Eq. (2), if $\sum_{j=1}^{q} \beta_{2j} \neq 0$ then, in the short run, non-performing loans *Granger*-causes SME lending. The long run causality can be determined by examining the significance of the coefficient of the error correction term in Eqs. (1) and (2). If the coefficient of error correction term turns out to be negative, this would indicate that the deviations from the long run equilibrium will be eliminated following changes in each variable. If for instance NPL is high relative to its equilibrium value, a negative change on NPL and/or a negative change in SME loans will correct towards equilibrium. To select the order of lag q, we start with a maximum lag length of 3 and pare it down as per the Akaike Information criterion (AIC). The maximum lag length is chosen according to the Bartlett kernel, which is equal to $4(T/100)^{2/9} \approx 3$ (Basher and Westerlund, 2008). The three quarter maximum lag is also consistent with the average maturity of SME debt in Turkey[8].

[7] We refer to Narayan and Popp (2012) for a similar estimation strategy.

[8] For example, Bakiciol (2017), in analyzing the impact of durable relationships on funding conditions, reports that his individual bank loan data with more than 9 million observations has a median maturity of 0.5 years

<INSERT TABLE 6 ABOUT HERE>

The empirical results of the *Granger* causality tests are shown in Table 6. The upper panel of present the results for Eq.(1). The test results for the sum of coefficients across the nine specifications, determined in function of lag length combinations, indicate that SME lending does not *Granger*-cause NPL in the short run. The statistics for AIC suggest that the optimal specification is the model with lag-lengths of one for *SME* lending and three for *NPL*. This finding is not in line with studies reporting higher NPL for increased bank lending (Salas and Saurina, 2002; Jiménez and Saurina, 2006; Klein, 2013). However, Keeton (1999) argues that an increase in loan growth is likely to lead to higher NPL only if the source of faster loan growth is due to a shift in bank credit supply. Therefore, the most plausible explanation for this disconnect is the conservative lending stance adopted by Turkish banks after the severe banking crisis in 2001 and the subsequent policy measures taken by the government to seriously deal with their NPL problems (see, e.g., Tanyeri, 2010; De Jonghe et al., 2012). The coefficient estimates on the error corrections terms suggests that SME lending and non-performing SME loans are related to each other in the long run.

The empirical results of the *Granger* causality tests for Eq. (2) are displayed in the lower part of Table 6. For the nine specifications testing causality running from *NPL* to *SME* lending, the tests for the sum of coefficients indicate that, in the short run, we cannot reject the null hypothesis of non-causality. The statistics for AIC suggest that the optimal specification is the model with lag-lengths of three for *NPL* and three for *SME* lending. In the long run, we again find that SME lending and NPL are related to each other.

<INSERT TABLE 7 ABOUT HERE>

Granger causality tests are typically performed in a simple bivariate setting. Bivariate models, however, might suffer from omitted variable bias (Justesen, 2008; Fiordelisi et al., 2011;

for the period 2002-2014. Moreover, SMEs in Turkey often use rotating credit lines which have short maturity structures.

Imbierowicz and Rauch, 2014). Therefore, in Table 7, we present the results of *Granger* causality tests with inclusion of bank specific variables. In analyses with inclusion of control variables, the one period lagged returns measure the speed of adjustment to equilibrium and are derived from the potential long run models: $\mathrm{NPL_{it}} = \lambda_{1i} + \lambda_{2i}\mathrm{SME} + \lambda_{3i}\mathrm{X} + \varepsilon_{1it}$ and $\mathrm{SME_{it}} = \delta_{1i} + \delta_{2i}\mathrm{NPL} + \delta_{3i}\mathrm{X} + \varepsilon_{2it}$. The X stands for bank-specific control variables, representing the volume of bank capital (in natural logarithms), the volume of deposits (in natural logarithm), the volume of liquid assets (in natural logarithms), and total bank size (in natural logarithm). In sum, the empirical results of the *Granger* causality tests with control variables confirm our previous observation that, in the short run, there is no causality in both directions between SME lending and non-performing SME loans. In the long run, we find that SME lending and NPL share two similar adjustment processes in response to deviations from long-run equilibrium. Most of the bank-specific control variables are not significant at conventional levels.

4.4. Islamic versus conventional banks

In the previous section, the test results show evidence that in the Turkish banking sector SME lending and non-performing SME loans do not *Granger*-cause each other in the short run. In order to examine the sensitivity of baseline *Granger* causality results to bank type (Islamic versus conventional banks), we extend our baseline specifications above with bank type interaction terms (Podpiera and Weill, 2008).[9] This leads us to the following specifications:

$$\Delta\mathrm{NPL_{it}} = \alpha_i + \sum_{j=1}^{q} \alpha_{1j}\Delta\mathrm{NPL_{i,t-q}} + \sum_{j=1}^{q} \alpha_{2j}\Delta\mathrm{SME_{i,t-q}} + \sum_{j=1}^{q} \alpha_{3j}\Delta\mathrm{SME_{i,t-q}} * \mathrm{Islamic_i} + \alpha_4\varepsilon_{1i,t-1} + \mu_{1it} \quad (3)$$

$$\Delta\mathrm{SME_{it}} = \beta_i + \sum_{j=1}^{q} \beta_{1j}\Delta\mathrm{SME_{i,t-q}} + \sum_{j=1}^{q} \beta_{2j}\Delta\mathrm{NPL_{i,t-q}} + \sum_{j=1}^{q} \beta_{3j}\Delta\mathrm{NPL_{i,t-q}} * \mathrm{Islamic_i} + \beta_4\varepsilon_{2i,t-1} + \mu_{2it} \quad (4)$$

[9] We follow a similar empirical strategy as in Podpiera and Weill (2008). They conducted a *Granger causality* test between NPLs and cost efficiency on a panel of Czech banks and examined, inter alia, whether their baseline findings were sensitive to bank ownership.

with the dummy variable Islamic equal to one for Islamic banks, and 0 for conventional banks. If the *Granger causality* test between NPL and SME lending yields different results for Islamic banks, then we should observe that $\sum_{j=1}^{q} \alpha_{3j} \neq 0$ in Eq. (3) and/or $\sum_{j=1}^{q} \beta_{3j} \neq 0$ in Eq. 4. The $\sum_{j=1}^{q} \alpha_{2j}$ and $\sum_{j=1}^{q} \beta_{2j}$ verifies the *Granger* causality for conventional banks, the $\sum_{j=1}^{q} \alpha_{3j}$ and $\sum_{j=1}^{q} \beta_{3j}$ capture the sensitivity difference produced by Islamic banks, hence $\sum_{j=1}^{q} \alpha_{2j} + \sum_{j=1}^{q} \alpha_{3j}$ and $\sum_{j=1}^{q} \beta_{2j} + \sum_{j=1}^{q} \beta_{3j}$ measure the *Granger* causality for Islamic banks. We again run all the bank-fixed effects regressions with and without other bank characteristics. The one period lagged errors are derived from the potential long run models: $\mathrm{NPL}_{it} = \lambda_{1i} + \lambda_{2i}\mathrm{SME} + \lambda_{3i}\mathrm{SME} * \mathrm{Islamic} + \varepsilon_{1it}$ and $\mathrm{SME}_{it} = \delta_{1i} + \delta_{2i}\mathrm{NPL} + \delta_{3i}\mathrm{NPL} * \mathrm{Islamic} + \varepsilon_{2it}$ for models without bank specific control variables, $\mathrm{NPL}_{it} = \lambda_{1i} + \lambda_{2i}\mathrm{SME} + \lambda_{3i}\mathrm{SME} * \mathrm{Islamic} + \lambda_{4i}\mathrm{X} + \varepsilon_{1it}$ and $\mathrm{SME}_{it} = \delta_{1i} + \delta_{2i}\mathrm{NPL} + \delta_{3i}\mathrm{NPL} * \mathrm{Islamic} + \delta_{4i}\mathrm{X} + \varepsilon_{2it}$ for models with bank controls. To select the order of lag q, we start with a maximum lag length of 3 (determined according to the Bartlett kernel) and pare it down as per the Akaike Information criterion (AIC).

The results from the modified *Granger* causality test are presented in Table 8. Compared to conventional banks, the *Granger* causality test between SME lending and non-performing SME lending yields different results for Islamic banks. More specifically, in the short run, we observe for Islamic banks a significant and negative total effect of SME lending on NPL. For Islamic banks, the total effect of SME lending on NPL is -0.363, which implies that an increase in bank credit with 10% leads to a reduction in NPL growth by 3.63%. An even stronger finding is observed in Model 2, which also includes other bank controls. When we examine the reverse causality in Models 3 and 4, we find that NPL *Granger*-causes a slowdown in the SME lending of Islamic banks. The total effect of a change in NPLs on change in bank loans is equal to -0.403, which indicates that a 10% increase in NPL leads to a decline in loan growth by 4.03%. Overall, in the short run, our results indicate that there is a negative bidirectional relation between NPL and SME lending for Islamic banks, whereas no relationship is found for conventional banks. Moreover, coefficients on error correction terms are negative and statistically significant at 1% confidence level. These findings indicate that any deviation from the long-run equilibrium between variables is corrected for each

period to return the long-run equilibrium level. Again, most of the bank-specific control variables are not significant at conventional levels.

<INSERT TABLE 8 ABOUT HERE>

The robustness of our findings is verified by performing the *Granger* causality test separately for the sample of conventional and Islamic bank. More specifically, we estimate Eq. (1) and Eq. (2) for each subsample separately. The *Granger* causality test results are presented in Table 9. The causality results confirm the bidirectional relationship between SME lending and non-performing SME loans for Islamic banks, whereas no relationship is observed for conventional banks.

<INSERT TABLE 9 ABOUT HERE>

At first glance, our results might seem puzzling why Islamic banks behave different from their conventional peers. However, this is less so if we take into account the *Shariah*-constrained environment in which Islamic banks operate, which has implications on the diversification of their funding sources. As is clear from the summary statistics in Table 2, Islamic banks are heavily reliant on deposit funding because they have limited access to the interbank market and the lender of last resort facility.[10] Deposits, however, are considered as a primary device to ensure market discipline (Calomiris and Kahn, 1991; Diamond and Rajan, 2001). Furthermore, the profit-and-loss sharing feature of deposit accounts makes Islamic banks even more subject to market discipline. Hence, given the nature of Islamic banking and the associated absence of preset returns, if Islamic banks' NPL are growing, deposit returns will be adversely affected and depositors, on their turn, will exercise power over bank management by withdrawing their deposits (Aysan et al., 2017). Turkish Islamic banks are therefore forced to be prudent by specializing in the small borrowers segment of the credit market, which enables them to achieve a lower growth in NPLs with increased bank lending. The spirit of Islam is balance, which ought to be embedded in every aspect of life. From this perspective, Islamic bank managers are not allowed to transgress common

[10] This forces Islamic banks to hold more liquid assets than their conventional counter parts (see Table 2).

principals of morality. Hence, Islamic bankers should intermediate the entrusted funds towards productive ventures with utmost diligence. Further, compared with conventional banks, the presence of *Shariah* boards in Islamic banks operate as an additional monitoring device to promote due diligence in risk management (Mollah et al., 2017). In addition, the modus operandi of Islamic banks will contain their risk-taking incentives. As long as conventional banks achieve a positive risk-adjusted intermediation margin, they will be able to fund their investments on the assets side by luring depositors with higher interest rate offerings. This could explain the disconnect between NPLs and credit expansion for conventional banks. However, this positive causality between growth in credits and deposits is less obvious for Islamic banks, since they cannot attract funds for their investments by offering depositors higher preset returns. Islamic banks are therefore operating under a more resource-constrained condition that forces them to intermediate more prudently

5. Conclusions

This paper aims to provide new empirical evidence on the relationship between bank lending and non-performing loans using quarterly balance sheet data of commercial banks operating in Turkey. Furthermore, our dataset allows us to explore a particular segment of the credit market, namely the market for SME loans, which has not yet been empirically documented in the literature. The study between bank credits and NPLs in Turkey is especially timely given the concerns raised by the European Banking Coordination "Vienna" Initiative (2012) about the acceleration in credit growth after the global financial crisis. To that end, we employ a *Granger causality* analysis to examine whether there is an indication of a significant direction of determination between SME lending and non-performing SME loans. The test results for the whole banking system indicate in general that there is no *Granger causality* between SME lending and NPL in the short-run. A plausible explanation for this finding is the application of tight lending standards towards SMEs.

Furthermore, increases in NPLs do not seem to affect bank lending either because of the diversified nature of banks' funding sources. However, in our modified *Granger causality* analysis with Islamic banking interactions, we observe that there is a bidirectional causality relationship between SME lending and NPL. This is true even after controlling for additional bank-specific control variables. We relate these findings to the particular environment in which Islamic banks are required to operate according to *Shariah* principles. The application of profit-and-loss sharing principles by Islamic banks in the absence of preset deposit rates, in combination with their heavy reliance on deposit-funding, make them especially subject to market discipline. This results into a more efficient aligning of banks' incentives with the interest of depositors. Furthermore, our findings are also in line with the moral guidelines that Islamic banks are expected to follow. Transgression of common principals of morality in the Islam are forbidden. Islamic banks should refrain from taking excessive risk, and they are expected to intermediate between savers and borrowers with utmost diligence.

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References

Altunbas, Y., Gambacorta, L., & Marques-Ibanez, D. (2010). Bank risk and monetary policy. Journal of Financial Stability, 6(3), 121-129.

Aysan, A. F., Disli, M., Ozturk, H., & Turhan, I. M. (2015). Are Islamic banks subject to depositor discipline?. The Singapore Economic Review, 60(01), 1550007.

Aysan, A.F., Disli, M., Duygun, M., & Ozturk, H. (2017). Islamic Banks, Deposit Insurance Reform, and Market Discipline: Evidence from a Natural Framework. Journal of Financial Services Research, 51(2), 257-282.

Aysan, A. F., Disli, M., Ng, A., & Ozturk, H. (2016). Is small the new big? Islamic banking for SMEs in Turkey. Economic Modelling, 54, 187-194.

Baele, L., Farooq, M., & Ongena, S. (2014). Of religion and redemption: Evidence from default on Islamic loans. Journal of Banking & Finance, 44, 141-159.

Bakiciol, T. (2017). The Impact of Durable Relationship with Banks when Crisis Hits. Emerging Markets Finance and Trade, 53(11), 2609-2624.

Balgova, M., Nies, M., & Plekhanov, A. (2016). The economic impact of reducing non-performing loans. EBRD Working Paper No. 193.

Basher, S. A., & Westerlund, J. (2008). Is there really a unit root in the inflation rate? More evidence from panel data models. Applied Economics Letters, 15(3), 161-164.

Beck, T., Demirgüç-Kunt, A., & Maksimovic, V. (2008). Financing patterns around the world: Are small firms different?. Journal of Financial Economics, 89(3), 467-487.

Beck, T., Demirgüç-Kunt, A., & Merrouche, O. (2013). Islamic vs. conventional banking: Business model, efficiency and stability. Journal of Banking & Finance, 37(2), 433-447.

Berger, A. N., & Udell, G. F. (1998). The economics of small business finance: The roles of private equity and debt markets in the financial growth cycle. Journal of Banking & Finance, 22(6), 613-673.

Berger, A. N., & Udell, G. F. (2004). The institutional memory hypothesis and the procyclicality of bank lending behavior. Journal of financial intermediation, 13(4), 458-495.

Bernanke, B. S., & Blinder, A. S. (1988). Credit, money, and aggregate demand. The American Economic Review, 78(2), 435-439

Borio, C., Furfine, C., & Lowe, P. (2001). Procyclicality of the financial system and financial stability: issues and policy options. BIS Papers No. 1, 1-57.

Calomiris, C. W., & Kahn, C. M. (1991). The role of demandable debt in structuring optimal banking arrangements. The American Economic Review, 81(3), 497-513.

Chen, W. Y., Chang, T., & Lin, Y. H. (2018). Investigating the persistence of suicide in the United States: Evidence from the quantile unit root test. Social Indicators Research, 135(2), 813-833.

Čihák, M., & Hesse, H. (2010). Islamic banks and financial stability: An empirical analysis. Journal of Financial Services Research, 38(2-3), 95-113.

Cornett, M. M., McNutt, J. J., Strahan, P. E., & Tehranian, H. (2011). Liquidity risk management and credit supply in the financial crisis. Journal of Financial Economics, 101(2), 297-312.

De Jonghe, O., Disli, M., & Schoors, K. (2012). Corporate governance, opaque bank activities, and risk/return efficiency: pre-and post-crisis evidence from Turkey. Journal of Financial Services Research, 41(1-2), 51-80.

Demirgüç-Kunt, A., & Huizinga, H. (2010). Bank activity and funding strategies: The impact on risk and returns. Journal of Financial Economics, 98(3), 626-650.

Diamond, D. W., & Rajan, R. G. (1999). Liquidity risk, liquidity creation and financial fragility: A theory of banking. Journal of the Political Economy, 109(2), 287-327

ECB (2013), "Box 6 – Small and Medium-Sized Enterprises in the Euro Area: Economic Importance and Financing Conditions", European Central Bank Monthly Bulletin, July.

European Banking Coordination "Vienna" Initiative (2012) Working Group on NPLs in Central, Eastern and Southeastern Europe.

European Commission, 2015. 2015 SBA Fact Sheet Turkey.

Farooq, M., & Zaheer, S. (2015). Are Islamic banks more resilient during financial panics?. Pacific Economic Review, 20(1), 101-124.

Fiordelisi, F., Marques-Ibanez, D., & Molyneux, P. (2011). Efficiency and risk in European banking. Journal of Banking & Finance, 35(5), 1315-1326.

Foos, D., Norden, L., & Weber, M. (2010). Loan growth and riskiness of banks. Journal of Banking & Finance, 34(12), 2929-2940.

Hasan, M., & Dridi, J. (2011). The effects of the global crisis on Islamic and conventional banks: A comparative study. Journal of International Commerce, Economics and Policy, 2(2), 163-200.

Hassan, M. K., & Aliyu, S. (2018). A contemporary survey of Islamic banking literature. Journal of Financial Stability, 34, 12-43.

Ibrahim, M. H. (2016). Business cycle and bank lending procyclicality in a dual banking system. Economic Modelling, 55, 127-134.

Imam, P., & Kpodar, K. (2015). Islamic banking: Good for growth? Economic Modelling, 59, 387–401.

Imbierowicz, B., & Rauch, C. (2014). The relationship between liquidity risk and credit risk in banks. Journal of Banking & Finance, 40, 242-256.

Ivashina, V., & Scharfstein, D. (2010). Bank lending during the financial crisis of 2008. Journal of Financial economics, 97(3), 319-338.

Jiménez, G., & Saurina, J. (2006). Credit cycles, credit risk, and prudential regulation. International Journal of Central Banking, 2(2), 65–98.

Judson, R. A., & Owen, A.L. (1999). Estimating dynamic panel data models: a guide for macroeconomists. Economics letters, 65(1), 9-15.

Justesen, M. K. (2008). The effect of economic freedom on growth revisited: New evidence on causality from a panel of countries 1970–1999. European Journal of Political Economy, 24(3), 642-660.

Keeton, W. (1999). Does faster loan growth lead to higher loan losses. Federal Reserve Bank of Kansas City. Economic Review 1999 (2nd quarter), 57–75.

Klein, N. (2013). Non-performing loans in CESEE: determinants and impact on macroeconomic performance, IMF Working Paper No. 13/72.

Kumru, C. S., & Sarntisart, S. (2016). Banking for those unwilling to bank: Implications of Islamic banking systems. Economic Modelling, 54, 1-12.

Lee, J., & Strazicich, M. C. (2003). Minimum Lagrange multiplier unit root test with two structural breaks. Review of Economics and Statistics, 85(4), 1082-1089.

Lumsdaine, R. L., & Papell, D. H. (1997). Multiple trend breaks and the unit-root hypothesis. Review of Economics and Statistics, 79(2), 212-218.

Maddala, G. S., & Wu, S. (1999). A comparative study of unit root tests with panel data and a new simple test. Oxford Bulletin of Economics and statistics, 61(S1), 631-652.

Mesnard, B., Margerit, A., Power, C., & Magnus, M. (2016). Non-performing loans in the Banking Union: stocktaking and challenges. Briefing Directorate-General for Internal Policies, Economic Governance Support Unit, European Parliament.

Mollah, S., Hassan, M. K., Al Farooque, O., & Mobarek, A. (2017). The governance, risk-taking, and performance of Islamic banks. Journal of Financial Services Research, 51(2), 195-219.

Narayan, P. K., & Bannigidadmath, D. (2017). Does financial news predict stock returns? New evidence from Islamic and non-Islamic stocks. Pacific-Basin Finance Journal, 42, 24-45.

Narayan, P. K., & Phan, D. H. B. (2019). A survey of Islamic banking and finance literature: Issues, challenges and future directions. Pacific-Basin Finance Journal, 53, 484-496.

Narayan, P. K., & Popp, S. (2010). A new unit root test with two structural breaks in level and slope at unknown time. Journal of Applied Statistics, 37(9), 1425-1438.

Narayan, P. K., & Popp, S. (2012). The energy consumption-real GDP nexus revisited: Empirical evidence from 93 countries. Economic Modelling, 29(2), 303-308.

Narayan, P. K., & Popp, S. (2013). Size and power properties of structural break unit root tests. Applied Economics, 45(6), 721-728.

Narayan, P. K., Sharma, S. S., Thuraisamy, K. S., & Westerlund, J. (2018). Some preliminary evidence of price discovery in Islamic banks. Pacific-Basin Finance Journal, 52, 107-122.

Narayan, P. K., & Smyth, R. (2007). Are shocks to energy consumption permanent or temporary? Evidence from 182 countries. Energy policy, 35(1), 333-341.

Nickell, S. (1981). Biases in dynamic models with fixed effects. Econometrica, 49(6), 1417-1426.

OECD (2012), Financing SMEs and Entrepreneurs 2012: An OECD Scoreboard. OECD Publishing, Paris.

Pedroni, P. (1999). Critical values for cointegration tests in heterogeneous panels with multiple regressors. Oxford Bulletin of Economics and statistics, 61(S1), 653-670.

Pedroni, P. (2004). Panel cointegration: asymptotic and finite sample properties of pooled time series tests with an application to the PPP hypothesis. Econometric Theory, 20(3), 597-625.

Pesaran, M. H. (2007). A simple panel unit root test in the presence of cross-section dependence. Journal of Applied Econometrics, 22(2), 265-312.

Petersen, M. A., & Rajan, R. G. (1995). The effect of credit market competition on lending relationships. The Quarterly Journal of Economics, 110(2), 407-443.

Podpiera, J., & Weill, L. (2008). Bad luck or bad management? Emerging banking market experience. Journal of Financial Stability, 4(2), 135-148.

Salas, V., & Saurina, J. (2002). Credit risk in two institutional regimes: Spanish commercial and savings banks. Journal of Financial Services Research, 22(3), 203-224.

Shaban, M., Duygun, M., Anwar, M., & Akbar, B. (2014). Diversification and banks' willingness to lend to small businesses: Evidence from Islamic and conventional banks in Indonesia. Journal of Economic Behavior & Organization, 103, S39-S55.

Schularick, M., & Taylor, A. M. (2012). Credit booms gone bust: monetary policy, leverage cycles, and financial crises, 1870–2008. The American Economic Review, 102(2), 1029-1061.

Sinkey Jr., J.F., & Greenawalt, M.B. (1991). Loan-loss experience and risk-taking behavior at large commercial banks. Journal of Financial Services Research, 5(1), 43-59.

Tanyeri, B. (2010). Financial transparency and sources of hidden capital in Turkish banks. Journal of Financial Services Research, 37(1), 25-43.

Tsong, C. C., & Lee, C. F. (2011). Asymmetric inflation dynamics: evidence from quantile regression analysis. Journal of Macroeconomics, 33(4), 668-680.

Tracey, M., & Leon, H. (2011). The impact of non-performing loans on loan growth. IMF Working Paper.

World Bank & Islamic Development Bank (WB-IDB). (2015). Leveraging Islamic finance for SMEs. Joint WB-IDB Policy Report.

Zhang, X., Chang, T., Su, C. W., & Wolde-Rufael, Y. (2016). Revisit causal nexus between military spending and debt: A panel causality test. Economic Modelling, 52, 939-944.

Table 1: SME importance in Turkey and EU-28.

	Number of enterprises			Number of persons employed			Value added		
	Turkey		EU28	Turkey		EU28	Turkey		EU28
Class size	Number	Share	Share	Number	Share	Share	Billion €	Share	Share
Micro	2,362,995	97.00%	92.70%	5,312,800	45.20%	29.20%	33	20.50%	21.10%
Small	48,229	2.00%	6.10%	1,491,995	12.70%	20.40%	20	12.80%	18.20%
Medium	20,692	0.80%	1.00%	2,072,448	17.60%	17.20%	33	20.60%	18.50%
SMEs	**2,431,916**	**99.80%**	**99.80%**	**8,877,243**	**75.50%**	**66.90%**	**86**	**53.90%**	**57.80%**
Large	3,858	0.20%	0.20%	2,879,712	24.50%	33.10%	74	46.10%	42.20%
Total	**2,435,774**	**100.00%**	**100.00%**	**11,756,955**	**100.00%**	**100.00%**	**160**	**100.00%**	**100.00%**

Source: European Commission's 2015 SBA Fact Sheet Turkey. According to the Turkish Statistical institute: businesses with fewer than 10 employees or annual sales of less than 1million TL are classified as micro-sized enterprises; businesses with 10–49 employees or annual sales of 1–5 million TL are identified as small businesses; and businesses that have 50–249 employees or annual sales of 5–25 million TL are categorized as medium-sized businesses. Turkey and EU use equal staff headcount ceilings for the definition of different SME categories.

Table 2: Summary statistics.

	Conventional banks			Islamic banks			Difference
Variable	Obs	Mean	SD	Obs	Mean	SD	
SME	793	13.7164	2.6184	124	14.5992	0.9890	0.8828***
ΔSME	760	0.0523	0.4067	120	0.0786	0.2577	0.0263
NPL	733	10.7060	2.4973	124	11.1922	1.3232	0.4862**
ΔNPL	701	0.0819	0.5549	120	0.1209	0.4380	0.0390
CAP	894	13.6308	1.8400	124	13.9155	0.6044	0.2847*
ΔCAP	857	0.0411	0.0998	120	0.0630	0.1789	0.0219*
DEP	889	14.5965	2.7915	124	15.7892	0.5690	1.1927***
ΔDEP	853	0.0348	0.4923	120	0.0584	0.0536	0.0236
LIQ	894	12.5018	3.0049	124	13.9334	0.8760	1.4316***
ΔLIQ	857	0.0562	0.5371	120	0.0866	0.2506	0.0303
SIZE	894	15.4429	2.2470	124	16.0884	0.6281	0.6455***
ΔSIZE	857	0.0358	0.2109	120	0.0664	0.0487	0.0306

The table reports summary statistics of bank-specific variables. The SME variable stands for the natural logarithm of the volume of bank credits to SMEs, while NPL represents the natural logarithm of the volume of non-performing loans in the SME lending portfolio. The control variables are: CAP, DEP, LIQ, and $SIZE$. The CAP is the natural logarithm of the volume of bank capital. The DEP is the natural logarithm of the volume of total deposits. The LIQ is the natural logarithm of the volume of liquid assets (such as cash, central bank debt and short-term government securities) to total assets. The $SIZE$ is measured as the natural logarithm of total assets. Δ stands for the first difference operator. The last column refers to the difference between Islamic and conventional banks. Statistical significance is indicated by *** p< 0.01, ** p <0.05, * p< 0.1.

Table 3: Panel unit root tests.

	Conventional banks						Islamic banks						Full sample					
	Fisher-ADF		Fisher-PP		CIPS		Fisher-ADF		Fisher-PP		CIPS		Fisher-ADF		Fisher-PP		CIPS	
SME	10.536		10.760		-3.033	***	0.146		0.032		3.907		14.143		14.647		4.006	
NPL	20.398		15.200		-4.284	***	1.019		0.341		-0.086		20.888		15.541		1.880	
DEP	18.595		27.108		2.326		0.066		0.006		3.526		25.288		27.947		-0.259	
CAP	5.024		6.158		-1.986	**	0.077		0.006		0.756		3.438		6.633		-6.374	***
LIQ	13.285		14.043		-2.153	**	0.149		0.071		-5.195	***	13.375		14.276		-11.696	***
SIZE	11.184		17.139		2.201		0.118		0.001		1.914		9.921		17.167		-3.046	***
ΔSME	453.209	***	543.729	***	-7.160	***	117.261	***	107.079	***	-15.375	***	548.152	***	650.809	***	-16.960	***
ΔNPL	710.459	***	699.312	***	-6.568	***	83.1402	***	110.456	***	-15.552	***	793.599	***	809.769	***	-17.491	***
ΔDEP	704.133	***	1123.470	***	-6.742	***	15.143	*	32.461	***	-18.449	***	721.410	***	1155.930	***	-19.842	***
ΔCAP	674.553	***	759.587	***	-7.174	***	78.2124	***	93.806	***	-12.05	***	720.241	***	853.393	***	-15.983	***
ΔLIQ	971.194	***	1422.850	***	-7.510	***	117.259	***	117.778	***	-19.534	***	1088.450	***	1540.620	***	-21.467	***
ΔSIZE	547.668	***	833.768	***	-5.397	***	14.1432	*	20.143	***	-17.310	***	561.811	***	853.911	***	-18.371	***

Fisher type Augmented Dickey-Fuller (Fisher-ADF), Fisher type Phillips-Perron (Fisher-PP) panel unit root tests, and the CIPS panel unit root test of Pesaran (2007). The Fisher-ADF, Fisher-PP and CIPS examine the null hypothesis of nonstationary variables. The SME variable stands for the natural logarithm of the volume of bank credits to SMEs, while NPL represents the natural logarithm of the volume of non-performing loans in the SME lending portfolio. The control variables are: CAP, DEP, LIQ, and $SIZE$. The CAP is the natural logarithm of the volume of bank capital. The DEP is the natural logarithm of the volume of total deposits. The LIQ is the natural logarithm of the volume of liquid assets (such as cash, central bank debt and short-term government securities) to total assets. The $SIZE$ is measured as the natural logarithm of total assets. Δ stands for the first difference operator. Statistical significance is indicated by *** p< 0.01, ** p <0.05, * p< 0.1.

Table 4: Narayan and Popp unit root test.

	SME				NPL				CAP			
	TB1	TB2	*t*	k	TB1	TB2	*t*	k	TB1	TB2	*t*	k
Conventional banks												
Akbank	2009Q4	2012Q2	-4,25	0	2009Q4	2011Q4	-7,18 *	3	2008Q3	2011Q2	-4,52	3
Alternatifbank	2010Q1	2012Q2	-1,89	0	2010Q3	2012Q2	-3,16	0	2008Q2	2011Q1	-3,02	1
Anadolubank	2009Q4	2011Q3	-2,81	0	2009Q1	2011Q3	-4,02	0	2008Q3	2012Q2	-2,80	1
Bank Mellat	2010Q4	2012Q4	-5,86 *	0	2011Q2	2012Q4	-8,08 *	2	2008Q3	2010Q4	-6,61 *	0
Birlesik Fon Bankasi	2007Q4	2008Q2	-1,93	0	2008Q3	2010Q1	-3,93	3	2009Q1	2010Q3	-1,82	3
Citibank	2010Q1	2010Q4	-4,13	3	2010Q3	2012Q2	-3,97	0	2011Q2	2012Q2	-4,20	2
Denizbank	2009Q2	2012Q1	-8,06 *	0	2009Q2	2010Q1	-2,70	3	2008Q2	2011Q2	-2,34	0
Finans Bank	2008Q3	2012Q3	-5,04 *	2	2009Q3	2011Q2	-3,92	0	2008Q4	2010Q3	-2,31	0
Fortis Bank	2008Q1	2008Q4	-1,88	2	2008Q3	2009Q2	-4,99 *	0	2008Q3	2009Q2	2,28	3
Garanti Bankasi	2009Q3	2012Q3	-3,34	0	2008Q2	2012Q2	-2,93	0	2010Q1	2010Q4	-3,47	0
Habib Bank	2012Q1	2012Q4	-6,05 *	2	2009Q4	2012Q1	-5,07 *	3	2009Q3	2010Q2	-5,60 *	3
Halk Bankasi	2008Q3	2012Q2	-7,55 *	0	2008Q3	2012Q3	-5,13 *	3	2008Q2	2012Q3	-3,50	2
HSBC Bank	2008Q2	2009Q3	-2,69	2	2008Q2	2008Q4	-0,06	0	2008Q3	2011Q2	-1,26	0
Millennium Bank	2011Q3	2012Q2	-3,92	0	2010Q1	2011Q2	-9,10 *	3	2008Q2	2010Q3	-3,52	3
MNG Bank	2008Q3	2012Q2	-4,29	0	2010Q3	2012Q2	-5,09 *	3	2008Q2	2011Q3	-3,19	0
Oyak Bank	2008Q3	2012Q2	-3,76	0	2009Q4	2012Q2	-6,64 *	2	2008Q2	2009Q2	-3,59	3
Sekerbank	2009Q2	2011Q3	-7,87 *	0	2010Q4	2012Q3	-2,58	3	2009Q2	2010Q4	-2,20	2
Tekfenbank	2008Q3	2010Q2	-2,18	0	2008Q2	2009Q2	-2,41	0	2008Q4	2011Q1	-2,51	0
Tekstil Bankasi	2009Q3	2011Q4	-3,48	0	2009Q4	2012Q3	3,20	2	2008Q2	2012Q3	-4,68	0
Türk Ekonomi Bankasi	2008Q1	2008Q4	-3,31	0	2008Q1	2009Q2	-6,63 *	2	2008Q1	2009Q1	-9,09 *	0
Türk Ekonomi Bankasi [a]	2012Q3	2013Q1	-0,49	0	2012Q4	2014Q2	-2,27	0	2012Q2	2012Q4	-0,15	0
Türkiye Is Bankasi	2010Q4	2012Q3	-5,16 *	3	2009Q1	2010Q3	-4,32	1	2009Q2	2010Q2	-5,32 *	3
Vakiflar Bankasi	2010Q3	2012Q1	-1,98	3	2009Q4	2012Q3	-4,97 *	1	2009Q2	2011Q2	-2,90	1
Yapi ve Kredi Bankasi	2008Q3	2011Q4	-6,72 *	0	2009Q4	2012Q2	-5,42 *	0	2008Q3	2012Q3	-3,62	0
Ziraat Bankasi	2010Q3	2012Q3	-3,04	0	2010Q1	2012Q2	-1,14	0	2008Q2	2010Q4	-1,67	0
Islamic banks												
Albaraka Türk	2011Q4	2012Q3	-5,28 *	2	2008Q2	2012Q3	-4,21	3	2008Q2	2012Q3	-6,03 *	3
Bank Asya	2009Q4	2011Q3	-3,86	1	2008Q4	2012Q1	-3,54	1	2008Q3	2009Q4	0,22	1
Kuveyt Türk	2008Q2	2012Q1	-9,94 *	0	2008Q3	2010Q1	-7,63 *	1	2008Q2	2010Q2	-1,39	0
Türkiye Finans	2009Q4	2012Q3	-4,42	1	2009Q1	2011Q4	-5,12 *	3	2008Q3	2012Q3	-5,76 *	1

Table 4: Narayan and Popp unit root test (continued).

	DEP				LIQ				SIZE			
	TB1	TB2	*t*	k	TB1	TB2	*t*	k	TB1	TB2	*t*	k
Conventional banks												
Akbank	2008Q4	2010Q1	-4.56	0	2009Q3	2012Q1	-4.27	1	2008Q4	2011Q2	-5.57 *	2
Alternatifbank	2008Q3	2011Q1	-3.50	0	2011Q1	2012Q2	-5.15 *	0	2008Q4	2010Q4	-3.93	0
Anadolubank	2009Q2	2011Q2	-2.61	0	2008Q3	2010Q3	-3.50	3	2011Q2	2012Q3	-4.90 *	0
Bank Mellat	2008Q2	2011Q1	-3.47	3	2010Q2	2012Q1	-3.52	0	2008Q2	2012Q1	-3.17	2
Birlesik Fon Bankasi	2011Q3	2012Q3	-4.76	3	2008Q4	2010Q2	-2.96	0	2008Q2	2011Q2	-7.74 *	2
Citibank	2008Q4	2012Q1	-4.53	3	2010Q4	2012Q2	-6.19 *	2	2008Q4	2011Q4	-4.02	3
Denizbank	2011Q2	2012Q1	-1.97	0	2008Q3	2011Q2	-3.30	0	2010Q3	2011Q2	-5.35 *	0
Finans Bank	2009Q3	2011Q4	-3.63	0	2010Q4	2012Q3	-5.35 *	0	2009Q1	2010Q3	-3.82	3
Fortis Bank	2008Q2	2009Q2	-5.12 *	0	2008Q3	2009Q2	-4.67	0	2008Q2	2009Q1	-54.42 *	3
Garanti Bankasi	2009Q2	2012Q3	-3.99	0	2009Q2	2011Q1	-4.90 *	3	2008Q3	2011Q1	-3.71	3
Habib Bank	2009Q2	2010Q4	-3.81	2	2008Q3	2011Q3	-4.02	0	2009Q2	2010Q3	-5.20 *	3
Halk Bankasi	2009Q2	2012Q1	-4.58	3	2010Q4	2012Q1	-3.35	0	2011Q1	2012Q2	-4.64	1
HSBC Bank	2009Q2	2011Q1	-5.43 *	3	2009Q4	2011Q1	-5.76 *	0	2010Q4	2011Q4	-3.32	1
Millennium Bank	2008Q3	2009Q4	-3.50	1	2009Q1	2010Q2	-7.07 *	2	2008Q2	2009Q3	-2.22	0
MNG Bank	2009Q3	2010Q3	-2.77	2	2008Q4	2011Q1	-5.67 *	3	2008Q2	2009Q2	-4.07	0
Oyak Bank	2008Q4	2010Q4	-4.73	2	2010Q1	2010Q4	-4.62	3	2008Q4	2010Q4	-2.58	0
Sekerbank	2008Q4	2012Q2	-4.03	0	2009Q3	2010Q4	-4.29	2	2010Q1	2010Q4	-2.80	1
Tekfenbank	2008Q4	2011Q4	-6.31 *	1	2008Q2	2011Q1	-4.51	3	2011Q2	2012Q1	-4.80 *	0
Tekstil Bankasi	2008Q2	2010Q3	-3.21	0	2009Q4	2010Q3	-3.71	0	2009Q3	2010Q3	-2.22	0
Türk Ekonomi Bankasi	2008Q2	2009Q1	-4.25	0	2008Q1	2009Q2	-4.01	0	2008Q2	2009Q1	-12.85 *	3
Türk Ekonomi Bankasi [a]	2012Q2	2012Q4	-0.06	0	2012Q2	2012Q4	-0.10	0	2012Q3	2013Q1	-0.13	0
Türkiye Is Bankasi	2011Q1	2011Q4	-4.41	0	2008Q3	2010Q4	-4.90 *	3	2008Q3	2011Q2	-5.42 *	2
Vakiflar Bankasi	2010Q2	2012Q1	-3.79	0	2010Q1	2011Q3	-7.29 *	1	2008Q4	2011Q1	-4.03	3
Yapi ve Kredi Bankasi	2009Q1	2011Q2	-3.65	0	2008Q4	2011Q1	-3.48	0	2009Q1	2010Q3	-3.99	0
Ziraat Bankasi	2011Q2	2012Q3	-3.66	0	2009Q4	2011Q1	-4.45	3	2008Q3	2011Q3	-4.86 *	2
Islamic banks												
Albaraka Türk	2008Q4	2011Q2	-0.10	2	2008Q4	2009Q4	-5.84 *	0	2011Q1	2011Q4	-5.09 *	0
Bank Asya	2009Q3	2010Q4	-3.32	3	2008Q4	2012Q2	-5.34 *	0	2008Q2	2010Q4	-4.33	3
Kuveyt Türk	2009Q4	2011Q4	-5.12 *	1	2009Q2	2012Q1	-4.47	0	2008Q3	2011Q2	-1.75	0
Türkiye Finans	2008Q4	2011Q4	-6.48 *	0	2009Q1	2010Q3	-4.96 *	0	2009Q4	2012Q3	-4.26	2

Narayan and Popp (2010) unit root test for two breaks in the level and slope of a trending series. T_{B1} and TB2 are the dates of the structural breaks. We set a maximum lag 3 and *k, the* optimum number of lagged differences, is selected based on SBC. The one-sided critical value is −4.789 and corresponds to 10% level of significance (T=50). [a] The series for Türk Ekonomi Bankasi were split into two subsamples, representing before and after the acquisition of Fortis Bank.

Table 5: Pedroni panel cointegration tests.

	SME, NPL, CAP, DEP, LIQ and SIZE					
	Conventional banks		**Islamic banks**		**Full sample**	
	Statistic	Prob.	Statistic	Prob.	Statistic	Prob.
Panel PP-Statistic	-1.9593 **	0.0250	-2.0236 **	0.0215	-1.6238 *	0.0522
Panel ADF-Statistic	-2.0671 **	0.0194	-2.3485 ***	0.0094	-2.7688 ***	0.0028
Group PP-Statistic	-1.2813	0.1000	-3.3460 ***	0.0004	-2.4146 ***	0.0079
Group ADF-Statistic	-2.1592 **	0.0154	-3.0317 ***	0.0012	-3.2036 ***	0.0007

The SME variable stands for the natural logarithm of the volume of bank credits to SMEs, while NPL represents the natural logarithm of the volume of non-performing loans in the SME lending portfolio. The CAP is the natural logarithm of the volume of bank capital. The DEP is the natural logarithm of the volume of total deposits. The LIQ is the natural logarithm of the volume of liquid assets (such as cash, central bank debt and short-term government securities) to total assets. The $SIZE$ is measured as the natural logarithm of total assets. Statistical significance is indicated by *** p< 0.01, ** p <0.05, * p< 0.1. Lag length and bandwidth are selected by Schwarz Information Criterion (SIC) and the Bartlett kernel Newey–West estimator.

Table 6: Baseline *Granger* causality results (without control variables).

Direction	**SME → NPL**								
Lag terms	[1/1]	[1/2]	[1/3]	[2/1]	[2/2]	[2/3]	**[3/1]**	[3/2]	[3/3]
∑ΔSME	-0.0776	-0.0848	-0.0346	-0.0789	-0.1360	-0.0885	-0.0803	-0.1460	-0.1450
	(0.0514)	(0.0645)	(0.0733)	(0.0503)	(0.0973)	(0.1050)	(0.0488)	(0.0904)	(0.1130)
ECT	-0.1246**	-0.1130*	-0.1228**	-0.1104*	-0.1119*	-0.1211*	-0.1203*	-0.1220*	-0.1219*
	(0.0558)	(0.0569)	(0.0602)	(0.0564)	(0.0576)	(0.0612)	(0.0617)	(0.0632)	(0.0637)
AIC	2105	2012	1942	1998	2004	1935	1920	1925	1932
R-squared	0.0782	0.0654	0.0767	0.0710	0.0723	0.0836	0.0833	0.0850	0.0850
Direction	**NPL → SME**								
Lag terms	[1/1]	[1/2]	[1/3]	[2/1]	[2/2]	[2/3]	[3/1]	[3/2]	**[3/3]**
∑ΔNPL	-0.0552	-0.1080*	-0.1020	-0.0583	-0.1460	-0.1480	-0.0573	-0.1450	-0.1060
	(0.0570)	(0.0602)	(0.0660)	(0.0605)	(0.1130)	(0.123)	(0.0637)	(0.1130)	(0.0656)
ECT	-0.1435***	-0.1588***	-0.1745***	-0.1444***	-0.1286***	-0.1451***	-0.1623***	-0.1481***	-0.1635***
	(0.0445)	(0.0437)	(0.0414)	(0.0312)	(0.0267)	(0.0267)	(0.0384)	(0.0340)	(0.0323)
AIC	1753	1652	1484	1672	1618	1448	1502	1445	1426
R-squared	0.0824	0.0950	0.1200	0.0978	0.1317	0.1590	0.1305	0.1664	0.1827

The first number in bracket [*p*/*q*] refers to the lag-length of the dependent variable (*p*), and the second number refers to the lag-length of the independent variable (*q*). The SME variable stands for the natural logarithm of the volume of bank credits to SMEs, while NPL represents the natural logarithm of the volume of non-performing loans in the SME lending portfolio. Δ stands for the first difference operator. ECT is the error correction term derived from the long run relationship. AIC stands for Akaike's Information Criterion. Statistical significance is indicated by *** p< 0.01, ** p <0.05, * p< 0.1.

Table 7: Baseline *Granger* causality results (with control variables).

Direction	**SME → NPL**								
Lag terms	[1/1]	[1/2]	[1/3]	[2/1]	[2/2]	[2/3]	**[3/1]**	[3/2]	[3/3]
∑ΔSME	-0.0787	-0.0799	-0.0231	-0.0771	-0.1370	-0.0808	-0.0800	-0.1490*	-0.143
	(0.0519)	(0.0617)	(0.0702)	(0.0501)	(0.0934)	(0.0995)	(0.0488)	(0.0874)	(0.1070)
ΔCAP	-0.1749	-0.0072	-0.0465	-0.0036	-0.0100	-0.0477	-0.0925	-0.1022	-0.1013
	(0.3155)	(0.1809)	(0.2544)	(0.1793)	(0.1821)	(0.2547)	(0.2635)	(0.2673)	(0.2698)
ΔLIQ	-0.1079	-0.0826	-0.1030	-0.0841	-0.0842	-0.1025	-0.0919	-0.0936	-0.0939
	(0.0680)	(0.0730)	(0.0761)	(0.0741)	(0.0746)	(0.0753)	(0.0747)	(0.0754)	(0.0760)
ΔDEP	0.1492*	0.1608*	0.1365	0.1728*	0.1685*	0.1422	0.1456	0.1407	0.1412
	(0.0779)	(0.0872)	(0.0927)	(0.0940)	(0.0924)	(0.0971)	(0.0957)	(0.0944)	(0.0948)
ΔSIZE	-0.4423	-0.3774	-0.3745	-0.4093	-0.3922	-0.3930	-0.4348	-0.4176	-0.4192
	(0.2914)	(0.2862)	(0.2860)	(0.2994)	(0.2910)	(0.2925)	(0.2894)	(0.2821)	(0.2829)
ECT	-0.1463***	-0.1330***	-0.1443***	-0.1304***	-0.1321***	-0.1429***	-0.1430***	-0.1449***	-0.1448***
	(0.0447)	(0.0454)	(0.0489)	(0.0447)	(0.0458)	(0.0496)	(0.0508)	(0.0521)	(0.0524)
AIC	2114	2024	1954	2012	2017	1948	1934	1939	1946
R-squared	0.0916	0.0761	0.0883	0.0814	0.0828	0.0947	0.0945	0.0963	0.0963
Direction	**NPL → SME**								
Lag terms	[1/1]	[1/2]	[1/3]	[2/1]	[2/2]	[2/3]	[3/1]	[3/2]	**[3/3]**
∑ΔNPL	-0.0522	-0.1090*	-0.1020*	-0.0550	-0.1430	-0.1470	-0.0551	-0.1460	-0.1050
	(0.0529)	(0.0578)	(0.0602)	(0.0563)	(0.1090)	(0.1160)	(0.0590)	(0.1100)	(0.0673)
ΔCAP	-0.0409	-0.0215	-0.0158	-0.0380	-0.0250	-0.0301	-0.0839	-0.0714	-0.0038
	(0.0970)	(0.0923)	(0.1080)	(0.0978)	(0.1077)	(0.1345)	(0.1435)	(0.1450)	(0.1126)
ΔLIQ	0.0250	0.0433	0.0451	0.0138	0.0402	0.0374	-0.0272	0.0015	0.0234
	(0.0845)	(0.0741)	(0.0750)	(0.0801)	(0.0690)	(0.0702)	(0.1041)	(0.0871)	(0.0808)
ΔDEP	0.4958	0.5455	0.5911	0.4826	0.5284	0.5726	0.4459	0.4933	0.5970
	(0.3680)	(0.3984)	(0.4093)	(0.3432)	(0.3714)	(0.3821)	(0.3573)	(0.3830)	(0.4208)
ΔSIZE	-0.3954	-0.4693	-0.5218	-0.3343	-0.4437	-0.5011	-0.2673	-0.3842	-0.5591
	(0.3804)	(0.3795)	(0.3695)	(0.3606)	(0.4086)	(0.4109)	(0.3853)	(0.4327)	(0.4838)
ECT	-0.1500***	-0.1645***	-0.1805***	-0.1511***	-0.1356***	-0.1509***	-0.1685***	-0.1532***	-0.1688***
	(0.0463)	(0.0458)	(0.0441)	(0.0336)	(0.0276)	(0.0281)	(0.0403)	(0.0347)	(0.0331)
AIC	1568	1508	1470	1534	1473	1435	1493	1435	1412
R-squared	0.1133	0.1272	0.1392	0.1249	0.1639	0.1770	0.1431	0.1808	0.2014

The first number in bracket [*p*/*q*] refers to the lag-length of the dependent variable (*p*), and the second number refers to the lag-length of the independent variable (*q*). The SME variable stands for the natural logarithm of the volume of bank credits to SMEs, while NPL represents the natural logarithm of the volume of non-performing loans in the SME lending portfolio. The CAP is the natural logarithm of the volume of bank capital. The DEP is the natural logarithm of the volume of total deposits. The LIQ is the natural logarithm of the volume of liquid assets (such as cash, central bank debt and short-term government securities) to total assets. The $SIZE$ is measured as the natural logarithm of total assets. Δ stands for the first difference operator. ECT is the error correction term derived from the long run relationship. AIC stands for Akaike's Information Criterion. Statistical significance is indicated by *** p< 0.01, ** p <0.05, * p< 0.1.

Table 8: *Granger* causality model – Islamic versus conventional banks

	ΔNPL (1)	ΔNPL (2)	ΔSME (3)	ΔSME (4)
∑ΔSME	-0.0724	-0.0663	-0.0972**	-0.0656*
	(0.0477	(0.0464)	(0.0384)	(0.0347)
∑ΔSME*Islamic	-0.2910***	-0.4570***		
	(0.1090)	(0.1400)		
∑ΔSME + ∑ΔSME*Islamic	-0.3630***	-0.5240***		
	(0.0954)	(0.1340)		
∑ΔNPL	-0.1500	-0.1130	-0.0935	-0.0886
	(0.0979)	(0.0971)	(0.0649	(0.0542)
∑ΔNPL*Islamic			-0.3100**	-0.3550***
			(0.1220)	(0.1300)
∑ΔNPL + ΔNPL*Islamic			-0.4030***	-0.4430***
			(0.1050)	(0.1330)
ΔCAP		-0.1019		-0.0525
		(0.2536)		(0.1238)
ΔLIQ		-0.0627		0.0196
		(0.0738)		(0.0821)
ΔDEP		0.1375		0.6049
		(0.0932)		(0.4249)
ΔSIZE		-0.4030		-0.5702
		(0.2724)		(0.4853)
ECT	-0.1272**	-0.1608***	-0.1638***	-0.1695***
	(0.0586)	(0.0575)	(0.0317)	(0.0328)
AIC	1926	1936	1430	1415
R-squared	0.0844	0.0998	0.1851	0.2043

The SME variable stands for the natural logarithm of the volume of bank credits to SMEs, while NPL represents the natural logarithm of the volume of non-performing loans in the SME lending portfolio. The CAP is the natural logarithm of the volume of bank capital. The DEP is the natural logarithm of the volume of total deposits. The LIQ is the natural logarithm of the volume of liquid assets (such as cash, central bank debt and short-term government securities) to total assets. The $SIZE$ is measured as the natural logarithm of total assets. Δ stands for the first difference operator. ECT is the error correction term derived from the long run relationship. To select the order of lag q, we start with a maximum lag length of 3 (determined according to the Bartlett kernel) and pare it down as per the Akaike Information criterion (AIC). Statistical significance is indicated by *** p< 0.01, ** p <0.05, * p< 0.1.

Table 9: *Granger* causality model – split sample.

	Islamic banks		Conventional banks	
	ΔNPL (1)	ΔSME (2)	ΔNPL (1)	ΔSME (2)
∑ΔSME	-1.046***	0.0250	-0.1110	-0.0218
	(0.4050)	(0.1520)	(0.0944)	(0.0478)
∑ΔNPL	0.0891	-0.2950*	0.1200	-0.0370
	(0.4020)	(0.1710)	(-0.0989)	(0.0460)
ΔCAP	-0.0619	0.0395	0.1223	0.2317
	(0.0648)	(0.0489)	(0.4546)	(0.1851)
ΔLIQ	0.2845	-0.0156	-0.0842	0.0525
	(0.1859)	(0.0925)	(0.0746)	(0.0810)
ΔDEP	0.1772	0.6129	0.1279	0.5948
	(1.0810)	(0.4239)	(0.0897)	(0.4145)
ΔSIZE	-1.2149	-0.3490	-0.3681	-0.4293
	(1.7852)	(0.9398)	(0.2553)	(0.3168)
ECT	-0.0072	-0.2441**	-0.2848**	-0.2061***
	(0.0047)	(0.0519)	(0.1066)	(0.0268)
AIC	97.20	-20.70	1685	1300
R-squared	0.1294	0.2679	0.1460	0.2190

The SME variable stands for the natural logarithm of the volume of bank credits to SMEs, while NPL represents the natural logarithm of the volume of non-performing loans in the SME lending portfolio. The CAP is the natural logarithm of the volume of bank capital. The DEP is the natural logarithm of the volume of total deposits. The LIQ is the natural logarithm of the volume of liquid assets (such as cash, central bank debt and short-term government securities) to total assets. The $SIZE$ is measured as the natural logarithm of total assets. Δ stands for the first difference operator. ECT is the error correction term derived from the long run relationship. To select the order of lag q, we start with a maximum lag length of 3 (determined according to the Bartlett kernel) and pare it down as per the Akaike Information criterion (AIC). Statistical significance is indicated by *** p< 0.01, ** p <0.05, * p< 0.1.