

# Journal Pre-proof

Liquidity and capital in bank lending: evidence from European banks\*

John Thornton , Caterina di Tommaso

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**Highlights**

- We look at the capital-liquidity-lending relationship in European banks
- The effect of bank capital on lending depends on the level of bank liquidity
- Capital exerts a positive effect on lending after banks retain sufficient liquid funds
- The results are robust to different measures of lending, capital and liquidity.
- Capital and liquidity are complementary for European banks.
- Policy actions to strengthen capital and liquidity should be considered together

JOURNAL PRE-PROOF

**Liquidity and capital in bank lending: evidence from European banks\***

By

John Thornton

Office of Technical Assistance, United States Department of the Treasury, 1750 Pennsylvania

Ave NW, Washington DC 20006, USA; Email: [john.thornton@otatreas.us](mailto:john.thornton@otatreas.us),

and

Norwich Business School, University of East Anglia, Norwich Research Park, Norwich NR4

7TJ, UK. Email: [John.Thornton@uea.ac.uk](mailto:John.Thornton@uea.ac.uk) (Corresponding author).

and

Caterina di Tommaso

Department of Business Administration and Law, Università della Calabria, Italy

Email: [caterina.ditommaso@unical.it](mailto:caterina.ditommaso@unical.it)

**Abstract**

We examine whether the effect of bank capital on credit growth differs depending upon the level of liquidity in a panel of up to 521 banks from 21 European countries. We find that the effect of an increase in bank capital is positively associated with the level of bank liquidity, suggesting that capital exerts a significantly positive effect on European banks' credit growth after they retain sufficient liquid funds.

**JEL classification:** G01, G21**Keywords:** Bank capital, liquidity, Lending behavior, European banks

**Wordcount:** 2637

## **1. Introduction**

The 2007–2009 financial crisis led to widespread support for the use of enhanced capital and liquidity requirements as policy tools and both have featured prominently in recent regulatory reforms. However, debate on the likely effects of the higher capital requirements in particular on bank lending has been heated, with a key issue being whether frictions in the market for bank equity (e.g., tax deductibility of debt interest payments, asymmetric information, debt overhang) undermine the Modigliani–Miller view that changes in the composition of banks’ liabilities should not affect the overall funding cost and hence the volume and structure of banks’ assets.<sup>1</sup> Empirical studies on the relationship between bank capital and lending have had mixed results with higher capital requirements having been found to reduce lending (Francis and Osborne, 2009; Aiyar et al., 2014; Bridges et al., 2014), to have no little or effect on lending (Ediz et al., 1998), or to be associated with an increase in lending (Berrospide and Edge, 2010; Buch and Prieto, 2014; Altunbas et al., 2016). A recent thread of the bank reform-related literature has stressed that the impact of higher capital ratios on lending may depend on developments in other bank characteristics, especially the level of bank liquidity. For example, Acharya and Schnabl (2010), Chava and Purnandam (2011) and Cetorelli and Goldberg (2012) report evidence that

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<sup>1</sup> In particular, a main argument that banks deploy against higher equity requirements is that equity is a costly form of funding that results in a reduction in bank lending. For example, in the context of the post-2007-2009 regulatory debate, the Institute for International Finance—a lobby group for the major international banks—asserted that additional capital requirements for its members could result in 3.2% lower output by 2015 in these economies than would otherwise be the case (Institute for International Finance 2011).

during the recent crisis foreign subsidiaries of US banks reduced their lending compared to domestic banks when parent banks experienced liquidity problems. Cornett et al. (2011) and Berrospide (2013) report that efforts of US banks to manage liquidity caused bank lending to decline during the recent crisis. Ivashina and Scharfstein (2010) show that the growth of lending by US banks falls more substantially for banks with less access to deposit financing. Kim and Sohn (2017) report that credit growth by US banks is positively associated with the level of bank liquidity in the case of large banks, and Khan et al. (2017) report that US banks having lower funding liquidity risk take more risk and thus are more inclined to lend. In this paper, we add to this thread but switch the focus to the behavior of European banks. Specifically, we examine whether the effect of bank capital on lending differs depending on the level of bank liquidity employing a panel of up to 521 banks from 21 European countries over the period 2007-2017. Our main finding is that there is a significant interaction effect of bank capital and liquidity on bank lending and the supply of credit more generally by European banks. Both bank capital and liquidity are needed to sustain bank lending, with capital exerting a significantly positive effect on lending after banks retain sufficient liquid funds. This result is broadly in line with the findings of recent studies of the role of liquidity in lending by US banks discussed above. The results are also consistent with recent theoretical research (e.g., Carletti et al., 2018; Vives, 2014; Schilling, 2016; Calomiris et al., 2015) suggesting that bank regulation for purpose of financial stability be designed in a way that considers both sides of banks' balance sheet.

## **2. Model and data**

We test the hypothesis that the relationship between bank capital and lending depends on the level of bank liquidity by estimating the following panel regression:

$Loan_{i,t} =$

$$\alpha_i + \beta_0 Loan_{i,t-1} + \beta_1 Capital_{i,t-1} + \beta_2 Liquidity_{i,t-1} + \beta_3 Capital * Liquidity_{i,t-1} + \gamma X_{i,t-1} + \delta_1 \Delta GDP_{t-1} + \delta_2 \Delta Policy\ rate_{t-1} + \theta Crisis + \vartheta_i + \varphi_t + \varepsilon_{i,t} \quad (1)$$

In equation (1), *Loan* is the lending of bank *i* in period *t*, *Capital* is a measure of bank capital, *Liquidity* is a measure of bank liquidity, *Capital \* Liquidity* is the interaction of bank capital and liquidity, *x* is a vector of other bank-specific characteristics, and  $\Delta GDP$  and  $\Delta Policy\ rate$  are the quarterly growth rate real GDP and the quarterly change in the central bank policy interest rate, respectively. *Crisis* is a 0-1 dummy variable equal to 1 during 2007Q3 to 2009Q2 to capture the worst effects of the financial crisis, and  $\vartheta_i$  and  $\varphi_t$  are bank and time fixed effects, respectively. In the panel estimates, capital, liquidity and the other bank-specific variables are lagged one period to mitigate possible endogeneity bias.

For robustness, we estimate equation (1) employing alternative measures of bank lending, capital and liquidity. We employ two measures of bank lending: a broad bank ‘credit’ measure, which is the quarterly real rate of growth of net loans and advances plus unused credit commitments, and a narrower definition, which is the quarterly real rate of growth of net loans and advances only. We distinguish between the two measures because drawdowns on existing credit commitments increase total bank credit and reduce bank liquidity without *new* loans being granted (Ivashina and Scharfstein, 2010; Kim and Sohn, 2017). We employ three measures of bank capital: the ratio of tier 1 capital to risk weighted assets, which is the regulator’s measure of the core strength of a financial institution; the ratio of tier 1 plus tier 2 capital to risk weighted assets, which measures total regulatory capital, and the ratio of equity capital to total assets because banks have considerable discretion over the assignment of risk weights, and hence over the risks they

banks take (Admati and Hellwig, 2013). Finally, we employ two measures of bank liquidity. The first is the commonly used ratio of liquid assets (cash and balances with central bank, due from other financial institutions, trading securities, available-for-sale securities, other securities, and unearned income from securities) to total assets, and a more restrictive measure, which is the ratio of liquid assets to deposits and short-term funding because liquidity strains are more likely to arise from the liabilities side of the balance sheet from the withdrawal of funds from wholesale deposits and the loss of other sources of short-term financing (Acharya and Naqvi, 2012; Cornett et al., 2011).

We include six other bank-specific variables in the vector  $X_{it}$  that are commonly used in the banking literature, but whose effects often do not have a strong theoretical foundation. The first variable is bank size, measured as the logarithm of total assets, *Size*. Large banks may have incentives to take more risk if there is a high expectation of a government bailout to prevent systemic risk (Afonso et al., 2014). However, risk may also decline for large banks because they are better able to diversify their portfolio, whereas small banks tend to pursue traditional banking (Demirgüç-Kunt and Huizinga, 2010). The second variable is market funding, *Fund*, measured as the ratio of non-deposit liabilities to total assets and where banks with a higher ratio of customer deposits to total liabilities might have a lower default risk because they have a more stable source of funding, particularly during periods of crises (Shleifer and Vishny, 2010). The third variable is the ratio of unused loan commitments to total assets, *Commitments*, which is expected to impact positively on the growth of net loans and advances (Cornett et al., 2011) but where banks exposed to a higher level of commitments are likely to be less willing to expand total credit (loans plus unused commitments) (Ivashina and Scharfstein, 2010; Kim and Sohn,

2017). Our fourth bank-specific variable is the return on assets, *Profit*, which is measured as the ratio of net income to total assets. According to the “pecking order theory of finance”, because increasing extra capital is costly, it may be easier to accumulate capital via higher retained earnings (Flannery and Rangan, 2008). In contrast, greater profitability might also make capital requirements less binding so that banks are less averse to occasional losses through risk-taking (Calem and Rob, 1999; Perotti et al., 2011). The final two bank-specific variables capture the quality of bank assets and are the ratio of impaired loans to total loans, *NPLs* and the ratio of loan loss provisions to total gross loans, *Provisions*; the impact of both variables is generally expected to be negative because they limit banks’ lending ability (Kim and Sohn, 2017). However, Angelini (2018) points out that this is probably only the case if the bank is perceived as weak and relatively risky, in which case it may experience difficulties accessing liquidity and capital markets that could be reflected in a bank’s lending supply. However, these channels may be dampened, or neutralized altogether, if the bank is sufficiently profitable and/or capitalized. Moreover, weak balance sheets could in principle induce banks to lend more, rather than less, following a ‘gamble for resurrection’ logic. The empirical evidence on NPLs in this regard is scant but a recent study by Accornero et al. (2017) of the influence of NPLs on the supply of bank credit to non-financial firms in Italy finds that, NPL ratios *per se* have no impact on the banks’ lending behaviour. Finally, real GDP growth,  $\Delta GDP$  and the change in the central bank policy interest rate,  $\Delta Policy\ rate$  are included to capture the effects on bank lending of the business cycle and changes in monetary policy. The expected sign of the growth rate of real GDP is positive because of the procyclicality of bank lending and increased loan demands, and the effect of changes in the policy interest rate could be negative if increases in market rates reduce loan demands, or positive if monetary policy is procyclical.



Our primary source of data for the bank-specific variables is BankScope, which provides us with balance sheet data for 521 banks from 21 European countries over the period 2007Q1 to 2017Q4. The GDP and policy interest rate data are from central banks' online statistical databases. Variable definitions and their summary statistics are presented in Table 1.

### 3. Empirical results

We present baseline panel regression results in Table 2. Columns 1 to 3 of the table report results for the three definitions of capital when the dependent variable is net loans plus unused loan commitments. The results are consistent across the three definitions of capital: the coefficients are positive and statistically significant and suggest that a 1 percentage point increase in the capital ratio is associated with a quarterly growth rate in real lending of between 0.01-0.13 percentage points, depending upon the definition of capital used. Columns 4 to 6 of the table report results when the dependent variable is net loans and advances. The coefficients on the three capital ratio are also positive and statistically significant and suggest that a 1 percentage point increase in the capital ratio is associated with a quarterly growth rate in real lending of between 0.04-0.49 percentage points. Banks appear to be least constrained by the total regulatory capital ratio (tier 1 plus tier 2) in expanding their lending, and less constrained by the regulatory ratios when they expand total credit. The coefficients on the other bank-specific variables suggest that banks are more likely to expand credit and net lending when they are liquid, have access to market funding, and are profitable, and less likely to lend if they are large. Unused loan commitments impact positively on loan growth but negatively on credit growth indicating that banks exposed to a higher level of commitments are likely to be less willing to expand total

credit; in contrast, the quality of existing assets (nonperforming loans and loan provisions) has uncertain effects on credit and lending. The coefficients on real GDP growth and the central bank policy rate suggest that credit, lending and monetary policy are procyclical. Finally, the coefficient on the crisis dummy is negative and statistically significant, capturing the crisis-induced reduction in credit and lending.

Tables 3 and 4 report results for credit and lending, respectively, when the regressions include interaction terms. In these results, the coefficients on capital and liquidity reflect the conditional effects of these variables on the growth of credit and lending. In columns 1, 3 and 5 of both tables the interaction is between bank liquidity and the three definitions of bank capital. The interaction term (capital\*liquidity) is always positive and statistically significant—i.e., the effect of bank capital on credit and lending is positively associated with the level of liquidity. A one standard deviation increase in the liquidity ratio raises the effects of a 1 percentage point increase in the capital ratio on credit growth by between 0.09 to 11.82 percentage points in a quarter, depending upon the definition of capital (Table 3),<sup>2</sup> and raises the effects of a 1 percentage point increase in the capital ratio on net loan growth by between 1.03 to 9.29 percentage points in a quarter, depending on the definition of capital (Table 4). In columns 2 4 and 6 of tables 3 and 4 we report results that also include the interaction of bank capital and liquidity with the crisis dummy. The important points here are that the crisis had a negligible impact on the role of bank capital in supporting lending (the coefficients on the capital\*crisis interaction term are positive but generally not significant), a negative impact on bank liquidity (the coefficients on the liquidity\*crisis interaction term are statistically significant and negative and are larger the

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<sup>2</sup> For example, in column 1 of Table 3:  $0.09 = 0.015(\text{coefficient on the interaction term}) * 19.069(\text{the standard deviation on the liquidity ratio reported in Table 1})$ .

coefficient on bank liquidity), but that the effect of bank capital on credit and lending remains positively associated with the level of liquidity overall (i.e., the coefficient on the capital\*liquidity\*crisis interaction terms remained positive and generally statistically significant). In these cases, a one standard deviation increase in the liquidity ratio raises the effects of a 1 percentage point increase in the capital ratio on credit growth by 0.00 to 2.59 percentage points in a quarter (Table 3) and on net loan growth by between 0.00 to 11.04 percentage points in a quarter (Table 4). In all of the regressions, the outcomes for other bank-specific variable, GDP and the policy interest rates are broadly as in the baseline results.

For additional robustness, in Tables 5 and 6 we report results for credit and lending, respectively, when the regressions include the interaction terms but where bank liquidity is defined as the ratio of liquid assets to deposits and short-term funding. The main conclusions from the earlier results hold—i.e., the effect of bank capital on credit and lending is positively associated with the level of bank liquidity, including in the crisis. Not surprising, the narrower definition of liquidity enhances its effect in elevating the impact of capital on bank credit and lending. For example, a one standard deviation increase in the liquidity ratio raises the effects of a 1 percentage point increase in the capital ratio on credit growth by 9.36 to 14.96 percentage points in a quarter, (Table 5), and on lending growth by between 2.82 to 10.68 percentage points (Table 6).

#### **4. Conclusions**

We examined whether the effect of bank capital on the growth of credit and lending by European banks differs depending upon the level of bank liquidity. We find that an increase in bank capital

is positively associated with the level of bank liquidity, suggesting that capital exerts a significantly positive effect on European banks' credit and lending growth after they retain sufficient liquid funds. The results are robust to different measures of bank lending, capital and liquidity. They suggest that bank capital and liquidity are complementary for European banks and, as such, policy actions that change both capital and liquidity requirements or inject official resources to strengthen capital and liquidity, should be considered together if the objective is to sustain the growth of bank credit and lending.

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**Table 1.**  
Variable definitions and summary statistics

Variable	Description	Mean	Median	Standard deviation	Maximum	Minimum
Loan	Quarterly real growth rate of net loans and unused commitments, or quarterly real growth rate of net loans	1.003	1.014	0.219	1.818	0.204
Capital	Ratio of Tier 1 capital to risk weighted assets, or ratio of equity to risk weighted assets, or ratio of equity to total assets	12.069	12.569	2.402	0.384	18.244
		19.285	17.333	0.087	34.700	1.111
Liquidity	Ratio of liquid assets (cash and balances with central bank, due from other financial institutions, trading securities, available-for-sale securities, other securities, and unearned income from securities) to total assets, or ratio of liquid assets to deposits and short-term funding	12.739	8.979	14.106	39.190	0.000
		22.024	16.239	19.069	59.508	0.000
Size	Logarithm of total assets	19.688	20.190	16.106	49.124	0.000
Funding	Ratio of non-deposit liabilities to total assets	16.027	16.092	2.216	22.004	8.438
Commitments	Ratio of unused commitments to total assets	34.743	30.804	2.437	57.481	0.879
Profit	Ratio of net income to total average assets	8.420	6.564	9.700	67.972	0.000
NPLs	Ratio of impaired loans to total loans	0.724	0.462	3.346	27.203	0.162
Provisions	Ratio of loan loss provisions to total average gross loans	3.088	3.046	0.112	5.321	0.000
GDP	Average quarterly growth rate of real GDP	1.202	0.407	3.600	4.583	0.102
Policy rate	Change in quarterly average central bank policy rate	0.471	0.469	5.260	5.600	-0.350
Crisis	Dummy variable equal to 1 2007Q3 to 2009Q2 and 0 otherwise	-0.031	0.000	0.176	4.500	-2.000
Countries	Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Germany, Denmark, Spain, Finland, France, United Kingdom, Greece, Croatia, Hungary, Ireland, Italy, Lithuania, Luxembourg, Latvia, Malta, Netherlands, Poland, Portugal, Romania, Sweden, Slovenia, and Slovakia					

Notes: The sample period is 2007Q1 to 2017Q4. All bank-specific variables are from BankScope. Data for real GDP and the central bank policy interest rate is from national central bank databases.



**Table 2.**  
Capital, liquidity, credit and lending growth by European banks: baseline results

	Credit=net loans and advances plus unused commitments			Lending=net loans and advances		
	Tier 1/RWA	Equity/RWA	Equity/total assets	Tier 1/RWA	Equity/RWA	Equity/total assets
	1	2	3	4	5	6
Loan <sub>t-1</sub>	0.107*** (0.014)	0.794*** (0.007)	0.849*** (0.004)	0.885*** (0.004)	0.812*** (0.008)	0.928*** (0.013)
Capital <sub>t-1</sub>	0.005** (0.002)	0.133** (0.0583)	0.052** (0.023)	0.038*** (0.012)	0.487*** (0.147)	0.079* (0.043)
Liquidity <sub>t-1</sub>	0.004** (0.002)	0.003*** (0.001)	0.013*** (0.003)	0.032** (0.013)	0.043*** (0.010)	0.011* (0.006)
Size <sub>t-1</sub>	0.018 (0.025)	-0.195*** (0.008)	-0.141*** (0.004)	-0.048* (0.028)	-0.148*** (0.071)	-0.130*** (0.033)
Funding <sub>t-1</sub>	0.008** (0.004)	0.048** (0.020)	0.049*** (0.016)	0.374** (0.190)	1.026* (0.568)	0.186** (0.093)
Commitments <sub>t-1</sub>	-0.002** (0.001)	-0.007*** (0.001)	-0.007*** (0.001)	-0.010 (0.008)	0.034*** (0.011)	-0.001 (0.007)
Profits <sub>t-1</sub>	0.002** (0.001)	0.014** (0.007)	0.008*** (0.002)	0.371*** (0.045)	0.285** (0.141)	0.149*** (0.087)
NPLs <sub>t-1</sub>	-0.001 (0.002)	-0.175 (0.096)	-0.005 (0.041)	0.078 (0.862)	0.405** (0.179)	0.743 (0.958)
Provisions <sub>t-1</sub>	-0.004 (0.006)	0.004 (0.003)	0.005*** (0.001)	-0.040 (0.033)	-0.015 (0.058)	-0.022** (0.010)
GDP <sub>t-1</sub>	0.004*** (0.001)	-0.001 (0.001)	-0.001 (0.001)	0.001 (0.016)	0.018 (0.023)	0.013* (0.008)
Policy rate <sub>t-1</sub>	0.105*** (0.018)	0.199*** (0.039)	0.161*** (0.020)	0.160** (0.063)	0.168** (0.070)	0.137** (0.063)
Crisis	-0.103** (0.045)	-0.112*** (0.016)	-0.105** (0.049)	-0.204*** (0.050)	-0.144*** (0.030)	-0.201*** (0.007)
Intercept	8.968*** (0.453)	-1.262*** (0.083)	-0.888*** (0.043)	1.509* (0.865)	-2.391* (1.344)	-0.790 (0.498)
Observations	0.123	0.134	0.251	0.112	0.193	0.251
R-squared	16210	17610	20639	11609	16191	13587
No. of panels	377	411	480	270	356	316

Notes: Estimates are unbalanced panel regressions with bank and time fixed effects. Credit is defined as the quarterly real rate of growth of net bank loans and advances plus unused credit commitments. Loans are defined as the quarterly real rate of growth of net bank loans and advances. \*\*\*, \*\*, and \* indicate statistical significance at the 1, 5 and 10% levels, respectively.

**Table 3.**

Capital, liquidity and credit growth (net loans and advances plus unused commitments) by European banks with interaction terms

	Tier 1 capital/RWA		Equity/RWA		Equity/total assets	
	1	2	3	4	5	6
Loan <sub>t-1</sub>	0.106*** (0.016)	0.106*** (0.014)	0.794*** (0.007)	0.793*** (0.007)	0.849*** (0.004)	0.848*** (0.004)
Capital <sub>t-1</sub>	0.010*** (0.003)	0.010*** (0.003)	0.149** (0.062)	0.157** (0.076)	0.060** (0.029)	0.062* (0.032)
Capital <sub>t-1</sub> * Crisis		0.008** (0.004)		0.062 (0.211)		0.062 (0.211)
Liquidity <sub>t-1</sub>	0.002** (0.001)	0.002** (0.001)	0.002** (0.001)	0.002** (0.001)	0.008** (0.004)	0.008*** (0.003)
Liquidity <sub>t-1</sub> * Crisis		-0.015*** (0.005)		-0.225** (0.105)		-0.039** (0.019)
Capital <sub>t-1</sub> *Liquidity <sub>t-1</sub>	0.015** (0.005)	0.015*** (0.005)	0.617*** (0.083)	0.654*** (0.086)	0.005** (0.002)	0.006** (0.003)
Capital <sub>t-1</sub> * Liquidity <sub>t-1</sub> * Crisis		0.007* (0.004)		0.155** (0.079)		0.003 (0.005)
Size <sub>t-1</sub>	0.021 (0.024)	0.021 (0.025)	-0.196*** (0.008)	-0.196*** (0.008)	-0.142*** (0.004)	-0.142*** (0.004)
Funding <sub>t-1</sub>	0.009* (0.005)	0.008** (0.004)	0.048** (0.020)	0.048** (0.020)	0.048*** (0.016)	0.048** (0.016)
Commitments <sub>t-1</sub>	0.002** (0.001)	-0.002** (0.001)	-0.007*** (0.001)	-0.007*** (0.001)	-0.007*** (0.001)	-0.007*** (0.001)
Profit <sub>t-1</sub>	0.007* (0.004)	0.008** (0.004)	0.014** (0.007)	0.014** (0.007)	0.008*** (0.002)	0.008*** (0.002)
NPLs <sub>t-1</sub>	-0.001 (0.002)	-0.001 (0.002)	-0.176* (0.096)	-0.176* (0.096)	-0.005 (0.040)	-0.005 (0.041)
Provisions <sub>t-1</sub>	0.001 (0.001)	0.001 (0.001)	0.004 (0.002)	0.004 (0.002)	0.005*** (0.002)	0.005*** (0.002)
GDP <sub>t-1</sub>	0.001** (0.000)	0.001** (0.000)	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)
Policy rate <sub>t-1</sub>	0.067*** (0.017)	0.067*** (0.037)	0.199*** (0.039)	0.199*** (0.039)	0.161*** (0.020)	0.161*** (0.020)
Crisis	-0.104** (0.052)	-0.107* (0.062)	-0.110*** (0.016)	-0.110* (0.059)	-0.105** (0.049)	-0.098* (0.057)
Intercept	9.010*** (0.441)	-9.011*** (0.063)	-1.247*** (0.085)	-1.247*** (0.085)	-0.882*** (0.043)	-0.880*** (0.043)
R <sup>2</sup>	0.127	0.129	0.178	0.152	0.231	0.244
Observations	16210	16210	17610	17610	20639	20639
No. of panels	377	377	411	411	480	480

Notes: Estimates are unbalanced panel regressions with bank and time fixed effects. Credit is defined as the quarterly real rate of growth of net bank loans and advances plus unused credit commitments. \*\*\*, \*\*, and \* indicate statistical significance at the 1, 5 and 10% levels, respectively.

**Table 4.**  
Capital, liquidity and lending growth (net loans and advances) by European banks with interaction terms

	Tier 1 capital/risk weighted assets		Equity/risk weighted assets		Equity/total assets	
	1	2	3	4	5	6
Loan <sub>t-1</sub>	0.885*** (0.004)	0.885*** (0.004)	0.809*** (0.008)	0.806*** (0.008)	0.928*** (0.013)	-0.001 (0.022)
Capital <sub>t-1</sub>	0.045** (0.020)	0.043** (0.021)	0.264* (0.147)	0.361** (0.172)	0.076** (0.036)	0.080* (0.047)
Capital <sub>t-1</sub> * Crisis		0.007 (0.028)		0.212 (0.373)		-0.001 (0.004)
Liquidity <sub>t-1</sub>	0.042*** (0.016)	0.042** (0.016)	0.048*** (0.010)	0.048** (0.010)	0.014* (0.007)	0.085*** (0.028)
Liquidity <sub>t-1</sub> * Crisis		0.264** (0.126)		-0.192*** (0.046)		-0.155*** (0.049)
Capital <sub>t-1</sub> * Liquidity <sub>t-1</sub>	0.054** (0.025)	0.057** (0.023)	0.487*** (0.138)	0.473*** (0.148)	0.126** (0.054)	0.146** (0.070)
Capital <sub>t-1</sub> * Liquidity <sub>t-1</sub> * Crisis		0.128* (0.073)		0.584** (0.277)		0.006 (0.024)
Size <sub>t-1</sub>	-0.048* (0.028)	-0.050** (0.023)	-0.140*** (0.071)	-0.140** (0.071)	-0.140*** (0.034)	-0.175*** (0.019)
Funding <sub>t-1</sub>	0.389** (0.176)	0.389** (0.176)	1.081* (0.567)	1.079* (0.568)	0.183* (0.098)	0.198** (0.087)
Commitments <sub>t-1</sub>	-0.010 (0.008)	-0.010 (0.008)	0.042*** (0.011)	0.042*** (0.011)	-0.001 (0.007)	0.007*** (0.003)
Profit <sub>t-1</sub>	0.342*** (0.046)	0.346*** (0.046)	0.302** (0.141)	0.302** (0.141)	0.149*** (0.087)	0.280*** (0.019)
NPLs <sub>t-1</sub>	0.070 (0.863)	0.069 (0.863)	0.388** (0.179)	0.388** (0.179)	0.706 (0.979)	-4.774 (3.067)
Provisions <sub>t-1</sub>	-0.039 (0.033)	-0.039 (0.033)	-0.024 (0.058)	-0.024 (0.058)	-0.021** (0.010)	-0.032*** (0.011)
GDP <sub>t-1</sub>	-0.001 (0.016)	-0.001 (0.016)	0.018 (0.023)	0.019 (0.023)	0.013* (0.008)	0.015 (0.009)
Policy rate <sub>t-1</sub>	0.160** (0.063)	0.182** (0.073)	0.172** (0.070)	0.180** (0.081)	0.137** (0.063)	0.143** (0.061)
Crisis	-0.204*** (0.051)	-0.098* (0.056)	-0.142*** (0.030)	-0.145* (0.081)	-0.205*** (0.009)	-0.209** (0.091)
Intercept	1.390 (0.914)	1.415 (0.918)	3.745*** (1.397)	3.709*** (1.403)	-0.751 (0.499)	1.637*** (0.474)
R <sup>2</sup>	0.124	0.145	0.178	0.216	0.231	0.202
Observations	11609	11609	16191	16191	13587	13587
Number of ID	270	270	356	356	316	316

Notes: Estimates are unbalanced panel regressions with bank and time fixed effects. Lending is defined as the quarterly real rate of growth of net bank loans and advances. \*\*\*, \*\*, and \* indicate statistical significance at the 1, 5 and 10% levels, respectively.

**Table 5.**

Capital, liquidity and credit growth (net loans and advances plus unused commitments) by European banks: interaction terms and alternative liquidity definition

	Tier 1 capital/risk weighted assets		Equity/risk weighted assets		Equity/total assets	
	1	2	3	4	5	6
Loan <sub>t-1</sub>	0.107** (0.016)	0.107*** (0.004)	0.793*** (0.007)	0.793*** (0.007)	0.850*** (0.004)	0.793*** (0.007)
Capital <sub>t-1</sub>	0.007*** (0.003)	0.007** (0.003)	0.129** (0.054)	0.130** (0.061)	0.161*** (0.056)	0.638*** (0.213)
Capital <sub>t-1</sub> * Crisis		0.026*** (0.007)		-0.004 (0.216)		-0.002 (0.003)
Liquidity <sub>t-1</sub>	0.108*** (0.014)	0.185*** (0.037)	1.200** (0.521)	0.889*** (0.195)	1.214** (0.556)	1.421*** (0.286)
Liquidity <sub>t-1</sub> * Crisis		-0.205*** (0.054)		0.084 (1.839)		-1.150 (1.448)
Capital <sub>t-1</sub> * Liquidity <sub>t-1</sub>	0.599* (0.328)	0.598* (0.334)	0.929* (0.562)	0.913* (0.529)	0.581*** (0.184)	0.311*** (0.083)
Capital <sub>t-1</sub> * Liquidity <sub>t-1</sub> * Crisis		0.875*** (0.260)				0.761 (0.654)
Size <sub>t-1</sub>	-0.190*** (0.025)	-0.193*** (0.027)	-0.195*** (0.008)	-0.195*** (0.008)	-0.137*** (0.004)	-0.188*** (0.008)
Funding <sub>t-1</sub>	0.095 (0.077)	0.096 (0.076)	0.056* (0.030)	0.056* (0.030)	0.049*** (0.016)	0.070** (0.001)
Commitments <sub>t-1</sub>	-0.002** (0.001)	-0.002** (0.001)	-0.007*** (0.001)	-0.007*** (0.001)	-0.007*** (0.000)	-0.007*** (0.001)
Profit <sub>t-1</sub>	0.016** (0.007)	0.016** (0.007)	0.013* (0.007)	0.013* (0.007)	0.008* (0.002)	0.012* (0.100)
NPLs <sub>t-1</sub>	-0.062 (0.209)	-0.062 (0.216)	-0.195** (0.097)	-0.196** (0.097)	0.004 (0.041)	0.193* (0.100)
Provisions <sub>t-1</sub>	0.001 (0.001)	0.001 (0.001)	0.002 (0.002)	0.002 (0.002)	0.005*** (0.002)	0.004* (0.002)
GDP <sub>t-1</sub>	0.002*** (0.000)	0.002*** (0.000)	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)
Policy rate <sub>t-1</sub>	0.070*** (0.018)	0.070*** (0.009)	0.196*** (0.039)	0.195*** (0.039)	0.160*** (0.020)	0.196*** (0.039)
Crisis	-0.004* (0.002)	-0.010*** (0.002)	-0.018** (0.008)	-0.015* (0.008)	-0.016** (0.008)	-0.022* (0.012)
Intercept	9.058*** (0.458)	9.058*** (0.466)	-1.189*** (0.084)	-1.188*** (0.084)	-0.846*** (0.043)	-1.165*** (0.088)
R <sup>2</sup>	0.156	0.193	0.211	0.219	0.204	0.225
Observations	16081	16081	17610	17610	20467	17610
Number of ID	374	374	411	411	476	177

Notes: Estimates are unbalanced panel regressions with bank and time fixed effects. Credit is defined as the quarterly real rate of growth of net bank loans and advances plus unused credit commitments. Liquidity is defined as the ratio of liquid assets to deposits and short-term funding. \*\*\*, \*\*, and \* indicate statistical significance at the 1, 5 and 10% levels, respectively.

**Table 6.**

Capital, liquidity and lending growth (net loans and advances) by European banks: interaction terms and alternative liquidity definition

	Tier 1 capital/risk weighted assets		Equity/risk-weighted assets		Equity/total assets	
	1	2	3	4	5	6
Loan <sub>t-1</sub>	0.023 (0.022)	0.023 (0.021)	0.887*** (0.006)	0.885*** (0.006)	0.929*** (0.003)	0.886*** (0.006)
Capital <sub>t-1</sub>	0.042*** (0.018)	0.042** (0.018)	0.502** (0.246)	0.505** (0.258)	0.541* (0.309)	0.434** (0.209)
Capital <sub>t-1</sub> * Crisis		1.250 (0.976)		0.270 (3.570)		-0.009 (0.047)
Liquidity <sub>t-1</sub>	0.859* (0.468)	0.858* (0.455)	0.325** (0.194)	0.321* (0.191)	0.229 (0.507)	0.395*** (0.137)
Liquidity <sub>t-1</sub> * Crisis		-1.409** (0.0655)		-0.238* (0.132)		-0.255* (0.147)
Capital <sub>t-1</sub> *	0.175*** (0.082)	0.175** (0.084)	0.239* (0.097)	0.250** (0.103)	0.663* (0.347)	0.345** (0.169)
Liquidity <sub>t-1</sub>				0.554*** (0.174)		0.754*** (0.116)
Capital <sub>t-1</sub> *		-0.239 (0.397)				
Liquidity <sub>t-1</sub> * Crisis						
Size <sub>t-1</sub>	-0.137*** (0.043)	-0.139*** (0.044)	-0.126* (0.068)	-0.125* (0.068)	-0.109*** (0.042)	-0.165*** (0.078)
Funding <sub>t-1</sub>	1.696 (1.676)	1.702 (1.772)	0.412 (0.532)	0.416 (0.532)	0.191 (0.315)	0.096 (0.540)
Commitments <sub>t-1</sub>	0.015* (0.009)	0.016* (0.009)	-0.003 (0.010)	-0.003 (0.010)	-0.001 (0.007)	-0.002 (0.010)
Profit <sub>t-1</sub>	0.334*** (0.118)	0.335*** (0.117)	0.123*** (1.712)	0.123*** (0.043)	0.146** (0.068)	0.184*** (0.061)
NPL <sub>t-1</sub>	0.211 (1.752)	0.211 (1.720)	1.577 (1.712)	1.584 (1.712)	0.884 (0.911)	2.601 (1.786)
Provisions <sub>t-1</sub>	-0.083** (0.037)	-0.083** (0.037)	-0.040 (0.054)	-0.041 (0.054)	-0.005 (0.038)	-0.011 (0.054)
GDP <sub>t-1</sub>	0.018 (0.012)	0.018* (0.010)	0.023 (0.021)	0.024 (0.021)	0.013* (0.008)	0.025 (0.021)
Policy rate <sub>t-1</sub>	0.179** (0.081)	0.174* (0.080)	0.660** (0.300)	0.660** (0.300)	0.363*** (0.042)	0.196*** (0.039)
Crisis	-0.107* (0.060)	-0.168* (0.099)	-0.138** (0.063)	-0.166** (0.067)	-0.176** (0.070)	-0.159* (0.091)
Intercept	16.225** (7.000)	16.264** (7.172)	2.147* (1.299)	2.068 (1.305)	0.848 (0.734)	2.835** (1.411)
R <sup>2</sup>	0.165	0.192	0.210	0.219	0.214	0.219
Observations	11050	11050	16062	16062	13415	13415
Number of panels	257	257	350	350	312	312

Notes: Estimates are unbalanced panel regressions with bank and time fixed effects. Lending is defined as the quarterly real rate of growth of net bank loans and advances. Liquidity is defined as the ratio of liquid assets to deposits and short-term funding. \*\*\*, \*\*, and \* indicate statistical significance at the 1, 5 and 10% levels, respectively.