Problemy Zarządzania, vol. 15, nr 1 (66), cz. 2: 11–36
ISSN 1644-9584, © Wydział Zarządzania UW
DOI 10.7172/1644-9584.66.1

Do Microprudential Regulations and Supervision Affect the Link Between Lending and Capital Ratio in Economic Downturns of Large Banks in the EU?

Submitted: 24.10.016 | Accepted: 20.01.17

Małgorzata Olszak*, Sylwia Roszkowska, Iwona Kowalska*****

This paper extends the literature on the capital crunch effect by examining the role of public policy for the link between lending and capital in a sample of large banks operating in the European Union during economic downturns. Applying Blundell and Bond (1998) two-step robust GMM estimator, we show that restrictions on bank activities and more stringent capital standards weaken the capital crunch effect, consistent with reduced risk-taking and boosted bank charter values. Official supervision also reduces the impact of capital ratio on lending in downturns; however, its effect is only marginally significant in the sample of unconsolidated banks. Private oversight seems to be related to thin capital buffers in expansions, and therefore the capital crunch effect is enhanced in countries with increased market discipline. We thus provide evidence that neither regulations nor supervision at the microprudential level is neutral from a financial stability perspective. Weak regulations and supervision seem to increase the pro-cyclical effect of capital on bank lending.

Keywords: loan supply, bank capital, bank regulations.

Czy regulacje i nadzór mikroostrożnościowy wpływają na związek między aktywnością kredytową a wskaźnikiem kapitałowym w dużych bankach w UE?

Nadesłany: 24.10.016 | Zaakceptowany do druku: 20.01.17

Artykuł poszerza dotychczasowe badania nad związkiem między ograniczającym wpływem wskaźnika kapitałowego na podaż kredytu bankowego w okresie dekoniunktury poprzez analizy znaczenia polityki regulacyjnej państwa dla związku między aktywnością kredytową a wskaźnikiem kapitałowym dużych banków prowadzących działalność w Unii Europejskiej. W badaniu zastosowano estymator odporny dwuetapowy Blundella i Bonda (1998) i zidentyfikowano, że ograniczenie skali czynności wykonywa-

* **Małgorzata Olszak** – Ph.D. (habilitated), University of Warsaw, Faculty of Management, Department of Banking and Money Markets.

** **Sylwia Roszkowska** – Ph.D., University of Łódź, Faculty of Economic and Social Sciences; National Bank of Poland.

*** **Iwona Kowalska** – Ph.D., University of Warsaw, Faculty of Management, Department of Operational Research.

Correspondence address: University of Warsaw, Faculty of Management, ul. Szturmowa 1/3, 02-678 Warsaw; e-mail: molszak@wz.uw.edu.pl, sylwiaroszkowska@gmail.com, IKowalska@wz.uw.edu.pl.

Ministry of Science and Higher Education
Republic of Poland

The creation of the English-language version of these publications is financed in the framework of contract No. 768/P-DUN/2016 by the Ministry of Science and Higher Education committed to activities aimed at the promotion of education.

nych przez banki oraz bardziej restrykcyjne standardy kapitałowe osłabiają negatywny wpływ wskaźnika kapitałowego na podaż kredytu bankowego w okresie dekoniunktury, co jest spójne z koncepcją, że w krajach o restrykcyjnych regulacjach banki podejmują niższe ryzyko oraz cechują się wyższymi buforami kapitałowymi. Oficjalny nadzór bankowy również ogranicza wpływ wskaźnika kapitałowego, ale jego siła oddziaływania jest jedynie marginalnie istotna statystycznie w populacji banków, które prezentują dane nieskonsolidowane. Prywatny nadzór rynkowy wydaje się nieskuteczny w ograniczaniu negatywnego wpływu wskaźnika kapitałowego na podaż kredytu bankowego w okresie dekoniunktury. Przeprowadzone badania pokazują, że przynajmniej w pewnym zakresie restrykcyjne regulacje mikroostrożnościowe oraz nadzór mikroostrożnościowy są skuteczne w dążeniu do zapewnienia stabilności finansowej i ograniczenia procykliczności.

Słowa kluczowe: podaż kredytu, kapitał banku, regulacje bankowe.

JEL: E32, G21, G28, G32

1. Introduction

The relationship between lending and capital ratios in economic downturns of large banks varies substantially among the European Union (EU) member states, meaning that the capital crunch effect (i.e. reduction in lending resulting from capital requirements, as defined by Peek and Rosengren, 1995, p. 625) is diversified. This diversity exists despite the fact that many of these banks compete with each other in the same or similar markets and thus are subject to more or less the same economic factors. They are also subject to the same Basel minimum capital requirements implemented in directives – which intend to create a level playing field in the EU single market. Why does the effect of capital on loan growth vary across different EU countries? This paper attempts to answer this puzzle. The primary hypothesis examined in this paper is that country-specific regulatory factors and supervision help to explain cross-country differences in the link between lending and capital ratios amongst large banks in the EU.

This paper extends the existing research by including the regulatory and supervisory characteristics that may affect the amount of capital private banks maintain (Brewer, Kaufmann and Wall, 2008) and capital buffers of banks (Fonseca and González, 2010). Previous studies have been limited to individual countries (United States by Beatty and Liao, 2011 and Carlson et al., 2013; France by Labonne and Lame, 2014; United Kingdom by Mora and Logan, 2011), so that all banks were affected equally by the country's regulations and supervisory policy towards banks. Those studies which focused on the link between lending and capital across countries have not accounted for regulations and supervision (Gambacorta and Marqués-Ibáñez, 2011). In other words, this paper explores the effects, if any, of government policy factors on the association between loan growth and capital ratio in economic downturns.

Whether and how the government policy affects the link between lending and capital is of importance today. The results may have implications

 DOI 10.7172/1644-9584.66.1

for the design of government policies towards bank regulations and bank supervision, both official and private. The different effects of capital ratio on lending may provide information about the extent to which more restrictive regulations result in the possibility of reduced risk-taking and therefore limit the impact of capital on loan growth as well as the extent to which prudential supervision is substituting for market discipline. Therefore our study should shed some light on the potential effects of current modifications in capital standards included in Basel III, and in the EU CRD IV and CRR provisions.

The EU countries in the second half of the nineties and in the first decade of 2000's are a very good sample for investigating the question of the factors explaining this diversity of relationship between capital and lending. On the one hand, in this period the process of harmonization of standards aiming at smoothing the functioning of a single market in Europe was gaining momentum. On the other hand, several significant differences between those countries were still present. The differences were particularly visible in the area of bank regulations and supervision (Barth et al., 2006, pp. 166–167). As Bart et al. find, both old member states as well as new EU countries (i.e. those which accessed the EU in 2004) differed with respect to the restrictiveness of the regulations and supervision.

The rest of the paper is organized as follows. Section 2 puts our study in the context of research on the role of bank capital for loan supply and thus develops our hypotheses. We describe our sample and research design in Section 3. We discuss results and supplemental analyses in Section 4. Section 5 concludes our work.

2. Theoretical and Empirical Background

Banking activity is a very strongly regulated business due its inherent financial vulnerability and instability (Minsky, 1986), which results from the market failures inherent to banking activity (i.e. asymmetric information and limited commitment). Banks play an important role in reducing information asymmetry between depositors (households) and borrowers (firms) by providing monitoring of borrowers (Diamond, 1984). This delegated monitoring potentially explains why banks hold lending portfolios instead of focusing on their comparative advantage, i.e. loan origination and monitoring of borrowers (Beatty and Liao, 2014, p. 343). As Diamond (1984) and Boyd and Prescott (1986) argue, by holding loans banks will have incentives to monitor borrowers and produce information about credit risk, which should reduce the scope for financial instability.

Delegated monitoring increases agency problems between depositors and bank managers because banks fail to take optimal risk from depositors' perspectives. Tirole (2006) shows that either demandable deposits or equity can be used as alternative mechanisms to control these agency problems. However, the need for government bailouts during the recent financial crisis highlighted concerns that insured demand deposits do not provide a proper mechanism for monitoring banks or adequate risk-taking incentives. This led to calls for banks to be obliged to hold more equity capital. Capital regulation in the form of internationally coordinated standards (Basel I, II and III accords) has been introduced to counteract banks' risk-shifting incentives being exacerbated by the provision of the government safety net. In particular, Dewatripont and Tirole (1994) put forth the representation hypothesis which argues that government is a representative monitor which helps to protect small dispersed depositors from moral hazard and adverse selection due to the inability of such depositors to perform the monitoring functions at low cost and due to the potential of free rider problem (see also Tirole, 2001).

Capital market imperfections can restrict bank lending during downturns (the so-called capital crunch hypothesis, Peek and Rosengren, 1995). Van den Heuvel (2011) argues that banks may reduce lending due to capital requirements and costs of raising new equity. The reduction in lending can occur even when the capital requirement is not currently binding because low-capital banks may optimally forgo profitable credit extension now to reduce the risk of future capital inadequacy (see also Borio and Zhu, 2012). This can occur whenever increasing the capital base is more costly than alternative funding sources. There are several explanations for this: information frictions in pecking order theory (asymmetric information, Myers, 1984); issuance of new equity may signal poor performance (adverse selection, Myers and Majluf, 1984); external equity finance may be regarded as more prone to misuse by managers unless it provides sufficient control (agency problems, Jensen and Meckling, 1984).

The problem of the effect of capital ratio on bank lending has been studied extensively since the 1990's, when the first Basel Accord was introduced as an international capital standard. Early studies of the association show that bank capital may exert some impact on lending, but this effect is relatively weak (see Jackson et al., 1999). Several recent papers focus mainly on the relationship between capital and lending but do not consider the capital crunch effect (see e.g. Berrospide and Edge, 2010; Bridges et al., 2014; Labonne and Lame, 2014). The capital crunch effect is found in large publicly traded banks by Beatty and Liao (2011) and in US commercial banks by Carlson et al. (2013). Additionally, in a cross-country study Gambacorta and Marqués-Ibáñez (2011) show that publicly traded banks tend to restrict their lending more during recessions or crisis periods. This study, however, does not take into consideration the factors explaining the cross-country heterogeneity of the link between lending and capital (i.e. the heterogeneity of the capital crunch effect).

 DOI 10.7172/1644-9584.66.1

Regulations and supervision may influence this link through their impact on market discipline and therefore on capital kept by banks to cover unexpected losses. On the one hand, tighter restrictions on bank activities may reduce depositors' incentives to monitor banks, as they may limit the opportunities for bank managers to undertake risky investments. This may result in lower capital buffers and therefore amplify the capital crunch effect. On the other hand, the opposite may be also true if such restrictions result in better risk management of credit portfolio due to deeper specialization and greater transparency. Fonseca and González (2010) show that more restrictive constraints on a bank's range of activities are related with greater capital buffers of banks. Carlson et al. (2013) also show that the capital crunch hypothesis is not found in banks with greater capital ratios. We therefore expect that more restrictive regulations should be associated with a weakened capital crunch effect. Additionally, Brewer et al. (2008) find that more restrictive capital standards are associated with more capital in relation to risky assets. We would accordingly expect tighter restrictions on capital standards to make the capital crunch effect weaker.

Supervisory policies (official supervision, private market oversight, the power of the deposit insurer and restrictiveness of the deposit insurance scheme) aimed at constraining excessive risk-taking resulting from moral hazard may affect the capital crunch effect in a number of ways. If official supervisory authorities and the deposit insurer have greater powers to intervene reasonably (i.e. without political pressure) in banks to discipline managers, they may reduce the risk undertaken by banks and will have a direct positive effect on capital buffers. Effective supervision may also enhance investor confidence regarding expropriation and boost charter values (Fonseca and González, 2010). Empirical evidence finds such valuation effect for large banking organizations (Brewer et al, 2008) and for capital buffers (Fonseca and González, 2010). We thus forecast that stricter official supervision is related with a weakened capital crunch effect. Increased market discipline in countries with better private oversight will make the cost of deposits more sensitive to bank risk and therefore result in higher capital buffers (and the weakened capital crunch effect). However, if banks decide to operate at lower capital buffers in expansions to adapt to perceptions of reduced short-term risk, then capital buffers will be thin (and the capital crunch effect would be strengthened). Reduced moral hazard, related to enhanced market discipline typical of less generous deposit insurance, discourages banks from taking greater risks (Merton, 1974) and to keep higher capital buffers. Empirical evidence confirms this effect, showing that more generous deposit insurance decreases bank capital buffers (Fonseca and González, 2010). For this reason, we expect that regulations reducing moral hazard would have a negative impact on the capital crunch effect.

3. Data and Research Methodology

3.1. Data

We use pooled cross-section and time series data of individual banks' balance sheet items and profit and loss accounts from 27 EU countries and country-specific macroeconomic indicators for these countries, over a period from 1996 to 2011. The balance sheet and profit and loss account data are taken from the Bankscope database, whereas the macroeconomic data were accessed from the EUROSTAT and the IMF web pages. Due to the fact that the capital crunch hypothesis is a better explanation of constrained lending of large banks (see Beatty and Liao, 2011 and Carlson et al., 2013), in each country we identify the 30% of banks with the largest assets. We look at both unconsolidated and consolidated data in a separate analysis to address the problem of a potentially different capital crunch effect in banks consolidating financial statements and thus conducting their business in several financial market segments, e.g. as financial conglomerates. In other words, large banks reporting consolidated statements are larger ("too big to fail" or "too interconnected to fail", see Schooner and Taylor, 2010; Stiglitz, 2010; De Haan and Poghosyan, 2012) and may be more prone to moral hazard problems because, as the economic theory predicts, such banks undertake too many risky investments (see also Freixas et al., 2007). We exclude from our sample outlier banks by eliminating the extreme bank-specific observations when a given variable adopts extreme values. In this respect we excluded banks with: negative capital ratios (such banks are bankrupt and thus cannot conduct traditional banking business effectively) and capital ratios exceeding 50% (such a ratio is not very typical of the highly levered banking business and thus may imply mistakes in the database); loans growth rate which is extremely negative (i.e. smaller than –50% – such values may result from mistakes in the database) or extremely positive (i.e. higher than 200% – such values may result from mistakes in the database); deposits to assets ratio which is higher than 100% (total deposits cannot exceed the balance sheet total, which is equal to total assets) or negative (deposits cannot be negative, the same is for total assets; negative values imply mistakes in the database); deposits from banks to total assets ratio which is higher than 100% (total deposits from banks cannot exceed the balance sheet total, which is equal to total assets) or negative (deposits from banks cannot be negative, the same is for total assets; negative values imply mistakes in the database); net loan loss provisions to average loans ratio (QLP) exceeding 20% or below –20% (average value of this ratio in banks is positive and around 0.05%; such extreme values of this ratio, i.e. over 20% and below –20%, may imply mistakes in the database). The resulting sample includes 657 banks (6058 observations) in the case of unconsolidated data and 144 banks (2091 observations) in the case of consolidated financial data.

 DOI 10.7172/1644-9584.66.1

Barth et al. (2006) assemble a detailed database on bank regulation and supervision in over 150 countries to which we refer in our study. The characteristics of bank regulation in each country will be incorporated through a measure of the scope of activities permitted to banks (REGRESTR) constructed by Barth et al. (2006, 2013). We measure the regulatory restrictiveness using an index comprising two variables: restrictions on the range of activities (securities, insurance, real-estate activities) and restrictions on bank ownership and control of non-financial firms. In our analysis we chose to use the first principal component of the above-mentioned variables (see Barth et al., 2006). It ranges from –0.3 to 0.5 with higher values indicating a wider range of activities permitted to banks.

We also incorporate the capital regulatory index constructed by Barth et al. (2006) as a measure of the stringency of capital requirements. We explore the role of two such indices, with higher values indicating greater stringency. First, the overall capital regulatory index (CAPREG), which is simply the sum of two components: overall capital stringency and initial capital stringency. Its values range from 0 to 10. The other is the initial capital stringency index (INCAPSTR), which ranges from 0 to 3 and shows whether certain funds may be used to initially capitalize a bank and whether they are officially verified.

As the supervisory effectiveness variable we incorporate two measures developed by Barth et al. (2006, 2013): the official supervisory power (OFFSUP) and the private sector monitoring (PRIVMON). The OFFSUP, ranging from 0 to 15, measures whether the supervisory authorities have the authority to take specific actions to prevent and correct problems in a bank and indicates the power of banking supervisors to take prompt corrective action, to restructure and reorganize a troubled bank, and to declare a bank insolvent. PRIVMON captures several private market forces: the intensity of audit requirements, percentage of ten biggest banks rated by international rating agencies as well as by domestic rating agencies, no explicit deposit insurance scheme present and transparency of bank accounting, and ranges between 0 and 11, with higher values suggesting higher powers.

The deposit insurance scheme prevailing in a given country is a very important determinant of banks' moral hazard, and therefore bank risk-taking behavior. In our study we adopt the power of the deposit insurer index (DEPINSURANCE) developed by Barth et al. (2006), which captures the ability of this authority to protect the deposit insurance fund. It measures whether the deposit insurer has the authority to make the decision to intervene in a bank, to take legal action against bank directors or officials, and whether it has ever taken any legal action against bank directors or officers. The values for this index range from 0 to 4, with higher values indicating more power.

Due to the fact that deposit insurance schemes are not uniform across countries, we additionally include an index which incorporates various factors mitigating the moral hazard (MORALHAZARD) developed by Barth et al. (2006). This variable ranges from 0 to 3, with higher values indicating stronger risk-mitigating factors, and measures whether banks fund the deposit insurance scheme or risk-based premiums as well as whether there is a formal coinsurance component.

3.2. The Econometric Model

The empirical models that addressed the question of whether a bank-capital induced credit crunch was hindering the recovery were developed in the early- and mid-1990s in the US. We follow contemporary adaptions of those models available in several studies (Berrospide and Edge, 2010; Beatty and Liao, 2011; Carlson et al., 2013; Labonne and Lame, 2014; Bridges et al., 2014). Our basic model is given in equation (1) and will be applied at each country level to identify the association between loan growth and capital ratio during downturns (Downturn*CAP). This model reads as follows:

$$\begin{aligned}\Delta Loan_{i,t} = \alpha_1 \Delta Loan_{i,t-1} &+ \alpha_2 \Delta Loan_{i,t-2} + \alpha_3 Downturn + \alpha_4 CAP_{i,t} + \\ &+ \alpha_5 Downturn * CAP_{i,t} + \alpha_6 LIQGAP_{i,t} + \\ &+ \alpha_7 DEPBANKS_{i,t} + \alpha_8 \Delta CAP_{i,t} + \alpha_9 QLP_{i,t} + \\ &+ a_{105} size_{i,t} + \alpha_{11} \Delta UNEMPL_{j,t} + \\ &+ \alpha_{12} \sum_{j=1}^{27} Country_j + \alpha_{13} \sum_{t=1996}^{2011} T_t + \vartheta_{i,t} + \varepsilon_t,\end{aligned} \tag{1}$$

where:

i	– the number of the bank;
j	– the number of country;
t	– the number of observation for the *i*-th bank;
ΔLoan	– annual real loan growth rate;
CAP	– capital ratio, i.e. equity capital divided by total assets;
LIQGAP	– liquidity gap, calculated as (loans to nonfinancial sector subtract deposits of nonfinancial sector subtract interbank deposits)/loans to nonfinancial sector; this variable measures the extent to which bank loans are financed by unstable funding (i.e. securitizations, etc.);
DEPBANKS	– deposits from banks divided by total assets;
ΔCAP	– annual change in capital ratio;
QLP	– quality of lending portfolio (it equals loan loss provisions divided by average loans);
size	– logarithm of assets;
ΔUNEMPL	– annual change in unemployment rate.

Downturn – is a dummy taking the value of 1 during downturns and 0 otherwise (values taken from Olszak et al., 2014; in this study there is also

 DOI 10.7172/1644-9584.66.1

a description of the method of computing the Downturn variable; see also Olszak et al., 2015 for the application of this dummy in a different context). Elements $\sum_{j=1}^{27} Country_j$ and $\sum_{t=1996}^{2011} T_t$ are a set of country and time dummy variables. ϑ are unobservable bank-specific effects that are not constant over time but vary across banks. Finally, ε is a white-noise error term.

Considering the fact that we have access to annual data, we relate the loan growth rate to the current period bank-specific variables instead of their lagged values. Such choice is motivated by three reasons. First, when banks design their capital allocation plans, they do it based on the amount of current risks (expressed in the previous level of capital ratio) and any expected increases in the risks (which result from the loan extension plans) (see Resti and Sironi, 2007, p. 712). Second, the actual lending decisions made throughout the year may also be adjusted, taking account of the current changes in bank capital as well as the changes in the quality of credit portfolio (because loan loss charge-offs affect capital through changes in bank profits). This effect would be omitted if the capital ratio was incorporated as lagged. Third, the usage of lagged variables would not resolve the problem of simultaneity and endogeneity bias (see also Roberts and Whited, 2011, p. 32).

We predict a negative coefficient on Downturn if loan supply declines during Downturns for reasons other than capital and liquidity constraints (as do Beatty and Liao, 2011, p. 7). A positive coefficient on Downturn implies that banks do not reduce their lending in economic downturns. Further, if external financing is not frictionless, and banks are concerned that they might violate capital requirements, then the coefficient on CAP is expected to be positive. That is banks with higher capital ratio will extend more loans. The coefficient on the interaction term between Downturn and CAP is our measure of the capital crunch effect. A positive coefficient implies that lending is constrained by capital. i.e. the lower the capital ratio, the lower the loans growth rate is, and vice versa. A negative coefficient would indicate that capital is not important in lending extension during downturns. Such an effect implies that banks are well capitalized (i.e. have sufficient capital buffers), and thus their lending is insensitive to the level of capital ratio.

The annual change in the unemployment rate is our measure of demand for loans. The unemployment rate is included because it not only reflects the business cycle but also the longer term and structural imbalances in economies. We hypothesize that microprudential behavior by banks is reflected by a positive correlation with unemployment. One can also expect banks operating in countries with lower unemployment to meet higher credit demand as the income may be considered to be more stable (Bikker et al., 2005; Dell'Ariccia et al., 2012); see also Navarro and Soto, 2006, for other extensions on procyclicality of labor).

To investigate the impact of government policy on the capital crunch effect, we interact regulatory and supervisory indices with our measure of capital crunch, i.e. Downturn*CAP. The large number of country variables and the need to use interaction terms indicate that it is best to incorporate each of the coefficients separately rather than incorporating the interaction terms of all country variables at once (see e.g. Barth et al., 2006; Fonseca and González, 2010). The model used to test the role of regulations (denoted as REGULATION) is given below:

$$\begin{aligned}\Delta Loan_{i,t} = \alpha_1 \Delta Loan_{i,t-1} &+ \alpha_2 \Delta Loan_{i,t-2} + \alpha_3 Downturn + \alpha_4 CAP_{i,t} + \\ &+ \alpha_5 Downturn * CAP_{i,t} + \alpha_6 LIQGAP_{i,t} + \\ &+ \alpha_7 DEPBANKS_{i,t} + \alpha_8 \Delta CAP_{i,t} + \alpha_9 QLP_{i,t} + \\ &+ a_{105} size_{i,t} + \alpha_{11} \Delta UNEMPL_{j,t} + \\ &+ \alpha_{13} \Delta REGULATION_j + \\ &+ \alpha_{14} \Delta REGULATION_j * Downturn * CAP_{i,t} + \\ &+ \alpha_{15} \sum_{j=1}^{27} Country_j + \alpha_{16} \sum_{t=1996}^{2011} T_t + \vartheta_{i,t} + \varepsilon_t.\end{aligned} \tag{2}$$

The model used to test the role of supervision (denoted as SUPERVISION) reads as:

$$\begin{aligned}\Delta Loan_{i,t} = \alpha_1 \Delta Loan_{i,t-1} &+ \alpha_2 \Delta Loan_{i,t-2} + \alpha_3 Downturn + \alpha_4 CAP_{i,t} + \\ &+ \alpha_5 Downturn * CAP_{i,t} + \alpha_6 LIQGAP_{i,t} + \\ &+ \alpha_7 DEPBANKS_{i,t} + \alpha_8 \Delta CAP_{i,t} + \alpha_9 QLP_{i,t} + \\ &+ a_{105} size_{i,t} + \alpha_{11} \Delta UNEMPL_{j,t} + \\ &+ \alpha_{13} SUPERVISION_j + \\ &+ \alpha_{14} SUPERVISION_j * Downturn * CAP_{i,t} + \\ &+ \alpha_{15} \sum_{j=1}^{27} Country_j + \alpha_{16} \sum_{t=1996}^{2011} T_t + \vartheta_{i,t} + \varepsilon_t.\end{aligned} \tag{3}$$

In equation (2) (equation (3)) a positive coefficient on the interaction term between REGULATIONS (SUPERVISION) and Downturn*CAP would indicate that the positive relation between loan growth and the capital ratio in downturns increases with the country variable, consistent with the diminished market discipline, which may lead to an enhanced capital crunch effect. A negative coefficient implies diminished risk-taking and indicates that the country variable mitigates the capital crunch effect.

In our study we apply the system of generalised method of moments (GMM) proposed by Blundell and Bond (1998) with Windmeijer correction (2005). We control for the potential endogeneity of CAP, LIQGAP, DEPBANKS, ΔCAP and QLP in the two-step system GMM estimation procedure by the inclusion of up to four lags of explanatory variables as instruments. The UNEMPL, as well as the country and the time dummy variables are the only variables considered exogenous. As the consistency of the GMM estimator depends on the validity of the instruments, we consider two specification tests. The first is the test verifying the hypothesis of

 DOI 10.7172/1644-9584.66.1

absence of second-order serial correlation in the first difference residuals (AR(2)) and the absence of first-order serial correlation in the differentiated residuals (AR(1)). The second test which we apply is the Hansen's J statistic for over-identifying restrictions (see Roodman, 2009, p. 141).

4. Empirical Results

Table 1 reports descriptive statistics of the sample (panel A) and the correlation coefficients from the pooled estimation (panel B). Consistent with prior research (e.g. Berrospide and Edge, 2010; Beatty and Liao, 2011; Carlson et al., 2013; Labonne and Lame, 2014), we find positive and significant coefficient of 0.074 (p-value below 0.01) on CAP, indicating that on average loan growth of banks in the EU is positively related to the capital ratio. The negative correlation coefficient between CAP and size suggests that banks with higher assets have lower capital ratios. Therefore, following Carlson et al. (2013), we expect that large banks will be more sensitive to the capital ratio in their lending activity.

In Table 2 we show the values of indices measuring the restrictiveness of regulations and supervision across the EU countries. As can be seen, there is a huge diversity of these measures in the EU member states.

4.1. Effects of Bank Regulation on the Link between Loan Growth and Capital Ratio

The regression results given by equation 2 are shown in columns (1)–(3) of Table 3 for unconsolidated data and in columns (4)–(6) for consolidated data. Coefficients of both CAP and Downturn*CAP are positive and statistically significant (but for the REGRESTR regression model in which they are marginally significant). The results in columns (1) and (4) are consistent with an expectation that restrictions on bank activities have two opposite effects on capital ratios and thus on the link between lending and capital. The negative (and statistically significant) coefficient in the unconsolidated data suggests that tighter restrictions on bank activities limit the capital crunch effect. The positive coefficient present in consolidated data implies that reduced market discipline increases the economic importance of capital in downturns but only in the sample of large banks, which operate as financial conglomerates (and thus are obliged to consolidate financial statements).

Moreover, more restrictive overall capital standards (CAPREG) and initial capital requirements (INCAPSTR) diminish the effect of capital ratio on loan growth in Downturns, as the coefficients on both Downturn*CAP*CAPREG and Downturn*CAP*INCAPSTR are negative in both unconsolidated and consolidated data. Thus our results are consistent with increased capital ratios in countries with more restrictive capital standards. This results in a weakened capital crunch effect.

PANEL A

	ΔLOANS	Downturn	CAP	Downturn*CAP	ΔUNEMPL	LIQGAP	DEPBANKS	ΔCAP	QLP	Size
UNCONSOLIDATED										
Mean	4.03	0.51	6.75	3.71	–0.15	–84.40	13.93	0.05	0.80	15.11
# observations	9773	11876	10452	10451	10955	10328	8042	9602	10145	10575
CONSOLIDATED										
Mean	3.82	0.51	5.83	3.04	–0.02	–49.82	17.96	0.03	0.43	7.79
# observations	1998	2304	2089	2089	2282	2091	2088	1943	2016	2091

PANEL B

UNCONSOLIDATED										
ΔLOANS	1									
Downturn	0.019 *	1								
CAP	0.086 ***	0.022 **	1							
Downturn*CAP	0.063 ***	0.751 ***	0.517 ***	1						
ΔUNEMPL	0.034 ***	0.261 ***	–0.034 ***	0.169 ***	1					
LIQGAP	–0.131 ***	0.001	0.092 ***	0.051 ***	0.003	1				
DEPBANKS	–0.058 ***	–0.024 **	–0.423 ***	–0.222 ***	0.020 *	0.014	1			
ΔCAP	–0.101 ***	0.002	0.081 ***	0.032 ***	0.041 ***	0.036 ***	0.038 ***	1		

DOI 10.7172/1644-9584.66.1

QLP	0.011	0.032 ***	–0.059 ***	0.006	0.142 ***	–0.033 ***	0.008	–0.068 ***	1	
size	0.025 **	–0.005	–0.276 ***	–0.140 ***	0.063 ***	–0.080 ***	0.238 ***	0.018 *	–0.085 ***	1
CONSOLIDATED										
ΔLOANS	1									
Downturn	–0.012	1								
CAP	–0.011	–0.030	1							
Downturn*CAP	–0.004	0.824 ***	0.382 ***	1						
ΔUNEMPL	–0.038 *	0.159 ***	–0.014	0.122 ***	1					
LIQGAP	–0.052 **	–0.020	0.123 ***	0.039 *	0.026	1				
DEPBANKS	–0.003	–0.019	–0.130 ***	–0.073 ***	0.033	–0.074 ***	1			
ΔCAP	–0.008	0.020	0.184 ***	0.128 ***	0.096 ***	–0.018	–0.021	1		
QLP	0.074 ***	0.044 *	0.164 ***	0.107 ***	0.315 ***	0.061 ***	0.032	–0.005	1	
size	–0.018	0.011	–0.506 ***	–0.207 ***	0.080 ***	0.048 **	–0.027	–0.001	–0.171 ***	1

Δloan – annual loan growth rate; CAP – capital ratio, i.e. equity capital to total assets; ΔCAP – annual change in capital ratio; DEPBANKS – Deposits from banks to total assets; LIQGAP – Loans less Total customer deposits less Deposits from banks divided by Loans; size – logarithm of total assets; QLP – Loan loss provisions divided by average loans; ΔUNEMPL – change in annual unemployment rate; # observations – number of observations; *, **, *** denote significance at the 10%, 5% and 1% level, respectively.

Tab. 1. Summary descriptive statistics of key regression variables (in percentage points) (PANEL A) and correlations (PANEL B). Source: authors' own elaboration.

Country	REGRESTR	CAPREG	INCAPSTR	OFFSUP	PRIVMON	DEPINSURANCE	MORALHAZARD
Austria	–0.94	5	2	10	8	2	2
Belgium	–0.94	6	0	13	9		
Bulgaria	1.05	5	1	10	6	1	1
Cyprus	1.49	3	2	11	7	2	2
Czech Republic	1.92	6	3	12	10	4	
Denmark	–0.06	4	2	14	9	0	1
Estonia	–0.50	8	2	8	7	1	2
Finland	–0.06	8	3	11	7	0	1
France	–0.06	4	2	6	7	4	2
Germany	–0.94	6	3	11	7	1	2
Greece	–0.50	3	2	11	11		
Hungary	0.82	5	2	15	9	0	2
Ireland	–0.94	5	2	10	7	2	1
Italy	1.92	8	3	12		0	1
Latvia	–0.50	4	3	10	7	1	2
Lithuania	0.82	4	1	10	10	1	1
Luxembourg	–0.06	9		15		1	
Malta	–0.72	5	3	14	9		
Netherlands	–2.04	3	2	11	10	0	0
Poland	–1.16	5	2	13		0	2
Portugal	1.92	4	0	9	8		2
Romania	1.49	8	3	9	8	3	2
Slovak Republic	1.05	7	2	8	9	0	2
Slovenia	0.38	7	2	13	4		
Spain	–0.94	4	1	10	9	1	1
Sweden	0.38	4	1	11	8	1	2
United Kingdom	–2.92	10	3	15	9	2	3

Notes: The coefficients measuring the link between lending and capital in downturns have been estimated using the GMM estimator with robust standard errors, applied to the model given by equation (1). *, **, *** denote significance at the 10%, 5% and 1% level, respectively; # denotes the number of banks or observations.

Tab. 2. Heterogeneity of indices measuring regulatory restrictiveness and stringency of supervision and of the link between lending and capital of large banks during downturns. Source: authors' own elaboration.

DOI 10.7172/1644-9584.66.1

Link between lending and capital		# banks	# observations	Link between lending and capital		# banks	# observations
UNCONSOLIDATED				CONSOLIDATED			
–0.518		24	211	–0.712		6	61
–2.253		6	39	0.219		7	68
0.373		4	43				
		1	5	0.701		3	37
		2	19	–0.240		3	39
–0.159	***	20	165	3.557		7	82
		1	7			2	23
		1	6			2	16
–1.727	*	27	200	–0.030		21	213
–0.850	**	350	3524	–1.945		6	72
		2	22	–0.297		5	64
						3	39
						4	46
0.048		145	1278	–1.984		14	143
–2.071		4	30			2	19
		2	11			2	18
–1.708	**	7	41			3	36
				0.959		7	76
0.195		8	61	–0.491		3	25
		2	15	–0.581		6	70
		2	19	–0.014		2	20
		2	14			2	24
		3	26			3	36
–1.815		20	172	0.304	*	10	128
–0.164		18	140			4	37
–8.336	*	6	20	–0.537		17	196

DOI 10.7172/1644-9584.66.1

Variables	(1)	(2)	(3)	(4)	(5)	(6)
	UNCONSOLIDATED			CONSOLIDATED		
Δloan(–1)	–0.079 **	–0.075 *	–0.065	0.002	0.006	0.018
	(–1.98)	(–1.87)	(–1.62)	(0.05)	(0.14)	(0.37)
Δloan(–2)	–0.115	–0.106	–0.047	0.086 **	0.085 **	0.079 *
	(–1.51)	(–1.41)	(–0.72)	(2.33)	(2.35)	(1.85)
Downturn	–2.864 **	–1.593 *	–0.739	–2.149	–6.354	–5.573
	(–2.34)	(–1.67	(–1.02	(–0.47)	(–1.10)	(–0.96)
CAP	0.249	0.493 ***	0.520 **	–0.683	–1.297	–1.106
	(1.46)	(2.65	(2.43)	(–0.73)	(–1.14)	(–1.09)
Downturn*CAP	0.306	0.681 **	0.882 **	0.368	3.393	2.114
	(1.56)	(2.02	(2.14)	(0.45)	(1.28)	(1.16)
LIQGAP	–0.008	–0.007	–0.007	0.002	0.005	0.003
	(–1.29)	(–1.12	(–1.15)	(0.28)	(0.53)	(0.42)
DEPBANKS	0.049	–0.008	–0.030	–0.096	–0.091	–0.108
	(0.5)	(–0.09	(–0.40)	(–1.01)	(–0.93)	(–1.13)
ΔCAP	–1.291 *	–1.443 **	–1.436 *	0.354	0.401	0.466
	(–1.90)	(–1.98	(–1.88)	(0.60)	(0.67)	(0.75)

QLP	–0.353	–0.389	–0.504	3.437	3.493	3.406
	(–0.69)	(–0.77	(–1.12)	(0.79)	(0.80)	(0.79)
size	0.795 ***	0.918 ***	1.060 ***	–2.634	–1.885	–1.288
	(3.49)	(3.68	(3.11)	(–0.72)	(–0.64)	(–0.55)
ΔUNEMPL	2.091 ***	2.084 ***	2.001 ***	–1.253 *	–1.445 **	–1.264 *
	(5.14)	(5.44	(5.35)	(–1.81)	(–2.11)	(–1.67)
Intercept	–9.534 *	–15.675 **	–18.420 **	27.560	16.743	14.188
	(–1.94)	(–2.49	(–2.24	(0.83)	(0.69)	(0.70)
REGRESTR	1.363 ***			–2.395		
	(2.93)			(–1.38)		
Downturn*CAP* REGRESTR	–0.136 ***			0.424		
	(–2.72)			(1.14)		
CAPREG		0.526 **			1.598	
		(1.96)			(1.50)	
Downturn*CAP* CAPREG		–0.091 **			–0.401	
		(–2.35)			(–1.23)	
INCAPSTR			1.423 **			2.997
			(2.25)			(1.37)

Tab. 3. cont.

Variables	(1)	(2)	(3)	(4)	(5)	(6)
	UNCONSOLIDATED			CONSOLIDATED		
Downturn*CAP* INCAPSTR			–0.341 **			–0.560
			(–2.48)			(–0.97)
AR(1)	–1.64	–1.64	–1.6	–1.85 *	–1.87 *	–1.79 *
AR(2)	–0.82	–0.85	–1.48	–1.56	–1.67	–1.35
Hansen test	602.23 ***	605.44 ***	598.16 ***	135.78	134.6	132.1
# banks	657	657	650	144	144	141
# observations	6068	6068	6027	1588	1588	1552

Notes: The models are given by equation (2). The symbols have the following meaning: Δloan – annual loan growth rate; Downturn – Dummy equal to one in Downturns and 0 otherwise; CAP – capital ratio, i.e. equity capital to total assets; Downturn*CAP – Interaction between Downturn and capital ratio (CAP)ΔCAP – annual change in capital ratio; DEPBANKS – Deposits from banks to total assets; LIQGAP – Loans less Total customer deposits less Deposits from banks divided by Loans; size – logarithm of total assets; QLP – Loan loss provisions divided by average loans; ΔUNEMPL – change in annual unemployment rate. REGRESTR is the measure of regulatory restrictions on bank activities. CAPREG is the measure of overall stringency of capital requirements. INCAPSTR is the initial capital stringency index. Coefficients for the country and time dummies are not reported. The models have been estimated using the GMM estimator with robust standard errors. T-statistics are given in brackets. Data range 1996–2011. *, **, *** denote significance at the 10%, 5% and 1% level, respectively. # denotes the number of banks or observations.

Tab. 3. Regulations and capital crunch. Source: authors' own elaboration.

DOI 10.7172/1644-9584.66.1

4.2. Effects of Supervision on the Link between Loan Growth and Capital Ratio

In Table 4 in columns (1) and (5) we find that the coefficient on the interaction between OFFSUP and Downturn*CAP is negative (but only marginally significant in unconsolidated data), which supports the hypothesis that effective official supervision reduces excessive risk-taking and boosts bank charter values and thus weakens the capital crunch effect. However, due to the fact that this association is only marginally significant (in statistical terms), we cannot state for sure that the effect of official supervision can be generalized. The positive Downturn*CAP* PRIVMON coefficient in columns (2) and (6) is consistent with thin capital buffers related to short-term risk perceptions in countries with increased market discipline. Thus we find support for an increased capital crunch effect in countries with more effective private oversight. However, this effect is statistically significant for large banks, which consolidate financial statements.

Results in columns (3) and (7) confirm the offsetting effects of the deposit insurer on the link between lending and capital. The positive and significant coefficient in the case of unconsolidated data (column (3)) supports the view that decreased market discipline in countries with a more restrictive deposit insurer reduces the capital buffers (and thus the capital crunch effect is enhanced). In contrast the negative, although not statistically significant coefficient of Downturn*CAP*DEPINSURANCE, is consistent with decreased risk-taking and the benefits of holding more capital in countries with greater powers of the deposit insurer.

The negative and statistically significant coefficient of Downturn*CAP*MORALHAZARD in column (8) confirms that the reduced moral hazard, related to more market discipline typical of less generous deposit insurance, encourages large banks operating as financial conglomerates to undertake low-risk investments and to keep higher capital buffers. We thus find that regulations reducing moral hazard have a negative impact on the capital crunch effect. Such result, however, is not supported in the case of unconsolidated data (column (4)) as the coefficient of Downturn*CAP*MORALHAZARD is positive, supporting the view that increased market discipline may result in short-term risk management producing thin capital buffers in expansions. This implies a strengthened capital crunch effect. So, generally our results imply that the capital crunch may be limited by regulations reducing moral hazard only in the sample of banks consolidating financial statements.

DOI 10.7172/1644-9584.66.1

Variables	1	2	3	4	5	6	7	8
	UNCONSOLIDATED				CONSOLIDATED			
Δloan(–1)	–0.079 **	–0.093 ***	–0.073 *	–0.070 *	0.003	–0.021	–0.011	–0.017
	(–2.00)	–3.28)	(–1.74)	(–1.79)	(0.08)	(–0.36)	(–0.23)	(–0.38)
Δloan(–2)	–0.107	–0.145 **	–0.123	–0.060	0.095 **	0.077	0.093 **	0.076 *
	(–1.39)	–2.13)	(–1.55)	(–0.85)	(2.36)	(1.47)	(2.08)	(1.88)
Downturn	–2.534 *	–1.356	–3.286 *	–2.631 **	–3.774	–3.450	–4.329	–5.282
	(–1.74)	(–0.88)	(–1.87)	(–1.99)	(–0.83)	(–0.70)	(–0.70)	(–0.97)
CAP	0.536 ***	0.385 **	0.447 ***	0.485 ***	–0.938	–0.691	–1.012	–1.225
	(2.80)	(2.16)	(2.88)	(2.84)	(–0.92)	(–0.65)	(–0.99)	(–1.18)
Downturn*CAP	1.966	–1.391	0.077	–0.470	1.232	–6.216 *	0.805	3.481 **
	(1.47)	(–1.15)	(0.57)	(–1.55)	(0.43)	(–1.93)	(1.13)	(1.97)
LIQGAP	–0.007	–0.010	–0.006	–0.007	0.001	0.000	0.002	0.005
	(–1.18)	(–1.18)	(–1.03)	(–1.07)	(0.15)	(0.06)	(0.27)	(0.61)
DEPBANKS	0.000	–0.042	0.010	0.001	–0.107	–0.118	–0.144	–0.140
	(0.00)	(–0.63)	(0.12)	(0.02)	(–0.93)	(–1.01)	(–1.07)	(–1.22)
ΔCAP	–1.473 **	–0.305	–1.433 *	–1.406 *	0.460	0.505	0.612	0.624
	(–1.97)	(–0.44)	(–1.92)	(–1.80)	(0.78)	(0.72)	(0.78)	(0.74)
QLP	–0.319	–0.638 **	–0.333	–0.365	3.648	3.890	4.206	4.114
	(–0.64)	(–2.10)	(–0.63)	(–0.72)	(0.81)	(0.84)	(0.86)	(0.77)

size	0.815 ***	1.063 ***	0.962 ***	0.861 ***	–1.108	–0.556	–1.158	–2.058
	(3.56)	(3.18)	(2.76)	(3.05)	(–0.38)	(–0.16)	(–0.41)	(–0.65)
ΔUNEMPL	2.132 ***	2.701 ***	2.015 ***	1.998 ***	–1.484 **	–1.059	–1.838 **	–1.439 *
	(5.42)	(4.09)	(5.28)	(5.06)	(–2.01)	(–1.55)	(–2.04)	(–1.78)
Intercept	–15.676 **	–4.655	–11.686 *	–9.401 **	15.282	39.433	18.610	15.664
	(–2.28)	(–0.92)	(–1.82)	(–2.00)	(0.63)	(1.05)	(0.61)	(0.56)
OFFSUP	0.392				0.213			
	(1.24)				(0.36)			
Downturn*CAP* OFFSUP	–0.153				–0.051			
	(–1.52)				(–0.22)			
PRIVMON		–1.221 *				–3.315 *		
		(–1.78)				(–1.67)		
Downturn*CAP* PRIVMON		0.201				0.823 *		
		(1.40)				(1.80)		
DEPSINSURANCE			–1.540 **				0.490	
			(–2.05)				(0.40)	
Downturn*CAP* DEPISNU-RANCE			0.395 *				–0.114	
			(1.93)				(–0.33)	

Tab. 4. cont.

Variables	1	2	3	4	5	6	7	8
	UNCONSOLIDATED				CONSOLIDATED			
MORALHAZARD				–1.656				7.280 **
				(–0.90)				(2.36)
Downturn*CAP* MORAL-HAZARD				0.524				–1.647 *
				(1.51)				(–1.85)
AR(1)	–1.63	–1.61	–1.64	–1.59	–1.81 *	–1.85 *	–1.79 *	–1.9 *
AR(2)	–0.89	–0.88	–0.86	–1.41	–1.82 *	–1.78 *	–1.78 *	–1.22
Hansen test	603.28 ***	468.2 ***	592.38 ***	590.9 ***	134.28	118.8	111.3	112.5
# banks	657	497	644	637	144	124	123	123
# observations	6068	4688	5966	5921	1588	1384	1350	1345

Notes: The models are given by equation (3). The symbols have the following meaning: Δloan – annual loan growth rate; Downturn – Dummy equal to one in Downturns and 0 otherwise; CAP – capital ratio, i.e. equity capital to total assets; Downturn*CAP – Interaction between Downturn and capital ratio (CAP); ΔCAP – annual change in capital ratio; DEPBANKS – Deposits from banks to total assets; LIQGAP – Loans less Total customer deposits less Deposits from banks divided by Loans; size – logarithm of total assets; QLP – Loan loss provisions divided by average loans; ΔUNEMPL – change in annual unemployment rate. OFFSUP is the measure of official supervisory power. PRIVMON is measured by private monitoring index. DEPINSURANCE is the index measuring the power of the deposit insurer. MORALHAZARD is the index which measures various factors mitigating moral hazard. Coefficients for the country and time dummies are not reported. The models have been estimated using the GMM estimator with robust standard errors. T-statistics are given in brackets. Data range 1996-2011. *, **, *** denote significance at the 10%, 5% and 1% level, respectively. # denotes the number of banks or observations.

Tab. 4. Supervision and capital crunch. Source: authors' own elaboration.

DOI 10.7172/1644-9584.66.1

5. Conclusions

This paper attempts to explain the substantial differences across the EU countries in the link between lending and capital of large banks in downturns by public policy characteristics unique to the country in which these banks are headquartered. We apply the GMM estimator to control for unobservable heterogeneity and potential endogeneity of explanatory variables included in the loan growth equation. The results highlight the fact that restrictions on bank activities and more stringent capital standards weaken the capital crunch effect, consistent with reduced risk-taking and boosted bank charter values.

Moreover, official supervision also alters the impact of the capital ratio on lending in downturns, which is consistent with reduced risk-taking incentives in countries with better microprudential supervision. However, its effect is only marginally statistically significant. Private market oversight seems to be related to short-term risk management producing thin capital buffers in expansions, and therefore the capital crunch effect is enhanced in countries with increased market discipline. Stricter powers of the deposit insurer and regulations reducing moral hazard have ambiguous effect on the link between lending and capital, as they are related with an increased capital crunch effect in unconsolidated data, and a weakened capital crunch effect in consolidated data.

Our analysis has three basic implications for public policy. First, neither regulations nor supervision at the microprudential level is neutral from a financial stability perspective. Weak regulations limiting the range of activities which banks can conduct and supervision increase the pro-cyclical effect of bank lending, due to insufficient capital buffers kept by banks to cover unexpected losses which rise in downturns.

Second, the results feed into the current policy debate on the new guidelines for capital suggested by the Basel Committee on Banking Supervision (BCBS, 2011), referred to as Basel III, since we find that lending of both groups of large banks (i.e. reporting unconsolidated and consolidated data) is less sensitive to the capital ratio if the regulations oblige banks to have more capital relative to risks.

Third, from a supervisory perspective, our results suggest that official supervision has the potential in reducing pro-cyclicality of capital. However, due to the fact that in the case of consolidated data (the "too big to fail" banks or systemically important financial institutions) we find that the countercyclical effect of microprudential supervision is not statistically significant, we infer that to supervise such banks effectively, there is a need for coordination between several national authorities. We thus provide empirical support to the establishment of multinational supervisory authorities, such as the Single Supervisory Mechanism in the EU.

Acknowledgements

We gratefully acknowledge the financial support provided by Polish National Scientific Centre (NCN), decision no. DEC-2012/05/D/HS4/01356. This paper's findings, interpretations, and conclusions are entirely those of the authors and do not necessarily represent the views of institutions with which the authors are affiliated. We would like to thank the two anonymous referees for their invaluable comments and suggestions which helped to enhance the quality of this paper.

References

Barth, J.R., Caprio, G. Jr., and Levine, R. (2006). *Rethinking Bank Regulation. Till Angels Govern.* New York: Cambridge University Press.

Barth, J.R., Caprio, G. Jr., and Levine, R. (2013). *Measure It, Improve It. Bank Regulation and Supervision in 180 Countries 1999–2011*. Milken Institute.

Basel Committee on Banking Supervision (BCBS). (2011). *Basel III: A Global Regulatory Framework for More Resilient Banks and Banking Systems*. Basel: Bank for International Settlements.

Beatty, A. and Liao, S. (2011). Do Delays in Expected Loss Recognition Affect Banks' Willingness to Lend? *Journal of Accounting and Economics, 52*, 1–20.

Beatty, A. and Liao, S. (2014). Financial Accounting in the Banking Industry: A Review of the Empirical Literature. *Journal of Accounting and Economics, 58*, 339–383.

Berrospide, J.M. and Edge, R.M. (2010). The Effects of Bank Capital on Lending: What Do We Know? And What Does It Mean? *International Journal of Central Banking*, (December), 5–54.

Bikker, J.A. and Metzemakers, P.A.J. (2005). Bank Provisioning Behavior and Procyclicality. *Journal of International Financial Markets, Institutions and Money, 15*, http://dx.doi.org/10.1016/j.intfin.2004.03.004.

Blundell, R. and Bond, S. (1998). Initial Conditions and Moment Restrictions in Dynamic Panel Data Model. *Journal of Econometrics, 87*, 115–143.

Borio, C. and Zhu, V.H. (2012). Capital Regulation, Risk-Taking, and Monetary Policy: A Missing Link in the Transmission Mechanism? *Journal of Financial Stability*, (8), 236–251.

Boyd, J. and Prescott, E. (1986). Financial Intermediary – Coalitions. *Journal of Economic Theory*, *38*, 211–232.

Brewer, E., Kaufman, G.G., and Wall, L.D. (2008). Bank Capital Ratios across Countries: Why Do They Vary? *Journal of Financial Services Research, 34*, 177–201.

Bridges, J., Gregory, D., Nielsen, M., Pezzini, S., Radia, A., and Spaltro, M. (2014). The Impact of Capital Requirements On Bank Lending. *Working Paper*. *Bank of England*, (486).

Carlson, M., Shan, H., and Warusawitharana, M. (2013). Capital Ratios and Bank Lending: A Matched Bank Approach. *Journal of Financial Intermediation, 22*, 663–687.

De Haan, J. and Poghosyan, T. (2012). Bank Size, Market Concentration and Bank Earnings Volatility in the US. *Journal of International Financial Markets, Institutions, and Money, 22*, 35–54.

Dell'Ariccia, G., Igan, D., and Laeven, L. (2012). Credit Booms and Lending Standards: Evidence from the Subprime Mortgage Market. *Journal of Money, Credit and Banking*, *44*(23).

Dewatripont, M. and Tirole, J. (1994). *The Prudential Regulation of Banks*. Cambridge: MIT Press.

Diamond, D.W. (1984). Financial Intermediation and Delegated Monitoring. *The Review of Economic Studies, 51*, 393–414.

 DOI 10.7172/1644-9584.66.1

Diamond, D.W. and Dybvig, P.H. (1983). Bank Runs, Deposit Insurance, and Liquidity. *Journal of Political Economy*, *91*(June), 401–419.
Directive 2013/36/EU of the European Parliament and of the Council of 26 June 2013 on access to the activity of credit institutions and the prudential supervision of credit institutions and investment firms, amending Directive 2002/87/EC and repealing Directives 2006/48/EC and 2006/49/EC (CRDIV) [2013] OJ L176.
Fonseca, A.R. and González, F. (2008). Cross-country Determinants of Bank Income Smoothing by Managing Loan-Loss Provisions. *Journal of Banking and Finance, 32*, 217–228.
Fonseca, A.R. and González, F. (2010). How Bank Capital Buffers Vary across Countries: The Influence of Cost of Deposits, Market Power and Bank Regulation. *Journal of Banking and Finance, 34*, 892–902.
Freixas, X, Loranth, G., and Morrison, A.D. (2007). Regulating Financial Conglomerates. *Journal of Financial Intermediation, 16*, 479–514.
Gambacorta, L. and Marqués-Ibáñez, D. (2011). The Bank Lending Channel. Lessons from the Crisis. *Working Paper Series. European Central Bank*, (1335/May).
Jackson, P., Furfine, C., Groeneveld, H., Hancock, D., Jones, D., Perraudin, W., Radecki, L., and Yoneyama, M. (1999). *Capital Requirements and Bank Behaviour: The Impact of the Basle Accord.* Basle: Bank for International Settlements.
Jensen, M. and Meckling, W. (1976). Theory of the Firm: Managerial Behaviour, Agency Costs and Ownership Structure. *Journal of Financial Economics*, (3), 305–360.
Labonne, C. and Lame, G. (2014). *Credit Growth and Bank Capital Requirements: Binding or Not?* Banque de France.
Merton, R.C. (1974). On the Pricing of Corporate Debt: The Risk Structure of Interest Rates. *Journal of Finance*, *29*, 449–470.
Minsky, H.P. (1986). *Stabilizing an Unstable Economy*. Mc Graw Hill.
Mora, N. and Logan, A. (2012). Shocks to Bank Capital: Evidence from UK Banks at Home and Away. *Applied Economics, 44*(9), 1103–1119.
Myers, S. (1984). The Capital Structure Puzzle. *Journal of Finance, 39*, 575–592.
Myers, S. and Majluf, N. (1984). Corporate Financing and Investment Decisions When Firms Have Information That Investors Do Not Have. *Journal of Financial Economics, 13*, 187–221
Navarro, L. and Soto, R. (2006). Procyclical Productivity in Manufacturing. *Cuadernos de Economia*, *43*(Mayo), 193–220.
Olszak, M., Pipień, M., and Roszkowska, S. (2015). Do Loan Loss Provisions Accounting and Procyclicality Matter for the Effects of Capital on Loan Growth of Big Banks in the EU? *Research Papers of Wrocław University of Economics, 397*, 171–181.
Olszak, M., Pipień, M., Roszkowska, S., and Kowalska, I. (2014). The Effects of Capital on Bank Lending in Large EU Banks – The Role of procyclicality, Income Smoothing, Regulations and Supervision. *University of Warsaw Faculty of Management Working Paper*, (5).
Peek, J. and Rosengren, E. (1995). The Capital Crunch: Neither a Borrower Nor a Lender Be. *Journal of Money, Credit, and Banking, 27*, 625–638.
Regulation (EU) 575/2013 of the European Parliament and of the Council of 26 June 2013 on prudential requirements for credit institutions and investment firms and amending Regulation (EU) No 648/2012 (CRR) [2013] OJ L176.
Resti, A. and Sironi, A. (2007). *Risk Management and Shareholders' Value in Banking*. John Wiley & Sons.
Roberts, M.R. and Whited, T.M. (2011). Endogeneity in Empirical Corporate Finance. *Financial Research and Policy Working Paper*, (FR 11–29). The Bradley Policy Research Center, University of Rochester.

Roodman, D. (2009). Practitioners Corner: A Note on the Theme of Too Many Instruments. *Oxford Bulletin of Economics and Statistics, 71*, 135–156.
Tirole, J. (2001). When Markets Fail. *IMF Survey, 30*(2).
Tirole, J. (2006). *The Theory of Corporate Finance.* Princeton: Princeton University Press.
Van den Heuvel, S.J. (2011). *Banking Conditions and the Effects of Monetary Policy: Evidence from U.S. States.* Federal Reserve Board.
Windmeijer, F. (2005). A Finite Sample Correction for the Variance of Linear Efficient Two Step GMM Estimators. *Journal of Econometrics*, *126*(1), 25–51.

 DOI 10.7172/1644-9584.66.1