A Note on Bank Capital Buffer: Does Bank Heterogeneity matter?

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Abstract:

The objective of this paper is to extend the literature on bank capital buffer by considering the role of bank heterogeneity. Using a sample of European commercial banks over 1992-2006, we show that four key determinants – risk, business cycle, market and peer discipline – have different impact on capital buffer depending on banks' financing mode, activity or size. Our results offer a framework for discussing the appropriateness of the still on-going suggestions on bank capital regulation. Whereas they support the differentiating measures undertaken in Basel 3 such as specific capital surcharges for SIFIs, they disagree with the adoption of uniform countercyclical buffers.

Keywords: bank capital buffer, prudential regulation, Basel accords

JEL Classification Numbers: G21, G28, G32.

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1. Introduction

Different studies deal with the determinants of bank capital buffer. They mainly focus on the relationship between a given factor and the buffer by controlling for its other potential determinants (Lindquist (2004), Jokipii and Milne (2008), Fonseca and Gonzalez (2010)). For example, Jokipii and Milne (2008) and Ayuso et al. (2004)[2] focus on the cyclical behavior of capital buffer. They show that the economic cycle (captured through the GDP) and capital buffer are negatively related. Nier and Baumann [2006][3] examine the link between market discipline and banks' capital ratios. They mainly show that, *ceteris paribus*, stronger market discipline, taken into account *via* the portion of uninsured liabilities, leads to a higher capital ratio. Alfon et al. (2004)[4] argue that regulatory environment, market discipline and risk management are the main determinants of the amount of capital held by banks.

However, all these studies consider all banks equally, or focus only on banking specialisation whereas banks have evolved towards the universal banking model, inducing a substantial heterogeneity in banks' activities even in the same banking specialisation. Banks mainly focused on traditional activities (loans supply and deposits collection) coexist with banks more involved in market activities. Similarly, large conglomerates coexist with small entities. We suspect that this heterogeneity may affect the determinants of capital buffer. Thus, we consider a set of European commercial banks over 1992-2006 and consider several sub-samples depending on three factors: bank activity type, financing mode and size. Indeed, European commercial banks are heterogeneous both in terms of size and balance sheet structure. However, the Basel capital constraint does not differentiate banks and seems almost set to fit banks turned towards traditional activities.

The main novelty of this paper lies in the fact that we consider the impact of the heterogeneity of banks' characteristics on the determinants of capital buffer. We assume that these determinants might differ depending on banks' size, activity and financing mode. Our hope is that our results might offer a framework for discussing the appropriateness of the still on-going suggestions on bank capital regulation. Concretely, according to our results, we might be able to judge whether the new Basel 3 measures such as the capital surcharge for Systemically Important Financial Institutions (SIFIs) or the prescription of a uniform countercyclical buffer for all banks are appropriate or not.

The rest of the paper is structured as follows. In section 2, we describe the method, the set of variables and the sample of banks. We present our results in section 3. Section 4 concludes the paper.

[2] Jokipii and Milne [2008] use a sample of European banks from 1997 to 2004 and Ayuso, Perez and Saurina, (2004) consider Spanish banks from 1986 to 2000.
[3] They use a substantial cross-country panel data of 32 countries from 1993 to 2000.
[4] They consider British banks from 1997 Q2 to 2002 Q2.

2. Sample, method and variables

The sample consists of 742 commercial banks from 16 European countries[5] over the period 1992-2006[6]. Accounting data for individual banks are obtained from Bankscope Fitch IBCA and we retain banks for which information about the total capital ratio[7] is available.

Before taking into account bank heterogeneity, we derive the determinants of European banks' capital buffer by estimating the model defined below on the whole sample of banks. Subscripts i and t denote bank and period respectively.

$$\begin{aligned} buffer_{i,t} &= \alpha_0 + \alpha_1 profit_{i,t-1} + \alpha_2 roe_{i,t-1} + \alpha_3 llpa_{i,t-1} + \alpha_4 obsa_{i,t-1} + \alpha_5 comp_{i,t-1} \\ &+ \alpha_6 uninsliab_{i,t-1} + \alpha_7 loang_{i,t} + \alpha_8 nla_{i,t-1} + \alpha_9 size_{i,t} + \alpha_{10} gdpg_{i,t} + \tau_t + \eta_i + u_{i,t} \end{aligned} \quad (1)$$

The regression includes time (τ_t) and individual (η_i) fixed effects and standard errors are robust to heteroscedasticity. Following Lindquist (2004), we introduce one year lag in explanatory variables which are susceptible to be endogenous in order to avoid simultaneity problems.

Table 1 presents the definition of the variables, the expected sign and shows some descriptive statistics for our sample of banks. We can notice that it exhibits a relatively high level of heterogeneity. The capital buffer is on average 6.10 and we denote a high volatility of this buffer as the standard deviation is 6.29. Besides, we can see that the sample of banks presents high differences in terms of size, activity type, and financing mode.

[5] Austria (19), Belgium (18), Denmark (65) Finland (11), France (147), Germany (28), Greece (18), Ireland (14), Italy (198), Netherlands (50), Norway (21), Portugal (20), Spain (31), Sweden (31), Switzerland (20), and United Kingdom (51). We notice that French and Italian banks are comparatively well represented in our sample. To make sure that our results do not depend on this unbalanced sample representation we ran, as a robustness check, all our regressions by excluding the banks from these two countries. Our conclusions remain unchanged.

[6] Note that on the whole time period, banks are under the Basel I framework.

[7] Total capital ratio is (Tier 1 + Tier 2)/ Risk weighted assets and is used to construct our dependent variable.

Table 1: Definition of the variables and summary descriptive statistics on 1992-2006.

Variable	*Mnemonic*	*Definition*	*Mean*	*Standard deviation*	*Min*	*Max*	*Expected Sign*
Capital buffer	buffer	((Tier 1+Tier 2 capital)/Risk-weighted assets)-regulatory minimum requirements	6.10	6.29	-7.90	33.70	
Profitability	profit	Post tax profit/Total assets	0.66	1.09	-12.37	10.60	+
Equity cost	roe	Net income/Equity[8]	9.39	12.54	-99.81	98.45	-
risk	llpa	Loan loss provisions/Total assets	0.54	0.67	0.00	6.58	-/+
Off-balance sheet	obsa	Off-balance sheet/Total assets	23.75	28.70	0.00	236.44	+
Market discipline	uninsliab	Total uninsured funding/Total liabilities	47.16	27.04	1.03	100.00	+
Peer discipline	comp	Annual mean of the capital buffer of banks in the same country	6.10	1.97	0.10	14.15	+
Size	size	Total assets (€ mil.) [9]	36558.00	$1.14*10^5$	9.54	$1.57*10^6$	-
Credit demand	loang	Annual net loan growth rate	13.56	28.94	-100.00	272.87	-
Asset structure	nla	Net loans[10]/Total assets	54.66	22.33	0.00	98.86	-
Economic cycle	gdpg	Annual growth rate of the real GDP (deseasonalized)	2.29	1.67	-3.97	15.43	-

After studying the determinants of European banks' capital buffer in a general framework, we investigate whether they differ depending on banks' size and balance sheet structure. In this aim, we estimate our equation separately on different sub-samples constructed on the basis of the size of banks, the proportion of loans in total assets and that of customer deposits in total liabilities. We define six sub-samples on the basis of three criteria:

- Financing mode: banks heavily (slightly) relying on customer deposits are defined as those with a ratio customer deposits/total liabilities greater (lower) than its median value (55.01%)

- Credit activity: banks with a high (low) credit activity are defined as those with a ratio of net loans/total assets greater (lower) than its median value[11] (56.23%);

[8] Notice that in our regressions, due to colinearity issues, the variable *roe* corresponds to the residuals of the regression of the Return on Equity on our profit variable.
[9] In our regressions, we consider the natural logarithm of total assets.
[10] Net loans are: gross loans – loan loss reserves.

- Size: banks with total assets greater (lower) than one billion[12] Euros are considered as large (small) banks;

3. Results

First, we study the determinants of capital buffer on the whole sample of banks. The results are presented in column (1) of table 2. We can see that seven out of the ten independent variables are significant at the one percent level with associated coefficients presenting the expected sign. Like Jokipii and Milne (2008), we find that the *profit* variable significantly and positively affects capital buffer. It appears that retained earnings are used by banks to increase their capital buffer. Our risk variable *llpa* which corresponds to the ratio of loan loss provisions to total assets is also highly significantly and positively related with capital buffer. This suggests that banks with greater expected losses raise capital buffer in order to reduce insolvency risk. Our indicators *comp* and *uninsliab* are highly significant and their coefficients are positive suggesting that European commercial banks are both disciplined by their peers and uninsured debtholders. This result is in line with those of Nier and Baumann (2006), Lindquist (2004) and Alfon and al. (2004). The loan demand variable *loang* is, as expected, negatively and significantly related to capital buffer indicating that high annual loan growth rate increases the capital requirement ratio and therefore reduces the bank capital buffer. This confirms the results of Ayuso et al. (2004) and Jokipii and Milne (2008). Similarly, the ratio net loans/total assets (*nla*) is negatively related to capital buffer, like in Fonseca and Gonzalez (2010) and Jokipii and Milne (2008), implying that banks more involved in credit activity have lower capital buffer. The *size* coefficient is significantly negative which gives support to the notion that large banks have lower capital buffer than small banks. This different behaviour may be explained by, among other things, the portfolio diversification and the economies of scale in screening and monitoring enjoyed by large banks which can allow them to operate with lower capital buffer.

Thus, our general findings are in line with those obtained in the previous literature. However, we suspect that the high heterogeneity of European banks in terms of size, activities and financing mode might have an impact on the relationship between these traditional determinants and capital buffer that is why we estimate this relationship on different sub-samples (columns 2-7 of Table 2).

[11] For both financing mode and credit activity, we considered other criteria to separate banks. Banks with a low value of the considered ratio are defined as those with a ratio lower than the first quartile and banks with a high value of the considered ratio are defined as those with a ratio greater than the third quartile. The first quartile is 44.72% for net loans/ total assets and 39.52% for customer deposits/ total liabilities. The third quartile is 70.59% for net loans/ total assets and 73.01% for customer deposits/ total liabilities. Considering these criteria leads to the same conclusions.

[12] This common criterion corresponds to the definition of large banks by Bankscope Fitch IBCA.

Table 2: Determinants of capital buffer taking into account bank heterogeneity

$$buffer_{i,t} = \alpha_0 + \alpha_1 profit_{i,t-1} + \alpha_2 roe_{i,t-1} + \alpha_3 llpa_{i,t-1} + \alpha_4 obsa_{i,t-1} + \alpha_5 comp_{i,t-1} + \alpha_6 uninsliab_{i,t-1} + \alpha_7 loang_{i,t} + \alpha_8 nla_{i,t-1} + \alpha_9 size_{i,t} + \alpha_{10} gdpg_{i,t} + \eta_i + \tau_t + u_{i,t}$$

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Variables	*Whole sample*	*(Net loans/ Total assets) low*	*(Net loans/ Total assets) high*	*(Customer deposits/ Total Liabilities) low*	*(Customer deposits/ Total Liabilities) high*	*Large*	*Small*
C	50.424	62.036	33.325	64.153	21.458	41.289	44.592
	(15.746)***	(12.578)***	(7.434)***	(13.262)***	(3.886)***	(10.391)***	(5.646)***
Profit	0.481	0.595	0.426	0.549	0.478	0.590	0.518
	(4.713)***	(3.267)***	(3.674)***	(3.715)***	(3.456)***	(4.097)***	(3.202)***
Roe	-0.010	-0.0008	-0.024	-0.021	-0.034	-0.015	-0.044
	(-0.945)	(-0.045)	(-1.751)*	(-1.439)	(-1.819)*	(-1.276)	(-1.605)
Llpa	0.389	0.675	0.221	0.435	-0.193	0.534	-0.187
	(2.752)***	(2.497)**	(1.487)	(2.125)**	(-0.936)	(2.870)***	(-0.768)
Obsa	-0.002	0.00003	-0.006	0.0006	-0.007	0.003	-0.012
	(-0.807)	(0.009)	(-1.759)*	(0.178)	(-1.792)*	(1.332)	(-1.384)
Comp	0.155	0.135	0.102	0.050	0.176	0.103	0.374
	(3.461)***	(1.848)*	(1.943)*	(0.844)	(2.585)***	(2.336)**	(2.672)***
Uninsliab	0.024	0.062	-0.015	0.028	0.013	-0.0002	0.031
	(3.610)***	(5.331)***	(-1.931)*	(2.624)***	(1.196)	(-0.031)	(2.028)**
Loang	-0.019	-0.017	-0.015	-0.016	-0.025	-0.014	-0.044
	(-7.314)***	(-4.846)***	(-4.484)***	(-5.588)***	(-5.4480)***	(-5.435)***	(-6.798)***
Nla	-0.092	-0.093	-0.076	-0.079	-0.089	-0.082	-0.141
	(-12.246)***	(-6.419)***	(-7.567)***	(-7.931)***	(-7.620)***	(-10.313)***	(-8.321)***
Size	-2.790	-3.593	-1.604	-3.588	-0.838	-2.061	-2.545
	(-13.444)***	(-11.644)***	(-5.331)***	(-12.333)***	(-2.182)**	(-8.434)***	(-4.013)***
Gdpg	0.052	0.051	-0.014	0.022	0.101	-0.067	0.339
	(0.987)	(0.739)	(-0.178)	(0.309)	(1.316)	(-1.316)	(2.230)**
Observations:	2874	1380	1493	1404	1462	1985	889
R-squared:	0.824	0.867	0.818	0.870	0.839	0.782	0.858

This table shows estimation results obtained using the panel fixed effects method. The regression includes both time and individual fixed effects. Net loans/total assets is considered as high (low) if it is greater (lower) than the median value on the whole sample (56.23%). Customer deposits/total liabilities is considered as high (low) if it is greater (lower) than the median value on the whole sample (55.01%). Large (small) banks are those with total assets greater (lower) than one billion euros (Bankscope criterion). Standard errors are adjusted robust to heteroscedasticity. ***, ** and * pertain to 1, 5 and 10% level of significance, respectively. T-stats are between parentheses.

Considering the results obtained on the different sub-samples, we can notice that the profitability (*profit*), the size of the bank (*size*), the importance of loans in total assets (*nla*) and loan demand (*loang*) are always significant determinants of capital buffer. Thus, the heterogeneity of banks does not affect the relevance of these variables.

However, we can notice several different behaviors for the other variables depending on banks' credit activity, financing mode[13] and size[14].

More precisely, the variable reflecting credit risk (*llpa*) appears significant only for large banks and banks more involved in non traditional activities that is banks with low ratios of net loans/total assets and customer deposits/total liabilities. The significance of this variable implies that credit risk is not properly taken into account in the capital constraint and that these banks have a better assessment of this risk which leads to the building of capital buffers. This result suggests that the refinements of the capital constraint to better capture risk might have an impact on bank actual capital essentially for small banks and banks involved in traditional activities.

The market discipline variable, *uninsliab*, is significant at least at the five percent level with the expected positive coefficient only for banks more turned towards non traditional activities and small banks. This may reflect the fact that the Basel capital constraint does not correctly take into account risks related to non traditional activities and that uninsured debtholders, aware of these risks, exert a pressure on banks to hold capital buffer. Besides, the significance of this variable only for small banks may be interpreted as a Too Big To Fail effect: large banks are considered as Too Big To Fail by uninsured debtholders which have no incentive to discipline them. Thus, if market discipline is to be considered in complement to capital regulation, it might be effective only for banks not perceived as Too Big To Fail and those more involved in non traditional activities.

We also find a significant positive relationship between the buffer and the annual growth rate of the real gross domestic product (*gdpg)* only for small banks. This result shows that capital buffers co-move positively with the business cycle highlighting a forward-looking behaviour i.e. small banks tend to increase capital buffer during good times that should be drawn upon during bad times. Thus, prescribing a uniform countercyclical buffer for all banks does not appear appropriate.

Finally, the effectiveness of peer discipline (*comp)* varies with banks' financing mode. It is only significant for banks highly funded by deposits. Thus, it seems that the competition between banks to attract deposit funding is fierce and capital buffer may act as a signaling tool for these banks.

[13] We ensure that the distinction between banks according to the importance of the ratio Net loans/ Total assets is not equivalent to the distinction according to the importance of the ratio Customer deposits/ Total Liabilities. Only 54.3% of banks with low Customer deposits/ Total Liabilities ratio are also banks with low Net loans/ Total assets ratio and 58,6% of banks with high Customer deposits/ Total Liabilities ratio are also banks with high Net loans/ Total assets ratio.

[14] Similarly, we ensure that the distinction between banks according to the size is not equivalent to the distinctions made according to the importance of loans or customer deposits. 53.7% of large banks have a high Net loans/ Total assets ratio and 41.6% a high (Customer deposits/ Total Liabilities) ratio. 40.8% of small banks have a low Net loans/ Total assets ratio and 40.4% a low (Customer deposits/ Total Liabilities) ratio. Thus, our criteria to separate banks are not equivalent and do not lead to identical sub-samples.

4. Conclusion

In this paper, we study the determinants of bank capital buffer considering bank heterogeneity. We find that the impact on capital buffer of factors such as risk, market discipline and economic cycle, which have been the main focus of the previous literature, differs depending on banks' financing mode, activity or size. These results might offer a framework to appreciate the appropriateness of the still on-going suggestions on bank capital regulation. More precisely, to tackle the procyclical behaviour of the regulatory capital in banking, it has been decided - in what is now known as Basel 3- to require banks to hold a countercyclical buffer of a magnitude between 0 and 2.5 % of risk weighted assets whatever the size and the type of the bank (BCBS, 2010). However, as our results indicate, the capital buffer is already countercyclical for small banks. Consistent with our findings, we therefore argue that this new burden might be nuanced as small and large banks seem to build differently their capital buffer. In the same way, our results suggest that reliance on market discipline for large banks might be a bad option. Hence, we welcome the underway Basel 3 measures, such as the capital surcharge, directed specifically towards Systemically Important Financial Institutions (SIFIs).

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