

# The role of market discipline on bank capital buffer: Evidence from a sample of European banks

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**Abstract:** Using a sample of European commercial banks over the period 1993-2006, we show that market discipline significantly and positively affects banks' capital buffer. By distinguishing junior from senior debt holders, we find that both types of investors exert a pressure on banks to hold more capital but that the pressure exerted by junior debt holders is higher. Furthermore, junior debt holders exert a pressure on banks whatever the importance of their non-traditional activities. By contrast, we find that senior debt holders exert a pressure only on banks that are heavily involved in non-traditional activities that are badly taken into account in the current bank capital regulation framework. These results might help us to better understand the role of market discipline as a complement to capital regulation.

**Key words:** bank capital buffer, prudential regulation, Basel accords, market discipline.

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## 1. Introduction

After the implementation of Basel I, there has been a noticeable upward trend in bank capital ratios throughout G-10 countries with banks holding capital ratios well beyond the minimum regulatory constraint. This has raised the question of why banks hold such high regulatory capital ratios, or put differently, why they hold capital in excess<sup>1</sup> of what is required by the regulator. Indeed, bankers often argue that capital is more expensive than debt. Therefore, several studies aim to determine what underlines this unexpected behavior by studying the determinants of capital buffer. In this vein, Lindquist (2004) considers Norwegian banks and investigates if risk is an important determinant of the buffer<sup>2</sup>. He does not find any significant link. Ayuso et al. (2004), Stolz and Wedow (2009) consider Spanish and German banks respectively and Jokipii and Milne (2008) consider banks from 25 European countries to investigate how the business cycle influences the buffer. Their results globally indicate that banks tend to decrease the buffer during the upturn and increase it in the downturn.

In our analysis, we mainly focus on the role played by market discipline. Using a sample of European commercial banks on 1993-2006<sup>3</sup>, we study the influence<sup>4</sup> of market discipline on the build-up of capital buffer. According to Evanoff and Wall (2000), banks can be exposed to ex-ante or ex-post market discipline. Ex-post market discipline implies that banks change their behaviour following a change in debt spread whereas ex-ante market discipline refers to the fact that banks exposed to market discipline may change their behaviour ex-ante in order to avoid the costs imposed by market participants through higher spreads. In this paper, we consider ex-ante discipline assuming that this discipline encourages banks to behave more prudently. Other papers have considered market discipline. For example, Flannery and Rangan (2008) using large US banks, investigate the causes of the bank capital build-up of the 1990s. They find that even though several factors explain the

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<sup>1</sup> Throughout this paper, this excess capital is called capital buffer and defined as the difference between the actual capital ratio ((Tier1+Tier2)/Risk weighted assets) and the Basel minimum required capital ratio (8%), except for special cases (see 2.2).

<sup>2</sup> A study by Jokipii and Milne (2010) focuses on the relationship between risk and the buffer adjustments and finds a positive two-way link.

<sup>3</sup> Our sample period ends in 2006 to avoid that the anticipation of Basel II implementation and the subprime crisis affect our analysis.

<sup>4</sup> Bliss and Flannery (2001) distinguish two components of market discipline: *monitoring* that corresponds to the fact that investors accurately assess changes in banks financial condition and promptly incorporate it into their stock and bond prices, and *influence* that is the ability of market participants to affect banks' financial decisions. In this paper, we focus on influence.

capital build-up, market discipline<sup>5</sup> contributed to the largest part of it. Fonseca and Gonzalez (2010), using a cross country data based on 70 countries, aim to determine if the influence of market discipline<sup>6</sup> (among other factors) on capital buffer varies between countries that have different frameworks of regulation, supervision and institutions. They show that, although the market discipline indicator has a positive impact on the bank capital buffer, the relationship depends on some structural factors. Restrictions on bank activities, official supervision and bad institutional environment reduce the incentives to hold capital buffers by weakening market discipline. The closest paper to ours is Nier and Baumann (2006). They test empirically the hypothesis that market discipline provides incentives for banks to constitute capital buffer in order to limit their default risk. They find, using a large cross-country panel data set from 32 countries, that market discipline, measured as the share of interbank deposits and subordinated debt in total liabilities, induces banks to choose higher capital ratios.

We contribute to the previous literature on two main aspects. First, we distinguish junior from senior debt holders. Indeed, both types of debt holders are not expected to similarly consider bankruptcy risk because their status in case of liquidation is different. Junior debt holders have a lower priority than senior debt holders and thus are more at risk. Thus, we test whether these two kinds of debt holders exert a significant pressure on banks to hold capital buffer and whether junior debt holders exert a higher pressure. It is important to determine whether the discipline exerted by these different debt holders might be considered as a complement to capital regulation and which one is the most effective. Second, we suspect that market participants may require capital buffer because the regulatory capital constraint does not appropriately take into account all the risks borne by banks specifically those related to non-traditional activities (in opposition to traditional activities such as loan supply). Indeed, it is widely known that the substantial growth of the off-balance sheet activities experienced during the last years was mainly motivated by the low capital regulatory requirements associated with them (Jagtiani et al. (1995)). Moreover, it is also recognized that the trading book was a key source of the build-up of the leverage witnessed during the last financial crisis. As argued in a recent BIS document (BCBS (2009b)), “an important contributing factor was that the current capital framework for market risk, based on the 1996 Amendment to the Capital Accord to incorporate market risks, does not capture some key risks”. Accordingly,

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<sup>5</sup> Flannery and Rangan (2008) consider bank's quasi-market value of assets volatility as the risk variable and assume that bank counterparties require higher capital buffers accordingly. Thus, if BHCs are subject to market forces the coefficient associated with the risk variable should be significant and the more market discipline there is the higher should be the coefficient.

<sup>6</sup> Fonseca and Gonzalez (2010) consider countries with very different banking systems and therefore, they are able to use the cost of deposits as a market discipline proxy.

the activities of banks have rapidly and deeply changed these last decades: market activities have expanded with the creation of more and more complex financial instruments and banks have broadly used securitization. These changes have been reflected in the structure of banks' income with an increasing proportion of non-interest income<sup>7</sup>. By contrast, capital regulation seems quite rigid; it is difficult to adapt it quickly and adequately to this highly evolving environment. We assume that market participants may adapt more rapidly and may consider these changes to determine the adequate level of capital of the bank. Thus, it appears interesting to determine whether the impact of market discipline on bank capital buffer is different depending on whether the bank is highly involved in non-traditional activities or not. If market discipline is effective for banks highly involved in non-traditional activities, it might be used as a complement to capital regulation.

The rest of the paper is structured as follows. In section 2, we set our hypotheses and the method used to test them, define our variables and present the sample of banks. The results and the robustness checks are presented in section 3. Section 4 concludes the paper.

## **2. Hypotheses, model, variables and sample**

### **2.1. Hypotheses**

Firstly, we consider that banks whose debt holders are more sensitive to default risk are expected to hold more capital than prescribed by the regulator. Indeed, we assume that these debt holders may lack confidence in the ability of a bank to survive if it operates with a capital ratio very close to the regulatory minimum. In that case, they may pressure the bank to hold more capital than required by regulation. Hence, we consider that the type of funding could impact bank capital buffer. Accordingly, we investigate the impact of market discipline on capital buffer by focusing on the extent to which banks rely on market funding. Capital buffer should be positively related to the proportion of market funding. Indeed, their holders are the creditors who have the highest incentives to exert a discipline and thus it is more costly for banks to increase their risk of default when they have a larger proportion of market liabilities (Nier and Baumann (2006)). Besides, it has been shown both theoretically and empirically by Gropp and Vesala (2004) that banks with a larger share of uninsured funding

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<sup>7</sup> Non-interest income includes trading income beyond commission and fee income.

have incentives to take less risk. They suggest that the larger is the proportion of uninsured funding, the stronger is the effect of market discipline. Indeed, the larger is the proportion of uninsured liabilities, the stronger is the cost impact related to market discipline for a given increase in bank risk<sup>8</sup>. Thus, following these studies, we consider that the structure of bank liabilities is a crucial factor and assume that banks heavily relying on market funding may exhibit higher capital buffer as they are potentially more subject to market discipline.<sup>9</sup>

H1: Market debt holders exert a pressure on banks to hold capital buffer: the more the bank relies on market funding the higher is its capital buffer.

Secondly, there is a variety of uninsured debt holders of banks and they may behave differently. A large part of the literature on market discipline is dedicated to subordinated debt (Bliss (2001), Evanoff and Wall (2000), Morgan and Stiroh (2001), Sironi (2003)). The reason is that for market discipline to be effective, market participants must have the incentives to exert it, that is they must feel at risk, and subordinated debt holders are particularly at risk due to their *junior* status. Indeed, junior debt also named subordinated debt corresponds to a debt that has a lower priority than other debt in case of failure of the issuer. It comes after government tax authorities and senior debt holders in the hierarchy of creditors and just before equity. Thus, subordinated debt holders are particularly at risk and have higher incentives to monitor banks and to exert a discipline. Therefore, we distinguish junior from senior debt holders and study whether both of them exert a pressure on banks to hold capital buffer. We expect that the pressure of the market on banks to hold capital buffer may be different depending on the status of the creditors: senior or junior debt holders. Junior debt holders should have more incentives to exert a pressure on banks.

H2: The market pressure exerted by junior debt holders on banks to hold capital buffer is higher than the one exerted by senior debt holders.

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<sup>8</sup> This assumes that the conditions of effectiveness of market discipline are fulfilled. These conditions are: i) debt holders consider themselves at risk if the bank defaults, ii) they have sufficient information to assess bank risk and, iii) changes in the bank's risk profile have cost implications for the bank (Nier and Baumann (2006)).

<sup>9</sup> We do not consider a price measure such as bond spread. Indeed, this would refer to ex-post market discipline and would assume that a higher spread leads a bank to increase its buffer in order to reduce its cost of funding. In this paper, we focus on ex-ante discipline and assume that banks exposed to market discipline change their behaviour ex-ante in order to avoid the costs imposed by market participants through higher spreads.

Lastly, we depart from the fact that trading activities and securitizations have gained an increasing importance in recent years but that they are more imperfectly taken into account in the current Basel accords than bank traditional activities (BCBS (2009a), BCBS (2009b)). We therefore conjecture that, the more the bank is involved in trading activities, the more capital buffer market participants require. Indeed, we assume that the market, contrary to regulators, can adapt quickly (De Young et al. (2001)) and consider the risk of these activities which are not well taken into account in the regulatory constraint. We hypothesize that the type of activity of banks affects capital buffer. The market pressure on banks heavily involved in non-traditional activities (market activities as opposed to loan activity)<sup>10</sup> to hold capital buffer may be higher than on those more turned towards traditional activities as it reflects the imperfection of the current regulation.

H3: The market pressure on banks to hold capital buffer is higher for those more involved in trading activities.

## 2.2. Model and main variables

To test our three hypotheses, we estimate the two following models. Subscripts  $i$  and  $t$  denote bank and period respectively.

$$buffer_{i,t} = \alpha_0 + \alpha_1 mktdisc_{i,t} + \sum_{j=1}^J \gamma_j C_{ji,t} + \eta_i + \tau_t + u_{i,t} \quad (1)$$

$$buffer_{i,t} = \beta_0 + \beta_1 mktdisc\_senior_{i,t} + \beta_2 mktdisc\_junior_{i,t} + \sum_{j=1}^J \delta_j C_{ji,t} + \eta_i + \tau_t + u_{i,t} \quad (2)$$

*Buffer* is the regulatory capital buffer variable, *mktdisc*, *mktdisc\_senior*, and *mktdisc\_junior* the market discipline variables,  $C_j$  the  $j^{\text{th}}$  control variable and  $\eta_i$  and  $\tau_t$  the individual and time fixed effects<sup>11</sup>.

The dependent variable *buffer* corresponds to the amount of capital banks hold in excess of what is required by national regulators. More precisely, we construct the variable *buffer* as the bank's actual total risk-weighted capital ratio less its regulatory minimum

<sup>10</sup> Non-traditional activities not only consist of market activities. For example, there are also insurance activities and other financial services. However, in this paper, we focus on activities generating market risks as they are considered to be imperfectly taken into account in the current Basel accords.

<sup>11</sup> The regressions include individual and time fixed effects as the Fisher test rejects the null hypothesis of homogeneity in both individual and time dimensions.

requirement. This regulatory minimum requirement is set to 8% in most countries of our sample except in Germany where it is set to 12.5% for newly established banks in the first two years of business and in the United Kingdom where we consider 9%. Indeed, the Financial Stability Authority (FSA) sets two separate capital requirements for each UK bank: a ‘trigger ratio’, which is the minimum individual capital ratio; and a ‘target ratio’ set above the trigger. We therefore follow Jokipii and Milne (2008) and consider 9% minimum capital requirement ratio for all UK banks.

Hypothesis H1 is tested by estimating Model 1 and testing the significance of the coefficient associated with our market discipline indicator *mktdisc*. We expect to find a positive and significant relationship with capital buffer. The market discipline indicator reflects the importance of market funded liabilities in total liabilities. This ratio is constructed as (total liabilities minus total deposits)/ total liabilities.

In order to test our second hypothesis H2, we estimate Model 2 in which we replace the previous market discipline indicator by two separate indicators: one for senior debt (*mktdisc\_senior*) and one for junior debt (*mktdisc\_junior*). Our variable *mktdisc\_junior* corresponds to the ratio of subordinated debt to total liabilities<sup>12</sup>. The ratio of senior market debt *mktdisc\_senior* is constructed as (total liabilities minus total deposits<sup>13</sup> minus subordinated debt)/ total liabilities<sup>14</sup>. This ratio considers only senior market debt that is market debt that takes priority over junior debt. In case of bank default, senior debt holders are reimbursed before junior debt holders. We expect to find higher significance level and/or higher coefficient magnitude for the variable *mktdisc\_junior* than for the variable *mktdisc\_senior*.

To test the third hypothesis H3 that is whether the pressure exerted by market participants on banks to hold capital buffer is different depending on bank activities, we estimate Models 1 and 2 on different sub-samples defined on the basis of two alternative

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<sup>12</sup> Tier 2 contains subordinated debt that consists only in “conventional unsecured subordinated debt capital instruments with a minimum original fixed term to maturity of over five years and limited life redeemable preference shares” and that is limited to 50% of Tier 1 (BCBS, 1988). However, this does not imply a straightforward positive relationship between our independent variable of interest *mktdisc\_junior* and *buffer*. Indeed, our dependent variable is not Tier 2 but capital buffer. Even if a bank issues subordinated debt to increase its Tier 2, it does not necessarily imply that it holds a higher capital buffer. For example, the bank can substitute Tier 2 to Tier 1. Besides, to check that our results are not mechanically driven by the potential inclusion of some subordinated debt into Tier 2 capital, we have run regressions considering only subordinated debt which cannot be potentially eligible for Tier 2. Our conclusions remain unchanged (see section 3.2.).

<sup>13</sup> Our variable *mktdisc\_senior* does not contain interbank deposits as they are included in total deposits.

<sup>14</sup> We also consider as a robustness check a narrower definition of senior debt focusing on money market funding. This leads to the same conclusions (see section 3.2.).

ratios. First, we consider the revenue generated by trading activities and construct the ratio of net trading revenue to net operating income where net operating income is defined as net interest income plus net non interest income<sup>15</sup>. We also consider the rough ratio of off-balance sheet activities to total assets as another proxy for the involvement of banks in non-traditional activities which generate market risk. The higher are these ratios, the higher is the involvement of banks in non-traditional activities. These ratios are used alternatively to separate our sample in two groups. For each ratio, we separate banks with a value of the considered ratio higher than the median from those with a ratio lower than the median<sup>16</sup>. Our hypothesis is that our market discipline variables may be more significant or only significant for banks more involved in non-traditional activities.

In all our regressions, in line with the existing literature, we consider several control variables  $C_j$  likely to explain banks' capital buffer.

Following Flannery and Rangan (2008), we consider the fact that capital buffer could simply reflect an unusual period of bank profitability. When raising new capital is costly, capital accumulation could rely on internally generated funds, in line with the “Pecking order theory” of capital structure. Bankers may increase capitalization through higher retained earnings and weaker dividend payments and stock repurchase. We therefore expect a positive relationship between *profit*, which is defined as post tax profit/ total assets, and capital buffer.

In a world different from that of Modigliani and Miller (1958), equity is more costly compared to other bank liabilities because of information asymmetries. Equity may also be disadvantaged because interest payments on debt are deducted from earnings before tax. Capital buffer is hence expected to be negatively associated with the cost of equity. However, direct measurement of this cost is difficult. Therefore, previous studies have considered the return on equity (ROE) as a proxy variable for the direct cost of capital buffer<sup>17</sup>.

We consider the ratio of loan loss provisions to net loans (*llpnl*) as the risk variable and the expected sign between this variable and capital buffer is not clear cut. Indeed, on the

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<sup>15</sup> Net non interest income is defined as the sum of net commission and fee income and net trading revenue.

<sup>16</sup> Note that 63% of the observations are classified similarly on the basis of these two different criteria. As a robustness check, we also consider another criterion than the median. In order to have sub-samples of banks with very different characteristics in terms of activity, we consider the median value of the considered ratio and delete the 10% of our sample observations with a value of the ratio around the median. Then, we separate banks with low values from banks with high values. Using this criterion leads to similar conclusions (see section 3.2.).

<sup>17</sup> As stressed by Jokipii and Milne (2008), ROE reflects both cost and revenue and is strongly correlated with the profit variable (in our sample, the coefficient of correlation between ROE and *profit* is of 77.4%). As the cost of equity may be an important determinant of capital buffer, we deal with the issue of correlation by orthogonalizing the variable ROE with our profit variable. The variable *roe* used in our regressions corresponds to the orthogonalized variable. Thus, we make sure that we do not omit an important determinant.



one hand a strand of literature outlines a significant positive impact of risk on capital (Flannery and Rangan (2008), Gropp and Heider (2010) and Berger et al. (2008)). The rationale for this finding is that good bank management implies that the more the risk the bank plans to take, the more the capital it keeps aside. On the other hand, there is another strand of literature that supports the idea that the increase of ex-post measure of risk should lower capital buffer given that capital is kept to face unexpected losses (Ayuso et al. (2004), Nier and Baumann (2006) and Fonseca and Gonzalez (2010)).

We also consider that banks which operate in a highly competitive environment are expected to hold more capital than prescribed by the regulator. The rationale for this behaviour might stem from the fact that capital buffer may serve as an instrument, which the bank is willing to pay for, in the competition with its peers for unsecured deposits and money market funding (Lindquist (2004), Dietrich and Vollmer (2005), Bernauer and Koubi (2006), and Schaeck and Cihak (2010)). Thus, we consider the annual mean of capital buffer of the bank's competitors in the same country, *comp*, which should positively affect capital buffer.

All else equal, an increase in assets through loans should increase capital requirements and therefore decrease capital buffer (Ayuso et al. (2004)). Thus, we expect a negative relationship between *loang*, the annual net loans growth rate, and the dependent variable. The importance of loans activity may also affect capital buffer. Indeed, we assume that loans activities are relatively better taken into account into the capital regulatory constraint than other non-traditional activities. Hence, we consider the variable *nla*, corresponding to the proportion of net loans in total assets, and expect a negative relationship between capital buffer and this variable.

A consensus among the previous literature also emerges: it indicates that larger banks hold less average capital in excess of regulatory requirements due to scale economies in screening and monitoring and larger diversification. The dependent variable should be negatively related to *size* that is the natural logarithm of total assets. Another reason for large banks to hold a smaller buffer may be their Too Big To Fail (TBTF) nature. Indeed, if a bank is perceived as TBTF, this implies that it benefits from government implicit guarantee. Consequently, it could be less prudent in the building of its capital buffer.

The level of capital banks hold may also depend on macroeconomic conditions. We therefore introduce the business cycle to determine whether it has any effect on the capital held by institutions. Previous studies have mostly shown that capital buffer and economic cycle tend to be negatively linked (Ayuso et al. (2004), Lindquist (2004), Jokipii and Milne (2008)). This is to say that banks tend to decrease their capital buffer during the upturn and

increase it in the downturn. The rationale for this finding may be found in Berger et al. (1995) who argue that banks may hold capital buffer to be able to exploit unexpected investment opportunities. Thus, we expect a negative link between the annual growth rate of the real Gross Domestic Product<sup>18</sup>,  $gdp_g$ , and capital buffer.

< Insert Table 1 >

Table 1 summarizes our set of variables with some descriptive statistics on our sample of banks that we present in the following section<sup>19</sup>.

### 2.3. Presentation of the sample

Our sample consists of commercial banks<sup>20</sup> established in 16 European countries<sup>21</sup>. The sample period is from 1993 to 2006<sup>22</sup>. Accounting data (annual financial statements) for individual banks are obtained from Bankscope Fitch IBCA. Bankscope reports balance sheets and income statements for 1985 commercial banks for the countries we consider in this study. Departing from these 1985 banks we end up with a sample of 742 banks. Indeed, the information about the total capital ratio<sup>23</sup> is available only for 766 banks among which 24 banks present outliers in the distribution of this ratio and were deleted. We verify that, on average, our sample of banks constitute over 56% of the banking assets of commercial banks of the respective sample countries in 2006<sup>24</sup>. We can notice that, except for four countries

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<sup>18</sup> We also consider the output gap obtained by applying the Hodrick-Prescott filter to the real GDP series as an alternative indicator and get similar results.

<sup>19</sup> We observe that our dependent variable *buffer* is on average equal to 4.72% which stands for the extra capital ratio that European commercial banks hold in excess of the regulatory minimum requirement. Nevertheless, our sample discloses a minimum of -6.48% which means that some banks do not comply with the regulatory constraint. We verify that only few observations correspond to a negative buffer (less than 3% of total observations) and that this does not affect our results. Therefore we keep them in our sample in order to avoid a selection bias. However, given that our investigation relates to capital buffer, we perform two robustness checks in which we exclude banks with negative capital buffer or banks whose capital ratio is close to the regulatory minimum (see section 3.2 for details).

<sup>20</sup> To identify commercial banks, we consider the Bankscope Fitch IBCA's classification. However, we notice that a bank classified as "commercial bank" can have a ratio (net loans/ total assets) equal to 0% or a ratio (market funding/ total liabilities) equal to 100%. Thus, to ensure that all the banks in our sample are commercial banks, i.e. they have loans and deposits activities, we clean our sample by deleting the observations of the ratios (net loans/ total assets) and (market funding/ total liabilities) that are respectively in the first and in the last percentile of their distribution. However, running our regressions with these observations does not affect our conclusions.

<sup>21</sup> Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and United Kingdom (see table A1 in Appendix for details).

<sup>22</sup> Notice that during the whole sample period banks are under the Basel I framework.

<sup>23</sup> Total capital ratio is (Tier 1 + Tier 2)/ Risk weighted assets and is used to construct our dependent variable.

<sup>24</sup> See table A1 in Appendix.

(Austria, Denmark, Germany and Switzerland), the final set of banks used in this study represents more than half of the banking system in terms of total assets of each country. Table 2 gives some descriptive statistics on the starting sample and on our final sample. It allows us to verify that our final sample does not considerably differ from the starting sample. Indeed, we consider 10 key variables and disclose their mean and their standard deviation for the full sample available in Bankscope and the final sample that we use. Overall, we can see that the two samples are very close even though the banks in our sample seem to be, on average, larger in terms of total assets.

< Insert Table 2 >

### 3. Results and robustness checks

#### 3.1. Results

In line with the previous literature (Ayuso et al. (2004), Jokipii and Milne (2008)), we suspect bank level variables to be endogenous, i.e. themselves dependent on capital buffer<sup>25</sup>. Following Nier and Baumann (2006), we therefore consider the TSLS procedure with estimators of variance-covariance matrix that are robust to heteroskedasticity. Our set of instruments consists of the one year lagged values of these variables.

< Insert Table 3 >

First, we estimate a model with our control variables and the market discipline variable *mktdisc* (model 1) on the full sample of banks. The results are presented in Table 3 column (1). The coefficient associated with the variable *mktdisc* is significant at the one percent level with the positive expected sign. Thus, market participants exert a pressure on banks to hold capital buffer. This result is in line with previous studies (Nier and Baumann (2006), Flannery and Rangan (2008) and Fonseca and Gonzalez (2010)) which find, with

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<sup>25</sup> Indeed, a reverse relationship with capital buffer can exist for almost all our explanatory variables. For example, another recent literature deals with the role of capital buffer as a strategic variable to attract and monitor borrowers (Allen et al. (2011)) or to charge higher borrowing interest rates (Kim et al. (2005) and Fischer et al. (2009)). In our models, following the previous literature on the determinants of capital buffer, the only bank level variable which is considered as exogenous is the size of the bank.

different proxy variables, that market discipline is an important factor to explain banks' capital ratios. Second, we split our market discipline indicator by separating junior from senior debt holders. We can see (column (2)) that both exert a significant pressure on banks to hold capital buffer. This result is shown through the high level of significance (at the 1% level) of the both positive coefficients associated with the variables *mktdisc\_senior* and *mktdisc\_junior*. However, consistent with the second hypothesis, the *mktdisc\_junior* coefficient is 13 times higher than the one of *mktdisc\_senior*<sup>26</sup>.

The remaining columns of Table 3 present the results obtained by estimating models (1) and (2) on different sub-samples defined on the basis of the degree of involvement of the bank in non-traditional activities. Hence, we study whether the pressure of the market taken globally or the pressure of junior and senior debt holders taken separately on banks to hold capital buffer is different depending on their activity. We consider two different ratios to split banks into two different categories. When we consider the importance of trading activities through the ratio net trading revenue/ net operating income, we find that the ratio of market funded liabilities to total liabilities (*mktdisc*) is significant only for banks heavily involved in these activities (columns (3) and (4)). Consistent with hypothesis H3, this result implies that market participants exert a pressure only on banks that are highly involved in trading activities which are imperfectly taken into account in the current capital regulation. When we distinguish senior debt holders from junior debt holders, we notice that this result holds only for senior debt holders, junior debt holders always exert a pressure, whatever the importance of trading activities (columns (5) and (6)). The significance and the comparative high value of the coefficient of the *mktdisc\_junior* variable irrespective of the bank's activity denote the high pressure exerted by these junior debt holders on banks to hold capital buffer. Using the ratio off-balance sheet activities/ total assets as an alternative criterion to separate banks gives similar results (columns (7)-(10)). Indeed, the market funding variable (*mktdisc*) is significant at the five percent level only for banks that have a high proportion of off-balance sheet activities that is for banks highly involved in non-traditional activities whereas it is not significant for banks with a low ratio. Besides, we also find that this result holds for senior debt but is different for junior debt as the variable *mktdisc\_junior* is significant whatever the importance of off-balance sheet activities.

To summarize, our results validate our three hypotheses H1, H2 and H3. Consistent with H1, we find that, after controlling for other determinants, market discipline is a

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<sup>26</sup> Besides, these two coefficients are statistically different at the one percent level of significance.

significant determinant of banks' capital buffer. Both senior debt holders and junior debt holders seem to exert a pressure on banks to hold capital buffer. However, as assumed in hypothesis H2, this pressure is higher for junior debt holders. In accordance with hypothesis H3, we find a higher pressure of market discipline on banks highly involved in non-traditional activities. Indeed, for banks highly involved in non-traditional activities, our market discipline indicators are always significant to explain bank capital buffer. By contrast, for those less involved in such activities, the importance of market funded liabilities as a whole is always insignificant to explain capital buffer. However, the behavior of senior and junior debt holders appears different: senior debt holders do not exert a pressure on such banks whereas junior debt holders do. Thus, junior debt holders exert a pressure on banks to hold capital buffer whatever the importance of non-traditional activities.

These results might suggest that senior debt holders exert a pressure to hold capital buffer on banks heavily involved in non-traditional activities because these activities are not well taken into account by the capital regulation. The buffer required by senior debt holders would reflect the capital needed for the risks not correctly embedded into the capital constraint. This would explain why they do not exert a pressure on banks mainly involved in traditional activities: the risks generated by these activities are already taken into account in the capital constraint. By contrast, junior debt holders always require capital buffer whatever banks' activities. This result might be due to the junior status of these debt holders: they are particularly at risk in case of bank default which might explain that they require higher capital buffer. Irrespective of banks' activities, they require capital buffer because they find the capital required by regulation insufficient even for traditional activities.

Regarding the control variables, we can notice that the coefficient of the loan activity variable *nla* is almost always negative and highly significant. This expected finding shows that banks highly involved in credit activities hold less capital buffer. We also confirm the well known result which stipulates that large banks operate with less capital buffer than small banks (Ayuso et al. (2004) for instance). In fact, our variable *size* has a negative and significant coefficient across almost all our specifications. The peer pressure variable *comp* is significant in 6 out of 10 of our specifications and its coefficient is positive as expected. Therefore, consistent with the findings from Lindquist (2004) and Alfon et al. (2004), the higher the peer pressure is, the higher capital buffer banks hold. In addition, we can notice that it is more significant for banks highly involved in non-traditional activities and hence the bank peer discipline seems consistent with the market discipline. The loan growth variable

(*loang*) is significant in some specifications and its coefficient has the expected negative sign. The risk variable *llpnl* is not significant; a result backed by Lindquist (2004) who shows with Norwegian data that risk is not a significant determinant of bank buffer under Basel I. Contrary to the results of Jokipii and Milne (2008), we find no significant relationship between the business cycle (*gdp*) and bank capital buffer.

### 3.2. Robustness checks

Before checking the robustness of our results, we show in the first place that the significant and positive relationship between one of our variables of interest, *mktdisc\_junior*, and regulatory capital buffer is not due to the potential inclusion of some of the subordinated debt in Tier 2 capital. Indeed, as we mentioned in section 2.2., we know that some subordinated debt can be eligible for Tier 2 and it consists in “conventional unsecured subordinated debt capital instruments with a minimum original fixed term to maturity of over five years and limited life redeemable preference shares. During the last five years to maturity, a cumulative discount (or amortization) factor of 20% per year will be applied to reflect the diminishing value of these instruments as a continuing source of strength” (BCBS, 1988). Unfortunately, we cannot isolate subordinated debt included in Tier 2 using standard databases. Therefore, we redefine our *mktdisc\_junior* variable by eliminating the part of subordinated debt that might be included in Tier 2<sup>27</sup>. More precisely, for each bank, we consider the whole amount of subordinated debt less the maximum amount that can be included in Tier 2 that is 50% of Tier 1 or the amount of Tier 2 if it is less than 50% of Tier 1<sup>28</sup>. This restricts considerably our sample as we need to have information about the amount of both Tier 1 and Tier 2. Besides, this is a very restrictive definition of subordinated debt not included in Tier 2 as we cannot check for the maturity and the amortization factor. For these reasons, the regression model is run only using the whole sample. We define *mktdisc\_junior2* as the ratio of subordinated debt non potentially eligible for Tier 2 to total liabilities and *mktdisc2* as the ratio of total market funding less subordinated debt potentially eligible for Tier 2 to total liabilities. The results obtained using these variables are presented in Table 4.

< Insert Table 4 >

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<sup>27</sup> Tier 2 is limited to 100% of Tier 1 and subordinated debt is limited to 50% of Tier 1.

<sup>28</sup> If we find an amount of subordinated debt not eligible for Tier 2 which is negative, we normalize it to zero.

We find a highly significant (at 1% level) and positive relationship between *mktdisc2* and capital buffer as before. More importantly, despite the high restrictions imposed on our new variable *mktdisc\_junior2*, consistent with our main results, we still find a positive relationship between this restricted new variable reflecting the pressure of junior debt holders (*mktdisc\_junior2*) and capital buffer even if less significant (at 10% instead of 1% level). Moreover, our second hypothesis (H2) is still validated as the coefficient magnitude of *mktdisc\_junior2* is more than 5 times higher than that of *mktdisc\_senior*. Overall, we conclude that the positive and significant relationship between *mktdisc\_junior* and capital buffer is not mechanically driven by the potential inclusion of some subordinated debt into Tier 2 capital.

We then perform several robustness checks reported in appendix in Tables A2 to A9.

*First*, in our regressions, we consider capital buffer of banks without any restriction. To check the robustness of our results, we perform new regressions restricting our sample to (1) positive capital buffer and, (2) capital buffer higher than 1, to deal with the issue that buffers could be explained by the fear of falling below the minimum regulatory requirement. We re-run all the regressions and we obtain the same conclusions (see Tables A2 and A3).

*Second*, we perform a robustness check regarding a potential sample bias. French and Italian banks are comparatively more represented in our sample. To make sure that our results do not depend on this unbalanced sample representation, we run again all our regressions by excluding the banks from these two countries. We also find that the conclusions remain globally unchanged (Table A4). The only noticeable difference is that the market discipline variable *mktdisc\_junior* is no longer significant for banks with a low proportion of off-balance sheet activities.

*Third*, banks in United Kingdom are somewhat differently regulated compared to other European banks in our sample (cf 2.2. and FSA (2001)<sup>29</sup> for details). Therefore, in our main regressions, we consider 9% (instead of 8%) as the minimum regulatory capital requirement. Thus, to ensure that this particular aspect of British banks regulation does not distort our results, we repeat all the regressions by excluding them. All our conclusions remain similar (Table A5). In order to take into account other potential differences in terms of capital regulation across European countries, we also introduce a capital regulatory variable. This country level variable is constructed from the databases of Barth et al. (2000, 2003, and 2007)

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<sup>29</sup> <http://www.fsa.gov.uk/Pages/Library/Policy/Policy/2001/pscapiatalratios.shtml>

and is a measure of capital regulatory stringency<sup>30</sup>. This variable appears significant in only two regressions and our conclusions remain the same (Table A6).

*Fourth*, we can suspect that some banks in our sample have experienced mergers and acquisitions during the considered period. Unfortunately, we have no direct way to identify those banks. An indirect way to do so is to look at the bank's total assets growth. Hence, we compute the total assets growth rate and we exclude banks that have experienced a growth rate exceeding 40 %<sup>31</sup>. We find similar results except that the market discipline variable *mktdisc\_junior* is no longer significant for banks with a low proportion of trading revenues (Table A7).

*Fifth*, concerning the separation of our sample in two sub-samples on the basis of the values of the ratios net trading revenue to net operating income and off-balance sheet activities to total assets, we consider another criterion than the median. In order to have sub-samples of banks with very different characteristics in terms of activity, we consider the median value of the considered ratio and delete the 10% of our sample observations with a value of the ratio around the median. Then, we separate banks with low values from banks with high values. This criterion ensures that banks in the high category one year are not in the low category the year after. Using this criterion leads to similar conclusions (Table A8).

*Finally*, as we consider a broad definition of senior debt corresponding to total liabilities minus total deposits and subordinated debt, we decide to check the robustness of our results using a narrower definition that focuses only on total money market funding. Total money market funding corresponds to certificates of deposits, commercial paper, debt securities, securities loaned and other securities. Thus, our senior debt variable *mktdisc\_senior2* consists of total money market funding/ total liabilities. Our conclusions concerning the discipline exerted by senior debt holders remain unchanged even though the significance of the new senior debt variable (*mktdisc\_senior2*) becomes slightly lower compared with our main results (Table A9).

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<sup>30</sup> To construct this variable, we use the 2000 database for the 1992-2000 period, the 2003 database for the 2001-2003 period and the 2007 database for the 2004-2006 period. This variable corresponds to the capital regulatory index defined in Barth et al. (2004).

<sup>31</sup> As there is no objective cut-off, we have considered other percentages less restrictive (50%) and more restrictive (30%) and we have found similar conclusions.



#### **4. Conclusion**

The aim of this paper was to investigate firstly whether market participants taken globally lead banks to hold a capital ratio higher than the minimum regulatory capital requirement. Secondly, we went a step further and studied whether market participants who are highly exposed to losses in case of bank failure (junior debt holders) exert a higher pressure than those (senior debt holders) less exposed to it. Finally, we investigated if market participants, taken globally or not, differentiate banks according to their involvement in non-traditional activities inappropriately taken into account in the Basel capital regulation framework.

Using an unbalanced panel data of European commercial banks from 16 countries on 1993-2006, our results show that, after controlling for other determinants of capital buffer, the higher the reliance on market funding is, the higher capital buffer banks hold. We also show that when we distinguish junior from senior debt holders, although they both have a positive impact on capital buffer, the former exert a higher pressure on banks to hold capital buffer due to their junior status. When we differentiate traditional from non-traditional bank activities, our results indicate that market players taken as a whole require capital buffer only for non-traditional activities reflecting the idea that they take into account the slow reaction of regulators concerning the rapid changes of bank activities. Besides, contrary to senior debt holders, junior debt holders do not distinguish banks according to their activities and exert a pressure whatever the importance of non-traditional activities.

These results highlight the benefits of the use of market discipline in complement to capital regulation: banks subject to market discipline behave more prudently as the pressure exerted by debt holders leads them to hold higher capital buffer. Besides, consistent with the proposals for mandatory subordinated debt, we show that this debt is the most disciplining one: junior debt holders exert a pressure on banks to hold capital buffer whatever their activities and this pressure is always higher than the one exerted by senior debt holders. However, one of the limits of mandatory subordinated debt is that due to its cost, it cannot be implemented for all banks. Interestingly, our results indicate that senior debt can also be an effective tool for market discipline. Indeed, we find that senior debt holders require capital buffers for banks involved in non-traditional activities that is when capital regulation is supposed to be the less efficient.

**Table 1: Presentation of the dependent and independent variables with their descriptive statistics on our sample period (1993-2006)**

Variable	Mnemonic	Definition	Mean	Median	Standard deviation	Min	Max	Expected Sign of the coefficient
Capital buffer	buffer	((Tier 1 + Tier 2 capital)/Risk-weighted assets) - regulatory minimum requirements	4.72	3.70	4.45	-6.48	33.30	
Profitability	profit	Post tax profit/ Total assets	0.69	0.63	0.78	-5.56	8.26	+
Equity cost	roe	Return on equity = Net income/ Equity <sup>33</sup>	9.53	10.18	10.49	-98.81	56.37	-
risk	llpnl	Loan loss provisions/ Net loans	0.96	0.66	1.10	0.00	15.65	-/+
Peer discipline	comp	Annual mean of the buffer of banks in the same country	6.29	6.01	1.87	2.03	13.62	+
Asset structure	nla	Net loans <sup>34</sup> / Total assets	56.33	56.84	17.82	2.12	95.37	-
Market discipline	mktdisc	Total market funding <sup>35</sup> / Total liabilities	23.27	21.86	16.81	0.48	87.43	+
	mktdisc_junior	Subordinated debt/ Total liabilities	1.87	1.74	1.59	0.00	13.59	+
	mktdisc_senior	Other market funding <sup>36</sup> / Total liabilities	21.39	19.92	16.74	0.48	85.92	+
Credit demand	loang	Annual net loan growth rate	11.28	9.51	20.43	-75.41	234.18	-
Economic cycle	gdpg	Annual growth rate of the real gross domestic product (deseasonalized)	2.38	2.24	1.76	-0.99	15.43	-
Size	size	Natural logarithm of total assets	15.44	15.46	2.34	10.40	20.63	-

<sup>33</sup> Notice that in our regressions, the variable *roe* corresponds to the residuals of the regression of the Return on Equity on our profit variable (see footnote 17).

<sup>34</sup> Net loans are: gross loans – loan loss reserves.

<sup>35</sup> Total market funding corresponds to Total Liabilities minus total deposits.

<sup>36</sup> Other market funding corresponds to Total Liabilities minus total deposits minus subordinated debt.

**Table 2: Descriptive statistics on average over the period 1993-2006**

	<i>Full sample of commercial banks available in Bankscope</i>		<i>Our sample</i>	
	Mean	Std. Dev.	Mean	Std. Dev.
Total assets	13 185.34	66 569.40	44 929.00	105 000.00
Total deposits/ total assets	70.16	21.64	70.67	14.78
Net loans/ total assets	48.25	28.39	56.33	17.82
Loan loss provisions/ total assets	0.62	1.00	0.52	0.57
Return on assets = Net income/ total assets	0.76	3.05	0.72	0.82
Net trading revenue/ Net operating income	9.41	24.81	7.52	8.62
Equity/ Total assets	10.55	8.99	7.42	3.94
Tier 1/ risk weighted assets	11.29	6.96	9.37	4.09
(Tier 1 + Tier 2)/ risk weighted assets	14.24	6.41	12.80	4.47
Off-balance sheet activities/ total assets	28.59	75.87	26.00	27.50

All variables are expressed in percentages, except Total assets which is in millions of Euros.

**Table 3: Capital buffer, market discipline and bank activity differentiation**

$$\text{Model 1: } \text{buffer}_{i,t} = \alpha_0 + \alpha_1 \text{mktdisc}_{i,t} + \sum_{j=1}^J \gamma_j C_{j,i,t} + \eta_i + \tau_t + u_{i,t}$$

$$\text{Model 2: } \text{buffer}_{i,t} = \beta_0 + \beta_1 \text{mktdisc}_{-senior_{i,t}} + \beta_2 \text{mktdisc}_{-junior_{i,t}} + \sum_{j=1}^J \delta_j C_{j,i,t} + \eta_i + \tau_t + u_{i,t}$$

<i>Eq Name:</i>	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
<i>Model:</i>	Model 1	Model 2	Model 1	Model 1	Model 2	Model 2	Model 1	Model 1	Model 2	Model 2
<i>Sample:</i>	Whole sample		(Trading revenue/ net operating income) high	(Trading revenue/ net operating income) low	(Trading revenue/ net operating income) high	(Trading revenue/ net operating income) low	(Off-balance sheet activities/ total assets) high	(Off-balance sheet activities/ total assets) low	(Off-balance sheet activities/ total assets) high	(Off-balance sheet activities/ total assets) low
Mktdisc	0.084 (3.824)***		0.106 (3.590)***	0.047 (1.069)			0.107 (2.371)**	0.098 (0.714)		
Mktdisc_Senior		0.065 (3.083)***			0.093 (2.940)***	0.006 (0.131)			0.100 (2.353)**	0.046 (0.663)
Mktdisc_Junior		0.892 (3.815)***			0.690 (3.759)***	0.862 (2.362)**			0.793 (2.852)***	1.055 (3.484)***
Nla	-0.118 (-5.489)***	-0.136 (-6.243)***	-0.096 (-3.644)***	-0.121 (-3.093)***	-0.107 (-3.480)***	-0.145 (-3.445)***	-0.067 (-1.124)	-0.177 (-3.364)***	-0.087 (-1.348)	-0.172 (-5.185)***
Size	-2.672 (-6.216)***	-2.720 (-6.018)***	-2.129 (-4.603)***	-1.723 (-1.594)	-2.211 (-4.353)***	-1.794 (-1.330)	-0.921 (-0.616)	-4.730 (-2.094)**	-0.985 (-0.654)	-4.012 (-3.405)***
Comp	0.178 (2.231)**	0.208 (2.343)**	0.270 (3.755)***	0.033 (0.382)	0.272 (3.447)***	0.082 (0.974)	0.200 (1.917)*	-0.010 (-0.058)	0.204 (1.878)*	-0.026 (-0.270)
Gdpg	0.057 (1.253)	0.032 (0.727)	0.014 (0.298)	0.170 (0.965)	-0.008 (-0.156)	0.155 (0.761)	0.045 (0.494)	-0.278 (-0.563)	0.028 (0.306)	-0.153 (-0.616)
Roe	-0.001 (-0.031)	0.037 (0.762)	-0.122 (-0.992)	-0.012 (-0.151)	-0.019 (-0.131)	-0.029 (-0.311)	-0.041 (-0.154)	0.042 (0.130)	0.026 (0.096)	-0.086 (-0.447)
Llpnl	-0.875 (-0.645)	-1.113 (-0.732)	-0.998 (-0.898)	1.222 (0.591)	-1.377 (-0.984)	1.837 (0.766)	-0.403 (-0.293)	-1.730 (-0.334)	-0.279 (-0.202)	-0.685 (-0.320)
Loang	-0.012 (-1.319)	-0.016 (-1.489)	-0.014 (-1.763)*	0.000 (0.015)	-0.018 (-1.831)*	0.002 (0.163)	-0.021 (-2.953)***	-0.010 (-0.364)	-0.023 (-3.060)***	-0.006 (-0.492)
Profit	0.654 (0.742)	0.256 (0.255)	0.954 (1.196)	2.771 (1.519)	0.327 (0.303)	3.034 (1.452)	3.247 (0.556)	1.671 (1.192)	3.181 (0.539)	0.862 (0.749)
Constant	49.978 (7.087)***	51.055 (6.909)***	39.759 (5.454)***	33.356 (1.849)*	41.641 (5.202)***	34.191 (1.521)	16.853 (0.535)	87.346 (2.314)**	17.617 (0.557)	74.999 (3.897)***
<i>Nb of Obs.:</i>	1902	1902	951	951	951	951	952	951	952	951
<i>R-squared:</i>	0.806	0.805	0.870	0.854	0.855	0.852	0.746	0.782	0.731	0.853

This table shows estimation results obtained using the TSLS method. Our set of instruments consists of the one year lagged value of the endogenous variables. The regression includes time and individual fixed effects. Trading revenue/ net operating income is considered as high (low) if it is greater (lower) than the median value on the whole sample (6.10%). Off-balance sheet activities/ total assets is considered as high (low) if it is greater (lower) than the median value on the whole sample (18.13%). Standard errors are adjusted robust to heteroskedasticity. \*\*\*, \*\* and \* pertain to 1, 5 and 10% level of significance, respectively. T-stats are between parentheses. Variables definition: Buffer = ((Tier 1 + Tier 2 capital)/ risk-weighted assets) - regulatory minimum requirements ; Nla = Net loans/ Total assets ; Mktdisc\_Junior = Subordinated debt/ total liabilities ; Mktdisc\_Senior = Other market funding/ total liabilities ; Mktdisc = Total market funding/ total liabilities ; Logta = Natural logarithm of total assets ; Comp = Annual mean of the buffer of banks in the same country ; Gdpg = Annual growth rate of the gross domestic product (deseasonalized) ; Roe = the residuals obtained when we regress the ratio (Net Income/ Total Equity) on the *profit* variable ; Llpnl = Loan loss provisions/ Net loans ; Loang = Annual net loan growth ; Profit = Post tax profit/ Total assets.

**Table 4: Capital buffer, market discipline and bank activity differentiation excluding subordinated debt potentially eligible for Tier 2.**

$$\text{Model 1: } \text{buffer}_{i,t} = \alpha_0 + \alpha_1 \text{mktdisc}_{2,i,t} + \sum_{j=1}^J \gamma_j C_{j,i,t} + \eta_i + \tau_t + u_{i,t}$$

$$\text{Model 2: } \text{buffer}_{i,t} = \beta_0 + \beta_1 \text{mktdisc}_{\text{senior},i,t} + \beta_2 \text{mktdisc}_{\text{junior},i,t} + \sum_{j=1}^J \delta_j C_{j,i,t} + \eta_i + \tau_t + u_{i,t}$$

<i>Eq Name:</i>	(1)	(2)
<i>Model:</i>	Model 1	Model 2
<i>Sample:</i>	Whole sample	
Mktdisc2	0.096 (3.763)***	
Mktdisc_Senior		0.092 (3.672)***
Mktdisc_Junior2		0.504 (1.697)*
Nla	-0.148 (-7.287)***	-0.148 (-7.309)***
Size	-3.077 (-5.322)***	-3.125 (-5.395)***
Comp	0.057 (0.804)	0.054 (0.765)
Gdpg	0.023 (0.237)	0.015 (0.157)
Roe	-0.101 (-1.466)	-0.092 (-1.376)
Llpnl	-0.279 (-0.395)	-0.239 (-0.337)
Loang	-0.009 (-1.384)	-0.010 (-1.502)
Profit	1.237 (2.880)***	1.161 (2.734)***
Constant	57.481 (6.260)***	58.244 (6.328)***
<i>Nb of Obs.:</i>	1249	1249
<i>R-squared:</i>	0.838	0.837

This table shows estimation results obtained using the TSLS method. Our set of instruments consists of one the year lagged value of the endogenous variables. The regression includes time and individual fixed effects. Standard errors are adjusted robust to heteroskedasticity. \*\*\*, \*\* and \* pertain to 1, 5 and 10% level of significance, respectively. T-stats are between parentheses. Variables definition: Buffer = ((Tier 1 + Tier 2 capital)/ risk-weighted assets) - regulatory minimum requirements ; Nla = Net loans/ Total assets ; Mktdisc\_Junior2 = (Total Subordinated debt- subordinated debt potentially eligible for Tier 2)/ total liabilities ; Mktdisc\_Senior = Other market funding/ total liabilities ; Mktdisc2 = (Total market funding - subordinated debt potentially eligible for Tier 2) / total liabilities ; Logta = Natural logarithm of total assets ; Comp = Annual mean of the buffer of banks in the same country ; Gdpg = Annual growth rate of the gross domestic product (deseasonalized) ; Roe = the residuals obtained when we regress the ratio (Net Income/ Total Equity) on the *profit* variable ; Llpnl = Loan loss provisions/ Net loans ; Loang = Annual net loan growth ; Profit = Post tax profit/ Total assets.

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**APPENDIX:****Table A1: Distribution of banks by country and percentage of the total banking assets of each country present in our sample in 2006**

<b>Country</b>	<b>Number of banks</b>	<b>Percentage of the total banking assets present in our final sample</b>
Austria	19	12.60
Belgium	18	74.53
Denmark	65	22.98
Finland	11	51.07
France	147	73.27
Germany	28	45.31
Greece	18	61.94
Ireland	14	68.83
Italy	198	67.94
Netherlands	50	67.84
Norway	21	66.50
Portugal	20	67.93
Spain	31	67.84
Sweden	31	69.39
Switzerland	20	22.64
United Kingdom	51	68.56
Total	742	56.82

*Source: Bankscope Fitch IBCA*

**Table A2: Capital buffer, market discipline and bank activity differentiation: the case of banks with positive buffer.**

$$\text{Model 1: } \text{buffer}_{i,t} = \alpha_0 + \alpha_1 \text{mktdisc}_{i,t} + \sum_{j=1}^J \gamma_j C_{j,i,t} + \eta_i + \tau_t + u_{i,t}$$

$$\text{Model 2: } \text{buffer}_{i,t} = \beta_0 + \beta_1 \text{mktdisc}_{-senior}_{i,t} + \beta_2 \text{mktdisc}_{-junior}_{i,t} + \sum_{j=1}^J \delta_j C_{j,i,t} + \eta_i + \tau_t + u_{i,t}$$

Eq Name:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Model:	Model 1	Model 2	Model 1	Model 1	Model 2	Model 2	Model 1	Model 1	Model 2	Model 2
Sample:	Whole sample		(Trading revenue/ net operating income) high	(Trading revenue/ net operating income) low	(Trading revenue/ net operating income) high	(Trading revenue/ net operating income) low	(Off-balance sheet activities/ total assets) high	(Off-balance sheet activities/ total assets) low	(Off-balance sheet activities/ total assets) high	(Off-balance sheet activities/ total assets) low
Mktdisc	0.098 (3.200)***		0.118 (3.471)***	0.077 (1.218)			0.118 (2.695)***	0.087 (1.240)		
Mktdisc_Senior		0.076 (2.688)***			0.105 (2.747)***	0.038 (0.778)			0.113 (2.752)***	0.061 (1.067)
Mktdisc_Junior		0.903 (3.082)***			0.615 (3.269)***	0.927 (2.414)**			0.850 (3.367)***	0.983 (2.532)**
Nla	-0.123 (-5.140)***	-0.141 (-5.970)***	-0.091 (-2.550)**	-0.128 (-3.506)***	-0.098 (-2.215)**	-0.143 (-4.108)***	-0.085 (-1.866)*	-0.176 (-4.678)***	-0.097 (-1.879)*	-0.179 (-5.447)***
Size	-2.436 (-5.452)***	-2.601 (-5.628)***	-1.858 (-3.009)***	-1.975 (-2.109)**	-1.917 (-2.515)**	-1.585 (-1.624)	-0.816 (-0.511)	-4.689 (-3.053)***	-1.070 (-0.627)	-4.158 (-3.231)***
Comp	0.159 (1.562)	0.191 (1.670)*	0.287 (2.647)***	0.015 (0.166)	0.302 (2.250)**	0.055 (0.662)	0.189 (2.058)**	-0.042 (-0.372)	0.185 (1.823)*	-0.050 (-0.519)
Gdpg	0.058 (1.172)	0.029 (0.620)	0.004 (0.071)	0.160 (0.885)	-0.015 (-0.229)	0.171 (0.953)	0.047 (0.472)	-0.219 (-0.899)	0.023 (0.218)	-0.178 (-0.877)
Roe	-0.098 (-1.004)	-0.034 (-0.296)	-0.106 (-0.673)	-0.091 (-1.036)	-0.012 (-0.060)	-0.131 (-1.417)	-0.152 (-0.302)	0.002 (0.008)	-0.005 (-0.009)	-0.124 (-0.488)
Llpnl	-1.266 (-0.695)	-1.450 (-0.728)	-1.419 (-0.744)	-0.022 (-0.010)	-1.889 (-0.755)	0.269 (0.128)	-0.876 (-1.049)	-1.122 (-0.584)	-0.564 (-0.611)	-1.185 (-0.949)
Loang	-0.012 (-1.071)	-0.015 (-1.201)	-0.015 (-1.374)	-0.002 (-0.284)	-0.019 (-1.343)	-0.002 (-0.316)	-0.021 (-2.878)***	-0.003 (-0.259)	-0.023 (-2.901)***	-0.003 (-0.425)
Profit	0.459 (0.416)	0.056 (0.046)	0.828 (0.707)	1.814 (1.129)	0.211 (0.133)	2.663 (1.566)	2.636 (0.518)	1.258 (1.615)	2.804 (0.509)	0.770 (0.839)
Constant	47.068 (6.483)***	49.927 (6.628)***	35.522 (3.711)***	38.959 (2.451)**	36.963 (3.135)***	32.139 (1.971)**	17.173 (0.562)	86.910 (3.515)***	19.905 (0.609)	78.314 (3.865)***
Nb of Obs.:	1834	1834	922	912	922	912	925	910	925	910
R-squared:	0.798	0.799	0.856	0.861	0.826	0.865	0.782	0.827	0.760	0.850

This table shows estimation results obtained using the TSLS method. Our set of instruments consists of the one year lagged value of the endogenous variables. The regression includes time and individual fixed effects. Trading revenue/ net operating income is considered as high (low) if it is greater (lower) than the median value on the whole sample (6.10%). Off-balance sheet activities/ total assets is considered as high (low) if it is greater (lower) than the median value on the whole sample (18.13%). Standard errors are adjusted robust to heteroskedasticity. \*\*\*, \*\* and \* pertain to 1, 5 and 10% level of significance, respectively. T-stats are between parentheses. Variables definition: Buffer = ((Tier 1 + Tier 2 capital)/ risk-weighted assets) - regulatory minimum requirements ; Nla = Net loans/ Total assets ; Mktdisc\_Junior = Subordinated debt/ total liabilities ; Mktdisc\_Senior = Other market funding/ total liabilities ; Mktdisc = Total market funding/ total liabilities ; Logta = Natural logarithm of total assets ; Comp = Annual mean of the buffer of banks in the same country ; Gdpg = Annual growth rate of the gross domestic product (deseasonalized) ; Roe = the residuals obtained when we regress the ratio (Net Income/ Total Equity) on the *profit* variable ; Llpnl = Loan loss provisions/ Net loans ; Loang = Annual net loan growth ; Profit = Post tax profit/ Total assets.

**Table A3: Capital buffer, market discipline and bank activity differentiation: the case of banks with a buffer of more than 1%.**

$$\text{Model 1: } \text{buffer}_{i,t} = \alpha_0 + \alpha_1 \text{mktdisc}_{i,t} + \sum_{j=1}^J \gamma_j C_{j,i,t} + \eta_i + \tau_t + u_{i,t}$$

$$\text{Model 2: } \text{buffer}_{i,t} = \beta_0 + \beta_1 \text{mktdisc}_{i,t} \text{ _ senior} + \beta_2 \text{mktdisc}_{i,t} \text{ _ junior} + \sum_{j=1}^J \delta_j C_{j,i,t} + \eta_i + \tau_t + u_{i,t}$$

<i>Eq Name:</i>	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
<i>Model:</i>	Model 1	Model 2	Model 1	Model 1	Model 2	Model 2	Model 1	Model 1	Model 2	Model 2
<i>Sample:</i>	Whole sample		(Trading revenue/ net operating income) high	(Trading revenue/ net operating income) low	(Trading revenue/ net operating income) high	(Trading revenue/ net operating income) low	(Off-balance sheet activities/ total assets) high	(Off-balance sheet activities/ total assets) low	(Off-balance sheet activities/ total assets) high	(Off-balance sheet activities/ total assets) low
Mktdisc	0.124 (2.015)**		0.135 (3.676)***	0.074 (1.004)			0.108 (2.179)**	0.103 (1.551)		
Mktdisc_Senior		0.099 (1.725)*			0.117 (2.572)**	0.032 (0.525)			0.100 (1.905)*	0.062 (1.223)
Mktdisc_Junior		0.998 (2.201)**			0.553 (2.513)**	0.837 (2.030)**			0.856 (2.873)***	1.094 (2.994)***
Nla	-0.115 (-3.065)***	-0.135 (-3.894)***	-0.088 (-1.562)	-0.128 (-3.824)***	-0.090 (-1.101)	-0.136 (-4.086)***	-0.075 (-1.447)	-0.186 (-4.843)***	-0.091 (-1.539)	-0.186 (-5.422)***
Size	-2.177 (-3.817)***	-2.440 (-4.036)***	-1.242 (-1.676)*	-1.973 (-2.008)**	-1.577 (-1.780)*	-1.494 (-1.428)	0.461 (0.140)	-5.008 (-4.130)***	0.465 (0.115)	-4.355 (-4.779)***
Comp	0.190 (0.915)	0.232 (0.979)	0.297 (1.133)	0.032 (0.365)	0.355 (0.997)	0.070 (0.864)	0.204 (1.532)	-0.041 (-0.434)	0.197 (1.233)	-0.038 (-0.463)
Gdpg	0.071 (1.182)	0.044 (0.848)	0.005 (0.094)	0.140 (0.843)	-0.007 (-0.122)	0.148 (0.856)	0.063 (0.685)	-0.156 (-0.936)	0.060 (0.567)	-0.100 (-0.686)
Roe	-0.099 (-0.577)	-0.003 (-0.012)	-0.187 (-0.507)	-0.115 (-1.331)	-0.024 (-0.053)	-0.147 (-1.655)*	-0.288 (-0.395)	0.016 (0.089)	-0.295 (-0.326)	-0.093 (-0.509)
Llpln	-1.718 (-0.530)	-1.855 (-0.528)	-1.658 (-0.521)	0.712 (0.417)	-2.294 (-0.515)	1.065 (0.662)	-1.194 (-1.855)*	-0.223 (-0.173)	-0.637 (-0.956)	-0.099 (-0.108)
Loang	-0.018 (-0.791)	-0.021 (-0.844)	-0.018 (-0.919)	-0.001 (-0.177)	-0.023 (-0.869)	-0.002 (-0.229)	-0.025 (-2.888)***	-0.001 (-0.177)	-0.027 (-2.640)***	-0.002 (-0.303)
Profit	0.445 (0.278)	0.047 (0.026)	0.841 (0.444)	1.964 (0.970)	0.127 (0.050)	2.925 (1.272)	3.016 (0.532)	1.983 (0.963)	4.588 (0.706)	1.918 (0.902)
Constant	42.582 (4.639)***	46.820 (4.812)***	25.755 (2.216)**	38.256 (2.341)**	31.453 (2.225)**	29.731 (1.686)*	-2.312 (-0.041)	90.942 (4.557)***	-4.776 (-0.070)	79.877 (5.409)***
<i>Nb of Obs.:</i>	1669	1669	847	821	847	821	859	811	859	811
<i>R-squared:</i>	0.760	0.757	0.843	0.860	0.794	0.859	0.742	0.837	0.696	0.863

This table shows estimation results obtained using the TSLS method. Our set of instruments consists of the one year lagged value of the endogenous variables. The regression includes time and individual fixed effects. Trading revenue/ net operating income is considered as high (low) if it is greater (lower) than the median value on the whole sample (6.10%). Off-balance sheet activities/ total assets is considered as high (low) if it is greater (lower) than the median value on the whole sample (18.13%). Standard errors are adjusted robust to heteroskedasticity. \*\*\*, \*\* and \* pertain to 1, 5 and 10% level of significance, respectively. T-stats are between parentheses. Variables definition: Buffer = ((Tier 1 + Tier 2 capital)/ risk-weighted assets) - regulatory minimum requirements ; Nla = Net loans/ Total assets ; Mktdisc\_Junior = Subordinated debt/ total liabilities ; Mktdisc\_Senior = Other market funding/ total liabilities ; Mktdisc = Total market funding/ total liabilities ; Logta = Natural logarithm of total assets ; Comp = Annual mean of the buffer of banks in the same country ; Gdpg = Annual growth rate of the gross domestic product (deseasonalized) ; Roe = the residuals obtained when we regress the ratio (Net Income/ Total Equity) on the *profit* variable ; Llpln = Loan loss provisions/ Net loans ; Loang = Annual net loan growth ; Profit = Post tax profit/ Total assets.

**Table A4: Capital buffer, market discipline and bank activity differentiation excluding French and Italian banks.**

$$\text{Model 1: } \text{buffer}_{i,t} = \alpha_0 + \alpha_1 \text{mktdisc}_{i,t} + \sum_{j=1}^J \gamma_j C_{ji,t} + \eta_i + \tau_t + u_{i,t}$$

$$\text{Model 2: } \text{buffer}_{i,t} = \beta_0 + \beta_1 \text{mktdisc}_{i,t} \text{ _ senior} + \beta_2 \text{mktdisc}_{i,t} \text{ _ junior} + \sum_{j=1}^J \delta_j C_{ji,t} + \eta_i + \tau_t + u_{i,t}$$

<i>Eq Name:</i>	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
<i>Model:</i>	Model 1	Model 2	Model 1	Model 1	Model 2	Model 2	Model 1	Model 1	Model 2	Model 2
<i>Sample:</i>	Whole sample		(Trading revenue/ net operating income) high	(Trading revenue/ net operating income) low	(Trading revenue/ net operating income) high	(Trading revenue/ net operating income) low	(Off-balance sheet activities/ total assets) high	(Off-balance sheet activities/ total assets) low	(Off-balance sheet activities/ total assets) high	(Off-balance sheet activities/ total assets) low
Mktdisc	0.079 (2.369)**		0.151 (2.482)**	0.076 (1.255)			0.127 (1.822)*	0.152 (1.238)		
Mktdisc_Senior		0.060 (2.122)**			0.135 (2.406)**	0.052 (0.862)			0.116 (1.773)*	0.147 (1.171)
Mktdisc_Junior		0.777 (4.938)***			0.567 (2.653)***	1.112 (2.475)**			0.776 (3.671)***	0.291 (0.344)
Nla	-0.106 (-4.270)***	-0.124 (-4.898)***	-0.099 (-2.753)***	-0.113 (-2.297)**	-0.111 (-3.158)***	-0.135 (-2.582)**	-0.103 (-1.725)*	-0.166 (-2.951)***	-0.115 (-1.819)*	-0.167 (-2.927)***
Size	-1.142 (-1.845)*	-1.497 (-2.628)***	-0.987 (-0.958)	-0.101 (-0.068)	-1.624 (-1.961)*	0.220 (0.142)	-0.501 (-0.208)	-5.469 (-2.537)**	-0.488 (-0.207)	-5.408 (-2.544)**
Comp	0.131 (1.749)*	0.166 (2.472)**	0.204 (2.849)***	0.120 (1.083)	0.217 (3.307)***	0.146 (1.373)	0.172 (0.898)	-0.026 (-0.221)	0.248 (1.301)	-0.030 (-0.250)
Gdpg	0.047 (0.891)	0.032 (0.689)	-0.009 (-0.170)	0.262 (1.386)	-0.012 (-0.262)	0.275 (1.420)	-0.045 (-0.668)	-0.502 (-1.518)	-0.000 (-0.007)	-0.503 (-1.567)
Roe	-0.213 (-2.059)**	-0.122 (-1.392)	-0.284 (-1.671)*	-0.188 (-1.275)	-0.173 (-1.238)	-0.195 (-1.305)	-0.009 (-0.018)	0.205 (0.819)	-0.014 (-0.029)	0.189 (0.653)
Llpnl	-0.046 (-0.054)	-0.082 (-0.109)	-0.816 (-0.915)	1.229 (1.089)	-0.886 (-1.095)	1.325 (1.179)	-1.745 (-3.265)***	-0.881 (-0.413)	-1.197 (-2.330)**	-0.901 (-0.439)
Loang	-0.005 (-0.533)	-0.009 (-1.052)	-0.010 (-1.097)	-0.005 (-0.330)	-0.013 (-1.430)	-0.004 (-0.270)	-0.022 (-2.656)***	0.005 (0.418)	-0.025 (-2.785)***	0.005 (0.423)
Profit	1.682 (2.637)***	1.296 (1.901)*	1.452 (2.428)**	5.013 (2.406)**	0.991 (1.522)	5.800 (2.703)***	-0.812 (-0.330)	1.904 (2.180)**	0.697 (0.300)	1.832 (1.735)*
Constant	25.213 (2.634)***	30.664 (3.401)***	21.695 (1.354)	5.950 (0.245)	32.001 (2.461)**	-0.083 (-0.003)	18.486 (0.479)	99.184 (2.783)***	15.022 (0.397)	98.232 (2.806)***
<i>Nb of Obs.:</i>	1168	1168	610	558	610	558	629	539	629	539
<i>R-squared:</i>	0.815	0.836	0.843	0.819	0.862	0.806	0.801	0.816	0.820	0.823

This table shows estimation results obtained using the TSLS method. Our set of instruments consists of one the year lagged value of the endogenous variables. The regression includes time and individual fixed effects. Trading revenue/ net operating income is considered as high (low) if it is greater (lower) than the median value on the sample (6.10%). Off-balance sheet activities/ total assets is considered as high (low) if it is greater (lower) than the median value on the whole sample (18.13%). Standard errors are adjusted robust to heteroskedasticity. \*\*\*, \*\* and \* pertain to 1, 5 and 10% level of significance, respectively. T-stats are between parentheses. Variables definition: Buffer = ((Tier 1 + Tier 2 capital)/ risk-weighted assets) - regulatory minimum requirements ; Nla = Net loans/ Total assets ; Mktdisc\_Junior = Subordinated debt/ total liabilities ; Mktdisc\_Senior = Other market funding/ total liabilities ; Mktdisc = Total market funding/ total liabilities ; Logta = Natural logarithm of total assets ; Comp = Annual mean of the buffer of banks in the same country ; Gdpg = Annual growth rate of the gross domestic product (deseasonalized) ; Roe = the residuals obtained when we regress the ratio (Net Income/ Total Equity) on the *profit* variable ; Llpnl = Loan loss provisions/ Net loans; Loang = Annual net loan growth ; Profit = Post tax profit/ Total assets.

**Table A5: Capital buffer, market discipline and bank activity differentiation excluding British banks.**

$$\text{Model 1: } \text{buffer}_{i,t} = \alpha_0 + \alpha_1 \text{mktdisc}_{i,t} + \sum_{j=1}^J \gamma_j C_{j,i,t} + \eta_i + \tau_t + u_{i,t}$$

$$\text{Model 2: } \text{buffer}_{i,t} = \beta_0 + \beta_1 \text{mktdisc}_{i,t} \text{ _ senior} + \beta_2 \text{mktdisc}_{i,t} \text{ _ junior} + \sum_{j=1}^J \delta_j C_{j,i,t} + \eta_i + \tau_t + u_{i,t}$$

<i>Eq Name:</i>	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
<i>Model:</i>	Model 1	Model 2	Model 1	Model 1	Model 2	Model 2	Model 1	Model 1	Model 2	Model 2
<i>Sample:</i>										
Mktdisc	0.093 (3.675)***		0.100 (3.238)***	0.058 (1.590)			0.108 (2.358)**	0.106 (0.954)		
Mktdisc_Senior		0.065 (3.083)***			0.089 (2.637)***	0.006 (0.197)			0.100 (2.337)**	0.057 (0.836)
Mktdisc_Junior		0.892 (3.815)***			0.701 (3.778)***	1.055 (3.329)***			0.794 (2.830)***	1.081 (3.589)***
Nla	-0.109 (-4.019)***	-0.136 (-6.243)***	-0.086 (-3.081)***	-0.124 (-2.877)***	-0.095 (-2.756)***	-0.158 (-3.551)***	-0.069 (-1.150)	-0.170 (-4.390)***	-0.090 (-1.394)	-0.173 (-5.187)***
Size	-2.809 (-5.819)***	-2.720 (-6.018)***	-2.148 (-4.330)***	-1.794 (-1.800)*	-2.380 (-4.530)***	-1.866 (-1.715)*	-0.970 (-0.627)	-4.869 (-2.648)***	-1.063 (-0.686)	-4.211 (-3.554)***
Comp	0.190 (1.730)*	0.208 (2.343)**	0.272 (3.403)***	0.011 (0.114)	0.278 (3.002)***	0.077 (0.846)	0.209 (1.523)	0.025 (0.102)	0.215 (1.521)	0.010 (0.075)
Gdpg	0.072 (1.432)	0.032 (0.727)	0.021 (0.432)	0.227 (1.497)	-0.004 (-0.083)	0.184 (1.186)	0.049 (0.517)	-0.205 (-0.625)	0.028 (0.301)	-0.136 (-0.636)
Roe	0.015 (0.296)	0.037 (0.762)	-0.118 (-0.811)	-0.020 (-0.229)	0.013 (0.070)	-0.033 (-0.339)	-0.030 (-0.107)	0.061 (0.231)	0.041 (0.140)	-0.036 (-0.209)
Llpln	-1.122 (-0.633)	-1.113 (-0.732)	-1.003 (-0.864)	0.945 (0.497)	-1.436 (-0.934)	1.436 (0.723)	-0.465 (-0.311)	-1.681 (-0.403)	-0.352 (-0.235)	-1.002 (-0.466)
Loang	-0.015 (-1.232)	-0.016 (-1.489)	-0.015 (-1.730)*	0.000 (0.042)	-0.019 (-1.745)*	0.001 (0.173)	-0.022 (-2.962)***	-0.010 (-0.434)	-0.023 (-3.058)***	-0.008 (-0.570)
Profit	0.606 (0.597)	0.256 (0.255)	0.959 (1.144)	2.756 (1.558)	0.257 (0.217)	2.880 (1.616)	3.112 (0.510)	1.803 (1.590)	2.960 (0.483)	1.111 (1.115)
Constant	51.245 (6.570)***	51.055 (6.909)***	39.451 (5.106)***	34.352 (2.084)**	43.649 (5.256)***	35.925 (2.010)**	17.753 (0.549)	87.783 (3.034)***	19.151 (0.593)	77.220 (4.191)***
<i>Nb of Obs.:</i>	1766	1902	893	873	893	873	904	863	904	863
<i>R-squared:</i>	0.783	0.805	0.869	0.846	0.846	0.852	0.734	0.767	0.721	0.837

This table shows estimation results obtained using the TSLS method. Our set of instruments consists of the one year lagged value of the endogenous variables. The regression includes time and individual fixed effects. Trading revenue/ net operating income is considered as high (low) if it is greater (lower) than the median value on the sample (6.10%). Off-balance sheet activities/ total assets is considered as high (low) if it is greater (lower) than the median value on the whole sample (18.13%). Standard errors are adjusted robust to heteroskedasticity. \*\*\*, \*\* and \* pertain to 1, 5 and 10% level of significance, respectively. T-stats are between parentheses. Variables definition: Buffer = ((Tier 1 + Tier 2 capital)/ risk-weighted assets) - regulatory minimum requirements ; Nla = Net loans/ Total assets ; Mktdisc\_Junior = Subordinated debt/ total liabilities ; Mktdisc\_Senior = Other market funding/ total liabilities ; Mktdisc = Total market funding/ total liabilities ; Logta = Natural logarithm of total assets ; Comp = Annual mean of the buffer of banks in the same country ; Gdpg = Annual growth rate of the gross domestic product (deseasonalized) ; Roe = the residuals obtained when we regress the ratio (Net Income/ Total Equity) on the *profit* variable ; Llpln = Loan loss provisions/ Net loans; Loang = Annual net loan growth ; Profit = Post tax profit/ Total assets.

**Table A6: Capital buffer, market discipline and bank activity differentiation taking into account capital regulatory stringency**

$$\text{Model 1: } \text{buffer}_{i,t} = \alpha_0 + \alpha_1 \text{mktdisc}_{i,t} + \sum_{j=1}^J \gamma_j C_{j,i,t} + \eta_i + \tau_t + u_{i,t}$$

$$\text{Model 2: } \text{buffer}_{i,t} = \beta_0 + \beta_1 \text{mktdisc}_{-senior_{i,t}} + \beta_2 \text{mktdisc}_{-junior_{i,t}} + \sum_{j=1}^J \delta_j C_{j,i,t} + \eta_i + \tau_t + u_{i,t}$$

<i>Eq Name:</i>	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
<i>Model:</i>	Model 1	Model 2	Model 1	Model 1	Model 2	Model 2	Model 1	Model 1	Model 2	Model 2
<i>Sample:</i>	Whole sample		(Trading revenue/ net operating income) high	(Trading revenue/ net operating income) low	(Trading revenue/ net operating income) high	(Trading revenue/ net operating income) low	(Off-balance sheet activities/ total assets) high	(Off-balance sheet activities/ total assets) low	(Off-balance sheet activities/ total assets) high	(Off-balance sheet activities/ total assets) low
Mktdisc	0.086 (2.877)***		0.110 (3.395)***	0.046 (1.630)			0.077 (1.382)	0.070 (1.125)		
Mktdisc_Senior		0.064 (2.310)**			0.093 (2.679)***	0.009 (0.330)			0.047 (0.865)	0.032 (0.656)
Mktdisc_Junior		0.977 (2.467)**			0.678 (3.188)***	0.820 (2.849)***			1.052 (2.214)**	1.101 (3.517)***
Nla	-0.108 (-3.078)***	-0.127 (-3.601)***	-0.087 (-3.218)***	-0.121 (-3.346)***	-0.102 (-3.349)***	-0.145 (-3.787)***	0.029 (0.126)	-0.161 (-4.844)***	0.007 (0.030)	-0.169 (-5.384)***
Size	-2.483 (-4.169)***	-2.509 (-3.760)***	-2.020 (-4.253)***	-1.328 (-1.436)	-2.134 (-4.145)***	-1.378 (-1.334)	0.897 (0.178)	-4.254 (-4.042)***	0.839 (0.164)	-3.896 (-4.508)***
Comp	0.154 (1.226)	0.177 (1.192)	0.230 (2.375)**	-0.092 (-0.778)	0.240 (2.171)**	-0.047 (-0.401)	-0.055 (-0.097)	-0.012 (-0.081)	-0.073 (-0.127)	-0.057 (-0.465)
Gdpg	0.072 (1.396)	0.055 (1.053)	-0.007 (-0.162)	0.306 (1.802)*	-0.012 (-0.259)	0.314 (1.721)*	0.038 (0.279)	-0.197 (-0.685)	0.032 (0.241)	-0.089 (-0.422)
Roe	0.010 (0.142)	0.051 (0.535)	-0.101 (-0.907)	-0.048 (-0.593)	-0.024 (-0.164)	-0.069 (-0.762)	-0.096 (-0.177)	-0.007 (-0.042)	0.005 (0.009)	-0.112 (-0.741)
Llpnl	-1.223 (-0.533)	-1.573 (-0.569)	-1.080 (-0.859)	1.175 (0.918)	-1.399 (-0.904)	1.682 (1.301)	-0.430 (-0.172)	-0.900 (-0.419)	-0.475 (-0.183)	-0.258 (-0.191)
Loang	-0.015 (-0.953)	-0.019 (-1.006)	-0.015 (-1.805)*	0.000 (0.040)	-0.018 (-1.793)*	0.001 (0.145)	-0.030 (-1.830)*	-0.006 (-0.460)	-0.035 (-1.917)*	-0.004 (-0.409)
Profit	0.733 (0.692)	0.354 (0.272)	0.966 (1.227)	3.191 (1.771)*	0.447 (0.420)	3.511 (1.857)*	6.137 (0.438)	1.546 (1.618)	5.995 (0.423)	0.792 (0.737)
Cap_index	-0.220 (-1.045)	-0.301 (-1.486)	-0.413 (-1.271)	-0.732 (-1.935)*	-0.298 (-0.778)	-0.778 (-1.967)**	-1.495 (-0.568)	0.227 (0.457)	-1.504 (-0.564)	-0.079 (-0.175)
Constant	48.289 (4.787)***	49.610 (4.458)***	40.593 (5.169)***	32.116 (2.165)**	42.331 (4.860)***	32.952 (2.029)**	-6.016 (-0.073)	77.691 (4.647)***	-4.872 (-0.059)	73.484 (5.250)***
<i>Nb of Obs.:</i>	1864	1864	927	937	927	937	922	943	922	943
<i>R-squared:</i>	0.785	0.772	0.869	0.851	0.856	0.853	0.466	0.828	0.387	0.859

This table shows estimation results obtained using the TSLS method. Our set of instruments consists of the one year lagged value of the endogenous variables. The regression includes time and individual fixed effects. Trading revenue/ net operating income is considered as high (low) if it is greater (lower) than the median value on the sample (6.10%). Off-balance sheet activities/ total assets is considered as high (low) if it is greater (lower) than the median value on the whole sample (18.13%). Standard errors are adjusted robust to heteroskedasticity. \*\*\*, \*\* and \* pertain to 1, 5 and 10% level of significance, respectively. T-stats are between parentheses. Variables definition: Buffer = ((Tier 1 + Tier 2 capital)/ risk-weighted assets) - regulatory minimum requirements ; Nla = Net loans/ Total assets ; Mktdisc\_Junior = Subordinated debt/ total liabilities ; Mktdisc\_Senior = Other market funding/ total liabilities ; Mktdisc = Total market funding/ total liabilities ; Logta = Natural logarithm of total assets ; Comp = Annual mean of the buffer of banks in the same country ; Gdpg = Annual growth rate of the gross domestic product (deseasonalized) ; Roe = the residuals obtained when we regress the ratio (Net Income/ Total Equity) on the *profit* variable ; Llpnl = Loan loss provisions/ Net loans; Loang = Annual net loan growth ; Profit = Post tax profit/ Total assets; Cap\_index is a capital regulatory stringency index from Barth, Caprio, and Levine (2004). It ranges from 0 to 9, with a higher value indicating greater stringency.

**Table A7: Capital buffer, market discipline and bank activity differentiation excluding banks that might have experienced M&A.**

$$\text{Model 1: } \text{buffer}_{i,t} = \alpha_0 + \alpha_1 \text{mktdisc}_{i,t} + \sum_{j=1}^J \gamma_j C_{j,i,t} + \eta_i + \tau_t + u_{i,t}$$

$$\text{Model 2: } \text{buffer}_{i,t} = \beta_0 + \beta_1 \text{mktdisc}_{i,t} + \beta_2 \text{mktdisc}_{i,t} + \sum_{j=1}^J \delta_j C_{j,i,t} + \eta_i + \tau_t + u_{i,t}$$

<i>Eq Name:</i>	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
<i>Model:</i>	Model 1	Model 2	Model 1	Model 1	Model 2	Model 2	Model 1	Model 1	Model 2	Model 2
<i>Sample:</i>	Whole sample		(Trading revenue/ net operating income) high	(Trading revenue/ net operating income) low	(Trading revenue/ net operating income) high	(Trading revenue/ net operating income) low	(Off-balance sheet activities/ total assets) high	(Off-balance sheet activities/ total assets) low	(Off-balance sheet activities/ total assets) high	(Off-balance sheet activities/ total assets) low
Mktdisc	0.087 (3.669)***		0.098 (3.654)***	0.039 (0.510)			0.117 (2.264)**	0.108 (0.711)		
Mktdisc_Senior		0.070 (3.061)***			0.084 (2.892)***	0.002 (0.027)			0.108 (2.221)**	0.064 (0.837)
Mktdisc_Junior		0.874 (3.990)***			0.657 (3.562)***	0.867 (1.572)			0.895 (3.272)***	1.089 (3.629)***
Nla	-0.125 (-6.237)***	-0.143 (-6.949)***	-0.106 (-3.929)***	-0.124 (-3.661)***	-0.114 (-3.585)***	-0.140 (-4.011)***	-0.093 (-1.296)	-0.175 (-2.929)***	-0.114 (-1.545)	-0.171 (-4.895)***
Size	-2.559 (-5.532)***	-2.631 (-5.392)***	-1.873 (-3.494)***	-1.939 (-1.542)	-1.880 (-2.928)***	-1.993 (-1.321)	-1.096 (-0.598)	-5.359 (-1.992)**	-1.182 (-0.633)	-4.756 (-3.377)***
Comp	0.191 (2.249)**	0.217 (2.327)**	0.269 (4.030)***	0.010 (0.090)	0.259 (3.703)***	0.061 (0.575)	0.225 (1.842)*	-0.004 (-0.018)	0.230 (1.785)*	-0.019 (-0.173)
Gdpg	0.047 (1.024)	0.022 (0.490)	0.014 (0.278)	0.136 (0.592)	-0.009 (-0.162)	0.126 (0.471)	0.024 (0.215)	-0.352 (-0.664)	0.001 (0.009)	-0.244 (-0.895)
Roe	-0.002 (-0.054)	0.035 (0.759)	-0.141 (-1.180)	-0.019 (-0.204)	-0.052 (-0.384)	-0.033 (-0.309)	-0.004 (-0.013)	0.120 (0.303)	0.068 (0.200)	-0.003 (-0.015)
Llpnl	-0.886 (-0.534)	-1.110 (-0.604)	-1.036 (-0.873)	2.726 (0.859)	-1.458 (-0.963)	3.267 (0.904)	-0.712 (-0.368)	-1.801 (-0.317)	-0.618 (-0.308)	-0.855 (-0.337)
Loang	-0.023 (-1.511)	-0.026 (-1.535)	-0.025 (-1.854)*	-0.003 (-0.197)	-0.028 (-1.770)*	-0.001 (-0.062)	-0.033 (-2.570)**	-0.021 (-0.553)	-0.036 (-2.697)***	-0.014 (-0.754)
Profit	0.994 (1.084)	0.634 (0.606)	1.046 (1.317)	3.517 (1.450)	0.430 (0.401)	3.770 (1.321)	2.836 (0.335)	2.185 (1.321)	2.783 (0.321)	1.336 (1.148)
Constant	48.318 (6.504)***	49.689 (6.357)***	36.397 (4.391)***	35.251 (1.730)*	37.116 (3.769)***	35.325 (1.435)	21.336 (0.530)	96.637 (2.153)**	22.461 (0.548)	85.983 (3.699)***
<i>Nb of Obs.:</i>	1814	1814	903	911	903	911	917	898	917	898
<i>R-squared:</i>	0.790	0.790	0.869	0.804	0.855	0.782	0.726	0.729	0.698	0.840

This table shows estimation results obtained using the TSLS method. Our set of instruments consists of the one year lagged value of the endogenous variables. The regression includes time and individual fixed effects. Trading revenue/ net operating income is considered as high (low) if it is greater (lower) than the median value on the whole sample (6.10%). Off-balance sheet activities/ total assets is considered as high (low) if it is greater (lower) than the median value on the whole sample (18.13%). Standard errors are adjusted robust to heteroskedasticity. \*\*\*, \*\* and \* pertain to 1, 5 and 10% level of significance, respectively. T-stats are between parentheses. Variables definition: Buffer = ((Tier 1 + Tier 2 capital)/ risk-weighted assets) - regulatory minimum requirements ; Nla = Net loans/ Total assets ; Mktdisc\_Junior = Subordinated debt/ total liabilities ; Mktdisc\_Senior = Other market funding/ total liabilities ; Mktdisc = Total market funding/ total liabilities ; Logta = Natural logarithm of total assets ; Comp = Annual mean of the buffer of banks in the same country ; Gdpg = Annual growth rate of the gross domestic product (deseasonalized) ; Roe = the residuals obtained when we regress the ratio (Net Income/ Total Equity) on the *profit* variable ; Llpnl = Loan loss provisions/ Net loans; Loang = Annual net loan growth ; Profit = Post tax profit/ Total assets.

**Table A8: Capital buffer, market discipline and bank activity differentiation considering another criterion to define sub-samples.**

$$\text{Model 1: } \text{buffer}_{i,t} = \alpha_0 + \alpha_1 \text{mktdisc}_{i,t} + \sum_{j=1}^J \gamma_j C_{j,i,t} + \eta_i + \tau_t + u_{i,t}$$

$$\text{Model 2: } \text{buffer}_{i,t} = \beta_0 + \beta_1 \text{mktdisc}_{-senior_{i,t}} + \beta_2 \text{mktdisc}_{-junior_{i,t}} + \sum_{j=1}^J \delta_j C_{j,i,t} + \eta_i + \tau_t + u_{i,t}$$

<i>Eq Name:</i>	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
<i>Model:</i>	Model 1	Model 1	Model 2	Model 2	Model 1	Model 1	Model 2	Model 2
<i>Sample:</i>	(Trading revenue/ net operating income) high	(Trading revenue/ net operating income) low	(Trading revenue/ net operating income) high	(Trading revenue/ net operating income) low	(Off-balance sheet activities/ total assets) high	(Off-balance sheet activities/ total assets) low	(Off-balance sheet activities/ total assets) high	(Off-balance sheet activities/ total assets) low
Mktdisc	0.098 (2.687)***	0.043 (1.327)			0.089 (1.866)*	0.060 (0.875)		
Mktdisc_Senior			0.084 (1.686)*	0.005 (0.157)			0.087 (1.964)*	0.011 (0.238)
Mktdisc_Junior			0.739 (2.207)**	0.897 (2.469)**			0.552 (1.734)*	1.190 (4.043)***
Nla	-0.074 (-1.328)	-0.127 (-2.799)***	-0.080 (-0.954)	-0.145 (-3.122)***	-0.047 (-0.798)	-0.204 (-5.153)***	-0.059 (-1.006)	-0.205 (-6.356)***
Size	-2.020 (-2.626)***	-1.261 (-1.326)	-2.121 (-1.926)*	-1.434 (-1.323)	-0.712 (-0.504)	-4.064 (-3.420)***	-0.715 (-0.515)	-3.412 (-4.365)***
Comp	0.328 (2.509)**	0.067 (0.671)	0.346 (1.692)*	0.128 (1.328)	0.182 (2.108)**	0.006 (0.053)	0.186 (2.111)**	0.027 (0.274)
Gdpg	-0.040 (-0.335)	0.194 (1.123)	-0.087 (-0.428)	0.164 (0.863)	0.067 (0.652)	-0.230 (-0.841)	0.056 (0.556)	-0.070 (-0.397)
Roe	-0.068 (-0.216)	0.000 (0.001)	0.124 (0.233)	-0.005 (-0.048)	-0.153 (-0.613)	-0.021 (-0.136)	-0.106 (-0.428)	-0.129 (-1.048)
Llpln	-1.994 (-0.661)	1.340 (0.861)	-2.773 (-0.549)	1.866 (1.097)	0.132 (0.139)	-0.754 (-0.285)	0.165 (0.177)	0.256 (0.193)
Loang	-0.022 (-1.019)	-0.000 (-0.042)	-0.029 (-0.814)	0.001 (0.167)	-0.021 (-2.051)**	-0.003 (-0.221)	-0.023 (-2.183)**	0.000 (0.041)
Profit	0.263 (0.119)	3.209 (1.714)*	-0.775 (-0.206)	3.183 (1.508)	4.872 (1.078)	2.589 (1.263)	4.785 (1.085)	2.047 (0.978)
Constant	38.466 (3.368)***	26.264 (1.654)*	40.903 (2.567)**	28.435 (1.587)	10.967 (0.392)	77.764 (3.834)***	10.881 (0.399)	66.029 (5.008)***
<i>Nb of Obs.:</i>	856	856	856	856	857	856	857	856
<i>R-squared:</i>	0.820	0.845	0.696	0.851	0.664	0.823	0.665	0.866

This table shows estimation results obtained using the TSLS method. Our set of instruments consists of the one year lagged value of the endogenous variables. The regression includes time and individual fixed effects. To define our sub-samples of banks, we consider the median value of the considered ratio (trading revenue/ net operating income or off-balance sheet activities/ total assets) and delete the 10% of our sample observations with a value of the ratio around the median. Then, we distinguish banks with low values from banks with high values. Trading revenue/ net operating income is considered as high (low) if it is greater (lower) than 6.15% (4.30%). Off-balance sheet activities/ total assets is considered as high (low) if it is greater (lower) than 20.17% (16.15%). Standard errors are adjusted robust to heteroskedasticity. \*\*\*, \*\* and \* pertain to 1, 5 and 10% level of significance, respectively. T-stats are between parentheses. Variables definition: Buffer = ((Tier 1 + Tier 2 capital)/ risk-weighted assets) - regulatory minimum requirements ; Nla = Net loans/ Total assets ; Mktdisc\_Junior = Subordinated debt/ total liabilities ; Mktdisc\_Senior = Other market funding/ total liabilities ; Mktdisc = Total market funding/ total liabilities ; Logta = Natural logarithm of total assets ; Comp = Annual mean of the buffer of banks in the same country ; Gdpg = Annual growth rate of the gross domestic product (deseasonalized) ; Roe = the residuals obtained when we regress the ratio (Net Income/ Total Equity) on the *profit* variable ; Llpln = Loan loss provisions/ Net loans ; Loang = Annual net loan growth ; Profit = Post tax profit/ Total assets.



**Table A9: Capital buffer, market discipline and bank activity differentiation considering a narrower definition of senior debt.**

$$\text{Model 2: } \text{buffer}_{i,t} = \beta_0 + \beta_1 \text{mktdisc}_{- \text{senior2}}_{i,t} + \beta_2 \text{mktdisc}_{- \text{junior}}_{i,t} + \sum_{j=1}^J \delta_j C_{ji,t} + \eta_i + \tau_t + u_{i,t}$$

<i>Eq Name:</i>	(2)	(5)	(6)	(9)	(10)
<i>Model:</i>	Model 2	Model 2	Model 2	Model 2	Model 2
<i>Sample:</i>	Whole sample	(Trading revenue/ net operating income) high	(Trading revenue/ net operating income) low	(Off-balance sheet activities/ total assets) high	(Off-balance sheet activities/ total assets) low
Mktdisc_Senior2	0.064 (2.121)**	0.082 (1.778)*	-0.043 (-0.343)	0.087 (2.341)**	-0.004 (-0.041)
Mktdisc_Junior	0.932 (3.680)***	0.730 (3.446)***	0.667 (0.841)	0.798 (2.354)**	1.061 (3.001)***
Nla	-0.129 (-5.027)***	-0.091 (-2.608)***	-0.161 (-2.809)***	-0.067 (-0.715)	-0.162 (-3.031)***
Size	-2.661 (-5.321)***	-2.316 (-4.059)***	-2.997 (-1.159)	-0.357 (-0.153)	-3.454 (-1.863)*
Comp	0.542 (4.052)***	0.528 (3.917)***	0.584 (3.202)***	0.690 (3.715)***	0.225 (1.022)
Gdpg	0.027 (0.615)	-0.019 (-0.322)	-0.040 (-0.101)	0.041 (0.347)	-0.020 (-0.051)
Roe	0.073 (1.217)	0.091 (0.455)	0.000 (0.003)	-0.053 (-0.135)	-0.171 (-0.488)
Llpnl	-1.427 (-0.822)	-1.572 (-1.014)	2.876 (0.573)	0.291 (0.155)	0.556 (0.148)
Loang	-0.018 (-1.552)	-0.021 (-1.878)*	0.006 (0.324)	-0.025 (-2.790)***	-0.000 (-0.005)
Profit	0.041 (0.036)	0.028 (0.021)	1.588 (0.508)	4.989 (0.586)	0.515 (0.318)
Constant	48.636 (5.901)***	42.128 (4.676)***	51.390 (1.222)	2.670 (0.054)	64.101 (1.882)*
<i>Nb of Obs.:</i>	1861	935	926	939	923
<i>R-squared:</i>	0.780	0.817	0.800	0.638	0.846

This table shows estimation results obtained using the TSLS method. Our set of instruments consists of the one year lagged value of the endogenous variables. The regression includes time and individual fixed effects. Trading revenue/ net operating income is considered as high (low) if it is greater (lower) than the median value on the whole sample (6.10%). Off-balance sheet activities/ total assets is considered as high (low) if it is greater (lower) than the median value on the whole sample (18.13%). Standard errors are adjusted robust to heteroskedasticity. \*\*\*, \*\* and \* pertain to 1, 5 and 10% level of significance, respectively. T-stats are between parentheses. Variables definition: Buffer = ((Tier 1 + Tier 2 capital)/ risk-weighted assets) - regulatory minimum requirements ; Nla = Net loans/ Total assets ; Mktdisc\_Junior = Subordinated debt/ total liabilities ; Mktdisc\_Senior2 = Total money market funding/ total liabilities; Mktdisc = Total market funding/ total liabilities ; Logta = Natural logarithm of total assets ; Comp = Annual mean of the buffer of banks in the same country ; Gdpg = Annual growth rate of the gross domestic product (deseasonalized) ; Roe = the residuals obtained when we regress the ratio (Net Income/ Total Equity) on the *profit* variable ; Llpnl = Loan loss provisions/ Net loans; Loang = Annual net loan growth ; Profit = Post tax profit/ Total assets.