How Do Banks Determine Capital ?

Evidence from Germany

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JEL classification code: G21, G32, C23

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1 Introduction

In July 1988 the Basle Committee on Banking Regulation and Supervisory Practices published its risk-based capital standard (Basle Accord), which took effect in the G-10 countries at the end of 1992. Since then, banks are obliged to hold a minimum regulatory capital ratio of 8 percent of all risk-weighted assets. According to the capital buffer theory, banks try to maintain a certain buffer of regulatory capital above the regulatory minimum. As a consequence, portfolio risk and regulatory capital are expected to be positively related. Banks increase capital when increasing portfolio risk and vice versa in order to maintain their capital buffer.

Indeed, evidence from the US banking sector by Shrieves and Dahl (1992), Jacques and Nigro (1997) and Aggarwal and Jaques (1998) as well as by Rime (2001) from Switzerland seems to confirm this positive relationship. Heid et al. (2004) focusing on German savings banks, however, only find meagre evidence, indicating that the results for Germany may differ. So far, evidence of the whole German banking system does not exist. However, the German banking system, in particular, may be of special interest. In an international context, German banks are less profitable and less capitalised than banks in most other countries. According to a long-lasting debate, this is partly attributed to the unique tripartite German banking system of public savings banks, cooperative banks and other banks, that fosters competition among these banking groups. Indeed, the four largest private banks in Germany still have a market share of below 20 percent, if measured by total assets. As a consequence, banking regulation may be expected to be more binding in Germany. Furthermore, these three banking groups expectedly manage capital differently because of their varying institutional characteristics. We deliberately differentiate between these three “pillars” of the German banking system in order to analyse the banks’ determinants of capital dependent on these very special institutional characteristics.

The first “pillar” of the German banking system comprises the German savings banks, which are the only savings banks within Europe that are still publicly owned. Savings banks in other

European countries have been privatised many years ago. Communities and districts are the responsible bodies of German savings banks. Unlike joint-stock-companies, councillors elect most members of the supervisory board (*Verwaltungsrat*), which supervise the savings bank's managers. Due to their specific public mandate, German savings banks have to offer financial services for the whole region in which they operate, and are not allowed to expand their business in other regions in order to avoid competition with savings banks in their neighbourhood. Further restrictions pertain to their investments. Often savings banks are not free to invest in private companies, but have to ask the relevant regulatory authority for permission, which monitors the additional regulations of public savings banks. As a consequence, savings banks may have a weakly diversified portfolio. Due to their special legal form, savings banks are not able to issue new shares on the capital market and have very limited access to the capital market. As a consequence, they heavily rely on increasing capital internally by accumulating profits. Their only alternatives to obtain external capital are to issue subordinate debt, some other hybrid capital (*Genussrechtskapital*) or to receive non-participating capital contributions (*stille Vermögenseinlagen*). In order to compensate for the public mandate, savings banks are granted public debt guarantees until July 2005 (*Gewährträgerhaftung* and *Anstaltslast*), which supplement the potent German deposit insurance system and completely prevent all savings banks from becoming insolvent.

Cooperative banks make up the second "pillar". Similar to savings banks, their business is restricted to the local region in which they operate to avoid competition with other cooperative banks. However, in contrast to savings banks, cooperative banks belong to their cooperative members. As these banks can receive fresh capital by winning new partners who have to pay in a certain amount of capital to join the cooperative bank, they may rely on accumulating profits to a lesser extent. In this regard, accumulating profits may be less important than attracting new members, which means paying high dividends.

The third "pillar" comprises other banks. On the one hand, this group consists of private commercial banks, i.e., big banks, branches of foreign banks and (private) regional banks and other commercial banks. On the other hand, this group comprises special banks, i.e., mortgage banks, building societies and banks with special functions (*Banken mit Sonderaufgaben*). Here, we also include Land banks (*Landesbanken*) and regional institutions of credit cooperatives in this category as their business is quite distinct from that of the savings and cooperative banking groups. Banks within this group titled *other banks* have easier access to the capital market than savings and cooperative banks, because many of them are joint-stock companies, which can easily raise external equity capital on the financial market. As argued by Dahl and Shrieves (1990), the magnitude of equity infusions makes them an important instrument to increase the bank capital ratio. Those banks in other legal forms are often subsidies of larger financial institutions and may easily obtain additional equity capital from their parent company. A further difference is the fact that these banks are allowed to operate nationally or even internationally, and are therefore not restricted to a certain local region. As a consequence, their credit portfolios may be more broadly diversified.

The different organisational structure of these banking groups may be responsible for different behaviour regarding the determination of their capital ratio, even though all German banking groups are subject to the same regulatory capital requirements and are supervised by the same regulatory agencies. A bank that can easily raise capital externally for instance, may be less willing to increase capital than savings banks when approaching the minimum ratio of regulatory capital. On the other hand, a savings bank approaching the regulatory minimum may be willing to increase capital, but might not be able to do so. Therefore, it is worth analysing these different banking groups in detail.

Indeed, we find remarkable differences between the behaviour of the banking groups. Results suggest that savings and cooperative banks rely on retained earnings more than *other banks*.

Additionally, we find a less pronounced negative relationship between size and the target capital ratio with regards to savings banks as compared to *other banks*. This finding may be due to public debt guarantees for savings banks and large savings banks having fewer chances to diversify their credit portfolios than large *other banks*.

Furthermore, we obtain evidence in favour of the buffer theory of bank capital. In the case of moderately capitalised banks we find a positive and significant impact of changes in portfolio risk on changes in the capital ratio. These banks try to maintain their regulatory capital ratio and thus increase capital when increasing portfolio risk. In the case of less capitalised banks we obtain a much smaller or even negative relationship between changes in portfolio risk and changes in the capital ratio. This finding suggests that these banks try to strengthen their regulatory capital buffer by both increasing capital and reducing portfolio risk. Indeed, we find some further evidence that less capitalised banks increase capital to a greater extent than better capitalised banks. Additionally, no significant impact of changes in portfolio risk on changes in the capital ratio is found for the whole group of *other banks*. Some of them hold such a high regulatory capital ratio that changes in portfolio risk cannot explain any changes in the capital ratio. However, if these highly capitalised *other banks* are excluded from the sample, we obtain a positive and significant effect for the remaining, moderately capitalised banks as well. Finally, we obtain evidence that especially savings and cooperative banks try to leave the zone of regulatory pressure by issuing subordinate debt or hybrid capital (*Genussrechtskapital*). Further research confirms the interrelationship between capitalisation and issuance of Tier 2 capital.

In contrast to earlier studies, bank deposits to customers and loan loss provisions, which may be major factors determining capital, are considered in this study as well. Finally, we apply a more appropriate econometric methodology. We estimate dynamic panel regressions using the generalised method of moments (GMM), which allows us to efficiently consider the endogeneity of explanatory variables.

The structure of this study is as follows. Section 2 presents some hypotheses to be examined. Furthermore, it gives an overview about potential determinants of bank capital. Section 3 characterises the dataset and Section 4 introduces the empirical methodology and the final specification of the model. Section 5 presents the results regarding the determinants of bank capital. In Section 6 the subordinated debt issue is examined in detail and Section 7 concludes.

2 Hypotheses

According to the capital buffer theory, banks wish to hold a certain amount of excess regulatory capital above the regulatory minimum. The reasoning behind their aim to maintain a certain capital buffer are the explicit and implicit regulatory costs, which would be the result of falling very close to or below the regulatory minimum. Buser et al. (1981) and Milne and Whalley (2001) argue that implicit costs of regulation may arise because of regulatory interference, which reduces the charter value[1] of the bank. Consequently, banks' changes in portfolio risk and the capital ratio may be positively related, as they wish to maintain their regulatory capital ratio. Those banks that have left their target capital zone and have fallen close to the regulatory minimum may have an incentive to return to their capital buffer by increasing capital and decreasing risk. Therefore, we may find a negative relationship between changes in portfolio risk and the capital ratio for less capitalised banks. The buffer theory, however, is not relevant for banks having an extraordinary high capital ratio. These banks are not forced to manage capital dependent on portfolio risk, as they are far away from experiencing regulatory costs. Consequently, we expect no significant relationship between changes in portfolio risk and the capital ratio for these banks.

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[1] The charter value of a bank is the present value of the bank's prospective new investments. See, for example, Keeley (1990) or Acharya (1996) for the importance of the charter value for a bank.

Hypothesis 1A (H1A) and 1B (H1B): Changes in portfolio risk and the capital ratio are positively (negatively) related for well (less) capitalised banks.

Hypothesis 1C (H1C): Changes in portfolio risk and the capital ratio are unrelated in the case of very strongly capitalised banks for which the buffer theory should not hold.

The banks‘ profitability determines the banks‘ ability to increase capital by accumulating profits. That is why a positive relationship between the banks’ profitability and the target capital ratio may be presumed. A positive relationship would also be consistent with the pecking-order theory of Myers and Majluf (1984), stressing the bank’s preference for internal funding due to lower costs. However, a positive relationship is not compellable. Varying yearly payout ratios or profit transfers to or from the parent companies may influence the result. Nevertheless, it is expected that the positive relationship holds at least for savings banks, as they have less alternatives to fund themselves. Furthermore, they do not have parent companies they must transfer profits to and usually do not pay out profits or if so, they have very low payout ratios.

Hypothesis 2A (H2A): The higher the profitability, the higher the banks’ target capital ratio.

Hypothesis 2B (H2B): Profitability as a determinant of the target capital ratio is most important for savings banks.

There are several reasons why larger banks may target a lower capital ratio. Larger banks may have easier access to the capital market and can raise external capital more easily due to lower transaction costs. Thus they may have greater financial flexibility and may need less excess regulatory capital than smaller banks. In addition, they are more likely to have a more diversified portfolio and thus need less excess capital from the bank manager’s point of view. According to Titman and Wessels (1988), fixed direct bankruptcy costs finally constitute a smaller portion of firm value when the firm is larger, lowering the importance of bankruptcy costs. All these reasons may result in a negative relationship between banks' size and their target capital ratio. This size effect, however, should be smaller for cooperative banks and particularly for savings banks. These banks are financially less flexible as they are not listed on the stock exchange and cannot issue new shares on the capital market if necessary. Instead they must rely on retained earnings or issue subordinate debt or other hybrid capital (*Genussrechtskapital*). Additionally, even large savings and cooperative banks may need a high capital ratio due to limited scale effects in the diversification of their credit portfolio, since their business is limited to a certain local area. In contrast to cooperative banks and *other banks*, bankruptcy costs may be less important even for small savings banks because of the public guarantees (*Gewährträgerhaftung* and *Anstaltslast*) granted to savings banks until July 2005, which completely prevent all savings banks from going bankrupt.

Hypothesis 3A (H3A): The larger the bank, the lower the target capital ratio (size effect).

Hypothesis 3B (H3B): The size effect is weaker for savings and cooperative banks.

3 Data

We examine German banks using a unique dataset provided by the Deutsche Bundesbank.[2] It comprises yearly (end-of-December) balance sheet and profit and loss account information from almost all German banks (no building societies) reported to the Deutsche Bundesbank from 1992 to 2001.[3] In order to analyse the banks' behaviour in detail, we divide the heterogenous sample

[2] We also used an alternative dataset, which is publicly available from Hoppenstedt, but which is unrepresentative, since it only comprises of a subsample of all German banks. Nevertheless, we obtained similar results.

[3] Some cooperative banks and *other banks* could not be taken into account because of data restrictions. Furtmermore, we excluded banks with six and less consecutive observations from the dataset, as we need a longer number of continuous observations of each bank to run dynamic panel regressions.

of all German banks into three subsamples. The first one comprises all German savings banks and the second subsample consists of nearly all German cooperative banks. The third group is denoted *other banks.* On the one hand, these *other banks* comprise commercial banks, i.e., big banks, branches of foreign banks and (private) regional banks and other commercial banks. On the other hand the group of *other banks* comprises mortgage banks, Land banks (*Landesbanken*), regional institutions of credit cooperatives, and banks with special functions (*Banken mit Sonderaufgaben*).[4]

3.1 Bank capital

Two different definitions of capital ratios are presented in this study to obtain a differentiated impression of how banks determine their target capital ratios. The first one is a simple capital ratio defined as equity capital over total assets (*CAP1*). Alternatively, the results do not change with the inclusion of the fund for general bank risks according to the definition of Tier 1 capital. The second definition (*CAP2*) refers to total regulatory capital (Tier 1 + Tier 2). It is defined as the ratio of paid-up equity capital including the fund for general bank risks, subordinate debt and other hybrid capital (*Genussrechtskapital*), which in total are divided by total assets.[5]

3.2 Bank risk

Banks' portfolio risk (*RISK*) is measured by the ratio of risk-weighted on-balance-sheet assets over total assets.[6] We use the risk weights suggested by the Basle Committee on Banking

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[4] A more detailed analysis of *other banks* is not possible, as the dataset allows no further identification of each bank.

[5] As we do not have any information about hidden reserves or revaluation reserves, CAP2 is a little smaller than the actual sum of Tier 1 + Tier 2 over total assets (see Deutsche Bundesbank 2003).

[6] Other risk assets like off-balance-sheet engagements and derivatives as well as market risk could not be considered because of data restrictions.

Regulation in 1988, which are still obligatory today. Within the Basle Accord framework the individual assets of a bank are weighted according to some broad risk classes. Recent literature has pointed to the fact that such a measure of portfolio risk is too rough to indicate the banks' probability of default. However, in this case, we are less interested in an accurate measure of the probability of default, but rather wish to explain banking behaviour in a regulatory context.

4 Partial-adjustment-framework and specification

Building on Shrieves and Dahl (1992), we assume that banks consciously aim at a certain target capital ratio (see Diamond et al. (2000) for the existence of an optimal bank capital ratio) and suggest that changes in the bank capital ratio result from discretionary adjustments towards the target capital ratio and factors exogenous to the bank:

$$\Delta CAP_{j,t} = \Delta CAP_{j,t}^{d} + \varepsilon_{j,t} \qquad (1)$$

where $\Delta CAP_{j,t}$ is the observed change in the capital ratio for bank *j* in period *t*, $\Delta CAP_{j,t}^{d}$ is the discretionary change, and $\varepsilon_{j,t}$ is the exogenous random shock, e.g. an unanticipated economic shock. The discretionary changes in the capital ratio $\Delta CAP_{j,t}^{d}$ are modelled within a partial adjustment framework. Institutional inertia, high costs of rapid change, or a lack of information may prevent banks from reaching their target capital ratio instantaneously. Peltzman (1970) and Marcus (1983) were among the first to model the bank capital decision within a partial adjustment model. Consequently, we rewrite equation (1) as follows:

$$\Delta CAP_{j,t} = \alpha\left[CAP_{j,t}^{*} - CAP_{j,t-1}\right] + \varepsilon_{j,t} \qquad (2)$$

where α is the speed of adjustment, and $CAP_{j,t}^{*}$ denotes the target capital ratio for bank *j* in period *t*, which is not directly observable. By adding lagged capital to both sides of the equation we obtain the following equation:

$$CAP_{j,t} = (1-\alpha)CAP_{j,t-1} + \alpha CAP^{*}_{j,t} + \varepsilon_{j,t} \qquad (3)$$

4.1 Variables affecting target capital

Since the target capital ratio $CAP^{*}_{j,t}$ is not directly observable, some observable proxy variables have to be found. In the following, the explanatory variables are presented, which affect the target capital ratio and thus determine changes in capital.

Portfolio risk

Changes in the capital ratio and portfolio risk are supposed to be interrelated due to banking regulation (see hypotheses *H1A* and *H1B*). Therefore, we included $\Delta RISK$ in the capital equation.

Profitability

Corresponding to hypothesis *H2A*, the target capital ratio may be influenced by banks' profitability. Thus, we also inserted the return on assets (*ROA)* as a common measure of profitability in the equation.

Bank deposits from non-bank customers

Bank deposits from non-bank customers are a very attractive means to fund a bank, because of the relatively lower interest rates compared to those of bearer bonds or borrowing from banks. Banks, therefore, compete for these deposits. In accordance with Gupta and Walker (1975), an increasing level of bank deposits from non-bank customers may be a proxy for the banks' competitiveness and positive earnings expectations in future years. In order to control the potential effects on the target capital ratio, we include the bank deposit ratio (*BDR*), defined as the ratio of all liabilities to non-bank customers divided by total assets, in the capital equation. A negative effect of *BDR* on the target capital ratio implies that lower (higher) future profitability involves increased (lower) pressure to extend buffer capital. A positive effect, in contrast, suggests that banks with a higher *BDR* can increase capital from external sources more easily than other banks, because they are in a better competitive position and have higher earnings expectations.

Provisions

We consider new loan loss provisions over total assets (*PROV*) as a potential determinant of the target capital ratio, as this ratio may indicate the banks' financial health. A negative impact of *PROV* on changes in capital could mean that banks in financial distress have more difficulties in increasing their capital ratio. In contrast, a positive effect could signal that banks voluntarily increase their capital to a greater extent in order to overcome their bad financial situation. Shrieves and Dahl (2003) argue that loan loss provisions do not have any effect on changes in capital, since they are offset by realised security gains. Savings banks, however, may have few possibilities to realise security gains, since their investments are restricted by law.

Regulatory pressure

A bank having a regulatory capital ratio close to the regulatory minimum may have an incentive to increase its regulatory capital ratio in order to prevent this ratio from falling below the regulatory minimum. Otherwise regulatory costs may arise. To capture this potential effect we include a dummy variable *REG* into the equation indicating the banks' regulatory pressure.[7]

[7] We assume that *REG* indicates regulatory pressure, although we cannot exclude that it partly measures the banks' own incentive to prevent bancruptcy costs.

In accordance with Ediz et al. (1998) and Rime (2001) we assume that both the ratio of capital over risk-weighted assets (*CRWA*) and its volatility have to be considered when measuring regulatory pressure, as the probability of falling below the regulatory minimum increases with the volatility of the capital ratio. The dummy variable *REG* equals unity if the ratio of capital over risk-weighted assets is within one standard deviation of a certain threshold and zero otherwise. Here, we set the threshold at the 25 percentile of the least capitalised German banks.[8] In order to analyse potential interactions with $\Delta RISK$ according to hypothesis H1B, we combined *REG* with $\Delta RISK$.

Merger

The German banking sector is characterised by many mergers and acquisitions in recent years, which could have a direct impact on the banks' capital ratio. We control this effect by including the variable *MERG* into the capital equation. The dummy variable equals unity if a bank has taken over another bank in the same year and zero otherwise.[9] If distress mergers among savings or cooperative banks dominated, we would expect a negative impact of the dummy variable on the target capital ratio.

Size

Corresponding to hypothesis *H3A*, size may have an influence on the target capital ratio. To capture size effects, the natural log of total assets (*SIZE*) is included in the capital equation.

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[8] We also experimented with other definitions of regulatory pressure, but obtained very similar results.

[9] The dummy variable *MERG* was kindly provided by the Deutsche Bundesbank.

Regulatory and macroeconomic shocks

Macroeconomic shocks must be taken into account, as changes in the volume or structure of loan demand can influence banks' observed capital. Also changes in banking regulation may influence the dependent variable in a specific year. Therefore, time dummies are included in the capital equation as well.

Considering these explanatory variables, the final specification of the capital equation is as follows:[10]

$$\begin{aligned} CAP_{j,t} = {} & \beta_0 + (1-\alpha)CAP_{j,t-1} + \beta_1 \Delta RISK_{j,t} + \beta_2 (\Delta RISK_{j,t} * REG_{j,t}) + \beta_3 ROA_{j,t} \\ & + \beta_4 BDR_{j,t} + \beta_5 PROV_{j,t} + \beta_6 SIZE_{j,t} + \beta_7 REG_{j,t-1} + \beta_8 MERG_{j,t} + u_{j,t} \end{aligned} \quad (4)$$

where $u_{j,t} = \mu_j + \varepsilon_{j,t}$ with $\mu_j \sim IID(0, \sigma_\mu^2)$ and $\varepsilon_{j,t} \sim IID(0, \sigma_\varepsilon^2)$. We estimate the model with both definitions of capital over total assets (*CAP1* and *CAP2*) as dependent variables.

(Insert Table 1 about here)

Table 1 presents the means of the variables for each year of the reference period and differentiates between the three banking groups. On average, *other banks* have a higher capital ratio than savings and cooperative banks. Another noteworthy fact is the high share of subordinate debt over total assets (*SDEBT*) for savings banks. It seems that these banks

[10] We include the lagged value of the dummy variable *REG* into our equation. Regulatory pressure in the previous year can lead the bank to increase the capital ratio in the next year. However, including the current dummy variable instead of the lagged dummy variable in the equation would lead to a potential problem of simultaneity: a bank under regulatory pressure in period *t* is unlikely to have increased its capital ratio above average in period *t*.

compensate their lower equity capital ratio by issuing subordinate debt. We analyse this potential relationship in Section 6.

4.2 Considering the panel structure

In contrast to many previous studies, e.g. by Shrieves and Dahl (1992), Jacques and Nigro (1997), Aggarwal and Jacques (2001) and Rime (2001), we explicitly consider the bank-specific effects μ_i.[11] In order to avoid the Nickell bias according to Nickell (1981), we estimate equation (4) in first differences and instrument the lagged dependent variable in first differences. Finally, we apply the generalised method of moments (GMM), which is argued to be most appropriate in the context of dynamic panel analysis by Arellano and Bond (1991) and Blundell and Bond (1998).

Banking regulation results in an interrelationship of capital and portfolio risk with the consequence that portfolio risk is an endogenous variable in the capital equation and has to be instrumented. Other explanatory variables may be endogenous as well. Berger (1995), for example, claims that profitability is affected by the capital ratio and McNichols and Wilson (1988), among others, argue that loan loss reserves are discretionarily set. We decided to instrument all explanatory variables because statistical tests also indicate that these variables are potentially endogenous.[12] We checked the validity of the instruments used. Firstly, absence of second order autocorrelation in the residuals in first differences is a necessary condition for

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[11] We also estimated a simultanous equation model (including a second equation explaning $\Delta RISK$) with pooled data in line with prior research, and obtained similar results. Regression results from 2SLS and 3SLS confirm our main findings in this paper.

[12] We had to regard *MERG* as exogenous, as we could not find suitable instruments for this dummy variable.

obtaining consistent estimates. Secondly, the Sargan test of over-identifying restrictions should indicate, that the instruments are not correlated with the residuals and thus are valid.

Arellano and Bover (1995) and Blundell and Bond (1998) argue that the conventional GMM model in first differences (GMM-DIF) may suffer from instruments, which are uncorrelated with the residuals, but are weakly correlated with the instrumented variable. As a consequence, poor estimation precision may result. They propose to use a system of instruments in first differences for equations in levels in addition to using instruments in levels for equations in first differences. GMM-SYS denotes this extended system of moments. Besides GMM-SYS, we also estimated GMM-DIF as a robustness check, as the Sargan test in the case of GMM-SYS does not always confirm the validity of the instruments. If the total sample of cooperative banks is examined, the Sargan test sheds some doubt on the validity of the instruments even in case of GMM-DIF. In order to find the validity of the set of instruments using the Sargan test, we gradually reduced the number of observed cooperative banks by ignoring the smaller ones. We found that the Sargan test just validates the instruments, when the subsample is limited to the largest 551 cooperative banks. Since the results of this subsample are very similar to those obtained from the sample of moderately capitalised cooperative banks, we interprete them in favour of the larger sample.

All calculations were conducted with Stata 8.0 and the DPD software package for Ox (see Doornik et al. 2002). We use the two-step version of the GMM estimator to obtain the Sargan test statistics, as the one-step version of the Sargan test over-rejects the validity of the set of instruments in presence of heteroskedasticity. As recommended by Arellano and Bond (1991), the coefficient estimates are based on the one-step version.

5 Results

Tables 2a and 2b show the GMM-DIF and GMM-SYS results for the dynamic model given by equation (4). Both methods provide similar results. On the one hand, we present the results for the three banking groups of savings banks, cooperative banks and *other banks*. On the other hand, we differentiate between both definitions of capital to reveal potential variations in the results.

The coefficients of the lagged dependent variable $(1-\alpha)$ tend to be somewhat lower in the GMM-DIF regression than in the GMM-SYS regression because of the special characteristics of the estimators. In the case of all *other banks*, we even obtain an insignificant coefficient of the lagged dependent variable in the case of GMM-DIF. Nevertheless, results indicate that the speed of adjustment (α) is comparatively slow for savings and cooperative banks, but higher for the group of *other banks*. These banks have some additional opportunities to manage their capital level by transfering capital from or to their parent companies, by absorbing capital from the financial market or by realising capital gains or losses on security transactions.

(Insert Table 2a about here)

(Insert Table 2b about here)

Contrary to previous US empirical literature, we do not find a significant relationship between the target capital ratio and changes in portfolio risk for all German banks, but for savings banks only. Nevertheless, the result is plausible. As *other banks* have much more excess capital on average than savings banks (see Table 1), they are less likely to be subject to regulatory constraints and may coordinate portfolio risk and capital unsystematically (see *H1C*). The finding is in line with the buffer theory claiming a positive relationship only for banks with a moderate capital buffer as banks having a capital ratio far away from the regulatory minimum need not care about regulatory costs.

If we ignore atypical banks having a high Tier 1 capital ratio to risk-weighted assets of more than 20 percent, we find a positive relationship between changes in portfolio risk and the target capital ratio even for the cooperative and *other banks*. This result remains robust to variations in the threshold. Accordingly, these moderately capitalised cooperative and *other banks* try to maintain their capital buffer by increasing both capital and portfolio risk, giving evidence in favour of *H1A*.

The buffer theory claims that weakly capitalised banks have fallen out of the range of appropriate regulatory capital ratios by external factors and will try to rebuild their appropriate capital buffer by increasing their capital ratio and decreasing portfolio risk. Therefore, a negative relationship between changes in the capital ratio and portfolio risk is expected. Indeed, the coefficients of the interacted term $REG_{j,t} * \Delta RISK_{j,t}$ indicates that the positive relationship is smaller or even turns negative for less capitalised banks (see *H1B*).

Further differentiating the results for both dependent variables *CAP1* and *CAP2*, respectively, provides more insights. We find mixed evidence for a deviant behaviour of less capitalised savings banks depending on the definition of the capital ratio. While even weakly capitalised savings banks seem to positively coordinate changes in *CAP1* and portfolio risk, we observe a significant and negative relationship for these banks if *CAP2* is considered. The reasoning behind this finding could be the fact, that savings banks can influence total capital easier than Tier 1 capital, e.g. by issuing subordinate debt. As a consequence, they could easily increase total capital while lowering portfolio risk. In the case of cooperative and *other* banks having a ratio of Tier 1 capital over risk-weighted assets of less than 20 percent, however, the positive coordination of Tier 1 capital and portfolio risk is already less pronounced or even negative for weaker capitalised banks. These results suggest that these banking groups can easily influence Tier 1 capital.

Considering the results of GMM-SYS, the dummy variable *REG* indicating regulatory pressure gives further evidence that savings banks can coordinate *CAP2* easier than *CAP1*. While the dummy variable is insignificant for the *CAP1* capital equation of savings and cooperative banks, it turns significant and positive in the case of *CAP2*. This fact, moreover, suggests that savings banks under regulatory pressure try to leave the zone of regulatory pressure by issuing subordinate debt or other hybrid capital (*Genussrechtskapital*).

Profitability is of great importance for both savings and cooperative banks, giving some evidence in favour of hypothesis *H2A*. As expected, the relationship is weaker for the group of *other banks* (see *H2B*). We attribute this finding to the institutional characteristics of *other* banks. While savings banks and cooperative banks strongly rely on retained profits to increase capital, *other banks* may use alternative ways to increase capital. Only *other banks* can issue new shares on the capital market or obtain fresh capital from their parent company.

BDR is of great importance for the group of all *other banks*. The lower the share of deposits to customers in relation to total assets, the higher is the target capital ratio of these banks. However, we adhere this special effect to the large heterogeneity of the group of *other* banks. In fact, specialised banks serving a certain niche in the banking industry without a notworthy amount of deposits from customers often have very high capital ratios, while the competitive universal banks with a more pronounced deposit business usually have moderate capital ratios. Indeed, the strong negative relationship disappears if only moderately capitalised banks with a ratio of Tier 1 capital over risk-weighted assets less than 20 percent are considered and indicates little importance in regard to *BDR* for moderatly capitalised *other banks*. However, we find a significant and positive relationship between *BDR* and the target capital ratio for cooperative banks, which strongly fund themselves by accepting deposits from customers (see Table 1). The results indicate that cooperative banks, which are more competitive and have higher earnings expectations, are able to increase capital from external sources easier than other banks. Particularly cooperative banks must be competitive in order to attract new partners and thus increase capital.

Loan loss provisions (*PROV*) have a significant and positive effect on the target capital ratio. The worse the financial health of the bank, the higher is the bank's target capital ratio. Especially savings banks and cooperative banks seem to realise the necessity to increase capital as a buffer against unexpected losses along with their raise of loan loss provisions. In that regard, savings and cooperative banks voluntarily increase capital in the face of financial distress, although they are not forced to do so by regulatory pressure.

We find remarkable differences between the banking groups regarding the effect of size on the target capital ratio. In the case of savings banks the effect is positive, which means that larger savings banks have a higher target capital ratio. However, the size effect is negative for *other banks*. Insofar, we obtain evidence in favour of *H3A* and *H3B*. The negative relationship between size and the target capital ratio holds even for this banking group if those atypical banks with a ratio of Tier 1 capital over risk-weighted assets above 20 percent is neglected. Otherwise it could be argued that the size effect is just a consequence of the heterogeneity of this banking group: Large universal banks usually aim at lower capital ratios than smaller highly specialised banks operating in niches.

Mergers among banks seem to have a small impact on changes in the capital ratio. Only in the case of cooperative banks and *other banks* we find some evidence that mergers positively influence the capital ratio. We find no evidence, however, that banks preferably merge with weakly capitalised banks.

6 Subordinate debt issue

Issuing subordinate debt may be of different relevance for the three banking groups to manage capital. As shown in Table 1, savings banks have issued subordinate debt to a larger extent than other banks in the reference period. Furthermore, Table 3a suggests that banks issuing subordinated debt have a lower capital ratio than non-issuing banks. Accordingly, we presume that a lack of equity capital could have led mainly savings banks to increase their Tier 2 capital ratio by issuing subordinate debt. In order to analyse our presumption, we regress the ratio of subordinate debt over Tier 1 capital on $CRWA3_{t-1}$, which denotes the lagged ratio of Tier 1 capital over risk-weighted assets.[13] We chose the lagged capital ratio because of potential endogeneity problems. Two interaction terms are added: firstly lagged *CRWA3* interacted with a dummy being unity for all savings banks (*SB*), and secondly, lagged *CRWA3* interacted with a dummy being unity for all cooperative banks (*CB*). Table 3b shows the results. As expected, the results indicate that all banking groups use subordinate debt in order to supplement their capital ratio. This finding is consistent with Ito and Sasaki (1998) and Horiuchi and Shimizu (1998) for Japanese banks. However, the coefficients of the interaction terms for the cooperative and savings banks are significant and negative, especially for savings banks, which suggests that particularly savings banks were forced to increase their capital ratios by issuing subordinate debt. In this regard, the subordinated debt ratio may be an alternative indicator of regulatory pressure.

(Insert Table 3a about here)

(Insert Table 3b about here)

7 Conclusions

This study examines, how German banks determine their capital ratios. A unique dataset provided by the Deutsche Bundesbank comprising yearly balance sheet and profit and loss account information from 1992 to 2001 for nearly all German banks is employed. We differentiate between savings banks, cooperative banks and *other banks* to consider the

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[13] A fixed effects logit model explaining *SDEBT*=0 and *SDEBT*>0, respectively, is estimated as well and shows similar results. An alternative random effects tobit model is inappropriate here, as the Hausman test rejects the random effects assumption.

characteristics of these three pillars of the German banking sector, which are expected to effect banks' capital management. We account for the panel structure of the dataset and apply the generalised method of moments (GMM) to estimate the banks' dynamic adjustments of capital.

We find evidence in favour of the capital buffer theory, which claims that moderately capitalised banks try to maintain their regulatory buffer capital because of potential regulatory costs. Indeed, changes in portfolio risk have a positive and significant effect on changes in the capital ratio for savings banks as regulation is likely to be binding for these moderately capitalised banks. If highly capitalised cooperative banks and *other banks* with a ratio of Tier 1 capital over risk-weighted assets of above 20 percent are disregarded, we obtain a positive and significant relationship between changes in the capital ratio and portfolio risk for these banking groups as well. The positive relationship diminishes or even turns negative in the case of less capitalised banks. According to the buffer theory these banks increase capital and decrease portfolio risk to rebuild their capital buffer. By differentiating between diverse capital definitions, we find some evidence that savings banks can manage total capital more easily than Tier 1 capital. It coincides with our result that savings banks in particular use subordinated debt as an instrument to increase low capital ratios.

As expected, banks' profitability has a positive and significant impact on the target capital ratio for savings banks and cooperative banks. These banks particularly depend on retained earnings, because they have fewer alternatives to increase their capital ratios than *other banks*. Accordingly, the effect is less pronounced for *other banks*. The relationship between the ratio of bank deposits from non-bank customers over total assets (*BDR*) and the target capital ratio is positive for cooperative banks but insignificant for the group of moderately capitalised *other banks*. The result indicates that cooperative banks with expected higher future earnings due to a higher bank deposit ratio can absorb capital from external sources more easily than other banks. For *other banks* this effect is insignificant, as their funding from non-bank customers is less pronounced. Loan loss provisions as a signal of banks' bad financial health positively influence the target capital ratio if savings and cooperative banks are considered. Insofar, these banks seem to increase their capital ratio voluntarily in the case of poor financial health, independent of regulatory pressure. Finally, size has a negative impact on the target capital ratio for *other banks*. For savings banks the size effect is insignificant, as some arguments in favour of a negative size effect only hold for *other banks*.

These findings have some policy implications. The absence of the size effect for savings banks suggests that large savings banks cannot exploit scale effects in diversification due to investment restrictions and their business being restricted to the local area they operate in. Insofar, the recent efforts of savings banks to diversify their credit portfolio by utilising credit derivatives are justified. Since our findings confirm the relevance of the capital buffer theory, we obtain evidence that banking regulation is effective in Germany as well. Furthermore, as poorly capitalised savings banks in particular make use of subordinate debt to increase capital, the regulator's restricted acknowledgement of Tier 2 capital up to 100 percent of Tier 1 capital gains in importance.

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Table 1: Number of observations and means of variables by year and banking group

	1993	1994	1995	1996	1997	1998	1999	2000	2001	total	sav. banks	coop. banks	*other banks*
observations	2,854	2,857	2,862	2,862	2,862	2,862	2,862	2,597	2,379	24,997			
sav. banks	578	578	578	578	578	578	578	561	535		5,142		
coop. banks	2,032	2,032	2,032	2,032	2,032	2,032	2,032	1,791	1,619			17,634	
other banks	244	247	252	252	252	252	252	245	225				2,221
$\Delta CAP1_t$	-0.0010	0.0015	0.0006	0.0006	0.0012	0.0012	0.0013	0.0028	0.0008	0.0010	0.0005	0.0012	0.0002
$\Delta CAP2_t$	0.0023	0.0032	0.0022	0.0015	0.0019	0.0012	0.0013	0.0028	0.0005	0.0019	0.0026	0.0017	0.0016
$CAP1_t$	0.0443	0.0461	0.0471	0.0476	0.0488	0.0500	0.0513	0.0537	0.0535	0.0490	0.0385	0.0474	0.0869
$CAP2_t$	0.0486	0.0522	0.0547	0.0562	0.0581	0.0594	0.0607	0.0633	0.0631	0.0572	0.0539	0.0529	0.0987
$CRWA1_t$	0.0946	0.1016	0.1007	0.1074	0.1046	0.1191	0.1103	0.1243	0.1226	0.1091	0.0641	0.0750	0.4839
$CRWA2_t$	0.1017	0.1122	0.1134	0.1217	0.1199	0.1344	0.1257	0.1398	0.1377	0.1225	0.0896	0.0834	0.5090
$sd(CRWA1)_t$	0.0229	0.0232	0.0236	0.0236	0.0236	0.0236	0.0236	0.0243	0.0238	0.0236	0.0055	0.0085	0.1855
$sd(CRWA2)_t$	0.0265	0.0268	0.0272	0.0272	0.0272	0.0272	0.0272	0.0279	0.0275	0.0272	0.0135	0.0108	0.1888
$RISK_t$	0.6031	0.6106	0.6120	0.6155	0.6229	0.6320	0.6328	0.6497	0.6448	0.6242	0.6074	0.6424	0.5183
$\Delta RISK_t$	-0.0106	0.0078	0.0018	0.0035	0.0074	0.0091	0.0007	0.0172	-0.0051	0.0036	0.0083	0.0026	0.0007
ROA_t	0.0036	0.0034	0.0034	0.0031	0.0029	0.0028	0.0024	0.0027	0.0028	0.0030	0.0026	0.0028	0.0057
BDR_t	0.7602	0.7410	0.7278	0.7206	0.7112	0.7046	0.6901	0.6729	0.6847	0.7135	0.6737	0.7678	0.3746
$PROV_t$	0.0029	0.0053	0.0031	0.0032	0.0037	0.0032	0.0032	0.0046	0.0047	0.0038	0.0043	0.0037	0.0033
$SIZE_t$	18.9098	19.0014	19.0816	19.1557	19.2131	19.2785	19.3320	19.4679	19.6010	19.2172	20.6170	18.6122	20.7800
$MERG_t$	0.0396	0.0459	0.0273	0.0290	0.0283	0.0451	0.0601	0.0743	0.0643	0.0453	0.0286	0.0536	0.0185
$SDEBT_t$	0.0027	0.0040	0.0053	0.0061	0.0066	0.0066	0.0066	0.0069	0.0070	0.0057	0.0140	0.0031	0.0076

Table 2a: Dynamic GMM-regression for CAP1$_{j,t}$

	Savings banks		*Cooperative banks*						*Other banks*			
	All		All		Moderately capitalised		Largest coop. banks		All		Moderately capitalised	
	GMM-DIF	GMM-SYS	GMM-DIF	GMM-SYS	GMM-DIF	GMM-SYS	GMM-DIF	GMM-SYS	GMM-DIF	GMM-SYS	GMM-DIF	GMM-SYS
CAP1$_{t-1}$	0.7372 ***	0.9687 ***	0.7297 ***	0.6978 ***	0.6907 ***	0.9422 ***	0.7240 ***	0.9210 ***	-0.0132	0.3178 ***	0.5815 ***	0.8071 ***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.844)	(0.001)	(0.000)	(0.000)
ΔRISK$_t$	0.0231 ***	0.0193 **	0.0202	-0.0118	0.0316 ***	0.0386 ***	0.0178 ***	0.0270 ***	-0.0092	-0.0010	0.0621 ***	0.0600 ***
	(0.002)	(0.032)	(0.184)	(0.679)	(0.000)	(0.000)	(0.002)	(0.000)	(0.912)	(0.991)	(0.007)	(0.007)
ΔRISK$_t$*REG$_t$	-0.0071	-0.0011	-0.0503	-0.0019 *	-0.0173	-0.0430 ***	-0.0183 *	-0.0244 *	0.0150	-0.0172	-0.0463 **	0.0399
	(0.447)	(0.910)	(0.375)	(0.063)	(0.113)	(0.000)	(0.096)	(0.067)	(0.888)	(0.877)	(0.050)	(0.113)
ROA$_t$	0.4471 ***	0.7458 ***	-1.0780	-0.4955	0.2522 **	0.6964 ***	0.4441 ***	0.6764 ***	0.4570	0.3592	-0.0546	0.0281
	(0.000)	(0.000)	(0.287)	(0.477)	(0.026)	(0.000)	(0.005)	(0.000)	(0.258)	(0.277)	(0.562)	(0.814)
BDR$_t$	0.0003	0.0020 *	-0.0882	-0.0156	-0.0027	0.0042 ***	0.0134 **	0.0050 **	-0.1677 **	-0.1910 ***	0.0046	0.0030
	(0.924)	(0.090)	(0.266)	(0.344)	(0.659)	(0.001)	(0.012)	(0.026)	(0.031)	(0.001)	(0.543)	(0.524)
PROV$_t$	0.1116 ***	0.1023 ***	0.2671 ***	0.1660 ***	0.1423 ***	0.1401 ***	0.1072 **	0.1745 ***	0.1330	-0.3534	0.1461	0.0626
	(0.000)	(0.001)	(0.000)	(0.010)	(0.000)	(0.000)	(0.045)	(0.001)	(0.777)	(0.483)	(0.114)	(0.565)
REG$_{t-1}$	-0.0005 *	-0.0001	0.0002	-0.0019 ***	-0.0003	0.0004	-0.0007 *	-0.0001	-0.0339 **	-0.0089	-0.0017	-0.0023
	(0.055)	(0.666)	(0.757)	(0.007)	(0.438)	(0.114)	(0.086)	(0.763)	(0.022)	(0.562)	(0.445)	(0.291)
SIZE$_t$	0.0029 **	0.0005 ***	-0.0308	-0.0028 ***	-0.0059 ***	-0.0006 ***	-0.0005	-0.0017 ***	-0.1196 ***	-0.0364 ***	-0.0057 **	-0.0012 *
	(0.019)	(0.006)	(0.160)	(0.000)	(0.000)	(0.001)	(0.733)	(0.000)	(0.000)	(0.000)	(0.019)	(0.077)
MERG$_t$	-0.0005	0.0002	0.0072	0.0015 ***	0.0023 ***	0.0016 ***	0.0011 ***	0.0015 ***	0.0149	0.0234 **	0.0003	0.0000
	(0.268)	(0.573)	(0.106)	(0.003)	(0.000)	(0.000)	(0.003)	(0.000)	(0.144)	(0.030)	(0.899)	(0.998)
Constant	0.0002 **	-0.0128 ***	0.0012 *	0.0809 ***	0.0009 ***	0.0094 **	-0.0002	0.0312 ***	0.0101 ***	0.8805 ***	0.0005 *	0.0346 *
	(0.018)	(0.002)	(0.051)	(0.000)	(0.000)	(0.043)	(0.410)	(0.000)	(0.000)	(0.000)	(0.098)	(0.055)
No. of obs.	3,986	4,568	13,570	15,602	13,529	15,556	3,662	4,213	1,717	1,969	1,118	1,281
No. of banks	578	578	2.032	2.032	2.027	2.027	551	551	252	252	163	163
Sargan test	0.425	0.002	0.000	0.000	0.000	0.000	0.035	0.104	0.110	0.601	0.998	1.000
AR(1) test	0.000	0.000	0.001	0.014	0.000	0.000	0.000	0.000	0.002	0.002	0.000	0.000
AR(2) test	0.799	0.880	0.013	0.585	0.360	0.497	0.832	0.760	0.380	0.949	0.371	0.304

Note: The dependent variable *CAP1$_{j,t}$* is defined as the book value of equity capital over total assets. Time dummies are included in each regression but are not reported. GMM-DIF and GMM-SYS refer to the GMM difference estimator suggested by Arellano and Bond (1991) and Blundell and Bond (1998), respectively. Accordingly, all variables are first-differenced. As recommended by Arellano and Bond (1991), one-step results are presented, whereas the Sargan test refers to the two-step estimation results. AR(1) and AR(2) are the tests of first and second order autocorrelation in the residuals. p-values are in parentheses. We report p-values on the basis of robust standard errors. *, **, *** indicate significance at the 10%, 5% and 1% levels, respectively.

Table 2b: Dynamic GMM-regression for $CAP2_{j,t}$

	Savings banks		*Cooperative banks*						*Other banks*			
	All		All		Moderately capitalised		Largest coop. banks		All		Moderately capitalised	
	GMM-DIF	GMM-SYS	GMM-DIF	GMM-SYS	GMM-DIF	GMM-SYS	GMM-DIF	GMM-SYS	GMM-DIF	GMM-SYS	GMM-DIF	GMM-SYS
$CAP2_{t-1}$	0.5891 ***	0.9931 ***	0.7246 ***	0.7068 ***	0.3632 ***	0.9249 ***	0.6775 ***	0.9596 ***	-0.0185	0.3394 ***	0.4774 ***	0.8195 ***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.786)	(0.000)	(0.000)	(0.000)
$\Delta RISK_t$	0.0586 ***	0.0752 ***	0.0425 **	0.0141	0.0502 ***	0.0303	0.0373 ***	0.0563 ***	-0.0170	0.0244	0.0427 ***	0.0575 ***
	(0.000)	(0.000)	(0.014)	(0.628)	(0.000)	(0.179)	(0.000)	(0.000)	(0.800)	(0.758)	(0.008)	(0.005)
$\Delta RISK_t*REG_t$	-0.0376	-0.0633 *	-0.0665	-0.1055 **	-0.0374	-0.0383	-0.0531 ***	-0.0681 ***	0.0022	-0.1114	-0.0392	-0.0575 *
	(0.229)	(0.064)	(0.328)	(0.021)	(0.017)	(0.335)	(0.002)	(0.001)	(0.981)	(0.236)	(0.181)	(0.059)
ROA_t	0.7623 ***	0.5745 ***	-0.8684	-0.6081	0.1530	0.5651 ***	0.6548 ***	0.6489 ***	0.5470	0.6109 *	0.0653	0.0995
	(0.000)	(0.000)	(0.459)	(0.464)	(0.357)	(0.000)	(0.005)	(0.000)	(0.191)	(0.085)	(0.400)	(0.302)
BDR_t	-0.0351 ***	-0.0004	-0.1101 *	-0.0236 *	-0.0333 ***	-0.0085 **	0.0161 *	-0.0026	-0.1323 *	-0.1829 ***	-0.0091	0.0031
	(0.001)	(0.753)	(0.100)	(0.096)	(0.000)	(0.022)	(0.051)	(0.119)	(0.073)	(0.002)	(0.349)	(0.593)
$PROV_t$	0.2788 ***	0.1619 **	0.3692 ***	0.2321 *	0.3593 ***	0.2665 ***	0.1472 **	0.2873 **	0.3495	0.0401	0.1935 **	0.0157
	(0.001)	(0.023)	(0.003)	(0.087)	(0.000)	(0.000)	(0.036)	(0.020)	(0.410)	(0.945)	(0.046)	(0.887)
REG_{t-1}	-0.0039 ***	0.0042 ***	0.0006	-0.0020 **	-0.0023 ***	0.0003	-0.0009	0.0025 ***	-0.0375 ***	-0.0118	-0.0042	-0.0014
	(0.000)	(0.000)	(0.273)	(0.019)	(0.002)	(0.742)	(0.118)	(0.000)	(0.005)	(0.355)	(0.245)	(0.669)
$SIZE_t$	0.0077 **	0.0000	-0.0289	-0.0026 ***	-0.0098 ***	-0.0006	0.0081 ***	-0.0001	-0.1310 ***	-0.0342 ***	-0.0096 ***	-0.0011
	(0.018)	(0.611)	(0.146)	(0.000)	(0.000)	(0.198)	(0.007)	(0.558)	(0.000)	(0.000)	(0.000)	(0.139)
$MERG_t$	-0.0009	0.0007	0.0069 *	0.0011	0.0032 ***	0.0012 ***	-0.0005	0.0008 ***	0.0268 **	0.0282 **	0.0023	0.0002
	(0.363)	(0.342)	(0.058)	(0.127)	(0.000)	(0.000)	(0.425)	(0.004)	(0.026)	(0.025)	(0.403)	(0.952)
Constant	-0.0003	0.0004	0.0007	0.0851 ***	0.0010 ***	0.0212	-0.0005	0.0045	0.0106 ***	0.8347 ***	0.0010 ***	0.0348 *
	(0.591)	(0.877)	(0.021)	(0.000)	(0.000)	(0.142)	(0.185)	(0.298)	(0.000)	(0.000)	(0.001)	(0.063)
No. of obs.	3,986	4,568	13,570	15,602	13,529	15,566	3,662	4,213	1,717	1,969	1,118	1,281
No. of banks	578	578	2,032	2,032	2,027	2,027	551	551	252	252	163	163
Sargan test	0.065	0.000	0.000	0.000	0.000	0.000	0.191	0.132	0.219	0.600	1.000	1.000
AR(1) test	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.002	0.000	0.000
AR(2) test	0.342	0.224	0.003	0.513	0.194	0.941	0.185	0.043	0.360	0.946	0.550	0.322

Note: The dependent variable $CAP2_{j,t}$ is a proxy variable for total capital over total assets. Time dummies are included in each regression but are not reported. GMM-DIF and GMM-SYS refer to the GMM difference estimator suggested by Arellano and Bond (1991) and Blundell and Bond (1998), respectively. Accordingly, all variables are first-differenced. As recommended by Arellano and Bond (1991), one-step results are presented, whereas the Sargan test refers to the two-step estimation results. AR(1) and AR(2) are the tests of first and second order autocorrelation in the residuals. p-values are in parentheses. We report p-values on the basis of robust standard errors. *, **, *** indicate significance at the 10%, 5% and 1% levels, respectively.

Table 3a: Medians of proxy Tier1 capital over risk weighted assets (CRWA3) for banks without and with subordinate debt

	subordinate debt=0		subordinate debt>0	
	obs.	median	obs.	median
all banks	13,064	0.0774	11,933	0.0622
sav. banks	983	0.0736	4,159	0.0596
coop. banks	10,908	0.0763	6,726	0.0634
other banks	1,173	0.1454	1,048	0.0697

Table 3b: Subordinate debt issue by different banking groups

	Coef.	P-value
$CRWA3_{t-1}$	-0.1598	0.00
$SB*CRWA3_{t-1}$	-5.3580	0.00
$CB*CRWA3_{t-1}$	-2.7940	0.00
Constant	0.4253	0.00
obs. (banks)	11,932 (1,587)	
R^2 within/betw./overall	0.12 / 0.05 / 0.02	

Note: These are fixed effects regression results of subordinate debt over proxy Tier 1 capital on $CRWA3_{t-1}$. $CRWA3_{t-1}$ denotes lagged proxy Tier 1 capital over risk-weighted assets. We differentiated between savings banks (SB) and cooperative banks (CB) by interaction with $CRWA3_{t-1}$. Time dummies are included, but not reported. Only banks with outstanding subordinate debt are taken into account.