Peer Monitoring on internal capital markets? Empirical evidence from German cooperative banks

Abstract:

Market discipline or Peer Monitoring is supposed to complete official supervisors in improving financial stability. What seems to be obvious for the governance of shareholding companies, for instance, is a special issue for cooperative banks. The objective of this paper is the evaluation of market forces within closed giro systems by conducting an empirical analysis of 1,034 German cooperative retail banks and especially of the operations of their capital market from 1999-2013. The research question is as follows: Does Peer Monitoring exist and is it influenced by the ownership structure of the German cooperative banking network? The analysis' contributions are: First, the provision of evidence on monitoring on internal capital markets; second, the support of the understanding of the Net Governance and its disciplining mechanisms, and third, the deep insight into the German banking system. By using dynamic panel data techniques, there are three main findings: (i) The cooperative central banks exert market discipline or Peer Monitoring by the internal capital allocation. (ii) This allocation sets incentives against moral hazard behavior. (iii) possible intra-political influence does not determine this capital allocation.

Keywords: Cooperative banks, governance, regulation, market discipline

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1. Introduction

The third pillar of the Basel regulatory framework intends to enhance market discipline through extended disclosure requirements. The motivation is to complete supervisory authorities to force banks to reduce risks on their balance sheets. But market discipline or Peer Monitoring is not the main objective of internal capital markets. It is rather the supportive provision of capital to its member institutions and therefore the naming as a 'market' can be misleading. SCHARFSTEIN/STEIN 2000 demonstrate with their model that an allocative efficiency of the capital distribution is no fundamental feature for internal capital markets. In order to prevent contagious insolvencies, the allocation obeys rather the rules of a cross-subsidizing of weaker members. SCHARFSTEIN/STEIN 2000 call this allocative procedure "socialism", although GOPALAN ET AL. 2007 show with their analysis that altruism is not at all the motivation. But, if relatively small banks participate only on such closed interbank markets, and not on overall markets, they are no subject to any market discipline and the danger of systemic risk by a large number of small banks surges. This is, among other things, because banks alter their loss absorbing capacity by improving capital buffers – as a result of regulatory requirements – but they do not necessarily reduce their risks on the balance sheet (BCBS 2017). In consequence, banking supervisory authorities are supposed to be completed by market discipline to reduce the perils of an exaggerated risk taking by banks. Whether such complementary forces exist also on the closed capital market of the German cooperative banking group is the essential question of this paper and a so far neglected question in research.

Why are German cooperative banks an interesting object of analysis? The German cooperative banks have a leading position within the German three pillar banking system (FONTEYNE 2007). They got very well through the last financial crisis of 2007/2008 and continued even during the crisis period to supply credit to the economy and thereby saved the German economy from a disastrous shortfall. The two cooperative central banks, which merged in 2016, and two of the larger member banks are classified as systemically important and are directly supervised by the European Central Bank (ECB). The ECB also monitors the institute guarantee scheme of the cooperative group, because it carries the status of a hybrid system due to systemically and non-systemically important members. Due to the fact that analyzes of small retail banks, their organization in networks and its implications are scarce, this paper aims to step in this gap. In this context, the analysis at hand conducts a rigorous empirical investigation of the information and capital allocation, the governance and internal monitoring mechanisms of German cooperative retail banks. Thereby it provides a deep understanding of the governance of the German cooperative banking network. This understanding is interesting for three main reasons. First, the governance mechanisms become even more important when market discipline is rare. German cooperative banks do not participate in overall interbank

markets for which evidence on Peer Monitoring is already provided (e.g. FURFINE 2001, COCCO ET AL. 2009, DISTINGUIN ET AL. 2013). Market discipline by depositors is doubtful due to an institute guarantee scheme and in addition, there is no market for cooperative shares. Thus, if the operations of these credit institutes are only supervised by official authorities – and the apex institution (hereinafter referred to as BVR) – systemic risk becomes relevant, especially when supervisors focus only on microprudential aspects. Thus, cooperative banks play a pivotal role in the question of systemic risk by too many small, interconnected and solvency endangered banks, because the cooperative governance itself tends to organizational network structures. According to the theoretical literature, a money center bank-structure - that is institutionalized within the cooperative interbank market - is particularly vulnerable for relatively small shocks (ROCHET/TIROLE 1996, FREIXAS ET AL. 2000, ALLEN/GALE 2000, ACEMOGLU ET AL. 2015). Even if somebody questions that small banks raise systemic risk, they probably participate in risk of other banks. Following intuition, this is not a problem up to the point of "no excess liquidity" and costly liquidations. Theory (e.g. ACHARYA/YORULMAZER 2007, BROWN/DINC 2011) and historic reality in the United States and Spain demonstrated that a group of relatively small banks with homogenous business models are also able to give rise to systemic risk, if the number of failure is large (Too Many to Fail). So, the unique ownership structure might create additional issues for the capital allocation and for cooperative banks' stability that is not necessarily relevant for other bank types. The other way around, empirical evidence on other bank types is not necessarily meaningful for the understanding of cooperative banking networks. For this reason, this research dares to create a deep empirical insight into the ownership structure of cooperative banks and the interactions and consequences of network's institutions. The analysis of this paper reveals evidence for Peer Monitoring on the internal capital market of German cooperative banks. This is quite striking, because of two reasons. First, the cooperative central banks were once established in order to supply capital to its cooperative member banks (THEURL/KRING 2002), and not to fulfill any function of discipline. Second, other empirical analyses on this question rather confirm the socialism hypothesis of SCHARFSTEIN/STEIN 2000.

Whereas conceptual analyses of the Governance of cooperative banks exist, there are few empirical results on the operation of these financial networks, its institute guarantee scheme, closed interbank market and its very special ownership structure. To put it into a nutshell, analyzes of small retail banks, their organization in networks and its implications are scarce and this paper steps in this gap.

The remainder of this paper is organized as follows. Chapter 2 reviews the theoretical and empirical literature that is relevant for the research question at hand. After that, the institutional background of the German cooperative banking network is described in more detail (chapter 3), to give a better understanding of the hypotheses (chapter 4). The empirical analysis takes place in chapter 5. It consists of the description of the data and the empirical

strategy, as well as of the regression results using system GMM-estimators. Chapter 6 concludes and points out the limitations.

2. Related literature

The first empirical paper of the question, whether banks monitor their peers is presented in 2001 by FURFINE 2001. Afterwards, and leaving the US-American money market, on which credit institutions are probably a complementary source of supervision (FURFINE 2001), there are studies on Peer Monitoring for Italy (ANGELINI ET AL. 2011), Portugal (COCCO ET AL. 2009), the Netherlands (LIEDORP ET AL. 2010, BLASQUES ET AL. 2015) or Germany (BRÄUNING/FECHT 2012, BECK 2002). The advantage of such studies with a national focus is the ability to take institutional conditions and their implications better into consideration. Whereas European (SIRONI 2003, TINTCHEV 2013) or other cross-country studies (e.g. NIER/BAUMANN 2006) evolve a broad understanding or comparisons among countries. However, this is at the expense of institutional accuracy. The literature focuses every so often on complete market structures and often neglects intra-group trading, probably assuming that there does not exist Peer Monitoring anyway. Studies that evaluate interbank markets do not exclusively focus on Peer Monitoring, but are dedicated to questions like the importance of relationships (BLASQUES ET AL. 2015, BRÄUNING/FECHT 2012, CRAIG ET AL. 2014) or the likelihood of contagion (LANG/STULZ 1992, LEITNER 2005, MEMMEL/SACHS 2013). Relationships between banks are specifically important for small credit institutes to get access to market liquidity. Furthermore, relationships enable all banks to achieve cost degression of otherwise costly Peer Monitoring. Recent studies consider the financial crisis of 2007 that triggered a higher fragmentation of the European money market. Anyway, banks are still internationally monitored by their peers (TINTCHEV 2013, DE ANDOAIN ET AL. 2014), although international monitoring is not as efficient as national monitoring (FREIXAS/HOLTHAUSEN 2005, LIEDORP ET AL. 2010).

Regarding market discipline on interbank markets, another important aspect seems to play a non-negligible role: Government bailouts. It seems straightforward that market participants anticipate whether governments bail out their (systemically important) banks during crises. Thus, this guarantee effect means a reduction of Peer Monitoring by banks on money markets (NIER/BAUMANN 2006, DISTINGUIN ET AL. 2013). Such government crisis measures result in lower interest rate for relatively big banks, i.e. bigger than 1 bn. US-Dollar
of total assets (FURFINE 2001), that is equivalent to the advantageous effects of implicit guarantees on capital markets (O'HARA/SHAW 1990). This implicit or explicit guarantee effect is accompanied by an effect based on the trustworthiness of official authorities. If trust in official institutions is high, market discipline is undermined (DEMIRGÜC-KUNT/DETRAGIACHE 2002, FLANNERY 2001). Adverse effects on Peer Monitoring cannot be created only by governmental actions, but as well by deposit insurance schemes. If banks enjoy the protection of this component of safety nets, the banks themselves have the incentives to moral hazard on

the one hand, and their peers might regard interbank deposits as protected, so they do not have any incentive to monitor, on the other hand. Nevertheless, explicit deposit or institute guarantee schemes might even provide incentives for market discipline. Although this argument does not appear reasonable at first sight, it is evolved and empirically validated by GROPP/VESALA 2004. The authors argue that explicit insurances also exclude explicitly interbank liabilities from the insurance coverage and therefore, maintain incentives for Peer Monitoring.

The evidence of Peer Monitoring on interbank markets cannot be transferred easily on internal capital markets, which are usually determined by only a fixed number of participants and a static organizational structure. In contrast to the empirical evidence of Peer Monitoring on interbank markets, the theoretical and empirical literature of internal capital markets sheds a different light on the question of disciplining forces. These markets often reveal a centralized organizational structure, i.e. the capital allocation is frequently organized via a central entity or a money center bank. An intra-group credit granting is nothing exclusive to banking or banking networks, but a common process in other industries and especially in holdings or conglomerations that pursue an efficient capital allocation within larger organizational entities (WILLIAMSON 1975). To put it empirically differentiable, the more efficient and profitable sub-entities are supposed to receive the demanded capital more likely than other divisions. There is some evidence for this allocative efficiency on internal capital markets for US-American department stores, i.e. the authors do not identify any cross-subsidizing of unprofitable divisions (KHANNA/TICE 2001). Contrary to that, there are also papers that deal with the already mentioned socialistic behavior and moreover, with Rent Seeking (SCHARFSTEIN/STEIN 2000, MEYER ET AL. 1992). For these theoretical elaborated results exits also empirical evidence (OZBAS/SCHARFSTEIN 2010, GOPALAN ET AL. 2007, SHIN/STULZ 1998, CREMERS ET AL. 2011). But the subsidizing does not occur for altruistic reasons at all, but due to negative spillovers of the first insolvency on all other member entities (GOPALAN ET AL. 2007). The idea that member entities exert their potential influence on the center bank within the corporate structure to receive more capital is examined by CREMERS ET AL. 2011. According to CREMERS ET AL. 2011, there exist intra-political influence in a cooperative banking group.[1] The outcomes indicate that for less profitable members the application of intra-political influence is more likely a tool of action because of lower opportunity cost. Apart from these negative aspects, internal capital markets extend the opportunities of credit refinancing for banks by deposit smoothing. They widen the restrictions of external financing restrictions what possibly results in a higher degree of financial intermediation. At least, the intermediation process is more independent of the own cash flow (HOUSTON ET AL. 1997, HOUSTON/JAMES 1998). A successful deposit smoothing

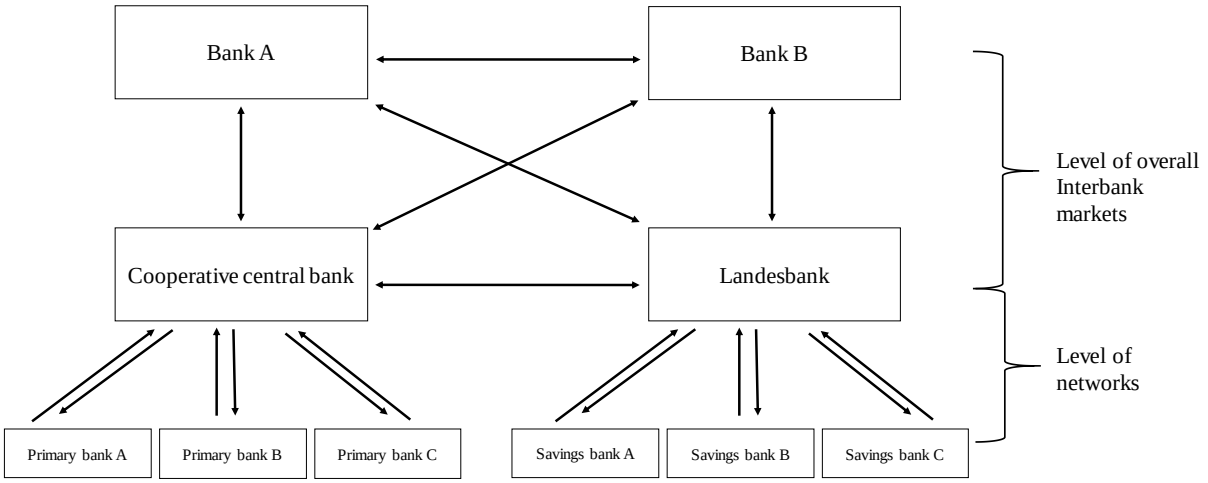
[1] Due to a confidential agreement, the identity of the group is not further specified.

has implications for monetary policy, because the connection of monetary policy and banks' credit behavior might be weakened, and monetary impulses are not directly transmitted anymore (CAMPELLO 2002). To sum up, the evidence of Peer Monitoring on internal capital markets is not as clear as it first appears. Therefore, the following chapters address the question of Peer Monitoring on the internal market of German cooperative banks, of intra-political influence during the capital allocation process based on the ownership structure and additionally evaluate the existence of incentives to beat moral hazard.

3. Institutional background

As already mentioned, internal capital markets are often characterized by a money center bank-structure, and so does the internal market of German cooperative banks. The cooperative central banks which merged in 2016, are in charge of group clearing and group refinancing (ALTUNBAS ET AL. 2001, THEURL/KRING 2002). The central banks[2] themselves are actively transacting on both the cooperative interbank market and the general interbank or international capital markets. By doing so, they connect the primary level with the larger international markets (see illustration 1).

Illustration 1: Structure of the German interbank market
(reference: Upper/Worms, 2002, p. 13)



The level of financial networks consists of a primary level which are the relationships between the members (owners) and the regional cooperative bank. Whereas the secondary level defines the organizational and financial connection between the primary banks and the respective cooperative central bank. Until the merger of the last two central banks, each of them has been a partner for a geographically defined area of primary banks. All banks of both organizational levels are members of the institute guarantee scheme, which is managed by the apex institution, namely the BVR (*Bundesverband der Volksbanken und Raiffeisenbanken*). The

[2] I use the plural here, because for the period of this analysis, 1999 – 2013, there exists both entities.

apex is not part of the mutual financial interlinkages but collects the levies from the member banks for the institute protection scheme. Furthermore, it is responsible for the supervision of the implementation of the statutory guidelines of the guarantee scheme and measures in cases of solvency problems or instabilities of the member institutes.

On the one hand, the membership in a deposit or institute guarantee scheme is legally compulsory by European and German legislation, and on the other hand by the cooperative network itself (BVR Statute of the Institute Guarantee Scheme). The cooperative banks' institute guarantee scheme exists since 1934 and its previous levying of flat-rate contributions was reformed in 2002/2003. The reason for this reform was a large and escalated number of rescue operations. Whereas in the longtime, on average 20 banks has been compelled to fall back on the guarantee scheme, in 2002 already 25 institutes and in 2003 175 credit cooperatives needed its support. Lawsuits from member banks against the flat-rate calculation followed and as a consequence, also the supervisory authorities requested for improvement of the overall risk situation of the network (SCHÖNING/NOLTE 2005). Consequently, since 2004 a risk-based calculation for the financial contributions is applied. Corrective and especially preventive actions by the apex were and still are targeted to avoid an insolvency of any member bank, which in turn could lead to instability and distrust of the whole network. The overall volume of the guarantee scheme consists of a guarantee funds and of guarantee obligations of payments from the member banks. The funds comprises the sum of annually collected charges, whereas the guarantee obligations are to be realized, if in case of emergency, the funds are insufficiently equipped. In this way, there is an ex ante and an ex post financing procedure, if the BVR aims to avoid insolvencies. The mandatory individual risk-based contributions (MC) to the funds are calculated according to the following formula:

$$\mathrm{MC} = \varphi \rho_i X_i \qquad \text{(F1)}$$

The coefficient φ describes the basic contribution rate (in German: Grunderhebungssatz) of 0.4 per mill or 0.5 per mill (see here and henceforth BVR Statute of the Institute Guarantee Scheme §4 and §5 ff.). This differentiation is based on the method of calculating the requirements of equity, i.e. the credit risk standardized approach or the internal rating-based approach. This coefficient is multiplied with the basis, X_i. Since the beginning of 2015, the basis is calculated on the sum of risk-weighted assets, of which network internal assets are subtracted. The coefficient ρ_i is the internal rating of the individual credit cooperative. It contains the information on several key figures that are supposed to represent different dimensions of risk. These risk indicators were identified during the review process of the flat rate contribution as essential for the high surge of troubled member cooperatives.

Table 1 provides an overview of the applied key figures and their weights to calculate the ratings. There are several pieces of private information used, especially concerning the risk indicators, which are evaluated by internal revisions.

Table 1: Ratios applied by the cooperative apex institution for calculating annual contributions of member banks (source: European Commission 2008, p.19)

Category	Factor	Definition	Weight
Capital structure	Capital	$\frac{\text{Retained capital}}{\text{Total assets}}$	20 %
	Tier 1-Capital	$\frac{\text{Tier 1} - \text{Capital}}{\text{Risk} - \text{weighted assets}}$	15%
Income structure	Operating Income	$\frac{\text{Operating income} - \text{Unrealised trading losses}}{\text{Average business volume}}$	15%
	Cost income	$\frac{\text{Personnel and admin. expenses}}{\text{Gross profits}}$	10%
	Risk revenue/expenses	$\frac{\text{Net risk result of credit business}}{\text{Gross profits}}$	20%
Risk structure	Blank credit I	$\frac{\text{Unsecured portion of not} - \text{prime loans}}{\text{Retained capital}}$	7,5%
	Blank credit II	$\frac{\text{Unsecured portion of not} - \text{prime loans}}{\text{Earnings before risk adjustments}}$	7,5%
	Segment concentration	$\frac{\text{Largest credit volume to a business sector}}{\text{Client credit volume}}$	5%

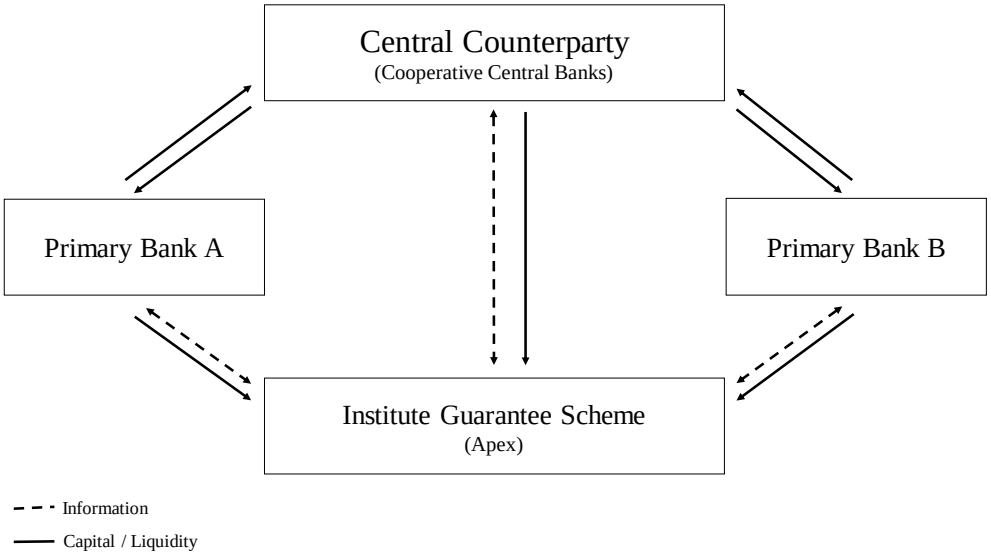
These individual indicator-based assessments are converted into a rating scale, which leads to surcharges or discounts on the individual contribution (see table 2).

Table 2: Rating classes and corresponding surcharges or discounts for member banks (based on BVR Statute of the Institute Guarantee Scheme §4).

Rating classes	Portion of the annual contribution ρ_i (in %)
A++	80
A+, A	90
A-, B+, B	100
B-	110
C	120
D	140

The rating assessment is highly confidential and only delivered to the executive board of the respective primary bank and the boards of the cooperative central banks, respectively (see illustration 2).

Illustration 2: Scheme of information and capital allocation within the cooperative banking network



Therefore, the apex institution does not only manage the assets of the guarantee funds, but it also supervises the banks among others to fulfil financial obligations and to initiate rescue operations, if necessary. This is possible, among other things, because of the legal right on information of the bank's financial condition and a wide-ranging powers of intervention. If a credit cooperative does not fulfil its obligations, the apex institution is obliged to inform the German national supervisory authorities (i.e. Bundesanstalt für Finanzdienstleistungsaufsicht and Deutsche Bundesbank). Furthermore, and at the extreme of non-fulfillment, the apex is authorized to sanction a primary bank by excluding it from the institute guarantee scheme. Previously, no cooperative bank suffers from insolvency. All problem cases so far were solved by mergers with geographical near located banks, what can also be regarded as market exit. The apex institution works discreetly, so that solvency problems often did not become public until the merger was complete.

4. Hypotheses

This paper addresses the key question, whether the change of the information allocation by the adjustment to a risk-based contribution scheme leads to a change in the capital allocation that can be identified as Peer Monitoring. In this context, the further question of intra-network influence by the member banks aims at the potential weakening of such a Peer Monitoring. The idea of intra-political influence, if possible, is especially important for cooperative networks due to their bottom up ownership structure. By answering these questions, the analysis contributes to the empirical literature which often leaves out such special markets or systems, or which is imprecise in the descriptions of institutional frameworks and relationships. Additionally, this paper reveals information on the utilization of private information within networks and gives implications whether supervisory authorities must

substitute market forces. In consequence, if the cooperative central banks only redistribute liquidity, the idea to rely on market discipline does not work out for this type of banks.

There are several reasons why to assume a non-existence of Peer Monitoring on cooperative interbank markets. First, the central banks are by statute founded to provide the primary banks with liquidity (THEURL/KRING 2002). Therefore, it seems to be their duty to offer liquidity coinsurance to their owners. Secondly, the fact that the cooperative central banks refinance themselves by the excess liquidity of the primary banks might be another point against the existence of any Monitoring. This source of liquidity is emphasized as extraordinarily important and stable in the rating reports of the central banks (e.g. STANDARD & POOR'S 2015a, FITCHRATINGS 2013b, MOODY'S 2015). And if the owners give credit, it is questionable whether the debtor exercises discipline on them (DINC 2006).

But these ratings are at once the flipside of the coin and may be an incentive for the cooperative central banks to apply discipline. If the central banks provide the primary banks with liquidity (group refinancing), they depend on good positions on capital markets and in turn on good ratings. The agencies rate the individual central bank, but these assessments include the constitution of the whole cooperative network, the Governance and the institute guarantee scheme (e.g. STANDARD & POOR'S 2013, STANDARD & POOR'S 2015, STANDARD & POOR'S 2015b, FITCHRATINGS 2013a). This economic perspective makes the aggregate financial standing of the primary banks crucial for the cooperative central banks' positions on capital markets. Thus, there is a rationale why the cooperative central banks monitor the primary banks. Additionally, information on creditworthiness come at low cost in networks (CALOMIRIS/KAHN 1996), and especially the German cooperative central banks do not use a lot of resources for otherwise costly monitoring. The apex institution delivers the ratings, which are used for the calculation of the institute guarantee scheme contributions, to the central banks. Furthermore, the resources of the guarantee funds are exhaustible and the central banks themselves, or to be more precise the DZ Bank, already needed the funds to avert a financial disaster in 2002. Thus, another motivation for Peer Monitoring might be the protection of these funds for own crisis periods from the (unnecessary) burden of passive risk policy by the primary banks.

To finish, although to date an institute guarantee scheme exists, interbank deposits are legally excluded from the insurance. Additionally, the charter of the scheme denies any legal right of the primary banks of financial supportive actions by the scheme (BVR Statute of the Institute Guarantee Scheme §36). Hence, the central banks can anticipate potential survivorship, but they do not have any guarantee, so that the cooperative central banks consider different key risk indicators of the individual primary banks for distributing long term liquidity on the cooperative interbank market. Therefore, the first hypothesis is as follows:

H1 (Monitoring Hypothesis): The growth rate of interbank liabilities correlates significantly with financial risk indicators of the primary bank.

Analyses that deal with banks, often consider the special role of size of the institute. As already mentioned, relatively big banks enjoy lower yields on interbank markets, which might lead to moral hazard behavior. But this fact does not apply only to big banks. DAM/KOETTER 2012 reveal that the relatively small German cooperative banks are responsible for the overall moral hazard behavior in this banking group. And it was this behavior, which triggered the reform of the contribution calculation. Before 2002/2003 the banks had been paying flat-rate premiums for the funds, what gave rise to mismanagement, risky credit policies, limited assessments of specific markets, and of course to an exceptionally high number of credit institutions in need of rescue (SCHÖNING/NOLTE 2005). This problem is supposed to be addressed by risk-based contributions since 2004. Nevertheless, the smaller banks are rather likely net-creditors of the central banks and play a determinant role for their liquidity supply. Their problems might be considered as more resolvable via the apex institution. Consequently, the following hypothesis is examined:

H2 (Moral Hazard Hypothesis): The growth rate of interbank liabilities of relatively small cooperative primary banks, i.e. banks smaller than 1 bio. Euro of total assets, does not correlate significantly with financial risk indicators.

The primary banks are shareholders of the cooperative central banks. Hence, they are represented in the supervisory boards and have thereby the opportunity to influence overall policies (EIM 2007). The idea of intra-political influence on the internal capital allocation is especially important for cooperative networks due to their bottom-up ownership structure. The consideration of the cooperative ownership structure contributes to empirical evidence of governance mechanisms of cooperative networks and reveals benefits as well as challenges. This is not unimportant for practical reasons, because no governance structure per se is good or bad (SHLEIFER/VISHNY 1997), but bad governance can become a market related problem. As we have theoretical as well as empirical evidence of intra-political influence (OZBAS/SCHARFSTEIN 2010, GOPALAN ET AL. 2007, SHIN/STULZ 1998, CREMERS ET AL. 2011), the next hypothesis is inspected in order to answer the research questions:

H3 (Influence Hypothesis): The growth rate of interbank liabilities correlates significantly positive with the approximated potential influence c.p. of the primary bank on the cooperative central bank.

5. Empirical strategy and results

The empirical tests of the formulated hypotheses are based on an unbalanced panel data set of 1,034 German cooperative primary banks, with a longitudinal dimension from 1999 to 2013 (T=15). The data points comprise the information from the balance sheets and earning statements of the annual financial statements. Mergers are taken into consideration by totaling all data of the affected institutes and by creating a third artificial bank for the whole period of study. So, this procedure avoids double counting. If mergers are strictly interpreted as market exist, the results calculated on the basis of this panel, suffer from a survivorship bias. If the absence of legal insolvencies is stressed, the results does not suffer from such a bias.

The formal definition of market discipline or Peer Monitoring $y = f(X_k)$ is econometrically specified by:

$$\Delta y_{it} = \alpha_0 + \varphi \Delta y_{i,t-1} + \beta_k X_{k,i,t-1} + \theta_i + \lambda_t + u_{it} \qquad \text{(F2)}$$

$$\text{with } u_{it} \sim N\ (0;\ \sigma^2)$$

whereby $\Delta y_{i,t}$ denotes the growth rate of interbank liabilities defined by the difference of the logarithms of interbank liabilities with maturity or notice period of primary bank $_i$ at time $_t$. $\Delta y_{i,t-1}$ is the dependent variable with one time lag to integrate dynamic effects and to consider the inertia of balance sheet data. $\mathbf{X}_{k,i,t-1}$ is a variable set of bank fundamentals (s. table 1) that are evaluated by the apex institutions and communicated to the cooperative central banks. The variables that consider different liquidity aspects are not part of the internal rating, but of the frequently used CAMEL-indicators in the academic literature. The table also displays the expected signs of the respective estimator in line with the concept of market discipline. β_k or φ denotes the value or the vector of the estimated parameters, respectively. θ_i or λ_t describe entity- and time fixed effects, respectively.

The econometric strategy is based on dynamic panel data techniques and on system GMM (Generalized Method of Moments)-estimators for two reasons. First, the use of dynamic effects seems plausible due to the inertia of balance sheet data, and to take adjustment effects of the respective variable into account. Second, the problem of endogeneity, i.e. $E\left(corr\ (X_b \mid u_i)\right) \neq 0$, cannot be totally solved by the integration of time lags of the independent variables. Thus, standard errors would be underestimated, and statistical inference misinterpreted. For this reason, dynamic panel data estimators are applied, e.g. (ARELLANO/BOVER 1995, BALTAGI 2013), which do not reveal these problems of inference. But instead of using the *first difference* as an instrument, the two step *system General Method of Moments (GMM)* or *forward orthogonal estimators* are applied to this panel data set, as it is recommended with unbalanced

panels (ROODMAN 2009). In this context, WINDMEIJER 2005-robust standard errors are applied, in order to avoid the problem of NICKELL 1981-bias by the two step calculations.

Table 3: Definitions of variables

	Dependent variable			
	Abbreviation	**Factor**	**Definition**	
	InterbankD	Approx. Percentage growth rate of interbank term liablities	$\ln(\text{Interbank liabilities with aggred term or notice})_t - \ln(\text{Interbank liabilities with aggred term or notice})_{t-1}$	
	Bank fundamentals			
Assigning to apex rating classes				**Expected sign**
Capital structure	**Kap**	Capital ratio	$\frac{\text{Retained capital}}{\text{Total assets}}$	$\hat{\beta} > 0$
Income structure	**RoE**	Return on equity	$\frac{\text{Annual net profit}}{\text{Retained capital + funds for general banking risk}}$	$\hat{\beta} > 0$
	CIR (modified)	Cost-income-ratio	$\frac{\text{Personnel and admin. expenses}}{\text{Interest income}}$	$\hat{\beta} < 0$
	Earnings	Earnings	$\frac{\text{Interest income}}{\text{Loans to customers}}$	$\hat{\beta} > 0$ / $\hat{\beta} < 0$
Risk structure	**Risk**	Approx. shortfall of credits	$\frac{\text{Depreciation and value adjustments for reporting purposes}}{\text{Loans to customers}}$	$\hat{\beta} < 0$
	dlogCredit	Credit growth	$\ln(\text{loans to customers})_t - \ln(\text{loans to customers})_{t-1}$	$\hat{\beta} > 0$ / $\hat{\beta} < 0$
	eCredit	Excessive credit growth	$\Delta\text{Loans to customers}_{it} - \frac{1}{n}\sum_{i=1}^{n}\Delta\text{Loans to customers}_t$	$\hat{\beta} > 0$
Academic literature	**CustomerDeposits**	Growth rate of customer Deposits	$\Delta\left(\frac{\Sigma\text{ Liabilities to customers}}{\text{Total assets}}\right)_{it}$	$\hat{\beta} < 0$ / $\hat{\beta} > 0$
	Liquidity	Liquidity ratio	$\frac{\text{Cash balance + balances held at central banks}}{\text{Total assets}}$	$\hat{\beta} > 0$
	Structure	Credit-deposit-ratio	$\frac{\sum\text{ Loans to customers}}{\Sigma\text{ Liabilities to customers}}$	$\hat{\beta} < 0$ / $\hat{\beta} > 0$

Moreover, the following control variables are integrated into the regressions: The logarithm of total assets (size) for any size-specific effects, the difference between claims and liabilities (ForVer) for demand-effects of the primary banks, and apart from time fixed effects for the control of macroeconomic developments, dummy variables for the years of the financial crisis (2007, 2008, 2009 =1 and 0 otherwise) are additionally integrated.

Before presenting the regression results, the next table shows the descriptive statistics and the transformations applied to approximate a normal distribution of the variables (s. table 1).

Table 4: Descriptive Statistics

Variable	Observations	Mean	Std. Dev.	Min.	Max.	1%-percentile	50%-percentile	99%-percentile	transformation
InterbankD	14.061	0,015	0,250	-4,257	4,845	-0,673	0,008	0,784	none
InterbankQuote	15.195	0,132	0,066	0,000	0,874	0,014	0,126	0,336	none
dailyInterbankQuote	15.173	0,002	0,009	0,000	0,206	0,000	0,000	0,045	none
Kap	15.195	0,043	0,016	0,000	0,173	0,014	0,040	0,091	none
RoE	15.160	0,072	0,061	-1,571	1,864	0,003	0,065	0,238	none
CIR	15.195	0,625	0,195	0,097	3,526	0,248	0,595	1,302	logarithm
Earnings	15.195	0,028	0,013	-0,390	0,332	-0,002	0,028	0,055	logarithm
Risk	15.195	0,014	0,010	0,000	0,356	0,001	0,012	0,048	none
Liquidity	15.192	0,022	0,008	0,000	0,117	0,005	0,022	0,045	none
Structure	15.194	1,223	0,646	0,096	37,502	0,460	1,153	2,814	logarithm
CustomerDeposits	14.076	0,028	0,095	-1,787	2,954	-0,096	0,025	0,210	none
dlogCredit	14.076	0,025	0,105	-2,670	3,501	-0,125	0,021	0,215	none
eCredit (in tsd. Euro)	14.076	0	31.274	-443.427	1.112.264	-50.536	-3.171	109.613	none
Total assets (in tsd. Euro)	15.195	485.946	602.167	8.195	4.795.867	26.385	277.498	3.233.503	logarithm

Regarding the correlation matrix (s. table 5), the analysis conducted by a linear regression model might depict the relationships between the growth rate of interbank liabilities and the financial indicators quite appropriate. Moreover, the estimated signs correspond with the expected signs (s. table 1). The bivariate correlations demonstrate that the problem of perfect multi-collinearity is rather less likely. Only the correlations between the credit and the deposit growth rate might be problematic. Therefore, an interaction term of these two variables is integrated which considers this correlation and the potential the relevance of financial intermediation.

Table 5: Correlation matrix

	InterbankD	Kap_{t-1}	RoE_{t-1}	$logCIR_{t-1}$	$Earnings_{t-1}$	$logRisk_{t-1}$	$Liquidity_{t-1}$	$logStructure_{t-1}$	$CustomerDeposits_{t-1}$	$dlogCredit_{t-1}$	$eCredit_{t-1}$
InterbankD	1										
Kap_{t-1}	0.0496***	1									
RoE_{t-1}	0.0197**	-0.0537***	1								
$logCIR_{t-1}$	-0.0376***	0.1729***	-0.0905***	1							
$Earnings_{t-1}$	-0.0801***	0.1869***	-0.0091	0.2959***	1						
$logRisk_{t-1}$	-0.0120	-0.1569***	-0.1799***	0.1122***	0.0271***	1					
$Liquidity_{t-1}$	-0.0214**	-0.1386***	-0.0811***	0.1749***	0.02026***	0.2322***	1				
$logStructure_{t-1}$	-0.0421***	0.0250***	0.0459***	-0.2051***	0.1654***	-0.1693***	-0.0666***	1			
$CustomerDeposits_{t-1}$	-0.1229***	-0.0191**	0.0404***	-0.0454***	-0.0432***	-0.0179**	-0.0053	0.0126	1		
$dlogCredit_{t-1}$	-0.0970***	0.0216**	0.0691***	-0.0603***	-0.0758***	-0.1193***	-0.0693***	0.0873***	0.8250***	1	
$eCredit_{t-1}$	-0.0103	-0.0699***	0.0695***	-0.1770***	-0.1581***	-0.0728***	-0.0441***	0.0973***	0.4543***	0.5551***	1
NB: *** p < 0.01, ** p < 0.05, * p < 0.1, respectively.											

The Pearson coefficients show relatively small correlations here, but the combined effect of the variables can only be verified by multivariate regression analyses. The first system GMM-estimations (s. table 6, regressions (1) and (2)) show that the growth rate of interbank liabilities correlates significantly with the key financial figures of the primary banks. The significant correlations also reveal the expected sign, apart from *Risk*. The coefficient is estimated with a positive instead of a negative sign. Additionally, the *Hansen-Tests* do not all confirm the exogeneity of the constructed instruments. Thus, the capital allocation seems to follow rules of market discipline to a certain extent, but at the same time, the coinsurance function of the cooperative interbank market is important as well. The differentiation of the panel between net creditors and net borrowers on the internal capital market (s. table 6, regressions (3) and (4)) reveals that the results are mainly driven by net borrowers, what is rather intuitive. Regarding the Monitoring Hypothesis, the estimations can confirm that the capital allocations relates to key financial indicators, and thus, the cooperative central banks monitored the primary banks. Nonetheless, this mechanism is combined with an insurance function possibly due to potential spillovers from one entity to another.

Table 6: Regression results I

				net creditor	*net borrower*
		(1)	**(2)**	**(3)**	**(4)**
		System GMM	***System GMM***	***System GMM***	***System GMM***
Variable	*Theory*	*InterbankD*	*InterbankD*	*InterbankD*	*InterbankD*
$InterbankD_{t-1}$	.	-0.0957 (0.0852)	-0.0895 (0.0826)	-0.234** (0.105)	0.0770 (0.123)
Kap_{t-1}	+	1.297** (0.540)	1.531*** (0.526)	-1.581 (1.340)	1.761*** (0.561)
RoE_{t-1}	+	0.0778 (0.269)	0.191 (0.229)	0.255 (0.679)	0.428* (0.227)
$logCIR_{t-1}$	-	-0.0656 (0.0593)	-0.0646 (0.0555)	-0.0255 (0.127)	0.0197 (0.0586)
$Earnings_{t-1}$	+ / (-)	-0.361*** (0.0778)	-0.351*** (0.0790)	-0.166 (0.156)	-0.342*** (0.116)
$logRisk_{t-1}$	-	0.0407** (0.0168)	0.0464*** (0.0172)	0.00553 (0.0347)	0.0531*** (0.0196)
$Liquidity_{t-1}$	+ / (-)	5.287** (2.214)	5.993** (2.404)	8.277* (4.472)	6.159** (2.958)
$logStructure_{t-1}$	-	-0.0416 (0.0419)	-0.0338 (0.0417)	0.0546 (0.0965)	0.0279 (0.0342)
$CustomerDeposits_{t-1}$	- / (+)	0.276 (0.290)	0.115 (0.329)	0.00441 (0.713)	0.127 (0.610)
$dlogCredit_{t-1}$	+ / (-)	-0.364 (0.290)	0.530 (0.332)	0.249 (0.169)	1.382** (0.695)
$CustomerDeposits_{t-1}$ x $dlogCredit_{t-1}$	+		-0.327** (0.153)	-0.154 (0.396)	-0.511** (0.243)
ForVer	.	1.91e-07** (8.12e-08)	1.54e-07** (7.26e-08)		
size	.	0.0433* (0.0242)	0.0469** (0.0231)	0.0100 (0.0515)	-0.00110 (0.0360)
Observations		12,951	12,951	3526	9425
Number of entities		1,028	1,028	613	982
F-Test		22.02***	21.33***	8.30***	17.06***
Number of instruments		74	81	74	73
Entity fxed effects		yes	yes	yes	yes
Time fixed effects		yes	yes	yes	yes
AR(1) - p-value		0.000	0.000	0.001	0.000
AR(2) - p-value		0.069	0.069	0.008	0.824
Hansen test - p-value		0.000	0.004	0.336	0.000
NB: Windmeijer-robusts standard errors. *** p<0.01, ** p<0.05, * p<0.1, respectively.					

Before I discuss the results for the second hypothesis, I differentiate the panel along its time dimension, i.e. before and after 2004. The intention of doing that is to analyze, whether the capital allocation changed with the introduction of the rating-based contributions to the insurance scheme, so the change in information allocation within the network. Looking at table 7, regressions 5 and 6, there are nearly no significant correlations in the period of flat rate contributions, but with the introduction of the rating-based approach, the capital allocation is more oriented to key figures – although capital (*Kap*) plays no significant role. The latter results might be explained by the trust in supervisory authorities, which supervise capital anyway.

Table 7: Regression results II

		1999-2003	2004-2013	>1 bn. Euro total assets	≤ 1 bn. Euro total assets
		(5)	(6)	(7)	(8)
		System GMM	*System GMM*	*System GMM*	*System GMM*
Variable	*Theorie*	*InterbankD*	*InterbankD*	InterbankD	InterbankD
$InterbankD_{t-1}$	.	-0.213**	0.0563	-0.0907*	0.0625
		(0.0924)	(0.0719)	(0.0518)	(0.0519)
Kap_{t-1}	+	24.00	3.937	4.252	1.102
		(16.92)	(4.102)	(5.764)	(3.446)
RoE_{t-1}	+	0.0848	0.253*	0.196	-0.0429
		(0.173)	(0.130)	(0.168)	(0.0771)
$logCIR_{t-1}$	-	-0.538	-0.175	-0.592***	-0.507***
		(0.420)	(0.239)	(0.221)	(0.133)
$Earnings_{t-1}$	+	-0.0844	-1.080***	-1.152***	-1.134***
		(0.801)	(0.272)	(0.339)	(0.196)
$logRisk_{t-1}$	-	0.0156	0.0257*	-0.0602	-0.00553
		(0.0290)	(0.0134)	(0.0368)	(0.00993)
$Liquidity_{t-1}$	+ / (-)	-0.947	3.802**	-0.169	0.616
		(0.910)	(1.607)	(1.883)	(0.688)
$logStructure_{t-1}$	-	-0.306	-1.113***	-0.544**	-0.911***
		(0.490)	(0.278)	(0.227)	(0.206)
$CustomerDeposits_{t-1}$	- / (+)	-0.195*	0.101	0.182	-0.212***
		(0.102)	(0.112)	(0.229)	(0.0759)
$dlogCredit_{t-1}$	+ / (-)	0.362***	0.567***	-0.321	-0.427***
		(0.0773)	(0.136)	(0.229)	(0.129)
$CustomerDeposits_{t-1}$ x $dlogCredit_{t-1}$	+	-0.0819***	-0.834***	-0.346	0.297***
		(0.0210)	(0.159)	(0.744)	(0.0395)
ForVer	-	4.16e-08	1.59e-06***	7.28e-07***	2.94e-06***
		(4.98e-07)	(4.46e-07)	(2.08e-07)	(6.75e-07)
size	.	0.239*	0.760***	-0.0207	-0.125*
		(0.142)	(0.264)	(0.158)	(0.0684)
Observations		2875	9086	1579	11279
Number of banks		993	1024	1159	926
F-Test		22.35***	73.12***	8.08***	23.03***
Number of instruments		33	37	125	37
Entity fxed effects		yes	yes	yes	yes
Time fixed effects		yes	yes	yes	yes
AR(1) - p-value		0.010	0.000	0.000	0.000
AR(2) - p-value		.	0.761	0.441	0.525
Hansen test - p-value		0.098	0.023	0.094	0.236
NB: Windmeijer-robust standard errors, *** p<0.01, ** p<0.05, * p<0.1.					

The change of the contribution scheme by the network itself seems to decrease information costs for the cooperative central banks, who consider these pieces of information to exert a certain degree of market discipline within the cooperative network.

To answer the question, whether the relatively smaller banks of the network tend to moral hazard behavior, the variables are regressed on the institutes smaller and bigger €1 bn. of total assets, respectively (s. table 7, regressions (7) and (8)). With regard to the number of significant correlations, cooperative primary banks smaller € 1 bn. of total assets reveal more significant correlations. The growth rates of customer deposits and credits correlate significantly negative with the growth rate of interbank liabilities whereas these variables do not show any significant relations for the relatively bigger banks. All other significant estimators are quite similar for both groups. Therefore, the Moral Hazard Hypothesis is rejected here, although I want to stress that I do not analyze the moral hazard behavior itself, but the incentives which might prevent such a behavior.

The overall result that Peer Monitoring exists on the cooperative capital market is good news. But before being satisfied with this result, the third hypothesis is examined. A new variable is integrated in the regression equation to consider the ownership structure between the primary banks and the cooperative central banks:

$$Influence_{it} = \frac{holdings_{it}}{total\ assets_{it}}$$

This variable approximates the potential influence of the primary banks on the cooperative central banks based on balance sheet data. So this is a strong approximation, but being dependent on publicly available data, there is no alternative so far. The balance sheet position 'holdings' is selected since the member institutes organized their shares in holding companies (among others WGZ Beteiligungs GmbH & Co. KG). The regression results (s. table 8) demonstrate that the ownership structure does not influence significantly the capital allocation. This holds for the differentiation of the panel along the size classes. So, the third hypothesis is to be rejected as well, or more formally, the corresponding null hypothesis cannot be rejected. Besides, the regressions (10) and (11) reveal once again disciplining measures on the relatively smaller banks. Thus, the mechanisms on the cooperative capital market rather counteract moral hazard behavior of the smaller banks.

Table 8: Regression results III

		all banks	***≤ 1 bn. Euro total assets***	***> 1 bn. Euro total assets***
		(9)	**(10)**	**(11)**
		System GMM	***System GMM***	***System GMM***
Variable	*Theory*	InterbankD	InterbankD	InterbankD
$InterbankD_{t-1}$	.	-0.0772	-0.0572	-0.164
		(0.0906)	(0.0994)	(0.102)
$Influence_{t-1}$	+	0.0676	0.355	-0.332
		(0.626)	(0.693)	(1.673)
Kap_{t-1}	+	1.776***	1.847***	-0.723
		(0.682)	(0.618)	(1.245)
RoE_{t-1}	+	-0.686***	-0.582**	0.132
		(0.248)	(0.247)	(0.558)
$logCIR_{t-1}$	-	-0.161**	-0.142**	-0.00803
		(0.0708)	(0.0706)	(0.104)
$Earnings_{t-1}$	+ / (-)	-0.123	-0.0708	-0.267
		(0.0875)	(0.113)	(0.311)
$logRisk_{t-1}$	-	0.00881	0.0126	0.00971
		(0.0164)	(0.0176)	(0.0358)
$Liquidity_{t-1}$	+ / (-)	9.411***	15.29***	-1.238
		(2.456)	(2.571)	(2.461)
$logStructure_{t-1}$	-	-0.0281	0.00606	-0.0278
		(0.0457)	(0.0416)	(0.0744)
$CustomerDeposits_{t-1}$	- / (+)	-0.247	-0.349	0.179
		(0.296)	(0.323)	(0.397)
$dlogCredit_{t-1}$	+ / (-)	0.633**	0.760**	0.0983
		(0.280)	(0.303)	(0.462)
ForVer	.	1.41e-07	-3.46e-07*	1.34e-07
		(1.02e-07)	(2.08e-07)	(1.08e-07)
size	.	0.0511*	0.0390	0.00849
		(0.0290)	(0.0307)	(0.0786)
DummyCrisis	.	0.0662***	0.0567***	0.158***
		(0.00748)	(0.00770)	(0.0264)
Observations		12951	11279	1579
Number of entities		1028	926	159
F-Test		15.79***	15.06***	4.15***
Number of instruments		81	81	81
Entity fxed effects		yes	yes	yes
Time fixed effects		yes	yes	yes
AR(1) - p-value		0.000	0.000	0.001
AR(2) - p-value		0.369	0.611	0.158
Hansen test - p-value		0.000	0.000	0.146
NB: Windmeijer-robust standard errors, *** p<0.01, ** p<0.05, * p<0.1, respectively.				

6. Conclusion and limitations

On internal capital markets Peer Monitoring is less likely, what leads to a lack of preventive mechanism for individual and systemic risk of various cooperative primary banks, that are not participating on general interbank markets. Although the institutional duty of the German cooperative central banks is the support of the primary banks, they restrict the capital allocation to financial key figures, since the favorable information supply by the apex. Consequently, the primary banks are as well as for instance commercial banks, object to market discipline on interbank markets. At least to a certain degree, because the coinsurance function of the group clearing is not completely neglected. This combination might stabilize

the network further. The finding of Peer Monitoring on the cooperative internal capital market contradicts the theoretical literature that hypothesizes rather cross-subsidizing. Nevertheless, the combination of a straight, efficient information allocation on the financial situation of the primary banks inside the network and the danger of spillover effects results in Peer Monitoring. This good news mean that private forces complete supervisory authorities in incentivizing banks to reduce their risks. But these forces cannot substitute official supervision, because the transparency is only increased within the network, but not to other market participants, like depositors, for instance. Moreover, the allocation mechanism is not correlated with the potential intra-political influence of the primary banks, as CREMERS ET AL. 2011 demonstrated. So, the internal capital allocation can be assumed to be rather objective, i.e. based on relatively hard factors. Nonetheless, coinsurance and mutual support and even guarantees are implemented at once through the institute guarantee scheme. The classic differentiation between banks smaller and bigger € 1 bn. of totals assets does not reveal that the entities of the former category are excepted from the disciplining mechanisms.

This analysis has of course limitations that might be subject to future research. First, the intra-political influence could only be analyzed on a high level of abstraction. Private or more detailed information on the financial depiction of the ownership structure of the secondary level result in more precise estimates on this issue. Second and once again with regard to the data, analyses with more differentiated information of the counterparty of liabilities lead also to a more precise estimation of the numerical effects. Third, the moral hazard behavior itself is not investigated here, but the empirical definition and its study are especially relevant for the German cooperatives due to their institute guarantee scheme. The ECB is in charge of supervising the institute guarantee scheme and the European Banking Authority emphasized recently the threat of potential pro-cyclical effect of risk-based contributions. Therefore, research on the microeconomic level of the effects on primary banks' stability by the financial fees and by Peer Monitoring is of academic and practical interest.

The presented insights into a special German banking network make clear that the special construction of incentives lead to Peer Monitoring, although theory and statutory information be skeptical about its existence. Comparative analyses which provides with additional insights in other banking sectors might be important for the understanding of the very diverse banking systems of the European Union. The distance of banks on the one, and regulators and supervisors on the other hand becomes larger by the recent regulatory novelties, so the improvement of circulating scientific information might be crucial for the creation of stable financial systems. This paper, as well as the mentioned further research opportunities, are a first step to integrate deep industry insights with macroprudential policies.

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