

Bank Recapitalization and Restructuring: An Economic Analysis of Various Options

A financial crisis leads to a debt overhang in the banking sector and subsequently to a credit crunch. In most cases, it is not possible to remedy this situation without economic policy measures. In this study, we use a uniform framework to analyze how banks in a crisis situation can be restructured at minimum cost to the taxpayer in order to enable them to function again. We discuss various forms of intervention: measures which do not affect the rights of existing bank owners and creditors (guaranteeing prior debts, purchasing troubled assets, injecting equity) and measures that do (good bank/bad bank, debt-for-equity swap). Measures which minimize the costs to the taxpayer will necessarily affect the rights of existing owners and creditors, meaning that they also raise issues related to the reform of bank insolvency law.

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JEL classification: G01, G2, G28, G33, G38, H0, H2, H81

Keywords: financial crisis, bank recapitalization policy, bank insolvency, financial regulation

In response to the international financial crisis, numerous governments adopted bank rescue packages in the fall of 2008. The purpose of those interventions was to recapitalize the banking system in order to prevent a (then) impending widespread collapse of financial intermediation. In combination with monetary and fiscal policy measures, these bailout packages achieved their goal; the banking system stabilized. Whether those measures were sufficient to restore the banks' ability to perform their central function – i.e. providing credit to the real economy – remains controversial (Ivashina and Scharfstein, 2010).

In addressing this problem, national legislators included different recapitalization measures in their bank rescue packages (Posch et al., 2009). But how can the various options be assessed and weighed against each other? Can they be ranked in any way? Might it be possible to make better choices in a future similar situation?

This study provides answers to those questions by examining different approaches to recapitalization within a uniform analytical framework. In conceptual terms, our analysis relies on a simplified bank balance sheet, the characteristics of debt and equity capital,

and the concept of incentive compatibility. The main advantage of such an abstract analysis is that it highlights key structural aspects of different recapitalization policies. This should make it possible to draw the right lessons from the crisis for future reference and to identify potential improvements in economic policy.

This study addresses two main questions: First, is it necessary to use taxpayer money in order to recapitalize the banking system? The second, closely related question is whether a reasonable recapitalization policy also calls for a reform of bank insolvency law.

Our analysis leads us to the following fundamental conclusions: In principle, it is possible to design a recapitalization policy which does not involve the use of tax funds. This option currently only exists in principle, as recapitalization policies that minimize the cost to taxpayers will necessarily affect the rights of bank owners and creditors. Avoiding the use of tax money thus requires a legal and institutional framework which goes beyond the scope of recapitalization policy and touches on issues related to bank insolvency law. Where it is mandatory that the rights of existing owners and debt

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lenders remain intact, tax funds must be used for bank recapitalization. We assessed the different intervention options in terms of effectiveness and ranked them according to the amount of government support they require.

1 Bank Recapitalization: The Problem of Debt Overhang and the Role of Economic Policy

Should recapitalizing the banking system even be a function of economic policy? It goes without saying that under normal circumstances, an undercapitalized bank should effect the necessary recapitalization on its own. If that is not possible, the bank must ultimately be allowed to fail. The question of what can happen with the failed bank in such a case and who can claim its assets is governed by bank insolvency law. The quality of this legal framework is a crucial factor for the economic and social costs of a bank insolvency. For reasons related to long-term incentives, it is necessary to ensure that banks are not recapitalized automatically. If banks cannot be allowed to fail, the situation encourages irresponsible behavior, excessive risk-taking and runaway expansionism; the number of crises will also rise, requiring increasingly dramatic and costly bailouts.

Economic policy-induced recapitalization can make sense in a systemic crisis, where one can expect a sweeping collapse of financial intermediation and the payment system. It may also be appropriate if a financial crisis brings about extremely high levels of debt in the banking system without leading to insolvency. In such a situation, it is not possible to finance valuable new projects because the payment obligations from existing debt are so high that the bank cannot actually profit from financing those projects. This means that socially valuable projects that

should be carried out for reasons of efficiency would not be realized because of a conflict of interests between investors. This situation is referred to as a debt overhang.

The economic literature discusses two types of debt overhang. The first variant is a direct result of limited liability. One example which illustrates the problem in a somewhat stylized manner is as follows: A bank holds a credit portfolio with a present value of 90 monetary units. The capital structure used to finance that portfolio comprises 86 units of debt capital and 4 units of equity. The risk assessment shows that there is a 50% probability that the credit portfolio will be worth 100 units and a 50% probability that it will be worth 80 units at the end of the period. In the upside case, the portfolio will be worth 100 units, and the bank can repay the debt in the amount of 86 units; for the sake of simplicity, we assume an interest rate of 0%. The equity investors will receive the remaining 14 units. In the downside scenario, the value of the credit portfolio will not be sufficient to repay the debt, and the bank will become insolvent. Assuming that bankruptcy proceedings are very simple and do not create additional costs, the creditors will receive the credit portfolio, which is valued at 80 units in this case. The equity investors will be left empty-handed. At the beginning of the period, the bank has the opportunity to grant another loan of 4 units which is certain to have a value of 5 units at the end of the period. As the present value of the loan is positive, from a general economic perspective it should be approved. However, the situation is rather different for the owners. At the start of the period, they would have to spend 4 units. In the upside case, they would receive 19 instead of 14 units, but in the downside

case, the value of the bank's loans would total 85 units – which is less than the bank's debt. The institution would go bankrupt, and all of the additional 5 units would benefit its creditors. For the bank's owners, the present value of the loan is negative: An investment of 4 would deliver an expected payoff of 2.5 units. For the debt lenders, on the other hand, the additional loan would be extremely lucrative, as they would see the value of the bank's debt capital rise by 2.5 units without investing their own funds.

Why can a competing financial institution not take advantage of this profitable opportunity? One reason frequently discussed in the literature is an information problem arising from the specific relationship between the bank and its customer (Greenbaum and Thakor, 1995). Thanks to its long-standing relationship with the potential borrower, bank A enjoys an information advantage; only the managers of bank A know that the loan will be worth 5 units at the end of its term. Procuring this information would be a tedious and cost-intensive process for the bank's competitors.

However, even if the new loan can only be granted by bank A, its owners and debt lenders could, in principle, resolve the situation through negotiations. The owners could offer to fund the loan if the debt lenders invest 2 units. Once again, an information problem arises: The investors do not know whether the information about the value of the loan at the end of the period is actually true. Moreover, there will generally not be just one creditor, but a large number of heterogeneous investors. If we assume that procuring information involves a relatively large proportion of fixed costs, a negotiated solution is highly improbable.

The equity investors of a bank with a positive probability of bankruptcy will base their decisions only on future scenarios in which the bank does not go bankrupt and in which they retain control over the bank. A potential debt overhang as a consequence of limited liability cannot be eliminated, but only mitigated. Furthermore, it is evident that there is no private-sector solution to the problem. If the objective is to restart lending, then economic policy intervention is necessary.

In the recent economic literature on bank recapitalization, two articles have dealt with debt overhang in the sense described above. Philippon and Schnabl (2009) provide an analysis of the costs of recapitalization. If banks are required to participate in the recapitalization program, the authors conclude that it is irrelevant whether the government takes direct equity stakes in banks, buys up risky assets or guarantees the banks' debts. All three measures create the same costs. If, on the other hand, participation in the program is voluntary and the private sector is better informed about the quality of the assets, then a direct equity investment is preferable. In such a case, the public sector faces a self-selection problem, as the banks with the lowest-quality assets will take part in the program. In this situation, a tradeoff exists between the benefits of financing desirable new projects and the adverse selection of banks with especially low asset quality. Philippon and Schnabl (2009) demonstrate that under asymmetric information, direct equity investment resolves this tradeoff more effectively than debt guarantees or the purchase of risky assets. Kocherlakota (2009), who assumes that the repayment of existing debts is at least implicitly guaranteed by the government, arrives at similar results. He argues that purchasing risky

securities and making a direct equity investment in the bank are equivalent options if the government is able to assess the quality of assets accurately. If, in contrast, the government has only incomplete information about the bank's assets, then direct equity investment is preferable.

The term *debt overhang* is also used in another context in the economic literature (Tirole, 2006). If equity investors are able to influence the probability of a project's success, they will only invest additional effort for that purpose if they are compensated with a higher return. Let us assume that a bank can grant a highly risky loan in the amount of 6 monetary units. The probability that the borrower will be able to repay 10 units at the end of the loan's term is 40%, while the probability of complete default is 60%. Under these circumstances, the loan has a negative present value and should not be approved. However, by monitoring the borrower, the bank owners can boost the probability of success to 90%. The costs of doing so amount to 2 units. In this case, the present value² of the loan is positive. Whether or not the borrower will be monitored depends on how much the bank owners receive in the case of success. Assume that the equity investors receive the amount R . If they decide to invest effort in monitoring, the expected return is $0.9 \cdot R - 2$. If they decide not to monitor the borrower, the expected return is $0.4 \cdot R$. The equity holders will therefore only make these efforts if their share of the return is at least 4 units. Potential debt investors know that a repayment of more than 6 units would create inappropriate incentives. The present value of a claim in the amount of 6 is 5.4, provided that the owners monitor the

loan carefully. Assuming that debt lenders are risk neutral and act under perfect competition, then 5.4 would be the maximum amount the bank could raise by issuing new debt. A debt overhang exists if the bank has less than 2.6 monetary units in equity, because the bank will not be able to raise the 8 units necessary to finance the loan and the monitoring infrastructure. This form of debt overhang likewise implies that new projects with a positive present value may not be financed.

Our study complements the work of Philippon and Schnabl (2009) and Kocherlakota (2009) by analyzing the costs of recapitalization measures when equity investors have the wrong incentives due to high levels of debt.

In practice, both forms of debt overhang are significant and can also be combined in theoretical analysis. In order to simplify our illustrations and to highlight the problem of incentives, we focus on the incentive view of the debt overhang problem.

In summary, specificity in intermediation knowledge as well as coordination and incentive problems may lead to a situation in which the only way to restore the functioning of a banking system is to develop a suitable recapitalization policy. Without such measures, banks' funding problems would imply the risk of a credit crunch regardless of the fact that new and profitable opportunities are available. In this case, neglecting to recapitalize banks would be inefficient.

2 Analytical Framework

In order to define an analytical framework in which various options can be discussed and compared, we use a simple, abstract model of a bank, its assets and capital structure as well as its own-

² Assuming an interest rate of 0% and risk-neutral investors.

ers' incentives. The model is derived from Tirole (2006) and stems from the literature on corporate finance. For the purposes of this discussion, we equate owners and management in order to focus on the decisive conflicts of interests among various investor groups and to separate our analysis from conflicts of interests between owners and management.

Analyzing various recapitalization options within an abstract framework instead of using examples from the recent past has the distinct advantage of allowing us to concentrate on conceptual elements. This approach is intended not to draw attention away from practical issues, but to maintain the focus on key aspects.

A bank is considered at two points in time: today ($t=0$) and tomorrow ($t=1$). Today the bank has assets valued at A and existing debt of D . The bank currently has the opportunity to grant a new loan in the amount of x . The loan is risky and will be worth either v or 0 tomorrow. Only the assets in excess of D can be liquidated or pledged to finance the project. The remaining funds necessary to make the loan must be derived from external sources of funding.

We assume that the bank's existing debts cannot be renegotiated ex post. The potential borrower can only take the loan out from this bank because it enjoys an information advantage over other banks and the capital market. The investors and equity investors are risk neutral, and the interest rate is 0%.

The level of risk associated with the new loan also depends on the behavior of the bank's owners. This is where the incentive problem comes into play: If the bank's owners ensure that the potential borrower is monitored diligently, then there is a probability of π_H that the borrower will repay the value v .

The costs arising from diligent monitoring amount to m . Assuming that $\pi_H v$ is greater than $x + m$, the loan has a positive present value. If the bank's owners opt not to monitor the borrower, the probability of repayment drops to $\pi_L < \pi_H$. The costs thus eliminated – i.e. m – are paid out as a dividend immediately at $t=0$. In this case, the present value of the loan is assumed to be negative ($\pi_L v < x$).

From the perspective of the potential investors financing the new loan, it is important to ensure that the bank has the right incentive to monitor the loan diligently. Assuming that the bank receives R_B , the expected return for the bank's owners in the case of diligent monitoring must be at least as high as it would be in the absence of such monitoring. The incentive condition $\pi_H R_B \geq \pi_L R_B + m$ must be fulfilled. The owners will only make efforts to monitor the borrower if they receive a sufficient share of the return in the case of success. Therefore, R_B must be at least equal to $\bar{R} = m / (\pi_H - \pi_L)$.

Given a promised repayment of R_I , competitive investors will be willing to finance the amount l if they can cover their costs with the expected value. We assume that the existing debt D has to be serviced before all other debts due to contractual seniority agreements. In order to ensure repayment, only that part of assets which exceeds D is pledged or sold in order to finance the new project. As a consequence, the new investors will only receive the promised repayment if the project is successful. The condition on which investors are willing to fund the new loan is thus $l = \pi_H R_I$.

The maximum amount which can be paid out to the investors in the case of success without violating the owners' incentive condition is limited by $v - \bar{R}$. As a result, the amount that can be

funded by issuing fresh debt is limited to $\bar{l} = \pi_H(v - \bar{R})$. If we assume that the investment volume $(x + m)$ exceeds the sum of available assets $(A - D)$ plus the maximum amount of debt capital which can be raised (\bar{l}), the bank suffers from a debt overhang and cannot grant profitable new loans without renegotiating with its existing creditors. The crux of the problem lies in the fact that such renegotiations are difficult, in many cases even impracticable. Without economic policy measures, valuable investment opportunities will be neglected. The consequence is a credit crunch.

The discussion of the analytical framework above already yields two perspectives on how to design recapitalization policy to eliminate a debt overhang. If the policy must leave the claims of existing creditors (D) unchanged, injecting external capital is the only option to shore up the bank's equity to such an extent that the bank can satisfy its existing debt obligations while at the same time allowing it to finance the new project. Another option might be to create a framework which enables the bank to realize the project and divide the resulting profits among its various investors. This approach resembles insolvency proceedings in that it forces existing creditors to forgive enough debt in order to make it profitable for investors to fund the new and desirable loan.

3 Analysis of Various Options

3.1 Measures without Effects on Existing Rights

3.1.1 Guaranteeing New Debt Issues

If the government guarantees the repayment of newly issued debt, then investors will obviously be willing to provide the bank with debt capital in

excess of \bar{l} . While this guarantee ensures that the new loan can be funded, it does not resolve the bank's incentive problem. As the owners receive too small a share of the profits, they will agree to grant the new loan but not monitor the borrower closely, opting instead to pay out those costs (i.e. m) as a dividend. This problem is exacerbated if the government demands a premium for the guarantee. Issuing guaranteed new debt will solve the debt overhang problem only if the government is able (through its regulatory authorities) to force the bank to monitor the new loan closely.³

3.1.2 Guaranteeing Existing Debt

A similar picture emerges when the government provides a guarantee for the repayment of a bank's prior debt, thus allowing the bank to use a larger share of its existing assets to fund the new loan. In this case, it is also in the bank's interest to approve the new loan and to fund it by selling a share of the bank's assets, specifically $\alpha A > A - D$. If the new loan is not repaid, the government will reimburse the prior creditors for the loss in the amount of $D - (1 - \alpha)A$. If the new loan is repaid, then part of v must be used to repay the bank's older liabilities, so that the bank's owners do not receive the entire value v . If the bank is heavily indebted, i.e. $A - D < x + m - (v - \bar{R})$,⁴ the incentive condition will be violated: The owners will grant the loan, but they will decide against monitoring. In cases where the bank's debt is lower, i.e. $x + m - (v - \bar{R}) \leq A - D$, the incentive problem is resolved. The expected costs of the government guarantee come to $c_0 = (1 - \pi_H)(x + m - (A - D))$.

³ Guarantees for new debt issues can be useful and effective when liquidity conditions are tight, but they cannot actually resolve the problem of a debt overhang.

⁴ This condition is stricter than in the case of a debt overhang.

3.1.3 Purchasing Troubled Assets

What triggered the debt overhang in the first place was the fact that banks had to take severe losses on the asset side of their balance sheets as a result of the crisis. Many argued that those losses in value resulted from panic on the financial markets and not from a change in fundamental data. Therefore, by buying up non-performing securities, the government could not only restructure the banks but also earn profits. However, those assessments remain speculative and hardly form a suitable basis for sound economic policy decisions. Taking a conservative view, we should assume that the loss of value has actually occurred.

In this model, we postulate that A is actually the correct value of the assets. In order for the new loan to be approved, it is necessary to compensate for the difference between the available funds ($A-D$ and \bar{I}) and the required funds ($x+m$) by means of a deliberate overpayment on the assets. The price to be paid is not determined by the potential future value of the assets, but by the extent of the bank's overindebtedness. The government thus has to pay a premium of $c_i = x+m - (A-D) - \pi_H(v-\bar{R})$. The costs incurred are lower than those of a government guarantee for the bank's existing debts ($c_i \leq c_0$).

3.1.4 Increasing Equity Using Tax Funds

Apart from restructuring the bank's assets or issuing new debt, the government may also opt to increase the bank's equity. The proceeds from this equity issue, E_i , have to be high enough to finance the new loan ($x+m = E_i + (A-D)$). In return, the investors receive a share (α) of the bank's value with a present value of $\pi_H \alpha v$. New shares will find a ready market if their present

value is at least equal to the issue price, that is, $E_i \leq \pi_H \alpha v$ or $\alpha \geq E_i / (\pi_H v)$.

Whether or not the capital increase eliminates the debt overhang depends on who bears the costs of diligent monitoring. If the costs of monitoring can be avoided and instead paid out as a special dividend to the existing owners, the capital increase will be limited to $E_i \leq \bar{I}$. In this case, the new loan cannot be funded. A different situation arises if the costs of diligent monitoring (m) have to be paid out in proportion to the shares. The existing owners will ensure that the loan is monitored if $\pi_H(1-\alpha)v \geq \pi_L(1-\alpha)v + (1-\alpha)m$ or $(\pi_H - \pi_L)v \geq m$. The incentive condition is fulfilled in this case. Another question is whether α can be defined in such a way that a sufficient amount of new equity is available on the one hand, i.e. $\pi_H \alpha v \geq x+m - (A-D)$, and that the loan is profitable for the existing owners on the other, i.e. $\pi_H(1-\alpha)v \geq A-D$. This is the case for

$$\alpha \in \left[\frac{x+m}{\pi_H v} - \frac{A-D}{\pi_H v}, 1 - \frac{A-D}{\pi_H v} \right]$$

Any value of α within this interval is permissible. The division of claims in proportion to capital contributions, $\alpha^* = E_i / (E_i + A-D)$, which is regarded as fair, also lies within this range. Therefore, a private-sector solution to the debt overhang problem is possible if the costs of monitoring m are not distributed as a dividend to the existing owners, if the new investors are not subject to an information disadvantage, and if the existing owners accept a reduction of their voting rights. Finally, it must also be possible to negotiate α successfully at $t=0$. This analysis explains why equity increases were observed occasionally during the crisis but were generally difficult to attain. An equity increase in the form of participation capital does not dilute the existing

shareholders' voting rights and will therefore be accepted more readily.

3.2 Measures with Effects on Existing Rights

The measures described above leave the rights of existing creditors and owners intact. Abandoning this imperative opens up a number of additional intervention opportunities, including separation into a "good bank" and a "bad bank" as well as compulsory debt-for-equity swaps. However, because they affect the rights of the existing owners and creditors, these measures resemble insolvency proceedings and thus go beyond the narrower scope of recapitalization policy.

3.2.1 Good Bank/Bad Bank

Good bank and bad bank were popular buzzwords in 2009. However, one point was often overlooked in this discussion: In terms of regulatory policy, there is a questionable and a sensible way to divide up a bank. These two options are referred to as the "bad bank solution" and the "good bank solution" below. While the former leaves existing rights intact and uses the taxpayers' money to recapitalize the bank, the latter manages to avoid using tax funds for that purpose.

In its simplest form, the bad bank solution involves splitting up the asset side of the bank's balance sheet into two categories. The impaired parts (A_1) are carved out, and together with the old debts (D) they are allocated to a newly established "bad bank" known as bank B. The other assets, $A_2 = A - A_1$, remain on the balance sheet of the old – and now good – bank A. In order to eliminate the problem of overindebtedness, the good bank must have sufficient equity, that is, $A_2 \geq x + m - \bar{l}$. This implies that without government support, bank B would have negative eq-

uity ($A_1 < D$). The separation of assets thus has to be subsidized, and the costs equal those incurred in the direct purchase of the troubled assets. In this way, the problem of overindebtedness is resolved.

However, the owners of bank B – generally the government – and its creditors bear the risk of any further changes in the value of A_1 . From a regulatory standpoint, this is a questionable solution.

Hall and Woodward (2009) present an approach which obviates this problem. They propose that bad bank B should also receive the ownership rights to good bank A. The prior owners therefore own bank B directly and bank A only indirectly. The advantage of this solution is that any changes in the value of A_1 still benefit – or still have to be borne by – the original investors.

Bank A is funded exclusively by equity. Let us assume that the value of its assets, A_2 , is high enough that it can be used – together with debt capital in the amount of \bar{l} – to fund the new loan, that is, $(A_2 + \bar{l} = x + m)$. If the managers of bank A maximize the value of the equity held by the creditors and owners of bank B, the incentive condition is clearly fulfilled. The loan will be granted and monitored diligently. However, if the shareholders of bank B – who hold all of the voting rights in bank A – succeed in having bank A pay out the cost savings (m) to bank B at $t=0$ and having bank B distribute them immediately in the form of a dividend, the incentive condition is violated. In that case, the new loan cannot be financed because the debt lenders would not be willing to invest \bar{l} . The problem of overindebtedness is resolved once it seems certain that bank A's management will maximize the value of equity or bank B's shareholders

will not demand the immediate distribution of dividends.

The bank's restructuring leads to a situation in which the originally senior claims of prior creditors are now satisfied only once bank A has repaid its new debt. The beneficiaries of the good bank solution are the taxpayers and the prior owners, while the losers are the prior creditors, whose claims are curtailed ex-post.

3.2.2 Debt-for-Equity Swaps

A debt-for-equity swap refers to the forced conversion of debt into equity.⁵ In contrast to conventional insolvency proceedings, this measure can be implemented within a very short period of time without interrupting the bank's ongoing operations. In the simple model presented here, a debt-for-equity swap involves reducing the claims of existing debt holders from D to D^* . In exchange, they receive a share α of the new equity, i.e. $A - D^*$. If the management acts in the interest of the prior owners – which is equivalent to the assumption in the model that m can be distributed to them in its entirety – then the debt-for-equity swap generates a present value loss for the creditors in the amount of $x + m - (A - D) - \bar{I}$, regardless of how D^* is defined. The forced conversion of debt into equity can be regarded as an effective disciplinary measure. If a bank's creditors know that a debt-for-equity swap will lead to a loss of value in the case of overindebtedness, they will not be willing to finance such a high debt-to-equity ratio ex ante.

If the managers maximize the value of equity, a share (α) of which is held by the prior creditors after the restructur-

ing, the incentive condition is fulfilled. As the new loan has a positive present value, it is possible to compensate the prior creditors for waiving their claims. In this case, the debt-for-equity swap acts as an institutionalized renegotiation mechanism.

This form of swap can be designed in two ways: On the one hand, legislation may require the bank to hold a certain volume of convertible capital (hybrid capital). On the other hand, the law may provide for the forced conversion of debt into equity in the event of a crisis.⁶

3.3 Can These Measures Be Ranked?

Our analysis enables us to rank the various forms of intervention, as most measures are capable of resolving the debt overhang problem, but they involve different costs.

Provided that existing rights must remain intact, an equity injection is the most favorable option for the taxpayer. Purchasing risky assets is the second best solution, while debt guarantees are either ineffective or comparatively expensive.

If it is possible to change existing rights, the costs of recapitalization have to be borne by the existing creditors. In such cases, the good bank solution and debt-for-equity swaps are equivalent options.

4 Recapitalization Policy and Bank Insolvency Law

Our analysis of various recapitalization options has shown that possible courses of action can essentially be assigned to two categories: measures that leave existing rights intact and measures that do not. This is where the discussions of

⁵ This approach was advocated most prominently by Zingales (2009).

⁶ Lloyds Banking Group issued such a convertible bond under the designation "contingent capital" in 2009. Kashyap et al. (2008) use the same term to denote a form of insurance payoff in the event of a crisis.

recapitalization policy and bank insolvency law intersect. Procedures which affect the rights of creditors are equivalent to insolvency proceedings or a bankruptcy regime in so far as they serve to redefine who has a claim to the bank's assets. Depending on the leeway given to prior shareholders in determining the future use of assets, such a procedure may be tantamount to insolvency proceedings.

The legal framework governing how to deal with banks facing financial difficulty could thus be improved by creating special bank insolvency legislation as an instrument available in parallel to government recapitalization measures.

Birchler and Egli (2003) propose bank-specific insolvency legislation which makes it possible to deal with a debt overhang and insolvency within a single legal framework. Their proposal was used as the basis for the reform of bank insolvency law in Switzerland. Under this framework, insolvency proceedings can be initiated by the regulatory authority, and the asset and liability sides of the bank's balance sheet are treated separately in the process. The liability side is homogenized by converting debt into equity. The conversion process is designed in such a way that seniority levels are maintained and outsiders also have the opportunity to invest in the bank. During the process, the existing management continues to administer the bank's assets under the supervision of the regulator. At the same time, the bank is put up for sale, and interested parties are allowed to submit bids for the entire bank or specific parts of the bank. The new owners of the bank after the restructuring process decide which offer is accepted.

From an economic perspective, this approach has three key advantages: First, the decision on the future of the

bank is made by the parties affected, namely the creditors and interested new investors. Second, the homogenization of the liability side ensures that interests are aligned, thus creating a uniform incentive to maximize the value of the bank. Third, the procedure can be completed quickly and therefore reduces systemic risk and procedural costs.

Our analysis shows that effective and up-to-date bank insolvency legislation would make it possible to handle both insolvency and undercapitalization within a single framework without requiring tax money to remedy those problems. Therefore, developing and discussing suitable legal reforms in this area would be a worthwhile project for the future. Such a reform would also make it possible to allow more latitude for market discipline. Moreover, the public sector would be relieved of two burdens: For one, such a framework would lower the pressure to create increasingly complicated regulations in the banking sector. At the same time, it would ensure that the public sector commands far more bargaining power in future crises than it currently has.

5 Conclusions

In a situation where a debt overhang exists in the banking system, it is necessary to be able to take recapitalization measures. Despite potential gains in efficiency, a private-sector solution to the problem usually cannot be attained due to information problems and conflicts of interests. If it is not possible to effect recapitalization of the banking system, the system runs the risk of a funding shortage and a resulting credit crunch. The macroeconomic consequences of that will lower the quality of assets even further and exacerbate the debt overhang problem, thus creating a negative feedback spiral.

In principle, economic policymakers can address a debt overhang in two different ways: First, they can introduce special legislation to allocate tax funds for the purpose of recapitalization during a crisis. Possible measures in this category include equity increases, the purchase of troubled assets, and guarantees for old and new debt. In line with the work of Philippon and Schnabl (2009) and Kocherlakota (2009), this study comes to the conclusion that an equity increase is an effective form of intervention which minimizes the burden on taxpayers. If banks are bailed out by means of special legislation, the danger arises that recapitalization measures will also be expected in the future. If those expectations become firmly established, we can no longer expect banks to be disciplined by debt holders.

The alternative to special legislation for such events would be a reform of

bank insolvency law that allows the competent regulatory authority to initiate a restructuring procedure once a bank reaches a certain undercapitalization threshold. The core objective of this approach would be to reduce prior claims to such an extent that the bank is able to resume lending for profitable new projects. This type of measure (unlike the special legislation approach) relies on rules and market discipline. Options include the good bank model as well as regulations which enable debt reductions and debt-for-equity swaps. This form of recapitalization does not require tax money. The creditors may have to take losses in assets, and one can expect the cost of debt capital to increase as a result, especially when debt-to-equity ratios reach levels at which recapitalization measures become probable. However, this effect may be entirely desirable as a control mechanism to limit risk.

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