Comparison of Different Bad Bank Models

Ulrike Neyer* Thomas Vieten†

Abstract

This paper develops a model to analyze two different bad bank models and their appropriateness for the achievement of a policymaker's objectives. Bad bank models have been implemented as a response to the worldwide financial crisis that has lead to severe losses in the banking sector caused by write offs on toxic assets in banks' balance sheets. The model distinguishes between an outright purchase of the toxic assets by the bad bank, similar to the Swiss model, and a transaction that can be compared to a repurchase agreement of the toxic assets between the bad bank and the initial bank, as in the German model. We show that the German model is superior in achieving the objective of reestablishing stability in the financial sector. In regard to the objectives of avoiding a credit crunch and minimizing costs to the taxpayers, we argue that there is a tradeoff between these two objectives.

JEL classification: G21, G28, G30

Keywords: bad banks, financial crisis, financial stability, credit crunch

*Heinrich-Heine-University Duesseldorf, Department of Economics, Universitaetsstrasse 1, 40225 Duesseldorf, Germany, Tel.: +49/(0)211/81 11511, Email: ulrike.neyer@uni-duesseldorf.de.

†Corresponding author, Heinrich-Heine-University Duesseldorf, Department of Economics, Universitaetsstrasse 1, 40225 Duesseldorf, Germany, Tel.: +49/(0)211/81 15318, Email: thomas-vieten@uni-duesseldorf.de.

1 Introduction

The worldwide financial crisis, which broke out in August 2007, led to severe losses in the financial sector. Banks suffered from so called toxic assets in their balance sheets. Uncertainty about the "true value" of these assets and necessary depreciations, which reduced significantly the banks' capital, raised concerns about the creditworthiness of banks. The consequence was the fear of a severe instability of the banking sector and of a severe reduction in credit supply (credit crunch). Therefore, governments implemented several concepts to relieve banks' balance sheets by offering banks to transfer toxic assets to publicly sponsored special purpose vehicles, so-called bad banks. The concrete design of such a bad bank differs between nations. In particular, the risk-distribution between the initial bank and the state, and therefore the taxpayers, varied between the concepts.

This paper analyzes theoretically two different bad-bank models with regard to their appropriateness for reestablishing the stability of the banking sector and for avoiding a credit crunch at minimal expected costs to taxpayers. In the first model, there is a full transfer of the toxic assets' risks to a bad bank, similar to the Swiss model. In the second model, there is a retention of these risks by the initial bank, comparable to the German bad-bank concept. In both models, the transfer value of the toxic assets plays a crucial role. On the one hand, it must be high enough to give the managers of the initial banks an incentive to transfer these assets to a bad bank. Furthermore, the supply of new credit increases in the transfer value. However, on the other hand, the costs to taxpayers also increases in the transfer value. Consequently, when deciding on the transfer value, i.e. on the price at which the toxic assets can be transferred, the policymakers face a trade-off between enhancing the supply of new credit and minimizing expected costs to taxpayers. We conclude that this price should depend on the importance of a possible credit crunch problem. In an economy in which this problem seems to be severe, the transfer payment should be relatively high. However, in an economy in which this problem does not seem to be of outstanding relevance, it should only be high enough to give the bank-manger the incentive to transfer the toxic assets to a bad bank.

Comparing both models in detail with respect to the policymaker's objectives leads to the following results. Concerning the enhancement of the banking sector's stability, the policy maker prefers to implement a bad bank that leaves the risks to the initial bank. Concerning the avoidance of a credit crunch, the two models do not differ, as long as there is an identical transfer value in both concepts. And finally, concerning the minimization of the expected costs to taxpayers, the superiority of one of the models is not unambiguous but this depends, inter alia, on the expected returns of the toxic assets.

Related literature deals with the resolution of bank failures. Aghion, Bolton, and Fries (1999) develop a model to analyze different regulatory responses and their effect on a bank's decision to truthfully disclose their bad loans. Corbett and Mitchell (2000) show the effect of reputation on a bank's decision to accept a rescue plan. Mitchell (2001) answers the question how different policies to clean bank's balance sheets of bad loans affect bank behavior. *(We will yet comment in more detail on* *related literature...)*

The paper is organized as follows. In the next section we present the institutional background. Section 3 and 4 develop the model. Section 3 examines a bad bank model that removes all the risk from the bank, section 4 extends the framework to the case of a bad bank that leaves the risks to the bank. Section 5 analyzes policy implications, section 6 concludes.

2 Institutional Background

National governments and central banks implemented rescue plans to support troubled banks by offering them to offload impaired financial assets onto publicly sponsored special purpose vehicles that hold the assets to maturity. Although the concrete design of such a bad bank scheme differs between nations, the common objectives are to reestablish stability of the financial system, to remove the high degree of uncertainty in the banking sector and to expand credit supply, while keeping the costs of these measures as low as possible. The historical examples with the implementation of bad banks to solve banking crises are mixed. The two most common examples are the US-Savings & Loan crisis and the Swedish banking crisis. While most authors criticize the establishment of bad banks in the U.S. due to relatively high costs (e.g. Curry and Shibut, 2000), the solution of the Swedish crisis is commonly rated as successful (e.g. Bergström, Englund, and Thorell, 2003).

In the following, two examples of national bad bank concepts are introduced in more detail: the Swiss scheme that allows for the bank a nearly full and final transfer of specified assets onto a bad bank and the German concept that leaves liability for the bad bank's losses to the bank. In the latter, a bank is relieved since the bank can restore equity because losses are stretched over time.

2.1 Swiss Bad Bank Scheme

Switzerland was one of the first states that implemented a bad bank in the current financial crisis. The Swiss National Bank (SNB) established a bad bank for Swiss private bank UBS. It allowed for UBS to transfer assets worth up to USD 60 billion to a state-controlled special purpose vehicle. The UBS provided 10 percent in equity for the bad bank that serves as a first-loss buffer. SNB supplied a loan for the remaining 90 percent of capital. UBS compensates SNB for interest payments. The final total amount of transferred assets matched USD 38.7 billion. The assets were valued by independent experts, but basically matched the book value stated in the accounts of 30 September 2008. The bad bank keeps the risky assets to maturity and UBS received safe assets in exchange. The management of the risky assets remains with UBS. In case the bad bank's dissolution involves a surplus, UBS participates, on the one hand. On the other hand, SNB holds stock option on UBS capital worth USD 5.8 billion exercisable in case of a deficit (Bank for International Settlement, 2009).

The transaction results in a final removal of the impaired assets to the bad bank. Uncertainty decreases significantly and the bank's balance sheet is relieved from further depreciations. The bank still participates in a bad bank's surplus. It has to bear a deficit, too, however, only to a certain extent.

2.2 German Bad Bank Scheme

In the German bad bank scheme the risk from the transferred assets remains with the bank, so that current shareholders stay responsible for losses. Credit institutions, financial holding companies and their subsidiaries domiciled in Germany that want to offload impaired assets to a bad bank, apply at the Financial Market Stabilization Agency. Approved banks are allowed to transfer structured products - no plain vanilla loans - that have been acquired prior to 31 December 2008. The assets are transferred at the higher value of the 90 percent book value as stated in the last audited accounts or the long-term economic value. The fixed 10 percent deduction for risk on the book value, may be lower, in case it causes the bank to fall below a core capital ratio of 7 percent. In exchange the bank receives securities that are guaranteed by the German state. Additionally, the fundamental value of the transferred assets is determined. The bank has to supply information about the current value that is confirmed by independent experts and the banking supervisory authorities and forms - a risk fee to be deducted - the fundamental value. The bank has to pay an annual compensation to the bad bank in the amount of the difference between the transfer rate and the fundamental value divided by the number of years to maturity to ensure that the bad bank does not end up with a loss from today's perspective. The constraint of this compensation payment is the dividend payments to the bank's shareholders. If dividends in one year lies below the required compensation, payments will be higher in the subsequent years, accordingly. The compensation payment are based on the dividend payout to the bank's existing shareholders only. Consequently, providers of new capital are shielded from the risks arising from the transferred assets. In case the compensation payment are insufficient to clear a bad bank's deficit at its dissolution, the bank stays liable with its future dividend payments. A bad bank's surplus benefits the bank as well (Deutsche Bundesbank, 2009).

The advantages of the participation in the German bad bank scheme - in spite of the disposition of risks in the banking system - is the temporary relief of banks' balance sheets that frees up equity since risk is reduced significantly and therefore allows the bank to grant new loans. Losses are entirely born by the bank, but stretched over time. Additionally, the guaranteed bonds may be used as collateral in refinancing transactions with the Eurosystem. The degree of uncertainty is decreased significantly since compensation payments are fixed and the bank will not be stressed with further depreciations on the transferred assets.

The German government implemented another scheme for the German state banks. It is an extension of the plan for the private banks since it allows for the state banks to not only transfer specified assets to a bad bank, but also entire business units.

In the following sections 3 and 4, we consider two extreme examples of bad bank design. Section 3 analyzes a bad bank concept, similar to the Swiss model, that allows for the bank to fully and finally offload the risks to a bad bank. In section

4 we model the German bad bank concept. The bank transfers risky assets to a special purpose vehicle, but stays liable for losses arising from these assets.

3 Model with Outright Purchase of the Toxic Asset

We consider a single bank which has an impaired risky financial asset on its balance sheet. Capital adequacy rules require risky assets to be backed with sufficient equity. The problem is that the write offs on the impaired asset have reduced the bank's equity down to the minimum amount of capital the bank must hold to fulfill the capital requirements. Due to the high degree of uncertainty the bank is not able to raise new capital either. Consequently, the bank is not able to grant further loans and faces a relatively high risk of going bankrupt. A risk-neutral bank manager now has to decide on hiving off the impaired asset to a state-owned bad bank. If he decides to do so, he exchanges the risky asset for safe government bonds. This transaction is comparable to an outright purchase of the toxic asset by the bad bank. The impaired asset is removed from the bank's balance sheet; the bank does not bear further losses from this asset but does not benefit from possible profits either. Furthermore, the bank is able to grant new loans since the government bonds are not subject to capital requirements. These loans are less risky than the impaired asset.

Figures 1 and 2 present the bank's balance sheet with and without the transfer of

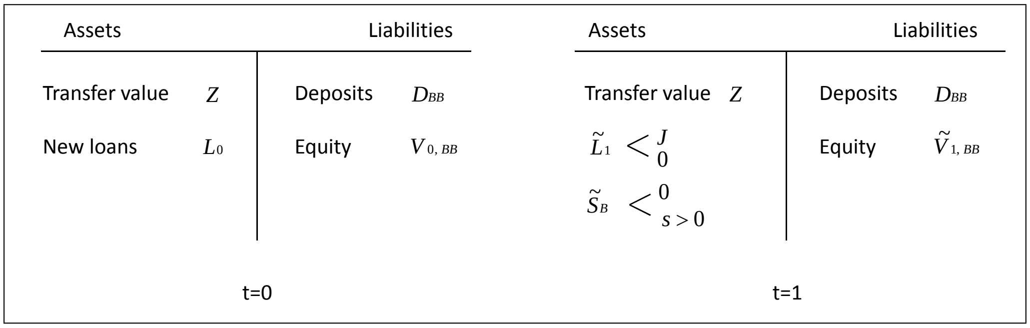

Figure 1: Banker decides to transfer the impaired assets to a bad bank.

the risky asset to a bad bank. We use the figures to elaborate in more detail on the bank's assets and liabilities.

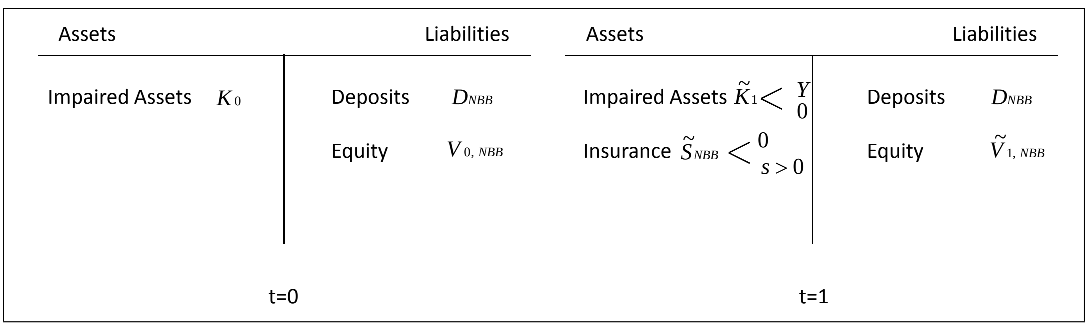

Figure 2: Banker decides to keep the impaired assets in the bank's balance sheet.

There are two dates, $t = 0, 1$. At $t = 0$, a risk-neutral bank-manager has to decide on hiving off an impaired risky financial asset to a bad bank. If he decides against transferring the risky asset, the asset side of the bank's balance sheet consists of the risky asset whose current value equals K_0. The bank's liability side consists of deposits D_{NBB} (the subscript NBB indicates that the manager has decided not to transfer the risky asset to a bad bank) and equity $V_{0,NBB}$. The balance sheet identity is therefore

$$K_0 = D_{NBB} + V_{0,NBB}. \tag{1}$$

Since the bank's capital is just sufficient to meet the capital requirements,

$$V_{0,NBB} = rK_0 \tag{2}$$

with $0 < r < 1$ denoting the required capital ratio. The value of the risky asset at date 1 is a random variable denoted by $\tilde{K}_1$, its values by k_i, with $i = a, b$. The latter shows that the random variable is binomially distributed. We assume that $k_a = Y > 0$ with probability θ and that $k_b = 0$ with probability $(1 - \theta)$. A deposit insurance has been established implying that independently of the realized value of $\tilde{K}_1$, the depositors receive D_{NBB}. For simplicity, the riskless rate and the deposit rate are normalized to zero. Furthermore, we abstain from modelling explicitly an insurance premium.[1] Therefore, the capital value $\tilde{V}_{1,NBB}$ and the insurance payment $\tilde{S}_{NBB}$ are random variables contingent on the outcome of the risky asset. If $k_a = Y$ is realized, the insurance payment will be equal to $s_a = 0$ and the capital value equals $(Y - D_{NBB})$. If the investment fails, the bank will go bankrupt, and the insurance payment will equal D_{NBB} and the capital value will be zero. The balance sheet identity is given by

$$\tilde{K}_1 + \tilde{S}_{NBB} = D_{NBB} + \tilde{V}_{1,NBB}. \tag{3}$$

If at $t = 0$ the bank manager hives off the risky asset to the bad bank, the asset side of the bank's balance sheet will consist of the transfer value Z and newly granted

[1] Freixas and Rochet (2008, p. 313 ff.) model an insurance premium to analyze the moral hazard issue of a deposit insurance.

loans L_0. New loans can be granted because the transfer to the bad bank implies an exchange of risky assets for safe government bonds not being subject to capital requirements. L_0 corresponds to the maximal possible amount of loans which can be granted considering the capital requirements, i.e. $L_0 = rV_{0,BB}$. The bank's liabilities consists of the deposits D_{BB} and the capital $V_{0,BB}$. Since the bank is not able to attract new capital and since the bank is not allowed to sell the government bonds, it has to take in new deposits which are provided unboundedly to the bank. Therefore,

$$D_{BB} = L_0 + D_{NBB}. \tag{4}$$

Concerning the transfer value Z we assume that

$$D_{NBB} \leq Z < D_{BB}. \tag{5}$$

The assumption $D_{NBB} \leq Z$ implies that the bank will not be bankrupt after transferring its risky asset to the bad bank, and the assumption $Z < D_{BB}$ means that deposits are not exclusively used to finance government bonds but also to finance new loans. The balance sheet identity at $t = 0$ is

$$L_0 + Z = D_{BB} + V_{0,BB}. \tag{6}$$

At $t = 1$, the value of the new loans is a random variable denoted by $\tilde{L}_1$. This random variable can take two values: with probability θ_{new} the loans are successful and their value equals $J = \alpha L_0$, with probability $(1 - \theta_{new})$ they fail and their value equals zero. Consequently, the insurance payment $\tilde{S}_{BB}$ and the capital value $\tilde{V}_{1,BB}$ are random variables contingent on the outcome of the new loans. If J will be the realized value, the insurance payment equals zero and the capital value is equal to $J + Z - D_{BB}$. If the loans fail, the insurance payment equals $D_{BB} - Z$ and the capital value is zero. We assume the newly granted loans to be less risky than those transferred to the bad bank so that $\theta_{new} > \theta$. The balance sheet identity at $t = 1$ is given by

$$Z + \tilde{L}_1 + \tilde{S}_{BB} = D_{BB} + \tilde{V}_{1,BB}. \tag{7}$$

The risk-neutral bank-manager maximizes its expected utility which depends on the capital value $\tilde{V}_1$ and a private benefit component B. The private benefit will accrue if the bank does not go bankrupt, i.e. if the loans are successful. Therefore, the private benefit component reflects the managers utility from a continuation of the bank's business, i.e. from retaining his job. Formally, the bank-manager's objective function can be expressed as

$$U = E[\tilde{V}_1] + BI_{[v_i>0]}. \tag{8}$$

The indicator function $I_{[\cdot]}$ takes a value of 1 when the realized value of $\tilde{V}_1$, denoted by v_i, is larger than 0, i.e. if it is equal to $Y - D_{NBB}$ and $J + Z - D_{BB}$ respectively, and 0 otherwise. This reflects that the manager will only accrue the private benefit B if the bank does not go bankrupt. The latter will be the case if $v_{1,i} = 0$. Consequently, if the bank manager decides not to transfer the risky asset to the bad bank, the objective function becomes

$$U_{NBB} = \theta(Y + B - D_{NBB}) + (1 - \theta)0. \tag{9}$$

If the manager decides to make the transfer the function is given by

$$U_{BB} = \theta_{new}(Z + J + B - D_{BB}) + (1 - \theta_{new})0. \tag{10}$$

The bank-manager is only willing to transfer the assets to the bad bank if $U_{NBB} \leq U_{BB}$. This implies that there exists a critical value for the transfer value Z given by

$$Z^* = \frac{r\theta Y + [\theta_{neu}(a-1) + r(\theta_{neu} - \theta)]D_{vG} - r(\theta_{neu} - \theta)B}{\theta_{neu}(a + r - 1)}. \tag{11}$$

If $Z < Z^*$, the manager's expected utility from not hiving off the risky asset will be higher than from making the transfer so that he will not make use of the bad bank offer. The critical value exists since transferring the risky asset to the bad bank, on the one hand, the manager benefits from a higher possibility that the bank does not go bankrupt and therefore, from a higher probability of retaining his job. Furthermore, he will be able to grant new loans which have a positive expected return. However, on the other hand, he will not benefit from a possible success of the transferred assets. Consequently, the critical value transfer value, i.e. the price which must be paid at least for giving the manger an incentive to hive off the impaired assets, depends positively on the expected return of the impaired assets and negatively on the expected return of the newly granted credits and the manager's private benefit B.

4 Model with Repurchase-Agreement of the Toxic Asset

The model presented in this section differs from the previous one by assuming that if the impaired asset is transferred to a bad bank, the bank still bears the default risk of this asset and also participates in possible profits. This is comparable to a transaction with a repurchase agreement of the transferred asset. The idea is that the government bonds the bank receives in exchange for the troubled assets are not subject to capital requirements so that new loans can be granted, and if this investment turns out to be successful, the profits can be used to cover possible losses from the impaired asset. In this section, we show that also in this framework a critical value for the transfer payment Z_0 exists in order to give the bank manager an incentive to hive off the asset to a bad bank.

If the bank manager does not transfer the impaired asset, the balance sheet will look the same as in the previous model (see figure 2). If the manager transfers the asset, at $t = 0$ the balance sheet looks the same as in the former model (figure 1). However, we have to adjust our assumption concerning the transfer value. For arguing along the same line as in the previous model we assume that

$$D_{NBB} \leq Z_0 < \min\left(D_{BB}, \min(J, Y) - D_{BB}\right). \tag{12}$$

The first restriction on Z_0 implies that at $t = 0$ the bank does not become bankrupt when transferring the asset to the bad bank, and the second restriction implies that at $t = 1$ the bank can go bankrupt, which will be the case if both, the impaired asset and the newly granted credit, fail. As long as at least one of these assets turns out to be successful, the bank will be able to repay the depositors as well as the transfer payment ($Y, J \geq Z_0 + D_{BB}$).

At date $t = 1$, the balance sheet looks different compared to the previous model, as shown in figure 3.

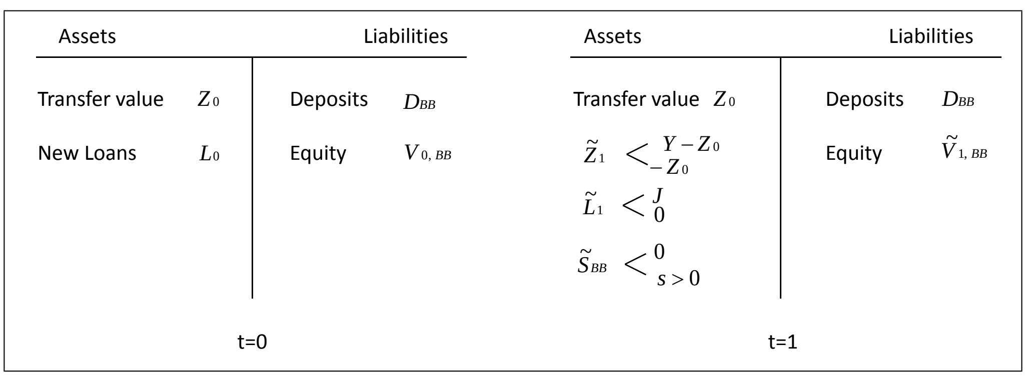

Figure 3: Banker decides to transfer the impaired assets to a bad bank.

Now, it has to be considered, that the bank participates in the risk and return of the transferred asset which is reflected by the random variable

$$\tilde{Z}_1 = \tilde{K}_1 - Z_0. \tag{13}$$

The remaining items of the bank's balance sheet correspond to those of the previous model, so that the balance sheet identity is given by

$$\tilde{K}_1 + \tilde{L}_1 + \tilde{S}_{BB} = D_{BB} + \tilde{V}_{1,BB}. \tag{14}$$

This identity implies that dependent on the outcome of $\tilde{K}_1$ and $\tilde{L}_1$, we can distinguish between four scenarios: (a) both investments are successful, (b) only the transferred credit is successful, (c) only the newly granted credit is repaid properly, and (d) both credits fail. Consequently, concerning the bank manager's objective function, U_{NBB} is the same as in the previous model given by (8): However, for U_{BB} we get

$$\begin{aligned} U_{BB} = \; & \theta\theta_{new}(Z + J + B + Y - Z - D_{BB}) & + \\ & \theta(1-\theta_{new})(Z + B + Y - Z - D_{BB}) & + \\ & (1-\theta)\theta_{new}(Z + J + B - Z - D_{BB}) & + \\ & (1-\theta)(1-\theta_{new})0. & \end{aligned} \tag{15}$$

Again, the manger will only be willing to transfer the asset to the bad bank if $U_{BB} \geq U_{NBB}$, and again, we obtain a critical value for the transfer payment given by

$$Z^{**} = \frac{[\theta_{neu}[a - 1 + r(1-\theta)] - \theta(1-\theta_{neu})]D_{vG} - \theta_{neu}(1-\theta)rB}{\theta_{neu}(a-1) - \theta(1-\theta_{neu})}. \tag{16}$$

A critical value for the transfer value also consists in this model, because on the one hand, the manager benefits from a higher possibility of not going bankrupt, and therefore, of retaining his job. The reason is that when transferring the risky asset to the bad bank and being able to grant a new credit, the bank will only go bankrupt if both credits fail. For this event to occur, the probability is equal to $\theta\theta_{new}$ which is strictly smaller than θ, the probability that the bank will go bankrupt if the asset is not transferred. Furthermore, in this model the manager will benefit from a positive outcome of $\tilde{K}_1$ and $\tilde{L}_1$. However, on the other hand, also in this model a disadvantage for the manager can be spotted if he decides to make the transfer to the bad bank. If scenario (b) will be realized, i.e. if the impaired asset turns out to be successful, while the newly granted credit fails, the bank manager's utility will be smaller compared to a situation in which he does not make use of transferring the impaired asset to a bad bank. In the situation with transfer, he receives $Y - D_{BB}$ in this scenario. In the situation without transfer, he receives $Y - D_{NBB}$, and $D_{BB} > D_{NBB}$, i.e. he has to share the profit with more depositors.

5 Policy Implications

In the sections 3 and 4 we have discussed two different bad-bad models. In the first model, the impaired asset is purchased outright by a state-owned bad-bank. In this case, the taxpayer bears the risk of default of this asset, but also benefits from a possible positive return. In the second model, the transaction between the initial bank and the bad bank can be compared with a credit transaction and repurchase agreement of the securities. In this case, the initial bank still bears the risk of default of the impaired asset but also still benefits from a possible positive return. However, due to the transfer to the bad bank, the initial bank is able to issue new credit and may cover possible losses from the transferred asset with the profits from those newly granted loans. This bad-bank model will involve costs to taxpayers if the transferred asset actually defaults and if the profit from the new credit is not sufficient to cover the losses. This section discusses the policy implications of our analysis.

We consider a policy-maker who pursues the following objectives when establishing a bad bank: (a) to reestablish the stability of the financial sector, (b) to avoid a credit crunch, and (c) to keep the costs for the taxpayer as low as possible. In the following, we will discuss both presented models with respect to these objectives.

Reestablishing the stability of the banking sector by allowing for transferring impaired assets to a bad bank, requires the transfer value Z to be sufficiently high, i.e. it may not be lower than the critical value Z^* and Z^{**} respectively, given by the equations (11) and (16). Otherwise, the bank-manager's expected utility would be higher if the assets were kept on the initial bank's balance sheet. Let us assume, that the actual transfer value is not lower than this critical value, and that the probability failure of a single bank reflects the stability of the banking sector because the bankruptcy of a single bank may cause contagion in the financial sector. Then, an implementation of a bad bank, as in the German concept, enhances stability of the banking sector to a higher degree than in the Swiss concept: In sections 3 and

4 we have shown that a bank's solvency depends on the outcome of its old and new assets, respectively. Referring to a bad bank scheme that allows for the bank to fully and finally offload its risk to a bad bank (section 3), it only depends on the outcome of the newly granted loans. In a bad bank model that leaves the risk from the transferred assets to the bank (section 4), the bank's solvency additionally depends on the outcome of the transferred assets. The bank will only go bankrupt if both assets fail, i.e. the losses occurring if only one of these assets defaults are at least compensated by the profit of the other. Therefore, the probability of failure in this bad bank concept is given by $(1-\theta)(1-\theta_{new})$ which is strictly smaller than the probability of failure in the concept that removes the risks from the bank given by $(1-\theta_{new})$.

Furthermore, the avoidance of a credit crunch (i.e. L_0 to be greater than 0) is one of the policy maker's objectives linked with the implementation of a bad bank. Concerning this objective, note that a bank that participates in either one of the discussed bad bank concepts is able to issue new credit since the transfer of risky assets to a bad bank releases equity that was required to back these assets. Additionally, if $Z > K_0$, the transfer will even imply an increase in the bank's equity. Note furthermore, that in both concepts the ability of issuing new credit increases in the transfer value Z:[2]

$$L_0 = \frac{Z - D_{NBB}}{r}. \tag{17}$$

[2]One obtains (17) by using the balance sheet identity given by (6) considering that $D_{BB} = L_0 + D_{NBB}$ and $V_{0,BB} = rL_0$.

Assuming an identical transfer value in each of the analyzed concepts, both concepts accomplish this objective to the same degree.

Referring to the government's objective to keep expected costs for the taxpayers as low as possible, the advantage of one bad-bank concept over the other depends on the expected profits of the transferred assets, the transfer value and the bank's probability of insolvency. The following equations describe the expected direct costs to the government, and, therefore, to the taxpayer. If a bad bank concept is implemented that allows for the bank to fully offload the risks, i.e. if there is an outright purchase of the impaired asset by the government, the expected costs will be given by

$$E[C_{OP}] = Z - \theta Y. \tag{18}$$

The crucial point is that the government will benefit from expected profits θY, which implies that the outright purchase of the asset may involve the possibility of future upside gains for the taxpayer. But, as pointed out by Beck, Coyle, Dewatripont, Freixas, and Seabright (2010, p. 44) there are strong incentives for politicians to exaggerate the likelihood of this outcome. If a bad-bank concept is implemented that leaves the risks to the banks, i.e. if it can be compared with a credit transaction and repurchase agreement of the securities, the expected costs to the taxpayers will be given by

$$E[C_{RA}] = Z(1 - \theta)(1 - \theta_{new}). \tag{19}$$

In this case the crucial point is that direct costs to the taxpayer will only accrue if the bank fails. The last two equations reveal that in both bad-bank concepts, the expected costs to the taxpayer increases in Z.

However, the discussion so far has shown that in both concepts policy makers face a trade-off when deciding on Z. On the one hand, a higher Z implies that more new credit can be issued. On the other hand, an increase in Z implies higher expected direct costs to the taxpayers. Obviously, the optimal Z depends on the importance of a possible credit crunch problem. In an economy in which this problem seems to be severe, the transfer payment should be relatively high. However, in an economy in which this problem seems not be of outstanding relevance, it should be enough to pay only the critical value Z^* or Z^{**} respectively to induce the bank manager to transfer the impaired assets to a bad bank.

6 Summary

In response to the worldwide financial crisis and subsequent severe losses for banks caused by write offs on so called "toxic assets", several governments implemented bad banks to relieve banks' balance sheets.

In our paper, we have focussed on two different bad bank models and their appropriateness for achieving a policymaker's objectives. Firstly, we have discussed an outright purchase of the impaired assets by the bad bank, similar to the Swiss model. Secondly, we have analyzed a bad bank concept that leaves the risks from the transferred assets to the initial bank, as in the German concept.

We have considered for the policymaker three objectives: (a) to reestablish the stability of the financial sectors, (b) to avoid a credit crunch, (c) to minimize the expected costs to taxpayers. Our model shows that the German bad bank design is superiorly able to reestablish stability since the probability of default of a bank is lower than in the bad bank design that allows for an outright purchase. In regard to the objectives of avoiding a credit crunch and minimizing expected costs to taxpayers, governments face a tradeoff between the former and the latter. A strong preference for the former objective induces to offer banks a high transfer value, on the one hand, since it increases a bank's equity and allows it to grant more loans. On the other hand, if the policymakers considers the risk of a credit crunch as low and focuses on the minimization of expected costs to the taxpayer, the transfer value should be low.

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