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FINANCIAL RESTRUCTURING IN TRANSITION ECONOMIES

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Financial Restructuring in Transition Economies*

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1 Introduction

As the transition towards a market economy advances in eastern Europe, economists and policy makers have become increasingly aware of the fact that success in enterprise restructuring depends on how well the financial system responds to and promotes changes in firms. In particular, a major concern is creditor passivity (Mitchell (1993)). It seems that in most east European economies banks have not significantly changed their lending behavior despite the reduction in the size of the state sector and the growth of the privatized sector. One often hears of complaints that the banks are too soft on their existing borrowers primarily state enterprises, and too tough on new loan applications from the private sector.

An early set of studies identified the main source of the problem to be the overhang of a large stock of bad debt, and suggested that all the inherited debt on the banks’ balance sheets be cancelled (see, for example, Begg and Portes (1992)). Later studies have investigated other possible reforms, such as (conditional or unconditional) recapitalization of insolvent banks, the carving out of their bad loans and the creation of separate units within banks or special institutions to manage the stock of bad debts (see, for example, Phelps et al (1993) and Fries and Lane (1994)).

This paper provides a first attempt at constructing a coherent and comprehensive framework in which the range of policies used to resolve banks’ bad loan problems can be analyzed. We compare soft and tough recapitalization policies and we examine a range of complementary policies. These include the carving out of bad loans (and the transfer of those loans into
hospital banks), high powered incentives for bank managers (e.g. through bank privatization) and the role of liquidity or reserve requirements.

The framework includes three types of agents: firms, banks and the government. Firms and banks are controlled by their managers who derive private benefits from their continued operations and the main source of discipline on their behavior is the possibility of dismissal associated with insolvency. The government's objectives are to avoid the dead-weight costs associated with funding excessive bank recapitalizations, and at the same time, to promote the efficient restructuring or liquidation of firms which have defaulted on their bank loans. Banks have private information about the quality of their loan portfolio and the continuation value of firms in default. The government knows only the probability distribution over the fraction of non-performing loans across banks in the economy. The government thus faces an adverse selection problem in the design of bank recapitalization.

Our analysis leads to a number of interesting results. First, a tough recapitalization policy in which the bank manager is always dismissed results in the bank managers rolling over bad loans in order to conceal the extent of their loan losses and, therefore, in the softening of the firms' budget constraints. Similarly, a soft approach to recapitalization in which the bank manager is never dismissed encourages her to take an overly tough approach to firm liquidations, while exaggerating her own recapitalization requirements¹. However, and this is the second main conclusion of the paper, the socially efficient outcome can often be achieved through a soft bail out policy combined with the carving out of bad loans and their transfer to a separate hospital bank at a suitable transfer price. Our key insight here

¹Similar results are obtained in a different context by Povel (1986).
is that a *non-linear* transfer pricing mechanism for bad loans can be used to combat effectively the adverse selection problem, and in particular to avoid over-reporting of non-performing loans by banks.

The existing theoretical literature on financial restructuring and bank recapitalization in transition economies comprises only a handful of papers, all of which emphasize the implications of *moral hazard* on the selection and monitoring of projects by banks. For example, Mitchell (1995) sets up a formal model of bank restructuring where banks must incur a (convex) cost of effort to avoid asset dissipation by firms. Also taking a moral hazard approach to bank restructuring, Berglof and Roland (1996) argue that the ex ante recapitalization of banks by governments can limit the extent to which banks will take on additional risky loans and then gamble for resurrection\(^2\).

These studies do not provide a complete characterization of all possible bail-out schemes and of the optimality of different bail-out policies under different circumstances. While moral hazard considerations (and in particular problems of excessive risk-taking in the choice of banks' portfolios) are reasonably well understood and arise in transition-and developed market economies alike, informational asymmetries of the kind emphasized in this paper are more likely to be particularly relevant in the context of transition economies where the institutions for evaluating and disclosing the credit-worthiness of both firms and banks are inherently weak. Moreover in all the major banking crises that have occurred during the past two decades in established market economies (e.g. in the US with the Savings and Loans crisis, and also in Chile, Argentina, Mexico, Japan, Scandinavia and recently

\(^2\text{Suarez (1995) also considers the question of optimal bank bail-outs. His paper, however, is not concerned with issues of informational asymmetries. Also, the paper does not focus directly on issues of financial restructuring in transition economies.}
in France with the Credit Lyonnais), the magnitude of the financial crisis has been underestimated initially as a result of banks' attempts to hide the full extent of their loan losses.

The remainder of the paper is organized as follows. Section 2 sets out the basic model, specifying the objectives and constraints of firms, banks and the government. Section 3 compares tough and soft bank recapitalization policies taken in isolation. Section 4 derives necessary and sufficient conditions for the existence of an efficient non-linear transfer pricing mechanism for the carving out of bad loans and their transfer to hospital banks. Sections 5 and 6 examine respectively the effects of high-powered incentives for bank managers and the role of liquidity or reserve requirements. We find that high-powered incentives can improve the efficiency of a soft approach to bank recapitalization, while the use of reserve requirements will increase the effectiveness of a tough bail out policy. Finally, section 7 offers some general conclusions.

2 The model

The model builds on Bolton and Scharfstein (1990) by enlarging their set up to allow for three types of agents: firms, state banks and the government. We consider each in turn.

2.1 Firms

For simplicity, we assume that all firms are run by self-interested managers. Be they state-owned or privatized firms, shareholders do not play a significant governance role; rather the focus is on bank debt as a disciplining device. A firm is represented by an asset, which yields a random return. In the first pe-
period, the return is either high, $\pi > 0$, or low (equal to zero). The probability of getting high returns is $p \in (0, 1)$. This probability could be controlled by the manager's actions, but for now we shall take it to be exogenously given. In the second period, the firm also has a random continuation value, which is the discounted stream of future returns.

Each firm has an outstanding stock of bank debt (and for simplicity no other liabilities). This stock of debt imposes repayment obligations on the firm of $D \in [0, \pi]$. When the firm defaults, the bank can either liquidate the firm, making the manager redundant, or it can let the firm continue. The certain liquidation value of the firm is $L$. The continuation value of the loan is either high, $v > 0$, or low (equal to zero), with $v > L > 0$. The probability of a high continuation value is $(1 - \beta)$. In the event of default, the continuation value can be costlessly observed.

For simplicity, we shall assume that the private continuation value of firms' managers is sufficiently large that they will always honour their debt repayments if they can$^3$.

### 2.2 Banks

As with firms, we assume that self-interested managers run banks and that banks are state owned. On the asset side of their balance sheets, banks have a portfolio of loans to firms, each of which has a scheduled debt service payment of $D$. As specified above, each firm may default on its loan due to inadequate cash flows with probability $(1 - p)$. In the event of a default, and in the absence of strategic behavior by the bank manager, the bank liquidates

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$^3$Introducing the possibility of strategic default would yield the additional result that any government policy towards banks which results in banks softening their liquidation policy towards firms will also result in a higher amount of strategic defaults occurring in equilibrium. See our remarks at the end of section 3.1 below.
the firm with probability $\beta$ and obtains $L$. The alternative to liquidation is firm continuation with a realized return $v$.

If all firms have independently and identically distributed returns, and if an individual bank holds a large and well diversified portfolio of loans, the bank has a fraction $(1 - p)$ of loans to firms with low cash flows in period one. On the liability side of their balance sheet, banks issue deposits in the amount $d$ to fund each loan. The net worth of the bank per loan is thus:

$$W = (1 - p)[\beta L + (1 - \beta)v] + pD - d. \quad (1)$$

For the bank to have a positive net worth, the weighted average payoff from non-performing and performing loans must exceed the value of deposits issued to fund the representative loan.

Suppose, however, that the returns of firms are correlated and that the fraction of the bank's loans to firms with adequate cash-flow in period one can take on a range of values, $p_1 > p_2 > p_3 > p_4 > 0$, with respective probabilities $\mu_1 > \mu_2 > \mu_3 > \mu_4 > 0$ and with $p = \sum_{i=1}^{4} \mu_i p_i$. The bank's realized net worth is again given by equation (1), but $p_i$, $(i = 1, ..., 4)$, now substitutes for $p$. Thus, under the four possible outcomes, $p_i$, the bank's realized net worth is equal respectively to:

$$W_i = (1 - p_i)[\beta L + (1 - \beta)v] + p_iD - d,$$

where we assume that:

$$W_4 < W_3 < W_2 = 0 < W_1.$$

That is, only banks in states 1 and 2 are solvent while banks in states 3 and 4 are insolvent. As will become clear in the next section, we need at least four different states of nature in order to analyze contingent (or conditional) bail-out policies.
Finally, let $\phi_i = (1 - p_i)\beta$ denote the fraction of liquidated loans. We obviously have: $\phi_1 < \phi_2 < \phi_3 < \phi_4$.

When a firm defaults, banks must decide whether to allow the firm to continue or to seek its liquidation. We assume that the sale of the firm’s assets can be observed costlessly so that the liquidation decision of the bank manager is observable and verifiable. However, loan continuation and write-down decisions are entirely at the discretion of the bank manager and cannot be verified. In other words, unless a non-performing loan is actually liquidated it is not possible to verify whether the loan is performing or not.\(^4\)

This limited verification of the bank manager’s behavior in turn allows for strategic behavior, on her part.

For example, the bank manager may want to inefficiently refinance bad loans in order to hide (or understate) the overall extent of her non-performing loans problem. This seems to be standard practice in banking all over the world. Similarly, when the bank is bailed out, the bank manager may want to overstate the proportion of non-performing loans in order to elicit a greater recapitalization from the government. The core analysis of our paper centers around these two forms of strategic behavior by bank managers.

As with firms, banks manager’s objective function involves a monetary and a private benefit component. The monetary component is the sum of a fixed salary $s_b$ (which we normalize at zero) and, in the case of a high-powered incentive scheme, of a share of the bank’s profit or net worth, say equal to

\(^4\)In practice it may be possible to detect some non-performing loans through careful auditing and indeed, bank credit agencies (such as IBCA) fulfill this particular function. However, even in established market economies, these rating agencies fail to uncover the problems. Moreover, it is worth adding that in the case of state-owned banks (such as Credit Lyonnais) efficient auditing systems are not in place. A fundamental reason why auditors cannot be fully relied upon in overcoming basic asymmetries of information, is that evaluating continuation values of loans is largely a matter of business judgement, and therefore difficult to do by independent outside auditors. Just as with non-financial enterprises the business-judgement rule plays an important role in banks.
$b \max(0, W_i)$. The private benefit component reflects the facts that: (i) \textit{bank managers like power} (to an extent that increases with the "size" of the bank's operations), and (ii) \textit{bank managers}, like firm managers, \textit{would rather stay in place than be fired}.

Formally, we can express the bank manager's objective as:

$$U_B = b \max(0, \hat{W}_i) + \hat{B}(1 + \max(0, W_i + R)).$$

where $\hat{B} = B$ if the bank's manager remains in control, and $\hat{B} = 0$ if she is fired; and $\hat{W}_i$ is the \textit{reported} net worth per loan of the bank (absent recapitalization) and $W_i$ is the \textit{true} net worth. Any additional resources accruing to the bank in period one, in particular as a result of recapitalization, is given by $R$.

To keep the analysis simple, we shall begin by assuming that the bank's manager does not respond to monetary incentives, so that $b = 0$,\footnote{Or, equivalently, the bank's manager is subject to a "low-powered" incentive scheme.} and therefore

$$U_B = \hat{B}(1 + \max(0, W_i + R)).$$

The effects of high-powered incentive schemes will be considered in Section 5.

\subsection*{2.3 The government}

The government may (or may not) undertake the recapitalization of banks with (announced) negative net worth. However, we shall assume that it is too costly for the government to let a bank fail and that all the depositors in any insolvent bank which is eventually closed down, are fully compensated by the government.
The government’s problem is then to design its bail-out policies so as to maximize the expected social return of the underlying assets of firms less the cost associated with any excessive recapitalization of banks. Let $\lambda$ denote the dead-weight cost associated with raising a unit of public revenue in excess of the minimum required recapitalization. Obviously, with full information about the net worth of banks, the government would avoid excessive recapitalizations and the corresponding dead-weight losses, by simply transferring $(-W_t)$ to the depositors of banks in states $i = 3, 4$ in period one.

The government’s problem, however, is that it does not know the current net worth of banks. But then, if the government wants to guarantee that all banks reach at least a minimum net worth of zero, it must be prepared to bail-out banks up to an amount $-W_4$, the worst possible negative net worth. Given that the government does not know the net worth of banks, their managers may be able to get away with claiming to be in the worst possible state. This possibility in turn implies that the ex-ante dead-weight loss from full recapitalization is

$$\lambda(\mu_1(W_1 - W_4) + \mu_2(W_2 - W_4) + \mu_3(W_3 - W_4)) = \lambda E. \quad (4)$$

Of course the government has the option to limit the size of the recapitalization to an amount less than $-W_4$, but then it exposes itself to the risk of inadequate recapitalizations in the worse state of nature. As will become clear, the cost of inadequate recapitalization in our model arises from the possibility that banks in the two worst states of nature will attempt to hide their insolvency by perpetuating unprofitable loans to inefficient firms with low period-one cash flows.
More formally, the government's objective function can be expressed as:

\[
U_G = \bar{p} \cdot \pi + \sum_{i=1}^{4} \mu_i \cdot \Omega_i - \lambda E,
\]

where \( \bar{p} \cdot \pi \) is the expected first period return per firm, \( \Omega_i \) is the expected (social) continuation value of each firm in state \( i \), and \( E \) is the extent of excessive recapitalization. The expected continuation value of a firm, \( \Omega_i \), is given by:

\[
\Omega_i = p_i(1 - \beta)v + (1 - p_i)[\min\{(1 - \beta), (1 - \beta_i)\}v + \hat{\beta}_i L]
\]

In other words, for the proportion of firms with high cash flows \( p_i \), the expected continuation value is \( (1 - \beta)v \) since these firms will never be liquidated by their managers. For the proportion of firms with low cash flows \( (1 - p_i) \), the manager is forced to default and the average continuation value per loan is \( \min\{(1 - \beta), (1 - \beta_i)\}v + \hat{\beta}_i L \). Here, \( \hat{\beta}_i \) denotes the fraction of defaulting loans the bank chooses to liquidate in state \( i = 1, \ldots, 4 \).

Thus, in our model social efficiency requires fulfillment of two conditions. First, a firm should be liquidated only if the liquidation value exceeds the continuation value \( \bar{v} \), that is \( \hat{\beta}_i \) should be equal to \( \beta \). Second, only those banks with truly negative net worth should be recapitalized, that is \( E \) should be equal to zero.

Throughout the remainder of the paper we make the rather realistic assumption that the liquidation value, \( L \), is greater than the manager's private benefit from the firm's continued operation. In other words, it is socially efficient to liquidate the firm whenever the bank's continuation value is zero, even though the firm's manager always prefers not to liquidate.
3 Tough vs soft recapitalization policy

The financial restructuring problem faced by the government or the bank regulator involves the following two questions:

(a) how "tough" should the recapitalization policy be? In particular should the bank's manager be dismissed in any bank bail-out?

(b) what should be done with the existing non-performing loans? Should they remain with the incumbent bank(s) or instead be carved out and put into a "hospital" bank?

Whilst the present section will focus on the first question, the role of hospital banks will be discussed in the next section.

Again, let us start with the benchmark case where the net worth of banks is known in period one. The optimal bail-out policy is then straightforward: restore the bank's net worth to zero after allowing for the expected recovery of non-performing loans and dismiss the manager if recoveries fall short of expectations. This policy achieves first-best efficiency. In particular it guarantees both that firms are liquidated only if their liquidation value exceeds their continuation value \( v \) (this maximizes \( W_t \)) and that only those banks with truly negative net worth are recapitalized.

The above "simple-minded" policy, however, may have perverse effects in the second-best situation where the bank's regulator must rely on bank managers' reports to learn about the net values \( W_t \). In this section, we shall examine the incentive problem faced by the bank regulator (or the government) by considering two extreme bail-out policies often recommended in practice:
1. A *tough* recapitalization policy, which results in the dismissal of the insolvent bank’s manager, the closure of the insolvent bank and the redeployment of its assets.

2. A *soft* recapitalization policy, which maintains the insolvent bank’s manager in control whilst the bank is being fully bailed out by the government.

### 3.1 Tough recapitalization policy

Consider first the case in which the manager of a bank with reported negative net worth is dismissed. Assuming for the moment that $b = 0$, the manager of a bank with realized $p_1$ or $p_2$ has no incentive to manipulate either the accounts of the bank or the decisions to liquidate firms or to write-down their loans. However, the bank would be insolvent if either $p_3$ or $p_4$ were realized. With such outcomes, the bank manager will act as if $p_k = p_2$ had occurred in order to preserve her job. Since the liquidation of firms is verifiable, the bank manager will pretend that $p_k = p_2$ by only liquidating a fraction $\phi_2$ of firms in its portfolio, (where $\phi_2$ has been defined as the fraction of liquidated loans in a bank with realized $p_2$, that is $\phi_2 = (1 - p_2)\beta$).

In other words, the bank manager will liquidate a fraction $\beta_k$ of defaulting firms, such that:

$$
(1 - p_k)\beta_k = \phi_2 = (1 - p_2)\beta.
$$

Therefore, the proportion of defaulted loans that are actually liquidated by the bank manager in states $p_3$ or $p_4$ is *less* than the socially efficient proportion, that is $\beta_k < \beta$. The banks managers’ incentive to maintain the appearance of bank solvency under a tough bail-out policy, thus leads to a
softening of debt as a disciplining device on firms and thereby a softening of firms' budget constraints!

More formally, a tough bail-out policy leads to an \textit{ex ante} payoff of:

\[
U_i: = \bar{p} \cdot \pi + \sum_{i=1}^{2} \mu_i [p_i (1 - \beta) v + (1 - p_i) ((1 - \beta) v + \beta L)]
+ \sum_{i=3}^{4} \mu_i [p_i (1 - \beta) v + (1 - p_i) ((1 - \beta) v + \beta_i L)]
\]

(8)

where, from equation (7) above, \( \beta_i < \beta \) for \( i = 3, 4 \). A tough bail-out policy thus leads to an insufficient number of firm liquidations. The loss in social surplus due to the softness of banks on firms in default is the foregone liquidation value of those firms which are continued even though they have a zero continuation value.

There is, however, no deadweight cost due to excessive recapitalization under a tough bail-out policy. True, we have assumed full compensation of insolvent banks' depositors, but such a compensation will not involve any excessive government transfer if it is carried out \textit{ex post}. It is natural to assume that at this stage, the true net worth of the bank, \( W_t \), becomes public information.

Two brief remarks to conclude this subsection:

(a) Introducing the possibility of \textit{strategic} default (that is, of firms not repaying their loans even when their profit realization \( \bar{\pi} \) is high) would amplify the loss in social surplus due to banks hiding the extent of their bad loan problem. More precisely, suppose that the private continuation value of firms' managers is such that firms' managers would choose \textit{not} to strategically default if the probability of liquidation in case of default is \( \beta \), but might decide to default if they anticipate a \textit{lower} probability of liquidation by the bank. Then, not only will the number of firms liquidations be
less than socially optimal, but there will also be a higher amount of asset dissipation.\textsuperscript{6}

(b) It directly follows from the above discussion that a tough bail-out policy will tend to produce a negative externality within banks between bad and good loans.\textsuperscript{7} Indeed, by softening the liquidation policy of an insolvent bank, tough bail-outs reduce the funds available for loans to \textit{good} firms who wish to borrow from the same bank.

3.2 Soft bail-outs

1. Under a "soft policy" toward bank recapitalization, a bank manager is immune from dismissal, regardless of reported net worth. This approach creates an incentive for bank managers to overstate their problem loans. Remember that the bank manager's utility is an increasing function of the "size" of the bank as measured by its true net worth.

\textsuperscript{6}For example, suppose that the private continuation value of firms' managers is random, equal to \(V\) with probability \((1 - \varepsilon)\) and to zero with probability \(\varepsilon\), where:

\(\beta|1 - p_2 + p_2\varepsilon|V < D < \beta V.\)

Then, we leave it to the reader to verify that, whilst in the case of a solvent bank (in state 1 or 2), the pair of strategies: \((\beta = \beta, \text{strategic default with probability } \varepsilon)\) is the unique Nash equilibrium, in the case of a bank in state 4 there exists a Nash equilibrium involving a higher probability of strategic default, namely: \((\beta_4 < \beta, \text{strategic default with probability } 1)\), where \(\beta_4\) satisfies the equation:

\[\frac{(1 - p_4) + p_4 \cdot 1}{\beta_4} = \phi_2,\]

or equivalently:

\[\beta_4 = \phi_2 = (1 - p_2)\beta + p_2\beta\varepsilon. \quad \Box.\]

\textsuperscript{7}No such externality would a priori arise otherwise. Also note that in practice the management of bad loans in most banks, the ultimate purpose of which is repossession, is undertaken in a separate department, since it requires specific skills which are quite distinct from those of a regular loan officer.
plus any recapitalizations,

\[ U_B = B(1 + \max(0, W_i + R)) \]

The change in bank manager utility from reporting the worse possible net worth \( W_4 \) instead of the true net worth \( W_i \) is thus always positive and equal to:

\[ \Delta U_B = B(W_i - W_4) \]

Since all banks will now act as if \( p_4 \) had occurred, the proportion \( \tilde{\beta}_k \) of defaulted loans that are liquidated by a bank in state \( k \) now satisfy:

\[ (1 - p_k)\tilde{\beta}_k = \phi_k = (1 - p_4)\beta, \quad (9) \]

so that \( \tilde{\beta}_k > \beta \) since \( p_k > p_4 \) for \( k = 1, 2, 3 \).

Thus, with soft recapitalization policies, the bank manager hardens the budget constraint on firm managers, increasing liquidations above the first-best fraction \( \beta \). In other words, the soft recapitalization policy encourages bank managers to be overly "tough" on firms which default.

The social payoff achieved through a soft bail-out policy is:

\[ U_G = \bar{p} \cdot \pi + \sum_{i=1}^{2} \mu_i [p_i((1 - \beta)\nu + (1 - p_i)((1 - \tilde{\beta}_i)\nu + \tilde{\beta}_i L)) - \lambda(\mu_1(W_1 - W_4) + \mu_2(W_2 - W_4) + \mu_3(W_3 - W_4)), \quad (10) \]

where, from equation (9), \( \tilde{\beta}_i > \beta \) for \( i = 1, 2, 3 \) and \( \tilde{\beta}_4 = \beta \).

The social costs of a soft bail-out policy are, first, the loss in continuation values due to excessive liquidations weighted by the associated probabilities, and, second, the dead-weight costs from excessive recapitalization:

\[ \lambda(\mu_1(W_1 - W_4) + \mu_2(W_2 - W_4) + \mu_3(W_3 - W_4)). \]

Comparing (10) and (11), one can immediately establish:
Proposition 1: When \( \mu_1 \) is close to 1, that is when the banking system is believed to be in crisis by the regulator, a soft bail-out policy dominates tough bail-out. When \( \mu_1 + \mu_2 \) is sufficiently close to 1, that is, when the banking system is perceived as essentially sound and healthy by the regulator, a tough bail-out dominates soft bail-out.

While tough (soft) bail-out policies approximate first-best efficiency when the banking system is believed to be healthy (in a deep crisis) by the regulator, the comparison between these two extreme policies becomes less clear cut in intermediate situations. For example, when \( \mu_3 \) is close to 1, then the excessive recapitalization of banks in state \( p_3 \) and the excessive liquidation of firms by those banks under soft bail-out, must be weighted against the insufficient liquidations by banks in state \( p_3 \) (and \( p_4 \)) under tough bail-out: depending upon the unit dead-weight loss \( \lambda \), and upon the cost of excessive liquidation \([v - L]\) and that of excessive continuation \([L]\), either of the two extreme policies will dominate the other, although none of these policies will approximate the first-best outcome.

3.3 Conditional bail-outs

Now consider a less extreme approach toward bank recapitalization, under which dismissal of the bank manager depends on the amount of required recapitalization. Specifically, if a bank reports that \( p_3 \) has occurred, the bank would be recapitalized without the manager being dismissed. But if a bank reports that \( p_4 \) has occurred, the recapitalization would be accompanied by its manager's dismissal. In other words, a bank manager would be held accountable only for an extremely poor outcome.

While banks in states \( p_1 \) and \( p_2 \) will seek to increase \( w_i + R \) (by increasing
liquidations of defaulted firms above $\beta$ and thereby pretending to be in the insolvency state $p_3$, banks in state $p_4$ will instead underliquidate in order to hide the extent of their insolvency problem. However, banks in state $p_3$ will take efficient liquidation decisions. Thus, although a conditional bail-out policy combines inefficiencies present in the two previous policies, it involves a smaller dead-weight cost of recapitalization than under soft bail-out and less underliquidation than under tough bail-outs. In particular it is easy to show that:

**Proposition 2:** When $\mu_3$ is close to 1, the conditional bail-out policy approximates first-best efficiency and thus dominates both tough and soft bail-out policies.

While conditionality may reduce the dead-weight cost of recapitalization by reducing the bank managers' incentive to exaggerate the extent of their bad loan problems, other policies can perform as well or better. In particular the combination of a soft bail-out policy together with the carving-out of bad loans and their transfer - at a suitable price - to a "hospital bank", can be shown to achieve first-best efficiency under a broad range of prior beliefs $(p_i, \mu_i)$. This is the main point of the next section:

4 Separate loan workout

With one or more hospital banks, the government can offer to purchase bad loans from the existing banking system and place them in special-purpose "banks" for loan recoveries. The basic idea behind a hospital bank scheme is to separate the management of problem loans from other loans. A common
justification for this separation is to avoid direct competition for funds and management time between existing problem loans and other loans. The general presumption is that managers of troubled banks do not make efficient fund allocation between problem loans and other loans. They tend to over-invest in non-performing loans. Our analysis so far, however, indicates that this general presumption is not always correct. If the bank is undercapitalized and the bail-out policy is soft, then the bank manager may well decide to underinvest in non-performing loans. Another lesson from our model so far is that the allocation of bad loans to a hospital bank may be subject to the same strategic behavior by bank managers as with other approaches to recapitalization. It is therefore not clear a priori what specific benefits a hospital bank type scheme has to offer.

It turns out that the carving-out of bad loans is always optimal in the context of our model, that is: for any bail-out policy, withdrawing the bad loans from the banks' portfolios, minimizes the bank managers' incentive to exaggerate the extent of their bad loans problem and thus it reduces the scope for excessive recapitalization of insolvent banks. Naturally, both the transfer of non-performing loans to a hospital bank and the hospital bank itself must be properly designed.

We model the hospital bank as an all equity firm. In other words, on its balance sheet, the hospital bank holds as assets loans purchased from the state banks, for which the counter-entry is an equity stake by the government. The hospital bank thus differs from existing banks in that it has no deposit liabilities. The reason why we adopt this specification is simply that this is a form that has been adopted in practice. We assume that the government gives the manager of the hospital bank an incentive in the form of a share
of the hospital bank's net worth. There is no prospect of recapitalizing the hospital bank, nor is there a threat of dismissing its manager. Her objective function is thus,

\[ U_H = b \max(0, W_t) + B(1 + W_t) + s \]  

where \( s \) is a fixed wage, \( B \) is the private benefit of (managerial) control, and \( W_t \) is the net worth of the hospital bank.

Thus, some of the incentive problems uncovered above in the case of existing insolvent banks (e.g. the incentive to misreport the net worth \( W_t \)) are not present in the all-equity hospital bank.

A key issue for any hospital bank scheme, however, concerns the transfer price to be paid to the existing banks in exchange for their bad loans. Consider first a linear pricing scheme, whereby the government pays a fixed amount \( t \) for any loan sold by the bank manager, say, with \( d < t < D \), and with no threat of dismissal of the bank manager. Since \( t < D \), bank managers would have no incentive to sell any performing loans to the government, since this would reduce the net worth of the bank and thereby the bank manager's utility. But even with \( t = d \), insolvent banks will end up with a strictly positive net worth (equal to the value of the performing loans in their portfolios minus \( d \)). Such a transfer price is clearly too generous, since the objective is to bring banks to a minimum net worth position of zero.

To achieve a zero net worth position for sure, the lowest linear transfer price \( t \) that can be set is such that banks in the worst possible state \( p_4 \) break even:

\[ p_4 D + (1 - p_4(1 - \beta))n + \phi_4 \cdot t = d. \]

At that price, however, the recapitalization policy is still too generous on
average, since in all states but the worst, banks can increase their net worth beyond zero.

But, we show that even with this price, an important advantage of the hospital bank scheme is that it limits the extent of excessive recapitalization since now the bank manager must give up a loan in order to receive a capital injection. As a result, the bank manager now has no incentive to dress up a performing loan into a non-performing loan. This is an important improvement over the soft recapitalization policy considered above.

Excessive recapitalization can be limited even further under a hospital bank scheme if the government introduces a non-linear transfer price. Indeed, suppose that the government sets a price $t_L$ per loan for a fraction $\bar{m} \leq \phi_2$ of a bank's portfolio and $t_H > t_L$ per loan thereafter. One can then establish the following:

**Proposition 3:** There exists $\bar{m} \leq \phi_2$ such that the above two-part transfer price $(t_L, t_H, \bar{m})$ implements the first-best outcome, if and only if:

$$p_4 D + (1 - p_4)(1 - \beta)v + (\phi_4 - \frac{\phi_2(v - L)}{v})v \geq d. \quad (12)$$

**Proof:** Without loss of generality we can assume $D > v$.

First, in order to avoid overreporting of non-performing loans by banks, the transfer price $t_H$ cannot be larger than the minimum value of a performing loan, namely $v$. So, we must have:

$$t_H \leq v.$$ 

Without loss of generality, we restrict ourselves to two-part transfer schemes such that $t_H = v$. With $t_H \leq v$, banks have no incentive to exaggerate their bad loans problems and pretend they are in state $p_4$, since doing so would
involve getting rid of performing loans at a price lower than the value of those loans.

Now, it suffices to show that the low tariff $t_L$ and cut-off level $\overline{m}$ can be chosen so as to deter solvent banks in state $p_2$ (and a fortiori those in state $p_1$) from selling their non-performing loans to the government. For example, set $t_L = 0^8$ and fix $\overline{m}$ such that:

$$(\phi_2 - \overline{m})v + \overline{m} \cdot t_L = \phi_2 \cdot L. \quad (13)$$

The LHS of equation (13) is the payoff that a bank in state $p_2$ would get by selling its non-performing loans to the government, and the RHS is the bank’s revenue from liquidating those loans. The choice of $\overline{m}$ will thus deter solvent banks in states $p_1$ and $p_2^9$ from selling their bad loans to the government.

Now, it suffices to show that the two-part transfer scheme $(t_L = 0, t_H = v, \overline{m} = \frac{\phi_4 (v - L)}{v})$ succeeds in fully bailing-out insolvent banks in states $p_3$ and $p_4$. In particular, consider a bank in state $p_4$ (the worst possible state). The realized net worth of such a bank under soft-bailout augmented by the above transfer scheme, will be:

$$p_4 D + (1 - p_4)(1 - \beta)v + (\phi_4 - \overline{m})v,$$

which is greater than $d$ under condition (12). This condition is therefore 

**sufficient** to avoid both misreporting of non-performing loans by all types of banks and the failure of any insolvent banks, and therefore to achieve first-best efficiency through a two-part transfer scheme $(t_L, t_H, \overline{m})$.

---

8As we shall see below, setting $t_L = 0$ involves no loss of generality.

9Since $\phi_1 < \phi_2$ and $v > L$, we obviously have:

$$(\phi_1 - \overline{m})v + \overline{m} \cdot t_L < \phi_1 \cdot L,$$

so that whenever the incentive constraint of banks in state $p_2$ as binding (i.e. whenever $\overline{m}$ satisfies equation (12)), the incentive constraint of banks in state $p_1$ is strictly satisfied.
To complete the proof of Proposition 4, we must show that condition (12) is necessary, which in turn boils down to showing that it cannot be relaxed by allowing for more general two-part pricing schemes with \( t_L > 0 \).

Suppose we take \( t_L > 0 \). The necessary condition on \( t_L \) and \( m \) for banks in state \( p_4 \) to be fully bailed out, becomes:

\[
p_4 D + (1 - p_4)(1 - \beta)v + [(\phi_4 - m)v + m t_L] \geq d. \tag{14}
\]

In choosing \( m \) and \( t_L \), the government will seek to relax the above constraint, whilst still discouraging the solvent banks from selling their bad loans. That is, the government will choose \( m \) and \( t_L \) so as to:

\[
\max[(\phi_4 - m)v + m \cdot t_L] \\
\text{s.t.} \ (\phi_2 - m)v + m \cdot t_L \leq \phi_2 \cdot L.
\]

At the optimum the incentive constraint of the (type-\( p_2 \)) bank is binding, so that the above maximum can be reexpressed as:

\[
\phi_4 v - \phi_2 (v - L).
\]

Substituting for \((\phi_4 - m)v + m t_L = \phi_4 v - \phi_2 (v - L)\) in (14) yields nothing but condition (12). In other words, there is no efficiency loss involved in setting \( t_L = 0 \) and \( m = \bar{m} \). This establishes Proposition 3.\( \square \)

Thus, whenever condition (12) is satisfied, a soft bail-out with a carefully designed carving-out (or "hospital bank") scheme can achieve first-best efficiency \textit{whatever} the regulator's prior beliefs \((\mu_4)\) about the health of the banking system. In particular, it dominates the tough, soft and conditional bail-out policies considered in the previous section, none of which would achieve first-best efficiency except perhaps on a measure-zero subset of parameters \((\mu_4)\). Second, when condition (12) does not hold, any bail-out plus
carve-out policy which avoids bank failure will lead to an excessive recap-
italization of solvent banks in state $p_2$ (and/or by insolvent banks in state $p_3$). Then, a soft bail-out with carve-out scheme will entail a deadweight cost at least equal to $\lambda \mu_2 \cdot \phi_2$, so that tough bail-outs may again dominate, in particular if $\mu_2$ is close to one.

To summarize our analysis in this section:

(a) Allowing for the carving-out of bad loans at a suitable transfer price will always improve the outcome of soft bail-out policies.

(b) Soft-bail out together with an adequate hospital bank scheme will achieve first-best efficiency for a large set of regulator beliefs about the health of the banking system.

(c) When the above condition is violated, tough bail-out may sometimes dominate, although in fewer circumstances than in the absence of hospital banks.

A final comment to conclude this section: we have shown that by reducing (or removing) the bank’s incentives to exaggerate the extent of their bad loan problems, a suitably designed hospital bank (plus soft bail-out) policy could (sometimes) achieve the socially efficient outcome in our model. However, in somewhat more complex circumstances, this efficiency could be lost. For example, if we allowed for heterogeneity in the “quality” of non-performing loans (e.g. measured by differences in the liquidation values $L_j$ of each loan) and if the exact quality of a bad loan were private information of bank managers, then two-part pricing mechanisms of the kind considered above would fail to achieve first-best efficiency. In particular such mechanisms dont prevent banks (insolvent and solvent) from seeking partial recapitalization by
transferring these bad loans to the hospital bank at price $t_B$. Characterizing the more sophisticated non-linear transfer scheme that would "solve" this additional adverse selection problem, and more generally deriving the conditions under which such a scheme can achieve the first-best outcome (or at least dominate the alternative policies analyzed in the previous section) is left for further research.

5 High powered incentive schemes and the effects of bank privatization

Our analysis so far has proceeded under the assumption that bank managers were not responding to monetary incentives. We now consider the more general case where a bank manager's utility takes the form:

$$U_B = \max(0, W_i) + \bar{B}(\max(0, W_i + R) + 1),$$

where $\tilde{W}_i$ is the reported net worth per loan of the bank.

Introducing monetary benefits will obviously affect the comparison between different kinds of bail-out policies. In particular, it will increase the inefficiency of tough bail-outs, since under such a policy bank managers have greater incentives to hide their loan losses. With high powered incentive schemes managers want to boost reported profits (by hiding loan losses) not only to avoid losing their job if the bank is found to be insolvent but also to increase their bonus. Thus, in our model managers may want to report net wealth of $W_1$ instead of only $W_2$. Alternatively, high powered incentives will reduce the inefficiency of soft bail-outs by raising the cost of overstating the size of their non-performing loans problem.

It follows from the above remarks that giving a greater monetary stake to bank managers (raising $b$), for example through bank privatization, can
be a useful complement to a soft-bailout policy. Put slightly differently, if a
government contemplates privatizing banks in order to provide higher pow-
ered incentives to bank managers, then it should combine bank privatization
with a soft bail-out policy. It would make little sense to privatize the banking
system with a tough bail-out policy in place.

6 Liquidity and reserve requirements

Under the tough recapitalization policy, we have assumed that it was costless
for the bank manager to roll over non-performing loans in order to maintain
the appearance of solvency. Now suppose that the bank must use scarce
liquidity to roll over a bad loan. The rolling over of non-performing loans
occurs under the tough recapitalization policy, as the managers of banks
with realized \( p_3 \) and \( p_4 \) seek to conceal the full extent of their asset quality
problem.

More formally, we have seen in Section 3 that the manager of a bank in
state \( p_i (i = 3 \text{ or } 4) \) liquidates a fraction \( \beta_i \) of defaulting loans, where \( \beta_i < \beta \)
satisfies:

\[
(1 - p_i)\beta_i = \phi_2,
\]

in order to maintain the appearance of solvency. The extent of rolling over
bad loans by such a bank is thus given by:

\[
\phi_1 - \phi_2 = (p_2 - p_i).
\]

To be able to roll over a loan the bank must have funds available of \( D \) per loan.
There are two sources of bank liquidity. The first is debt service payments
made by those firms that do not default. These payments provide the bank
with \( p_i D \) in liquid funds. The second source of liquidity is the liquidation of
firms in default. These asset sales realize for the bank \((1 - p_2)L\) in liquidity. The overall liquid assets of the bank are thus given by \(p_4D + (1 - p_2)L\). The bank is able to roll over the required fraction of loans to maintain the appearance of solvency provided the following liquidity constraint is satisfied:

\[
[p_4D + (1 - p_2)L](1 - \delta) \geq p_2 - p_1
\]

where \(\delta\) is the fraction of the bank's liquidity which is taken up by reserve requirements and/or withdrawals from depositors.

For a sufficiently high reserve requirement the government can prevent the manager of a bank with realized \(p_4\) from rolling over enough loans to maintain the appearance of solvency. The critical value of \(\delta\) is given by the condition

\[
\delta \geq 1 - (p_2 - p_4)/[p_4D + (1 - p_2)L].
\]

(16)

Liquidity and reserve requirements can thus be used to supplement a tough recapitalization policy, thereby increasing the range of parameters \(((p_4), (\mu_i))\) for which such a policy dominates soft and/or conditional bail-out.

7 Conclusion

This paper examines the problem of designing a bank recapitalization and bad loan workout scheme when banking regulators (or the government) do not have verifiable information on loan quality. The government thus faces an adverse selection problem in the design of this scheme. Several approaches to overcoming this problem are considered.

The main finding is that "soft" recapitalization combined with the efficient transfer of bad loans to a hospital bank can implement the socially efficient outcome. The "soft" approach to recapitalizations ensures that bank
managers have reduced incentives (or no incentives in our model) to hide bad loans in order to preserve their jobs. At the same time an efficient non-linear transfer pricing scheme reduces the bank managers' incentive to overstate loan losses.

The form of the hospital bank is quite general. While it must be an institution separate from an insolvent bank, there can be more than one hospital bank and each can be privately operated. The hospital banks once created, can even be privatized by the government. However, there may be conditions under which the non-linear transfer pricing mechanism does not implement the first-best outcome, particularly when bad loans can be of different "quality" or value.

Recognizing the potential limits of the transfer pricing scheme, the paper also considers other approaches. In particular, consideration is given to "hard" and "soft" recapitalization policies and how these can be complemented with high-powered incentive schemes and liquidity requirements. The second-best choice among these schemes is shown to depend on the overall condition of the banking system, that is the extent of the bad loan crisis.

References


<table>
<thead>
<tr>
<th>No.</th>
<th>Author(s)</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>9630</td>
<td>C. Fershtman and A. de Zeeuw</td>
<td>Tradeable Emission Permits in Oligopoly</td>
</tr>
<tr>
<td>9631</td>
<td>A. Cukierman</td>
<td>The Economics of Central Banking</td>
</tr>
<tr>
<td>9632</td>
<td>A. Cukierman</td>
<td>Targeting Monetary Aggregates and Inflation in Europe</td>
</tr>
<tr>
<td>9633</td>
<td>F. de Roon, C. Veld and J. Wei</td>
<td>A Study on the Efficiency of the Market for Dutch Long Term Call Options</td>
</tr>
<tr>
<td>9634</td>
<td>B. van Aarle, L. Bovenberg M. Raith</td>
<td>Money, Fiscal Deficits and Government Debt in a Monetary Union</td>
</tr>
<tr>
<td>9635</td>
<td>G. van der Laan, D. Talman and Z. Yang</td>
<td>Existence of and Equilibrium in a Competitive Economy with Indivisibilities and Money</td>
</tr>
<tr>
<td>9636</td>
<td>I. Brouwer, J. van der Put C. Veld</td>
<td>Contrarian Investment Strategies in a European Context</td>
</tr>
<tr>
<td>9637</td>
<td>M. Berg, F. van der Duyn Schouten and J. Jansen</td>
<td>Optimal Service Policies to Remote Customers with Delay-Limits</td>
</tr>
<tr>
<td>9639</td>
<td>A.G. de Kok and F.B.S.L.P. Janssen</td>
<td>Demand Management in Multi-Stage Distribution Chain</td>
</tr>
<tr>
<td>9640</td>
<td>D.A. Freund, T.J. Kniesner A.T. LoSasso</td>
<td>How Managed Care Affects Medicaid Utilization A Synthetic Difference-in-Differences Zero-Inflated Count Model</td>
</tr>
<tr>
<td>9641</td>
<td>M.J. Lee</td>
<td>Instrumental Variable Estimation For Linear Panel Data Models</td>
</tr>
<tr>
<td>9642</td>
<td>W. Härdle, E. Mammen and M. Müller</td>
<td>Testing Parametric versus Semiparametric Modelling in Generalized Linear Models</td>
</tr>
<tr>
<td>9643</td>
<td>C. Dustmann, N. Rajah and A. van Soest</td>
<td>Part-Time Work, School Success and School Leaving</td>
</tr>
<tr>
<td>9644</td>
<td>S.C.W. Eijffinger and M. Hoeberichts</td>
<td>The Trade Off Between Central Bank Independence and Conservativeness</td>
</tr>
<tr>
<td>9645</td>
<td>R. Sarin and P. Wakker</td>
<td>A Single-Stage Approach to Anscombe and Aumann's Expected Utility</td>
</tr>
<tr>
<td>9646</td>
<td>J.P. Ziliak and T.J. Kniesner</td>
<td>The Importance of Sample Attrition in Life Cycle Labor Supply Estimation</td>
</tr>
<tr>
<td>9647</td>
<td>P.M. Kort</td>
<td>Optimal R&amp;D Investments of the Firm</td>
</tr>
<tr>
<td>No.</td>
<td>Author(s)</td>
<td>Title</td>
</tr>
<tr>
<td>------</td>
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<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>9648</td>
<td>M.P. Berg</td>
<td>Performance Comparisons for Maintained Items</td>
</tr>
<tr>
<td>9649</td>
<td>H. Uhlig and Y. Xu</td>
<td>Effort and the Cycle: Cyclical Implications of Efficiency Wages</td>
</tr>
<tr>
<td>9650</td>
<td>M. Slikker and A. van den Nouweland</td>
<td>Communication Situations with a Hierarchical Player Partition</td>
</tr>
<tr>
<td>9651</td>
<td>H.I.F. de Groot</td>
<td>The Struggle for Rents in a Schumpeterian Economy</td>
</tr>
<tr>
<td>9652</td>
<td>R.M. de Jong and J. Davidson</td>
<td>Consistency of Kernel Estimators of heteroscedastic and Autocorrelated Covariance Matrices</td>
</tr>
<tr>
<td>9653</td>
<td>J. Suijs, A. De Waegenaere and P. Borm</td>
<td>Stochastic Cooperative Games in Insurance and Reinsurance</td>
</tr>
<tr>
<td>9654</td>
<td>A.N. Banerjee and J.R. Magnus</td>
<td>Testing the Sensitivity of OLS when the Variance Matrix is (Partially) Unknown</td>
</tr>
<tr>
<td>9655</td>
<td>A. Kalwij</td>
<td>Estimating the Economic Return to Schooling on the basis of Panel Data</td>
</tr>
<tr>
<td>9656</td>
<td>M. Lind and P. van Megen</td>
<td>Order Based Cost Allocation Rules</td>
</tr>
<tr>
<td>9657</td>
<td>A. van Soest, P. Fontein and Rob Eeuwals</td>
<td>Earnings Capacity and Labour Market Participation</td>
</tr>
<tr>
<td>9658</td>
<td>C. Fernández and M.F.J. Steel</td>
<td>On Bayesian Modelling of Fat Tails and Skewness</td>
</tr>
<tr>
<td>9659</td>
<td>R. Sarin and P. Wakker</td>
<td>Revealed Likelihood and Knightian Uncertainty</td>
</tr>
<tr>
<td>9660</td>
<td>J.R. Magnus and J. Durbin</td>
<td>A Classical Problem in Linear Regression or How to Estimate the Mean of a Univariate Normal Distribution with Known Variance</td>
</tr>
<tr>
<td>9661</td>
<td>U. Gneezy and J. Potters</td>
<td>An Experiment on Risk Taking and Evaluation Periods</td>
</tr>
<tr>
<td>9662</td>
<td>H.J. Bierens</td>
<td>Nonparametric Nonlinear Co-Trending Analysis, with an Application to Interest and Inflation in the U.S.</td>
</tr>
<tr>
<td>9663</td>
<td>J.P.C. Blanc</td>
<td>Optimization of Periodic Polling Systems with Non-Preemptive, Time-Limited Service</td>
</tr>
<tr>
<td>9664</td>
<td>M.J. Lee</td>
<td>A Root-N Consistent Semiparametric Estimator for Fixed Effect Binary Response Panel Data</td>
</tr>
<tr>
<td>9665</td>
<td>C. Fernández, J. Osiewalski and M.F.J. Steel</td>
<td>Robust Bayesian Inference on Scale Parameters</td>
</tr>
<tr>
<td>9666</td>
<td>X. Han and H. Webers</td>
<td>A Comment on Shaked and Sutton's Model of Vertical Product Differentiation</td>
</tr>
<tr>
<td>No.</td>
<td>Author(s)</td>
<td>Title</td>
</tr>
<tr>
<td>-----</td>
<td>-----------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>9667</td>
<td>R. Kollmann</td>
<td>The Exchange Rate in a Dynamic-Optimizing Current Account Model with Nominal Rigidities: A Quantitative Investigation</td>
</tr>
<tr>
<td>9668</td>
<td>R.C.H. Cheng and J.P.C. Kleijnen</td>
<td>Improved Design of Queueing Simulation Experiments with Highly Heteroscedastic Responses</td>
</tr>
<tr>
<td>9669</td>
<td>E. van Heck and P.M.A. Ribbers</td>
<td>Economic Effects of Electronic Markets</td>
</tr>
<tr>
<td>9670</td>
<td>F.Y. Kumah</td>
<td>The Effect of Monetary Policy on Exchange Rates: How to Solve the Puzzles</td>
</tr>
<tr>
<td>9671</td>
<td>J. Jansen</td>
<td>On the First Entrance Time Distribution of the M/D/\infty Queue: a Combinatorial Approach</td>
</tr>
<tr>
<td>9672</td>
<td>Y.H. Farzin, K.J.M. Huisman and P.M. Kort</td>
<td>Optimal Timing of Technology Adoption</td>
</tr>
<tr>
<td>9673</td>
<td>J.R. Magnus and F.J.G.M. Klaassen</td>
<td>Testing Some Common Tennis Hypotheses: Four Years at Wimbledon</td>
</tr>
<tr>
<td>9674</td>
<td>J. Fidrmuc</td>
<td>Political Sustainability of Economic Reforms: Dynamics and Analysis of Regional Economic Factors</td>
</tr>
<tr>
<td>9675</td>
<td>M. Das and A. van Soest</td>
<td>A Panel Data Model for Subjective Information on Household Income Growth</td>
</tr>
<tr>
<td>9677</td>
<td>B. van Aarle and S.-E. Hougaard Jensen</td>
<td>Output Stabilization in EMU: Is There a Case for an EFTS?</td>
</tr>
<tr>
<td>9678</td>
<td>Th.E. Nijman, F.A. de Roon and C.Veld</td>
<td>Pricing Term Structure Risk in Futures Markets</td>
</tr>
<tr>
<td>9679</td>
<td>M. Dufwenberg and U. Gneezy</td>
<td>Efficiency, Reciprocity, and Expectations in an Experimental Game</td>
</tr>
<tr>
<td>9680</td>
<td>P. Bolton and E.-L. von Thadden</td>
<td>Blocks, Liquidity, and Corporate Control</td>
</tr>
<tr>
<td>9681</td>
<td>T. ten Raa and P. Mohnen</td>
<td>The Location of Comparative Advantages on the Basis of Fundamentals only</td>
</tr>
<tr>
<td>9682</td>
<td>S. Hochguertel and A. van Soest</td>
<td>The Relation between Financial and Housing Wealth of Dutch Households</td>
</tr>
<tr>
<td>9684</td>
<td>F.Y. Kumah</td>
<td>Common Stochastic Trends in the Current Account</td>
</tr>
<tr>
<td>No.</td>
<td>Author(s)</td>
<td>Title</td>
</tr>
<tr>
<td>-----</td>
<td>--------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>9685</td>
<td>U.Gneezy and M. Das</td>
<td>Experimental Investigation of Perceived Risk in Finite Random Walk Processes</td>
</tr>
<tr>
<td>9686</td>
<td>B. von Stengel, A. van den Elzen and D. Talman</td>
<td>Tracing Equilibria in Extensive Games by Complementary Pivoting</td>
</tr>
<tr>
<td>9687</td>
<td>S.Tijjs and M. Koster</td>
<td>General Aggregation of Demand and Cost Sharing Methods</td>
</tr>
<tr>
<td>9688</td>
<td>S.C.W. Eijffinger, H.P. Huizinga and J.J.G. Lemmen</td>
<td>Short-Term and Long-Term Government Debt and Nonresident Interest Withholding Taxes</td>
</tr>
<tr>
<td>9689</td>
<td>T. ten Raa and E.N. Wolff</td>
<td>Outsourcing of Services and the Productivity Recovery in U.S. Manufacturing in the 1980s</td>
</tr>
<tr>
<td>9690</td>
<td>J. Suijs</td>
<td>A Nucleolus for Stochastic Cooperative Games</td>
</tr>
<tr>
<td>9691</td>
<td>C. Seidl and S.Traub</td>
<td>Rational Choice and the Relevance of Irrelevant Alternatives</td>
</tr>
<tr>
<td>9692</td>
<td>C. Seidl and S.Traub</td>
<td>Testing Decision Rules for Multiattribute Decision Making</td>
</tr>
<tr>
<td>9693</td>
<td>R.M.W.J. Beetsma and H. Jensen</td>
<td>Inflation Targets and Contracts with Uncertain Central Banker Preferences</td>
</tr>
<tr>
<td>9694</td>
<td>M. Voorneveld</td>
<td>Equilibria and Approximate Equilibria in Infinite Potential Games</td>
</tr>
<tr>
<td>9695</td>
<td>F.B.S.L.P. Janssen and A.G. de Kok</td>
<td>A Two-Supplier Inventory Model</td>
</tr>
<tr>
<td>9696</td>
<td>L. Ljungqvist and H. Uhlig</td>
<td>Catching up with the Keynesians</td>
</tr>
<tr>
<td>9697</td>
<td>A. Rustichini</td>
<td>Dynamic Programming Solution of Incentive Constrained Problems</td>
</tr>
<tr>
<td>9698</td>
<td>G.Gürkan and A.Y. Özge</td>
<td>Sample-Path Optimization of Buffer Allocations in a Tandem Queue - Part I: Theoretical Issues</td>
</tr>
<tr>
<td>9699</td>
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