The effects of credit risk transfer on bank monitoring and firm financing

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Agenda

- Motivation and aim of the paper
- Related Literature
- Main results
- The basic model
- The model with credit risk transfer
- The commitment problem
- Model implications/extensions

Motivation

- Immense growth of CRT markets in recent years
- $3 trillion outstanding contract volume (Fitch Ratings)
- Growth expected to continue to $8,2 trillion in 2006 (British Bankers Association)
- According to ECB most CRT deals take place between banks (e.g. 80% in Germany) and also cross-border (in each country between 80-100%)
- Fact: Market is huge, banks are the main players
- What is so good about CRT?
- What are the negative effects? And: Does one effect (always) dominate the other?

Aim of the paper

- Primary interest in the effect of credit risk transfers on the “properties” of financial intermediation
- Properties: Price and Level of Monitoring
- Three main questions have driven our research:

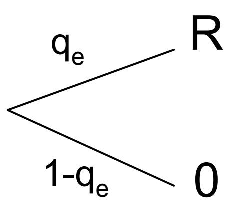
1. What impact does the possibility to transfer credit risk have on the intensity with which banks monitor their debtors?
2. What effect does this have on the level of firm financing in an economy?
3. Given that there is a trade-off, which direction does it (generally) take?

Related Literature

- The effect of credit risk transfer (CRT) on financial intermediation and the real sector:
  - Morrison (2003): CRT lowers monitoring and increases real sector productivity
  - Marsh/Wagner (2003): CRT lowers monitoring and can enhance financial sector stability and effectiveness
  - Arping (2004): CRT increases monitoring incentives and enhances real sector productivity
  - Somewhat contradictory theoretical “evidence”
  - No explicit trade-off between positive and negative effects of CRT modeled
- Our contribution to the literature
  - explicit trade-off between the *costs and benefits* of credit risk transfer, and
  - Combined statements about monitoring intensity *and* firm financing
- Our formal approach is based on
  - Holmstrom/Tirole (1997, QJE): Endogenous bank monitoring
  - Carletti (2004, JFI): Continuous monitoring intensity
  - Diamond (1984, JF): Diversification and delegation costs

The real sector

- Continuum of risk-neutral entrepreneurs with one investment project each, $R \; \varepsilon \; [0,+\infty]$
- It costs I = 1 at date 1 to invest in the project
- Two possible project realizations at final date T

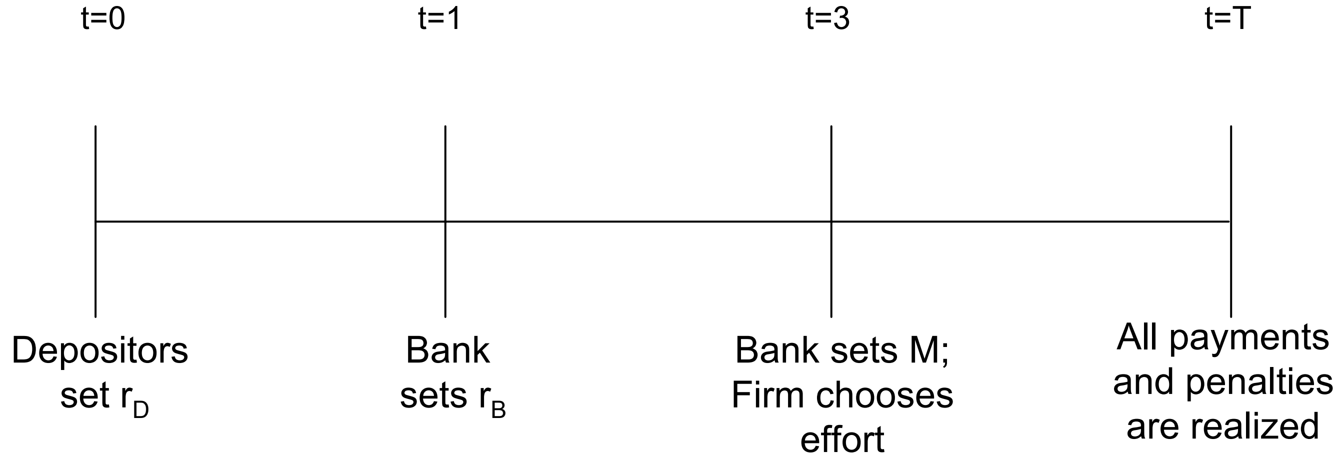


- At date t=3 firms choose effort
  - High effort leads to $q_e = q_h$ and low effort to $q_e = q_l$ with $q_h > q_l$
  - Low effort allows to enjoy private benefit B from shirking

- Entrepreneurs have no initial wealth and are risk-neutral

The financial sector

- Banks that can monitor with M ε [0;1] and $C(M) = mM^2/2$
- Monitoring changes shirking firms success probability to $q_m=q_l+\Delta q*M$
- Banks lend I to the firms and fund themselves through deposits (perfect competition in credit and deposit markets)
- Banks may choose low monitoring and lie about project return (MH- and State Verification(SV)-Problem)
- Depositors impose non-pecuniary penalty function on banks à la Diamond (1984) → incentive mechanism



Information and contracts

- Date T return is private information (SVP)
- Firm and bank efforts are private knowledge (MH)
- Courts cannot verify states and efforts but only the monetary transfers
- All else is common knowledge/observable (R, q_h, q_l, B)
- Only pure discount debt contracts are possible

The penalty function

- The deposit contract
  - Banks have to repay r_D at T, z is the repayment by the firm
  - If they can't they incur a penalty of the form

$$\theta(r_D, z) = \begin{cases} r_D - z & \text{if } z < r_D \\ 0 & \text{if } z = r_D \end{cases}$$

- Expected penalty is

$$E[\theta] = (1-q)r_D$$

- θ is a deadweight loss

The bank's and depositor's profit functions

- With h-firms

$$\Pi_B^h = q_h * r_B - r_D$$

$$\Pi_D^h = q_h * r_D - 1$$

- With l-firms

$$\Pi_B^l = q_M * r_B - r_D - mM^2 / 2$$

$$\Pi_D^h = q_M * r_D - 1$$

The different loan contracts (I)

- Choice of firm effort
  - Firms expected profit depends on their effort e and on M
  - FIC is

$$R > \theta = \frac{B}{\Delta q} + r_B^h$$

- Such firms (h-firms) will always exert high effort and banks can offer M = 0, r_B^h = $1/q_h^2$ and r_D = $1/q_h$ (contract I or h-contract)

The different loan contracts (II)

- Contract II is given by:
- Proposition 1

Contract II: $\Gamma_2(r_D^l, r_B^l, M^*)$ which satisfies the system

$$r_D^* = \begin{cases} 1/\mathrm{q_h} & \text{for} \quad \mathrm{m} < \tilde{m} \\ 1/\mathrm{q_{M^*}} & \text{otherwise} \end{cases}$$

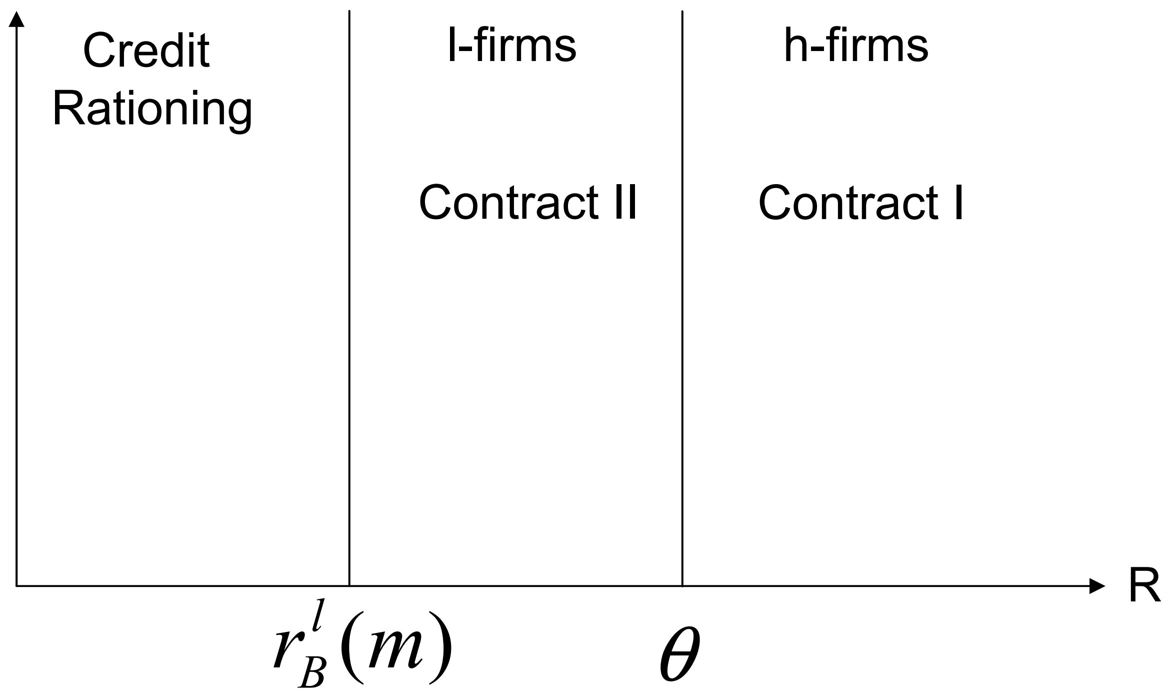
$$r_B^* = \begin{cases} \dfrac{1/q_h + m/2}{q_l + \Delta q} & \text{for} \quad \mathrm{m} < \tilde{m} \\ \dfrac{-\mathrm{mq}_l + \sqrt{(mq_l)^2 + 2m\Delta^2 q r_D^l}}{\Delta_q^2} & \text{otherwise} \end{cases}$$

with $\tilde{m} = \dfrac{2\Delta q 1/q_h}{q_h + q_l}$

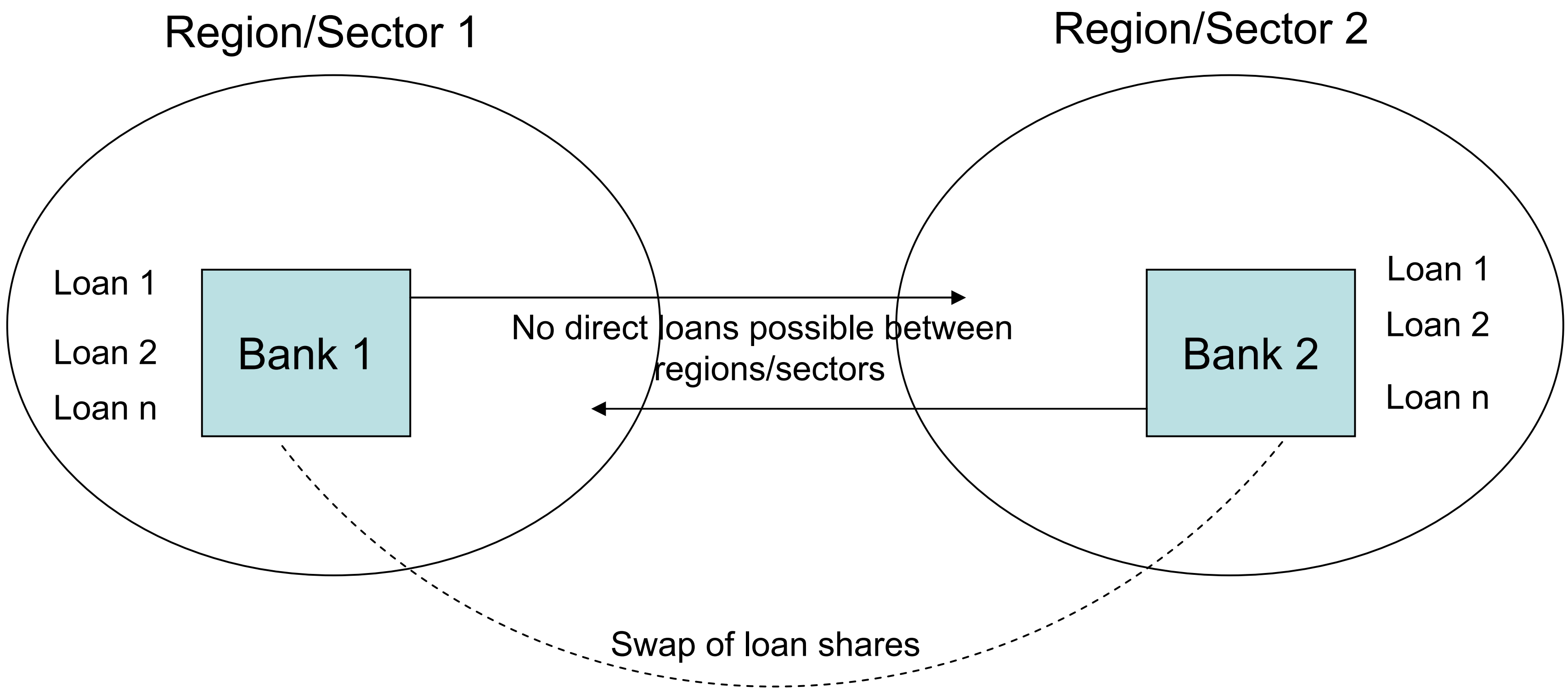
$$M^* = \begin{cases} 1 & \text{for} \quad \mathrm{m} < \tilde{m} \\ \dfrac{-\mathrm{mq}_l + \sqrt{(mq_l)^2 + 2m\Delta^2 q r_D^l}}{m\Delta q} & \text{otherwise} \end{cases}$$

Loan market segments

- The population of firms is segmented in the loan market



Allowing for CRT



- Banks are subject to limits to diversification (Acharya et al. (2004), Almazan (2002), Winton (1999) but also ECB (2004))
- Within each region there is perfect correlation between loans, between the regions there is zero correlation

Sources of benefits and costs of CRT

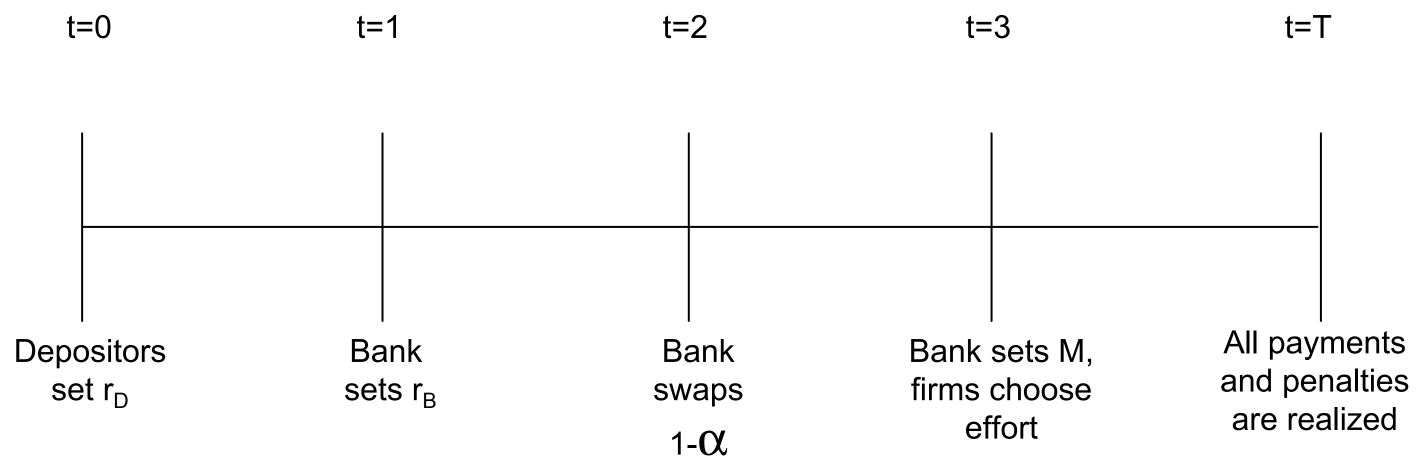
- By assumption risk-neutrality of all agents
- CRT does not affect utility but riskiness of the bank → **Benefits** stem from reduction of expected penalty (deadweight loss) → passed on to firms

- The ‘swap’ lowers monitoring incentives because banks retain only α of their loans but bear full monitoring costs (joint production problem)
- **Cost** of CRT is due to lowering of monitoring intensity

- Overall effect of CRT is thus ambiguous
- Note: Benefits due to SVP, costs due to MH - ASID drives the model.

Timetable with CRT

- At date 0, bank makes an α-promise (at this point this is *merely* a promise)
- At additional date 2 CRT takes place between two banks from two different regions/sectors (banks are identical → symmetric solution)
- CRT: banks swap (1-α) of their portfolios.



Swap of Contract l/h-contract

- Diversification has no direct effect on the bank‘s profit function but on the deposit rate

$$r_{D1}^{h} = \begin{cases} \dfrac{1}{1-q_h(1-q_h)} \text{ for } q_h \geq 1/2 \\ \dfrac{1}{q_h(2-q_h)} \text{ for } q_h \leq 1/2 \end{cases} \quad \rightarrow \quad r_{B1}^{h} = \begin{cases} \dfrac{1}{1-q_h^2(1-q_h)} \text{ for } q_h \geq 1/2 \\ \dfrac{1}{q_h^2(2-q_h)} \text{ for } q_h \leq 1/2 \end{cases}$$

- From this follows: $r_{D1}^{h} \leq r_{D}^{h}$ which implies $r_{B1}^{h} \leq r_{B}^{h}$

- Diversification decreases the cost of arm’s length credit and

- Proposition 2: For 0 < qh < 1, CRT reduces the price of arm’s length credit (price effect) by lowering the bank’s refinancing costs. It thereby weakens the incentive compatibility constraint for firms and increases the range of firms which are eligible for arm’s length financing (segment-shifting effect)

Swap of Contract II

- With regard to monitoring the bank's optimal behavior is

$$M^* = \begin{cases} 1 & \text{for} \quad m < \dfrac{2\alpha\Delta q r_{D1}^{l}}{(2-\alpha)q_h + \alpha q_l} \\ \dfrac{-\mathrm{mq}_1 + \sqrt{(mq_l)^2 + 2m\alpha(2-\alpha)\Delta^2 q r_D^l}}{m(2-\alpha)\Delta q} & \text{otherwise} \end{cases}$$

- From this follows Proposition 3:

CRT decreases bank monitoring in that it i) lowers the monitoring cost threshold for a solution to be interior and, for such cases, ii) lowers the value of the interior solution

$M_1^* = M^*$ for $\alpha = 1$, $\overline{m}_1 = \overline{m}$ for $\alpha = 1$, $dM_1^* / d\alpha > 0$, $d\overline{m_1} / d\alpha > 0$

→ Diversification increases the post-monitoring risk of shirking firms

Contract II with CRT

- Proposition 4:

Contract IIα which satisfies the system

$$r_{D1}^{l}=\begin{cases}\dfrac{1-q_h(1-q_h)(1-\alpha)r_{B1}^{l}}{q_h} & \text{for} \quad m<\tilde{m}_1\\ \dfrac{1-q_{M_1^*}(1-q_{M_1^*})(1-\alpha)r_{B1}^{l}}{q_{M_1^*}} & \text{otherwise}\end{cases}$$

$$r_{B1}^{l}=\begin{cases}\dfrac{r_{D1}^{1}+\dfrac{m}{2}}{q_h} & \text{for} \quad m<\tilde{m}_1\\ \dfrac{-mq_1+\sqrt{(mq_l)^2+2m\alpha(2-\alpha)\Delta^2 q r_{D1}^{l}}}{m(2-\alpha)\Delta^2 q} & \text{otherwise}\end{cases}$$

$$M_1^{*}=\begin{cases}1 & \text{for} \quad m<\tilde{m}1\\ \dfrac{-mq_1+\sqrt{(mq_l)^2+2m\alpha(2-\alpha)\Delta^2 q r_{D1}^{l}}}{m(2-\alpha)\Delta q} & \text{otherwise}\end{cases}$$

with $\tilde{m}_\alpha=\dfrac{2\alpha\Delta q r_{D1}^{l}}{(2-\alpha)q_h+\alpha q_l}$

Choice of α

- Any given α constitutes an equilibrium → multiple equilibria
- Investors and banks are indifferent between the equilibria but firms have a clear preference

- Proposition 5:

  A competitive date 1 credit market will force the bank to adopt that α which minimizes the credit rate, $r_B^l \to r_B^l(\alpha^*)$

→ If α*<1, CRT leads to financial deepening

- Crucial point: Is the promise of α time-consistent?

Time inconsistency of α

- Proposition 6:

  The promise of α* is generally time-inconsistent, i.e. not credible. In particular α = 1 is always the ex post dominant strategy unless $\alpha^* \rightarrow M_1^* = 1$

- Problem: Benefits of CRT will already be reaped when bank decides how much effort to exert → bank has incentive to prevent monitoring erosion
- Rational depositors would anticipate this
- If $a^* \rightarrow M1^* \neq 1$, loan risk is not transferred. The aforementioned benefits of CRT will not be realized.

Bank capital and bank profits

- 1. (Partially) self-financed banks
  - Diminishes but do not overcome the problem because α does not have a direct effect on the bank‘s profit function
- 2. Bank profits
  - Banks could choose a higher credit rate than it‘s competitive equilibrium
  - Corner solution (full monitoring) becomes more likely; monitoring increases because banks monitor for their own account → CRT becomes more likely
  - But what are the effects on the real sector due to higher credit rates?

Bank reputation

- Can the bank build up reputation vis-à-vis short-lived depositors to gain credibility?
- Suppose a bank incurs a non-monetary benefit from continuing the relationship → i.e. the bank sticks to its promise
- Then it will keep the promise if its profits from keeping it are higher than from breaching it
- A reputational equilibrium emerges

$$\frac{(1-\alpha^*)^2 * r_B^l(\alpha^*)^2 * \Delta^2 q}{2m} \geq \frac{\varepsilon}{1-\delta}$$

- With δ = prob of repetition and ε = non-monetary utility from continuation

Implications/Possible Extensions

- CRT reduces monitoring but leads to financial deepening in an economy → only for arm's length credit
- CRT may reduce incentives to invest in relationships → a threat to relationship banking systems (corresponds to empirical observations)?
- CRT creates a new commitment problem between originator and investors in CRT → may be solved by reputation
- Comparative statics indicate that loans with a lesser degree are more suitable for CRT (empirical evidence supports this); that relationship lending systems with high involvement of intermediaries in CG experiences less CRT (see, for instance, Germany)
- Problem: We cannot undertake a solid welfare analysis due to external effects not considered in the model (higher riskiness of jobs, shift from CB to IB)
- Possible model extensions/robustness checks:
  - Public regulation (in progress)
  - Asymmetric risk sharing (e.g. ABS/optimal security design)
  - Different correlation structures (e.g. perfect hedge against credit risk)
  - How about a linear monitoring cost function?