DEUTSCHE
BUNDESBANK
EUROSYSTEM

# Risky Banks & Risky Borrowers
# Relationship Banking in the Crisis

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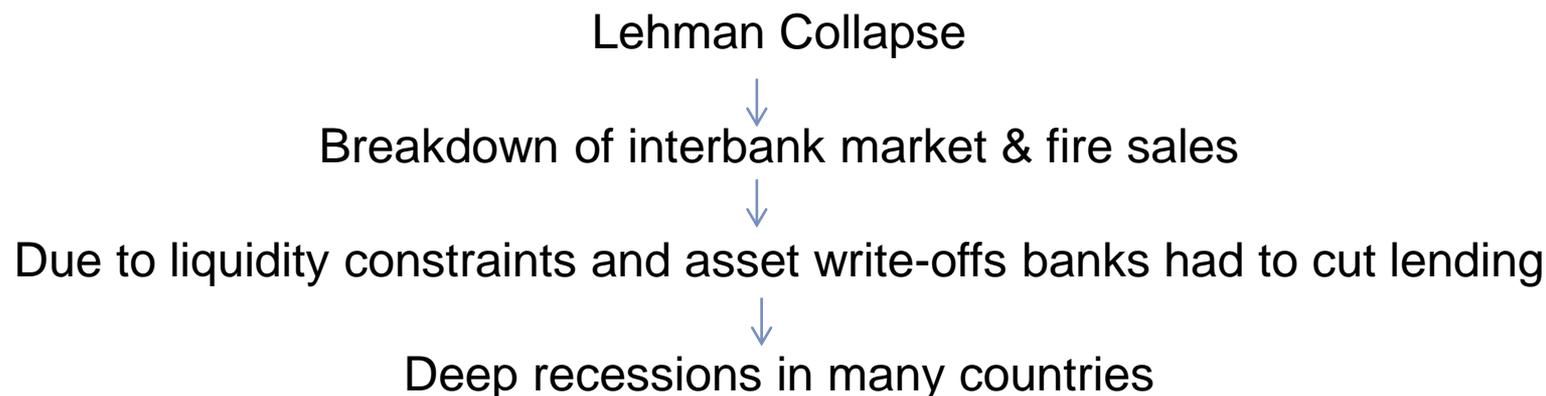
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5th EBA Policy Research Workshop

# Motivation 1/2

– Global financial crisis: Banks pass on and amplify shocks

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Lehman Collapse

↓

Breakdown of interbank market & fire sales

↓

Due to liquidity constraints and asset write-offs banks had to cut lending

↓

Deep recessions in many countries

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– Banks are in the center of this process

– Lot is known about the transmission channels, but open question how banks adjust riskiness of their loan portfolio and which types of borrowers are affected

# Motivation 2/2

Our paper:

- looks at banks in distress (identified by capital support of head association)
- Support is expected to be followed by adjustments in resources to be able to repay the capital injection

If banks get into distress

→ Do banks pass through this realized risk or do they safeguard customers?

→ In other words: does the PD of affected customers rise or not?

- Mechanisms:

Adjustments in loan conditions, interest rates, securities, reductions in liquidity insurance, increase in fee, reductions in services

versus

Avoid further losses, back up of bad risks ("Evergreening")
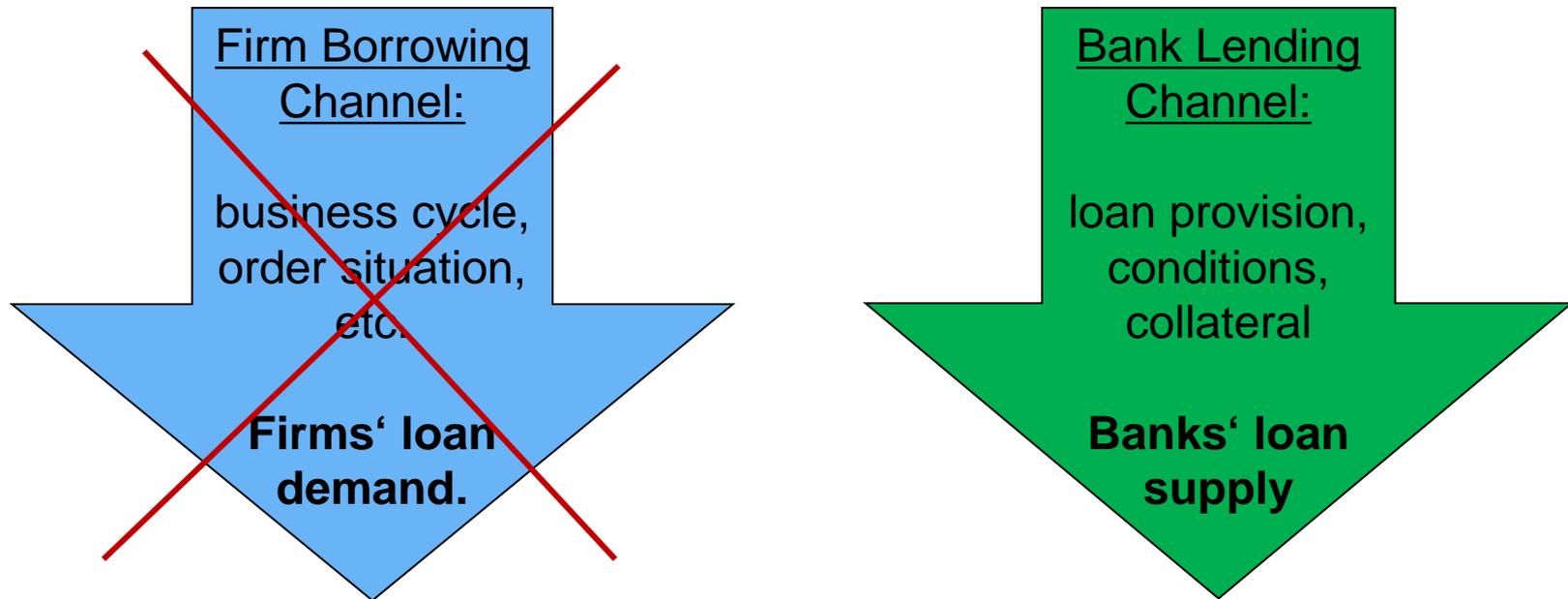
# Research Questions

1. Do distressed banks pass through risks to their customers?

2. Does this risk pass-through affect customers differently depending on their riskiness?

3. Does relationship building spur or ease the pass-through?

4. Does this differ in crisis times compared to normal times?

# Key Findings

1. Bank distress leads to a **pass-through of risk** into the real sector, indicated by higher PDs and lower loan recommendations.

2. Effects **driven by shocks in crisis-times**.

3. Good, low-risk customers suffer at relationship banks while they are unaffected at transaction banks**.**

4. **Relationship banks shield bad, high-risk borrowers** while transaction banks punish them. -> Evidence for **evergreening** at relationship banks
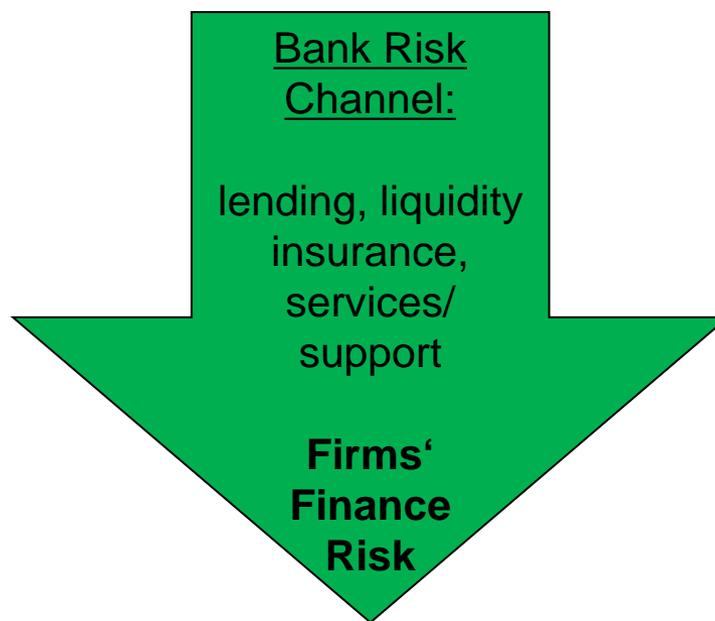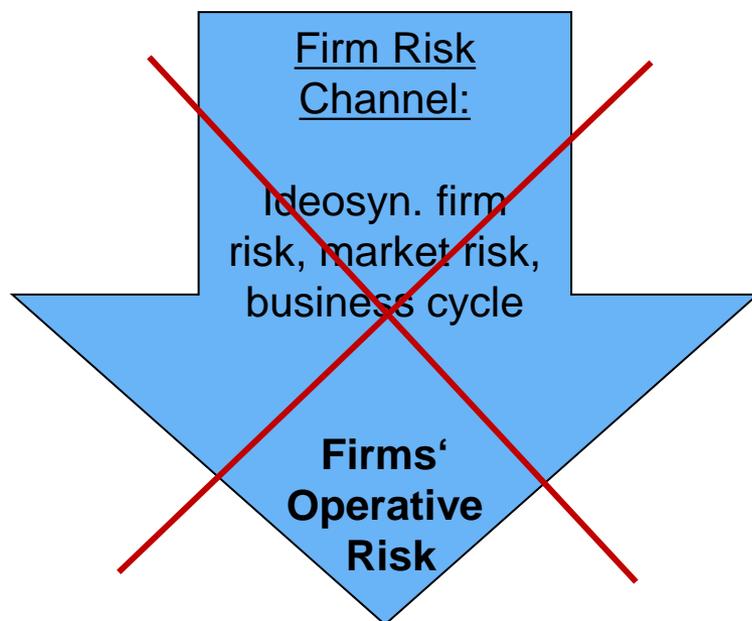
# Methodology 1/4: in the Literature

Aim: Identifying the „Bank **Lending** Channel"

Firm Borrowing
Channel:

business cycle,
order situation,
etc.

**Firms' loan
demand.**

Bank Lending
Channel:

loan provision,
conditions,
collateral

**Banks' loan
supply**

Loan Volume granted to a Firm

# Methodology 2/4: in our Paper

Aim: Identifying the „Bank **Risk** Channel"

Firm Risk
Channel:

Ideosyn. firm
risk, market risk,
business cycle

**Firms'
Operative
Risk**

Bank Risk
Channel:

lending, liquidity
insurance,
services/
support

**Firms'
Finance
Risk**

Individual Probability of Default (PD) of a Firm
(~Credit Rating)

# Methodology 3/4

− Aim: **exclude firm-("demand"-) related factors** in *PD*

− Seminal contribution: Kwaja & Mian (AER 2008)
  - Study only firms with at least two relationships and use yearly bank-firm variation in loan volumes at these banks to exclude demand-side effects

− Our paper:
  - Focus on main bank -> No variation within a firm in a year ☹
  - But: Grouping possible (similar approach in Degryse et al., 2016).
  - Build groups made of **industry, year, size, legal form, single relationship status** and **age** of firm
    - use this group as your panel variable

# Methodology 4/4

Setup:          Conditional Difference-in-Difference setup :
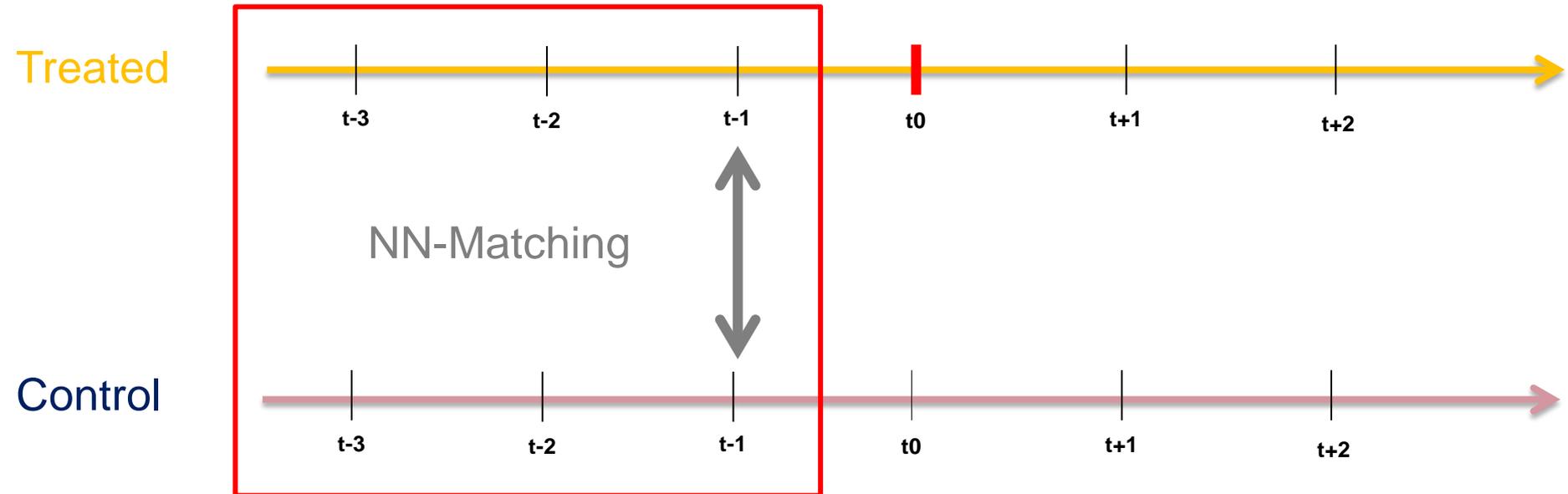                     1. Matching (for banks in distress)
                     2. Difference-in-Difference estimation (on firm level)

Treatment:    Initial Capital Support by Deposit Insurance Scheme

Interpretation: Support necessary to prevent default



**Treated**

t-3      t-2      t-1      t0      t+1      t+2

NN-Matching

**Control**

t-3      t-2      t-1      t0      t+1      t+2

Use bank covariates at t-1

# Empirical Approach

## 1. Matching

− Take full sample of banks and assign treated banks as receiving initial capital injection between 2003 and 2009.

− Estimate the propensity to get the treatment and find matching partners in t − 1 -> sample of treated and control banks

## 2. Diff-in-Diff Estimation

− Construct sample of firms by linking firms to treated and control banks based on their main bank relationship

− Follow banks and their firm customers for a time span of 3 years before and after bank distress

− Estimate in this conditional Diff-in-Diff-setting  the treatment effects on firm PD (and maximum loan recommendation)
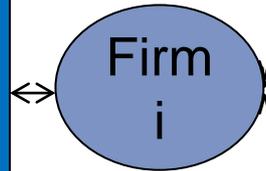
# Data 1/2 - Overview

| Firm ID | BLZ or Bank Name | Bank ID |
|---|---|---|

**ZEW Firm Data (Mannheim Enterprise Panel)**
- Credit Rating (~PD) from *Creditreform*
- Size, Age, Industry, Legal Form, Location, Survival

Firm i

Bank 1
Bank 2
Bank 3
Bank 4
Bank 5
Bank 6

**Bundesbank Data**
- Supervisory Data (Capital Injections)
- Balance Sheet/ Income Statement Data

Aggregate Bank Data (# Customers, Share of Single Relationship Customers/Main Bank Customers/ Customers within 50km distance)

# Data 2/2 – Summary

| Panel A: Treatment and Control Banks by Year of Treatment | | | |
|---|---|---|---|
| **Treatment Year** | Control Banks | Treated Banks | Total |
| **2003** | 9 | 5 | 14 |
| **2004** | 7 | 3 | 10 |
| **2005** | 11 | 4 | 15 |
| **2006** | 2 | 1 | 3 |
| **2007** | 7 | 3 | 10 |
| **2008** | 8 | 4 | 12 |
| **2009** | 6 | 2 | 8 |
| **Total** | 50 | 22 | 72 |

| Panel B: Firm Observations by Year of Observation (left) and Year of Treatment (top) | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Year of Obs.** | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | Total |
| **2000** | 10,144 | 0 | 0 | 0 | 0 | 0 | 0 | 10,144 |
| **2001** | 10,368 | 5,450 | 0 | 0 | 0 | 0 | 0 | 15,818 |
| **2002** | 10,514 | 5,330 | 5,166 | 0 | 0 | 0 | 0 | 21,010 |
| **2003** | 10,972 | 5,314 | 5,497 | 2,748 | 0 | 0 | 0 | 24,531 |
| **2004** | 11,631 | 5,491 | 5,604 | 2,808 | 1,652 | 0 | 0 | 27,186 |
| **2005** | 11,735 | 5,453 | 5,258 | 2,737 | 1,707 | 2,850 | 0 | 29,740 |
| **2006** | 0 | 5,348 | 5,344 | 3,035 | 1,833 | 3,066 | 12,114 | 30,740 |
| **2007** | 0 | 0 | 5,360 | 3,031 | 1,941 | 3,373 | 12,260 | 25,965 |
| **2008** | 0 | 0 | 0 | 3,045 | 2,145 | 3,739 | 12,487 | 21,416 |
| **2009** | 0 | 0 | 0 | 0 | 2,281 | 4,105 | 12,536 | 18,922 |
| **2010** | 0 | 0 | 0 | 0 | 0 | 4,426 | 12,534 | 16,960 |
| **2011** | 0 | 0 | 0 | 0 | 0 | 0 | 12,528 | 12,528 |
| **Total** | 65,364 | 32,386 | 32,229 | 17,404 | 11,559 | 21,559 | 74,459 | 254,960 |

# Estimation

- Estimate
$$PD_{i,t}$$
$$= \beta_0 + \beta_{post} * i(post_{ik,t}) + \beta_{affected} * i(affected_{ik,t}) + \beta_{ATET}$$
$$* i(affected_{ik,t}) * i(post_{ik,t}) + \rho_{gk,t}(f(.); a(.); p(.)) + \varepsilon_{igk,t}$$

$\rho_{gk,t}(f(.); a(.); p(.))$ is a group-fixed effect

- Note that $\rho_{ik,t}(.)$ consists of:
  - $f(.)$: Firm group: industry, size class, age class, region, year
  - $a(.)$: Agency group: Creditreform agency area, year
  - $p(.)$: Bank pair: matched bank "neighbours"

- As panel variable choose indicator for group g, as time variable choose indicator for firm i

# Results 1/6: Is there a risk pass-through?

|  | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
|  | GLM logit link | GLM logit link | OLS FE | OLS FE | FE Probit |
| **Dependent Variable** | PD | PD | MAXLOAN | LOG MAXLOAN | DEFAULT |
| **Sample** | all | no defaultees | all | all | all |
| **Time** | All Years | All Years | All Years | All Years | All Years |
|  |  |  |  |  |  |
| **Treatment Effect** | 0.120*** | 0.0694*** | -905.0** | -0.0794*** | 0.0675** |
|  |  |  |  |  |  |
| **Observations** | 267,195 | 228,708 | 214,833 | 214,833 | 197,692 |
| **Number of groups** | 54,407 | 53,332 | 51,443 | 51,443 |  |

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

# Results 2/6: How large is the risk pass-through in a crisis?

| | (6) | (7) | (8) | (9) | (10) |
|---|---|---|---|---|---|
| | GLM logit link | GLM logit link | OLS FE | OLS FE | FE Probit |
| **Dependent Variable** | PD | PD | MAXLOAN | LOG MAXLOAN | DEFAULT |
| **Sample** | all | no defaultees | all | all | all |
| **Time** | Crisis (Treatment year = 2008/2009) | | | | |
| | | | | | |
| **Treatment Effect** | 0.231*** | 0.132*** | -1,323 | -0.102*** | 0.141*** |
| | | | | | |
| **Observations** | 108,253 | 96,770 | 92,702 | 92,702 | 80,039 |
| **Number of groups** | 23,106 | 22,812 | 22,605 | 22,605 | |

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

# Results 3/6: How large is the risk pass-through in normal times?

| | (11) | (12) | (13) | (14) | (15) |
|---|---|---|---|---|---|
| | GLM logit link | GLM logit link | OLS FE | OLS FE | FE Probit |
| **Dependent Variable** | PD | PD | MAXLOAN | LOG MAXLOAN | DEFAULT |
| **Sample** | all | no defaultees | all | all | all |
| **Time** | No Crisis (Treatment years = 2003-2007) | | | | |
| | | | | | |
| **Treatment Effect** | 0.0528 | 0.00916 | -360.6 | -0.0459 | 0.0199 |
| | | | | | |
| **Observations** | 158,942 | 131,938 | 122,131 | 122,131 | 117,653 |
| **Number of groups** | 31,301 | 30,520 | 28,838 | 28,838 | |

**Robust standard errors in parentheses, \*\*\* p<0.01, \*\* p<0.05, \* p<0.1**

# Results 4/6: How does the risk pass-through depend on the riskiness of the borrower?



## Quantile Regressions, P.p.-Effect

Legend: Coeff, CI 5%, CI 95%
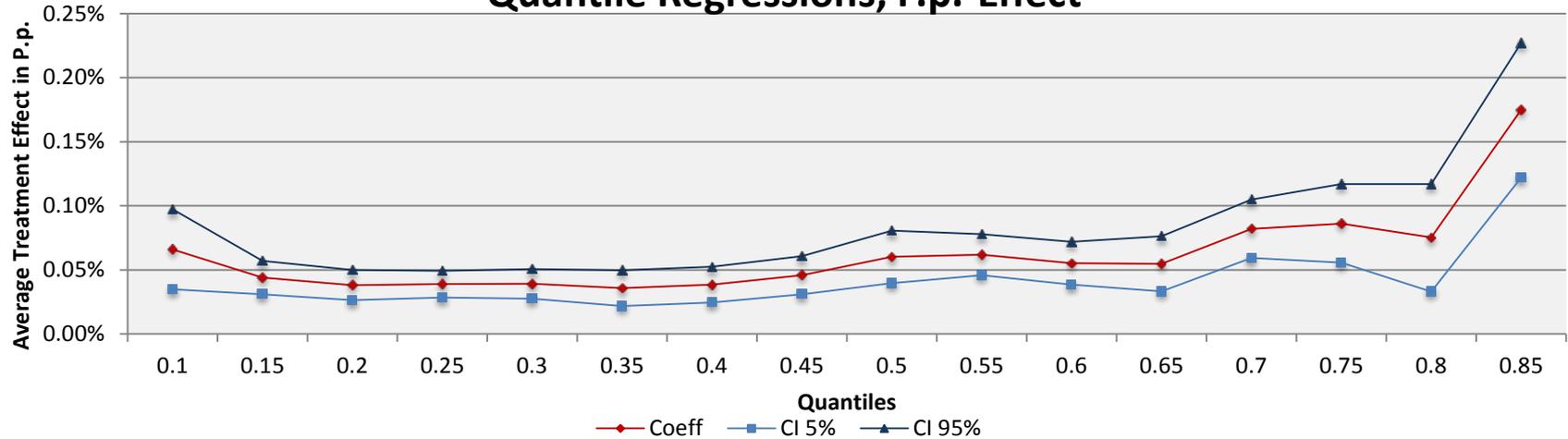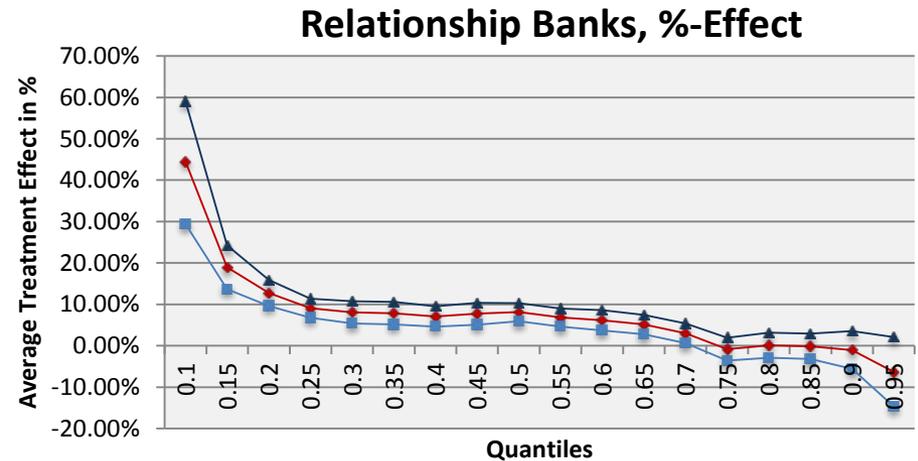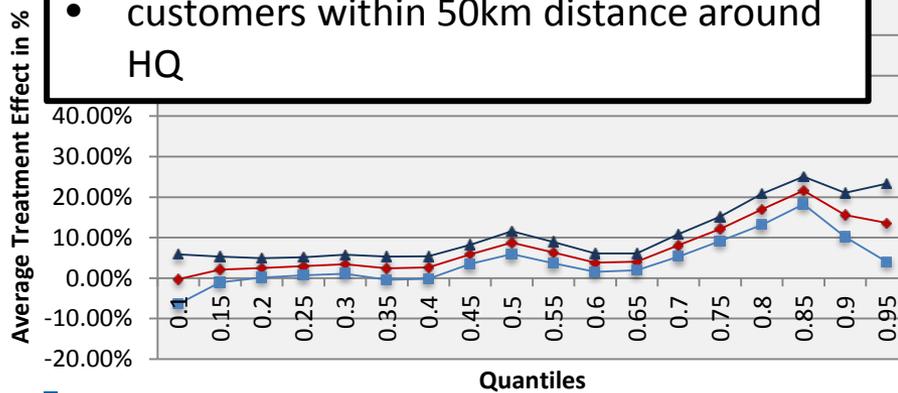
## Quantile Regressions, %-Effect

Legend: Coeff adj., CI 5%, CI 95%
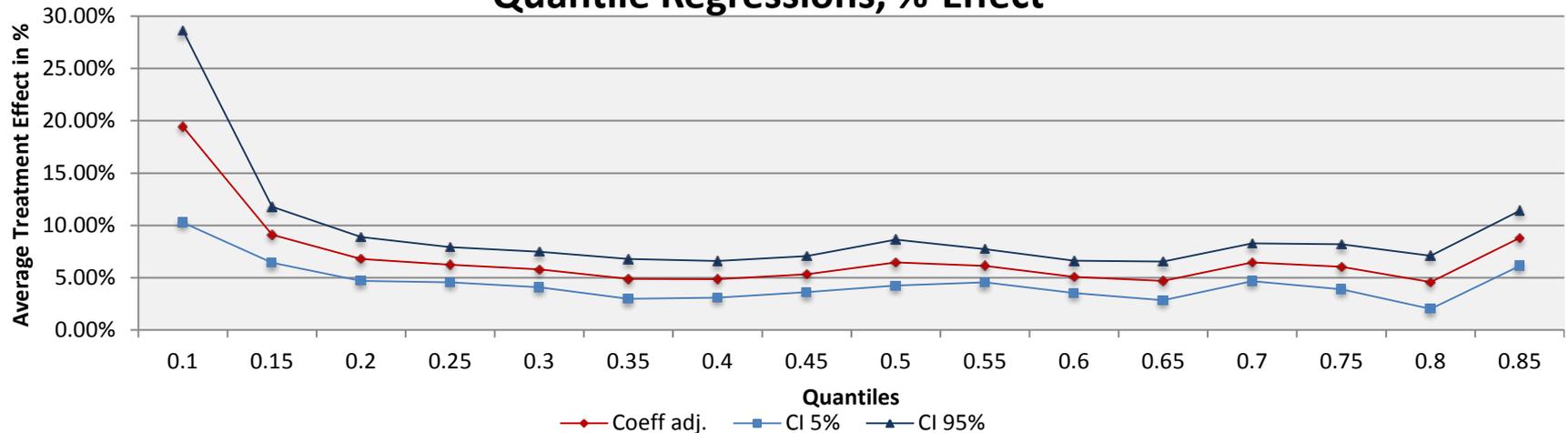
# Results 5/6: How does the risk pass-through depend on the riskiness of the borrower and the bank business model?

## Transaction Banks, P.p.-Effect

## Relationship Banks, P.p.Effect

Legend: Coeff. | Ci 5% | Ci 95%
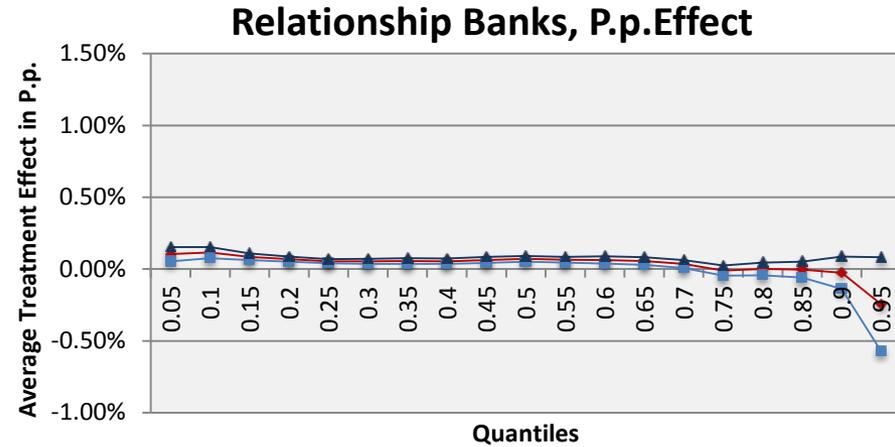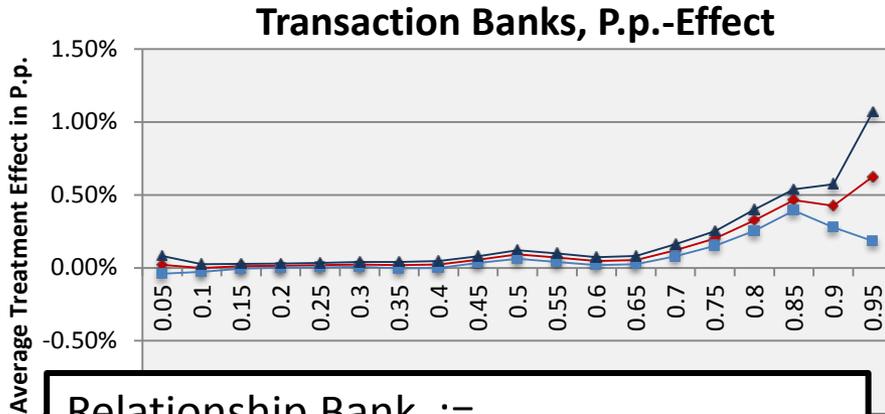
### Relationship Bank :=

Bank with a high (p75+) share of

- main bank customers or
- single relationship customers or
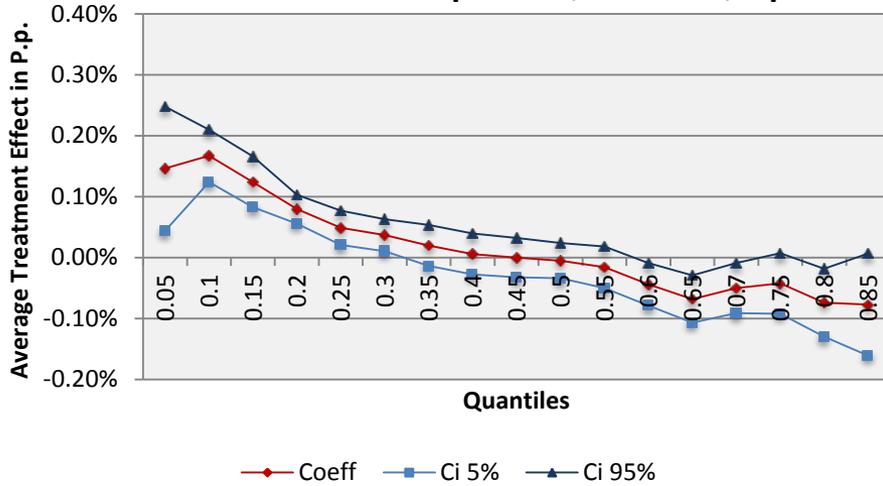- customers within 50km distance around HQ

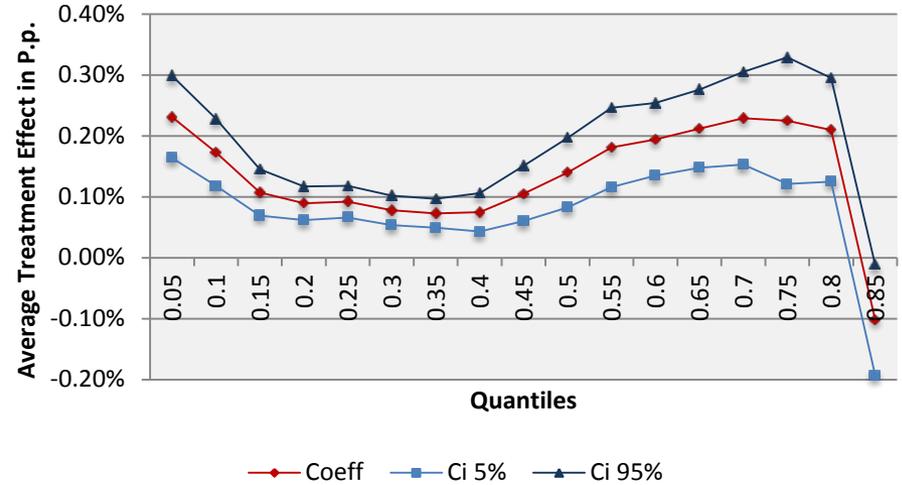## Relationship Banks, %-Effect

Legend: Coeff adj. | CI 5% | CI 95%

Legend: Coeff adj. | Ci 5% | Ci 95%

# Results 6/6: How does the risk pass-through depend on the riskiness of the borrower, the bank business model and financial stability?
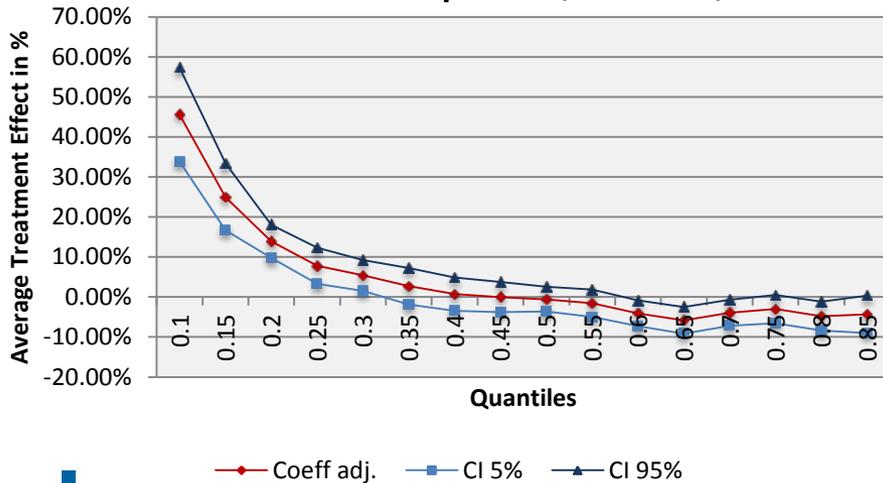


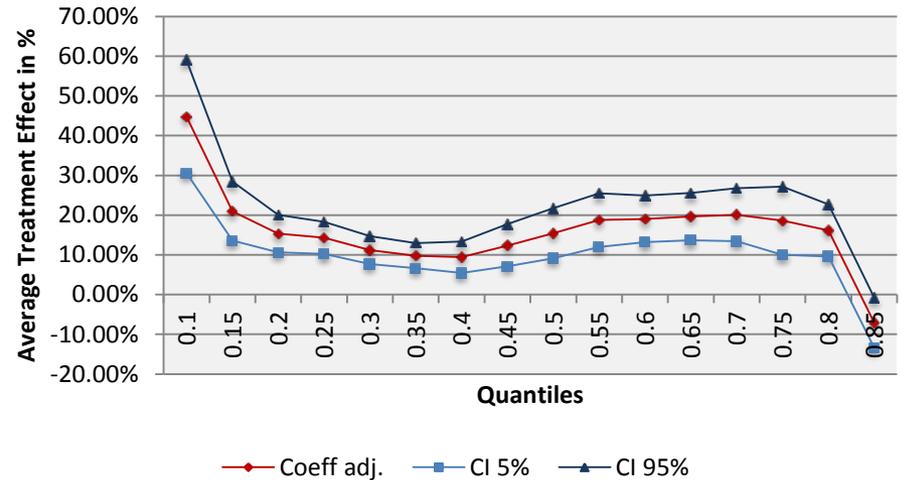Relationship Banks, No Crisis, P.p.



Relationship Banks, Crisis, P.p.



Relationship Banks, No Crisis, %



Relationship Banks, Crisis, %

# Conclusion

- **Bank distress** has **adverse effects on borrowers**:

  bank distress leads to a **pass-through of risk** into the real sector and weakens customers' financial position (indicated by higher PDs and lower loan recommendations)

- Effects much more severe when distress occurred during times of crisis

- Good, low-risk customers suffer at **relationship banks** while they are unaffected at **transaction banks**

- Relationship banks shield bad, high-risk borrowers while transaction banks punish them -> evidence for evergreening at relationship banks

Thank you for your Attention!

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