Chapter 2.1 Negotiation costs 1

Andreas Krause

Outline

- Problem and model assumptions
- Direct lending only
- Bank lending only
- Direct and bank lending
 - Market structure

Summary

Problem and model assumptions •00			

Problem and model assumptions

Direct lending only

Bank lending only

Direct and bank lending

Market structure

Summary

irect lending only 0000 Bank lending onl

Direct and bank lending

Market structure

Summary 0000

Cost advantage of banks

Copyright 🔘 by Andreas Krause

Chapter 2.1: Negotiation costs Theoretical Foundations of Banking Slide 4 of 32

Problem and model assumptions ○●○			

Cost advantage of banks

Direct negotiations between borrowers and lenders on loan conditions are costly

Summary 0000

Cost advantage of banks

- Direct negotiations between borrowers and lenders on loan conditions are costly
- Banks have experience and standardised contracts

Cost advantage of banks

Direct negotiations between borrowers and lenders on loan conditions are costly
 Banks have experience and standardised contracts, reducing these negotiation costs

Summary 0000

Cost advantage of banks

- Direct negotiations between borrowers and lenders on loan conditions are costly
- Banks have experience and standardised contracts, reducing these negotiation costs
- This affects loans and deposits, which are loans to banks

Summary 0000

Cost advantage of banks

- Direct negotiations between borrowers and lenders on loan conditions are costly
- Banks have experience and standardised contracts, reducing these negotiation costs
- This affects loans and deposits, which are loans to banks

Problem	and	model	assumptions
000			

Direct lending only 00000 Bank lending or

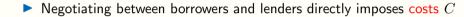
Direct and bank lending

Market structure

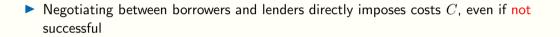
Summary 0000

Nash bargaining

Problem and model assumptions $\circ \circ \bullet$			Summary 0000
Nash bargaining			



Problem and model assumptions			
Nash bargaining			



- Negotiating between borrowers and lenders directly imposes costs C, even if not successful
- Negotiation between banks and borrowers/depositors are free

- Negotiating between borrowers and lenders directly imposes costs C, even if not successful
- Negotiation between banks and borrowers/depositors are free
- All participants engage in Nash bargaining

- Negotiating between borrowers and lenders directly imposes costs C, even if not successful
- Negotiation between banks and borrowers/depositors are free
- All participants engage in Nash bargaining, limited to the interest rates for simplicity

- Negotiating between borrowers and lenders directly imposes costs C, even if not successful
- Negotiation between banks and borrowers/depositors are free
- All participants engage in Nash bargaining, limited to the interest rates for simplicity
- If a bank and direct lending are both available, the other lending channel can be used if a negotiation fails

- Negotiating between borrowers and lenders directly imposes costs C, even if not successful
- Negotiation between banks and borrowers/depositors are free
- All participants engage in Nash bargaining, limited to the interest rates for simplicity
- If a bank and direct lending are both available, the other lending channel can be used if a negotiation fails

Problem and model assumptions

Direct lending only

- Bank lending only
- Direct and bank lending
 - Market structure

Summary

Bank lending or

Direct and bank lending

Market structure

Summary 0000

Profit functions

	Direct lending only 0●000		
Profit functions			

-C

 \blacktriangleright Company and 'depositor' face negotiation costs of C each

• Company profits: $\hat{\Pi}_C =$

Company and 'depositor' face negotiation costs of C each Investment of company succeeds with probability π

• Company profits:
$$\hat{\Pi}_C = \pi \left(\begin{array}{c} \\ \end{array} \right) - C$$

	Direct lending only 0●000		
Profit functions			

- Company and 'depositor' face negotiation costs of C each
- linvestment of company succeeds with probability π , yields a return R if successful

• Company profits:
$$\hat{\Pi}_C = \pi \left((1+R) L \right) - C$$

- - Company and 'depositor' face negotiation costs of C each
 - lnvestment of company succeeds with probability π , yields a return R if successful and pays a loan rate r_C
 - Company profits: $\hat{\Pi}_{C} = \pi \left((1+R) L (1+r_{C}) L \right) C$

- Company and 'depositor' face negotiation costs of C each
- lnvestment of company succeeds with probability π , yields a return R if successful and pays a loan rate r_C
- Company profits: $\hat{\Pi}_{C} = \pi \left((1+R) L (1+r_{C}) L \right) C$
- Depositors obtain the loan with interest
- Depositor profits: $\hat{\Pi}_D = (1 + r_C) L C$

- Company and 'depositor' face negotiation costs of C each
- lnvestment of company succeeds with probability π , yields a return R if successful and pays a loan rate r_C
- Company profits: $\hat{\Pi}_{C} = \pi \left((1+R) L (1+r_{C}) L \right) C$
- Depositors obtain the loan with interest if the investment is successful

• Depositor profits:
$$\hat{\Pi}_D = \pi (1 + r_C) L - C$$

- Company and 'depositor' face negotiation costs of C each
- lnvestment of company succeeds with probability π , yields a return R if successful and pays a loan rate r_C
- Company profits: $\hat{\Pi}_C = \pi \left((1+R) L (1+r_C) L \right) C$
- Depositors obtain the loan with interest if the investment is successful and have an outlay of the initial loan
- Depositor profits: $\hat{\Pi}_D = \pi (1 + r_C) L L C$

- Company and 'depositor' face negotiation costs of C each
- lnvestment of company succeeds with probability π , yields a return R if successful and pays a loan rate r_C
- Company profits: $\hat{\Pi}_{C} = \pi \left((1+R) L (1+r_{C}) L \right) C$
- Depositors obtain the loan with interest if the investment is successful and have an outlay of the initial loan
- Depositor profits: $\hat{\Pi}_D = \pi (1 + r_C) L L C$

Problem and model assumptions	Direct lending only 00●00		

Copyright 🔘 by Andreas Krause

Chapter 2.1: Negotiation costs Theoretical Foundations of Banking Slide 8 of 32

Direct lending only		

The outside option of companies and depositors is to not enter an agreement, just incurring costs C

Direct lending only 00●00		

- The outside option of companies and depositors is to not enter an agreement, just incurring costs C
- ► Nash bargaining maximizes $\mathcal{L} = \left(\hat{\Pi}_C + C\right) \left(\hat{\Pi}_D + C\right)$

Direct lending only 00●00		

- The outside option of companies and depositors is to not enter an agreement, just incurring costs C
- ► Nash bargaining maximizes $\mathcal{L} = \left(\hat{\Pi}_C + C\right) \left(\hat{\Pi}_D + C\right)$
- This gives $\hat{\Pi}_D = \hat{\Pi}_C$

Direct lending only 00●00		

- The outside option of companies and depositors is to not enter an agreement, just incurring costs C
- ► Nash bargaining maximizes $\mathcal{L} = \left(\hat{\Pi}_C + C\right) \left(\hat{\Pi}_D + C\right)$
- This gives $\hat{\Pi}_D = \hat{\Pi}_C$
- ► Loan rate fulfilling this: $\pi (1 + r_C) L = \frac{1}{2} (\pi (1 + R) + 1) L$

Direct lending only 00●00		

- The outside option of companies and depositors is to not enter an agreement, just incurring costs C
- ▶ Nash bargaining maximizes $\mathcal{L} = \left(\hat{\Pi}_C + C\right) \left(\hat{\Pi}_D + C\right)$
- This gives $\hat{\Pi}_D = \hat{\Pi}_C$
- ► Loan rate fulfilling this: $\pi (1 + r_C) L = \frac{1}{2} (\pi (1 + R) + 1) L$

Direct lending only

Bank lending 00000 Direct and bank lending

Market structure

Summary 0000

Profits of company and depositor

Copyright 🔘 by Andreas Krause

Chapter 2.1: Negotiation costs Theoretical Foundations of Banking Slide 9 of 32

Direct lending only

Bank lending

Direct and bank lending

Market structure

Summary 0000

Profits of company and depositor

• The profits are then given by $\hat{\Pi}_C = \hat{\Pi}_D = \frac{1}{2} \left(\pi \left(1 + R \right) - 1 \right) L - C$

Profits of company and depositor

- The profits are then given by $\hat{\Pi}_C = \hat{\Pi}_D = \frac{1}{2} \left(\pi \left(1 + R \right) 1 \right) L C$
- ▶ To demand a loan and be willing to lend, we need $\hat{\Pi}_C = \hat{\Pi}_D \ge 0$

Summary 0000

Profits of company and depositor

- The profits are then given by $\hat{\Pi}_C = \hat{\Pi}_D = \frac{1}{2} \left(\pi \left(1 + R \right) 1 \right) L C$
- To demand a loan and be willing to lend, we need $\hat{\Pi}_C = \hat{\Pi}_D \ge 0$ $\Rightarrow C \le C^* = \frac{1}{2} (\pi (1+R) - 1) L$

Profits of company and depositor

- The profits are then given by $\hat{\Pi}_C = \hat{\Pi}_D = \frac{1}{2} \left(\pi \left(1 + R \right) 1 \right) L C$
- \blacktriangleright To demand a loan and be willing to lend, we need $\hat{\Pi}_{C}=\hat{\Pi}_{D}\geq 0$
- $\Rightarrow C \leq C^* = \frac{1}{2} \left(\pi \left(1 + R \right) 1 \right) L$
- A direct loan is feasible if the negotiation costs are not too high

Profits of company and depositor

- The profits are then given by $\hat{\Pi}_C = \hat{\Pi}_D = \frac{1}{2} \left(\pi \left(1 + R \right) 1 \right) L C$
- \blacktriangleright To demand a loan and be willing to lend, we need $\hat{\Pi}_{C}=\hat{\Pi}_{D}\geq 0$
- $\Rightarrow C \leq C^* = \frac{1}{2} \left(\pi \left(1 + R \right) 1 \right) L$
- A direct loan is feasible if the negotiation costs are not too high

Direct lending only

Bank lending only 00000 Direct and bank lending

Market structure

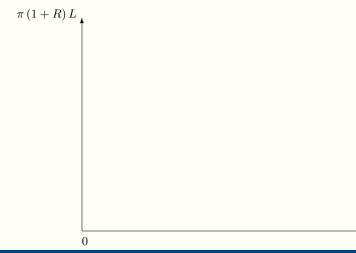
Summary 0000

Feasibility of direct lending

Copyright 🔘 by Andreas Krause

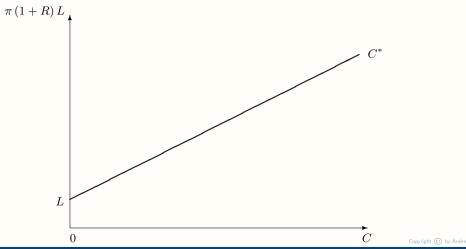
Chapter 2.1: Negotiation costs Theoretical Foundations of Banking

Problem and model assumptions Direct lending only O0000 Bank lending only Direct and bank lending Market structure Summa					
--	--	--	--	--	--



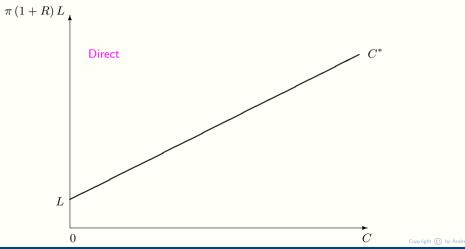
C

|--|



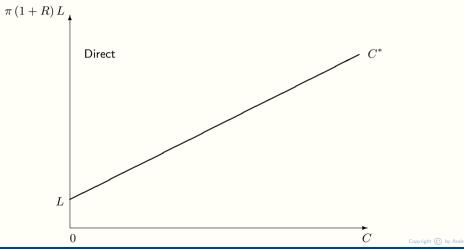
Chapter 2.1: Negotiation costs Theoretical Foundations of Banking

|--|



Chapter 2.1: Negotiation costs Theoretical Foundations of Banking

Direct lending only 0000●		



Chapter 2.1: Negotiation costs Theoretical Foundations of Banking

	Bank lending only ●0000		

Problem and model assumptions

Direct lending only

Bank lending only

Direct and bank lending

Market structure

Summary

Copyright (C) by Andreas Krause

Chapter 2.1: Negotiation costs Theoretical Foundations of Banking

	Bank lending only 0●000		

Profit functions

Copyright 🔘 by Andreas Krause

Chapter 2.1: Negotiation costs Theoretical Foundations of Banking

	Bank lending only 0●000		
Profit functions			

Bank lending does not involve any negotiation costs

Copyright (C) by Andreas Krause

Chapter 2.1: Negotiation costs Theoretical Foundations of Banking

	Bank lending only 0●000		Summary 0000
Profit functions			

- Bank lending does not involve any negotiation costs
- Company and depositor profits are as before

	Bank lending only 0●000		
Profit functions			

- Bank lending does not involve any negotiation costs
- Company and depositor profits are as before, without negotiation costs

Profit functions

- Bank lending does not involve any negotiation costs
- Company and depositor profits are as before, without negotiation costs and (different) lending rate r_L

- Bank lending does not involve any negotiation costs
- Company and depositor profits are as before, without negotiation costs and (different) lending rate r_L
- Company profits: $\Pi_C = \pi \left((1+R) L (1+r_L) L \right)$

- - Bank lending does not involve any negotiation costs
 - Company and depositor profits are as before, without negotiation costs and (different) lending rate r_L
 - Company profits: $\Pi_C = \pi \left((1+R) L (1+r_L) L \right)$
 - Depositor profits: $\Pi_D = \pi (1 + r_D) L L$

- Bank lending does not involve any negotiation costs
- Company and depositor profits are as before, without negotiation costs and (different) lending rate r_L
- Company profits: $\Pi_C = \pi \left((1+R) L (1+r_L) L \right)$
- Depositor profits: $\Pi_D = \pi \left(1 + r_D\right) L L$
- Banks can only repay deposits if the loan is repaid: $\Pi_B = \pi \left((1 + r_L) L - (1 + r_D) L \right)$

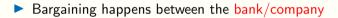
- Bank lending does not involve any negotiation costs
- Company and depositor profits are as before, without negotiation costs and (different) lending rate r_L
- Company profits: $\Pi_C = \pi \left((1+R) L (1+r_L) L \right)$
- Depositor profits: $\Pi_D = \pi \left(1 + r_D\right) L L$
- Banks can only repay deposits if the loan is repaid: $\Pi_B = \pi \left((1 + r_L) L - (1 + r_D) L \right)$

	Bank lending only 00●00		

Copyright 🔘 by Andreas Krause

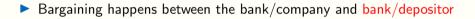
Chapter 2.1: Negotiation costs Theoretical Foundations of Banking

	Bank lending only		



Chapter 2.1: Negotiation costs Theoretical Foundations of Banking Slide 13 of 32 $\,$

	Bank lending only 00●00		
NI I I · ·			



- Bargaining happens between the bank/company and bank/depositor
- If the parties do not agree, they do not face any costs

- Bargaining happens between the bank/company and bank/depositor
- If the parties do not agree, they do not face any costs
- Bank/company bargaining: $\mathcal{L} = \Pi_B \Pi_D$

- Bargaining happens between the bank/company and bank/depositor
- If the parties do not agree, they do not face any costs
- Bank/company bargaining: $\mathcal{L} = \Pi_B \Pi_D$
- Bank/depositor bargaining: $\mathcal{L} = \Pi_B \Pi_C$

- Bargaining happens between the bank/company and bank/depositor
- If the parties do not agree, they do not face any costs
- Bank/company bargaining: $\mathcal{L} = \Pi_B \Pi_D$
- Bank/depositor bargaining: $\mathcal{L} = \Pi_B \Pi_C$

Direct lending only

Bank lending only

Direct and bank lending

Market structure

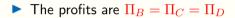
Summary 0000

Optimal loan and deposit rates

Copyright 🔘 by Andreas Krause

Chapter 2.1: Negotiation costs Theoretical Foundations of Banking

	Bank lending only 000●0		



Copyright (C) by Andreas Krause

Chapter 2.1: Negotiation costs Theoretical Foundations of Banking

- The profits are $\Pi_B = \Pi_C = \Pi_D$
- \Rightarrow Loan rate: $\pi (1 + r_L) L = \frac{2}{3}\pi (1 + R) + \frac{1}{3}$

► The profits are
$$\Pi_B = \Pi_C = \Pi_D$$

⇒ Loan rate: $\pi (1 + r_L) L = \frac{2}{3}\pi (1 + R) + \frac{1}{3}$
Deposit rate: $\pi (1 + r_D) L = \frac{1}{3}\pi (1 + R) + \frac{2}{3}$

Copyright 🔘 by Andreas Krause

► The profits are
$$\Pi_B = \Pi_C = \Pi_D$$

⇒ Loan rate: $\pi (1 + r_L) L = \frac{2}{3}\pi (1 + R) + \frac{1}{3}$
Deposit rate: $\pi (1 + r_D) L = \frac{1}{3}\pi (1 + R) + \frac{2}{3}$

⇒ Profits:
$$\Pi_B = \Pi_C = \Pi_D = \frac{1}{3} (\pi (1+R) - 1) L$$

- The profits are $\Pi_B = \Pi_C = \Pi_D$
- ⇒ Loan rate: $\pi (1 + r_L) L = \frac{2}{3}\pi (1 + R) + \frac{1}{3}$ Deposit rate: $\pi (1 + r_D) L = \frac{1}{3}\pi (1 + R) + \frac{2}{3}$
- ⇒ Profits: $\Pi_B = \Pi_C = \Pi_D = \frac{1}{3} (\pi (1+R) 1) L$
- ▶ Bank lending is only feasible if $\Pi_B = \Pi_C = \Pi_D \ge 0$

- The profits are $\Pi_B = \Pi_C = \Pi_D$
- ⇒ Loan rate: $\pi (1 + r_L) L = \frac{2}{3}\pi (1 + R) + \frac{1}{3}$ Deposit rate: $\pi (1 + r_D) L = \frac{1}{3}\pi (1 + R) + \frac{2}{3}$
- ⇒ Profits: $\Pi_B = \Pi_C = \Pi_D = \frac{1}{3} (\pi (1 + R) 1) L$
- ► Bank lending is only feasible if $\Pi_B = \Pi_C = \Pi_D \ge 0$ ⇒ $\pi (1 + R) L \ge L$

- The profits are $\Pi_B = \Pi_C = \Pi_D$
- ⇒ Loan rate: $\pi (1 + r_L) L = \frac{2}{3}\pi (1 + R) + \frac{1}{3}$ Deposit rate: $\pi (1 + r_D) L = \frac{1}{3}\pi (1 + R) + \frac{2}{3}$
- ⇒ Profits: $\Pi_B = \Pi_C = \Pi_D = \frac{1}{3} (\pi (1 + R) 1) L$
- ► Bank lending is only feasible if $\Pi_B = \Pi_C = \Pi_D \ge 0$ ⇒ $\pi (1+R) L > L$

irect lending only 0000 Bank lending only 0000●

Direct and bank lending

Market structure

Summary 0000

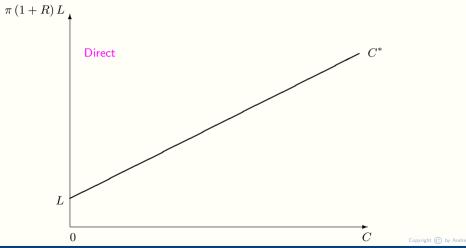
Feasibility of bank lending

Copyright 🔘 by Andreas Krause

Chapter 2.1: Negotiation costs Theoretical Foundations of Banking

	Bank lending only 0000●		

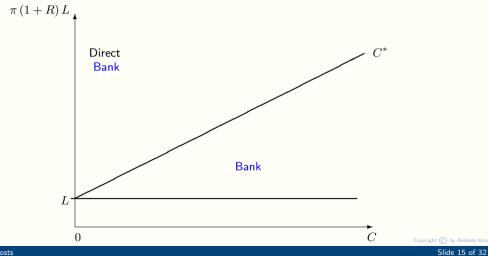
Feasibility of bank lending



Chapter 2.1: Negotiation costs Theoretical Foundations of Banking

	Bank lending only 0000●		

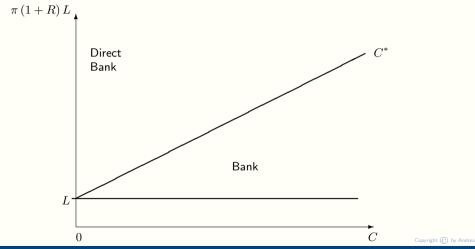
Feasibility of bank lending



Chapter 2.1: Negotiation costs Theoretical Foundations of Banking

	Bank lending only 0000●		

Feasibility of bank lending



Chapter 2.1: Negotiation costs Theoretical Foundations of Banking

	Direct and bank lending ●00000	

Problem and model assumptions

Direct lending only

Bank lending only

Direct and bank lending

Market structure

Summary

Copyright (C) by Andreas Krause

Chapter 2.1: Negotiation costs Theoretical Foundations of Banking

	Direct and bank lending ○●○○○○	

Copyright 🔘 by Andreas Krause

Chapter 2.1: Negotiation costs Theoretical Foundations of Banking Slide 17 of 32

		Direct and bank lending	
Outside options			

If direct and bank lending is available, a breakdown in negotiations can still lead to a loan agreement

		Direct and bank lending ○●○○○○	
Outside options			

- If direct and bank lending is available, a breakdown in negotiations can still lead to a loan agreement
- If depositors and lenders do not agree a contract with the bank, they can negotiate directly

- If direct and bank lending is available, a breakdown in negotiations can still lead to a loan agreement
- If depositors and lenders do not agree a contract with the bank, they can negotiate directly
- In this case banks have no outside option

- If direct and bank lending is available, a breakdown in negotiations can still lead to a loan agreement
- If depositors and lenders do not agree a contract with the bank, they can negotiate directly
- In this case banks have no outside option
- $\Rightarrow \mathcal{L} = \Pi_B \left(\Pi_D \hat{\Pi}_D \right)$

- If direct and bank lending is available, a breakdown in negotiations can still lead to a loan agreement
- If depositors and lenders do not agree a contract with the bank, they can negotiate directly
- In this case banks have no outside option

$$\Rightarrow \mathcal{L} = \Pi_B \left(\Pi_D - \hat{\Pi}_D \right)$$

If negotiating directly, the outside option is to negotiate with a bank

- If direct and bank lending is available, a breakdown in negotiations can still lead to a loan agreement
- If depositors and lenders do not agree a contract with the bank, they can negotiate directly
- In this case banks have no outside option

$$\Rightarrow \mathcal{L} = \Pi_B \left(\Pi_D - \hat{\Pi}_D \right)$$

► If negotiating directly, the outside option is to negotiate with a bank ⇒ $\mathcal{L} = \prod_B \left(\prod_C - \hat{\Pi}_C \right)$

- If direct and bank lending is available, a breakdown in negotiations can still lead to a loan agreement
- If depositors and lenders do not agree a contract with the bank, they can negotiate directly
- In this case banks have no outside option

$$\Rightarrow \mathcal{L} = \Pi_B \left(\Pi_D - \hat{\Pi}_D \right)$$

► If negotiating directly, the outside option is to negotiate with a bank ⇒ $\mathcal{L} = \Pi_B \left(\Pi_C - \hat{\Pi}_C \right)$

Direct and bank lending

Market structure 0000000 Summary 0000

Optimal loan, deposit and direct lending rates

Copyright (C) by Andreas Krause

Chapter 2.1: Negotiation costs Theoretical Foundations of Banking Slide 18 of 32

• Optimization yields $\Pi_C - \hat{\Pi}_C = \Pi_D - \hat{\Pi}_D = \Pi_B$

	Direct and bank lending	

- Optimization yields $\Pi_C \hat{\Pi}_C = \Pi_D \hat{\Pi}_D = \Pi_B$
- ⇒ Loan rate: $\pi (1 + r_L) L = \pi (1 + r_D) L + \frac{2}{3}C$

Copyright 🔘 by Andreas Krause

- Optimization yields $\Pi_C \hat{\Pi}_C = \Pi_D \hat{\Pi}_D = \Pi_B$
- $\Rightarrow \text{ Loan rate: } \pi (1+r_L) L = \pi (1+r_D) L + \frac{2}{3}C$ Direct lending rate: $\pi (1+r_C) L = \pi (1+r_D) L + \frac{1}{3}C$

- Optimization yields $\Pi_C \hat{\Pi}_C = \Pi_D \hat{\Pi}_D = \Pi_B$
- $\Rightarrow \text{ Loan rate: } \pi (1 + r_L) L = \pi (1 + r_D) L + \frac{2}{3}C$ Direct lending rate: $\pi (1 + r_C) L = \pi (1 + r_D) L + \frac{1}{3}C$
- \Rightarrow The deposit rate can be freely chosen

- Optimization yields $\Pi_C \hat{\Pi}_C = \Pi_D \hat{\Pi}_D = \Pi_B$
- $\Rightarrow \text{ Loan rate: } \pi (1 + r_L) L = \pi (1 + r_D) L + \frac{2}{3}C$ Direct lending rate: $\pi (1 + r_C) L = \pi (1 + r_D) L + \frac{1}{3}C$
- \Rightarrow The deposit rate can be freely chosen

Direct lending only

Bank lending only 00000 Direct and bank lending

Market structure

Summary 0000

Profits of market participants

Copyright 🔘 by Andreas Krause

Chapter 2.1: Negotiation costs Theoretical Foundations of Banking Slide 19 of 32

Problem and model assumptions

Direct lending only

Bank lending only 00000 Direct and bank lending

Market structure

Summary 0000

Profits of market participants

$$\blacktriangleright \Pi_B = \frac{2}{3}C > 0$$

Copyright 🔘 by Andreas Krause

Chapter 2.1: Negotiation costs Theoretical Foundations of Banking Slide 19 of 32

•
$$\Pi_B = \frac{2}{3}C > 0$$
: banks are always willing to lend

Copyright 🔘 by Andreas Krause

Chapter 2.1: Negotiation costs Theoretical Foundations of Banking Slide 19 of 32

•
$$\Pi_B = \frac{2}{3}C > 0$$
: banks are always willing to lend
• $\Pi_D = \pi (1 + r_D) L - L$

Copyright 🔘 by Andreas Krause

- $\Pi_B = \frac{2}{3}C > 0$: banks are always willing to lend
- $\square \Pi_D = \pi \left(1 + r_D \right) L L$
- $\Pi_C = \pi (1+R) L \pi (1+r_D) L \frac{2}{3}C$

•
$$\Pi_B = \frac{2}{3}C > 0$$
: banks are always willing to lend
• $\Pi_D = \pi (1 + r_D) L - L$
• $\Pi_C = \pi (1 + R) L - \pi (1 + r_D) L - \frac{2}{3}C$
• $\hat{\Pi}_D = \Pi_D - \frac{2}{3}C < \Pi_D$

Copyright 🔘 by Andreas Krause

•
$$\Pi_B = \frac{2}{3}C > 0$$
: banks are always willing to lend
• $\Pi_D = \pi (1 + r_D) L - L$
• $\Pi_C = \pi (1 + R) L - \pi (1 + r_D) L - \frac{2}{3}C$
• $\hat{\Pi}_D = \Pi_D - \frac{2}{3}C < \Pi_D$: depositors prefer banks

•
$$\Pi_B = \frac{2}{3}C > 0$$
: banks are always willing to lend
• $\Pi_D = \pi (1 + r_D) L - L$
• $\Pi_C = \pi (1 + R) L - \pi (1 + r_D) L - \frac{2}{3}C$
• $\hat{\Pi}_D = \Pi_D - \frac{2}{3}C < \Pi_D$: depositors prefer banks
• $\hat{\Pi}_C = \Pi_C - \frac{2}{3}C < \Pi_C$

•
$$\Pi_B = \frac{2}{3}C > 0$$
: banks are always willing to lend
• $\Pi_D = \pi (1 + r_D) L - L$
• $\Pi_C = \pi (1 + R) L - \pi (1 + r_D) L - \frac{2}{3}C$
• $\hat{\Pi}_D = \Pi_D - \frac{2}{3}C < \Pi_D$: depositors prefer banks
• $\hat{\Pi}_C = \Pi_C - \frac{2}{3}C < \Pi_C$: companies prefer banks

Copyright 🔘 by Andreas Krause

•
$$\Pi_B = \frac{2}{3}C > 0$$
: banks are always willing to lend
• $\Pi_D = \pi (1 + r_D) L - L$
• $\Pi_C = \pi (1 + R) L - \pi (1 + r_D) L - \frac{2}{3}C$
• $\hat{\Pi}_D = \Pi_D - \frac{2}{3}C < \Pi_D$: depositors prefer banks

•
$$\hat{\Pi}_C = \Pi_C - \frac{2}{3}C < \Pi_C$$
: companies prefer banks

► The cost advantage of banks is 2C

- $\Pi_B = \frac{2}{3}C > 0$: banks are always willing to lend
- $\blacktriangleright \Pi_D = \pi \left(1 + r_D \right) L L$

•
$$\Pi_C = \pi (1+R) L - \pi (1+r_D) L - \frac{2}{3}C$$

- $\hat{\Pi}_D = \Pi_D \frac{2}{3}C < \Pi_D$: depositors prefer banks
- $\hat{\Pi}_C = \Pi_C \frac{2}{3}C < \Pi_C$: companies prefer banks
- The cost advantage of banks is 2C, which is distributed between banks and their customers

- $\Pi_B = \frac{2}{3}C > 0$: banks are always willing to lend
- $\blacktriangleright \Pi_D = \pi \left(1 + r_D \right) L L$

•
$$\Pi_C = \pi (1+R) L - \pi (1+r_D) L - \frac{2}{3}C$$

- $\hat{\Pi}_D = \Pi_D \frac{2}{3}C < \Pi_D$: depositors prefer banks
- $\hat{\Pi}_C = \Pi_C \frac{2}{3}C < \Pi_C$: companies prefer banks
- The cost advantage of banks is 2C, which is distributed between banks and their customers

irect lending only 0000 Bank lending only

Direct and bank lending

Market structure

Summary 0000

Participating in the market

Copyright 🔘 by Andreas Krause

	Direct and bank lending	



• Depositor prefer bank lending if $\Pi_D \ge 0$

	Direct and bank lending ○○○○●○	

► Depositor prefer bank lending if $\Pi_D \ge 0$ ⇒ $\pi (1 + r_D) L \ge L$

	Direct and bank lending 0000●0	

- Depositor prefer bank lending if $\Pi_D \ge 0$
- $\Rightarrow \pi (1 + r_D) L \ge L$
- Companies prefer bank lending if $\Pi_C \ge 0$

- Depositor prefer bank lending if $\Pi_D \ge 0$
- $\Rightarrow \pi (1 + r_D) L \ge L$
- Companies prefer bank lending if $\Pi_C \ge 0$
- $\Rightarrow C \le C^{**} = \frac{3}{2} \left(\pi \left(1 + R \right) L \pi \left(1 + r_D \right) L \right)$

- Depositor prefer bank lending if $\Pi_D \ge 0$
- $\Rightarrow \pi (1 + r_D) L \ge L$
- Companies prefer bank lending if $\Pi_C \ge 0$
- $\Rightarrow C \le C^{**} = \frac{3}{2} \left(\pi \left(1 + R \right) L \pi \left(1 + r_D \right) L \right)$
- Bank lending is feasible if the costs are not too high

- Depositor prefer bank lending if $\Pi_D \ge 0$
- $\Rightarrow \pi (1 + r_D) L \ge L$
- Companies prefer bank lending if $\Pi_C \ge 0$
- $\Rightarrow C \le C^{**} = \frac{3}{2} \left(\pi \left(1 + R \right) L \pi \left(1 + r_D \right) L \right)$
- Bank lending is feasible if the costs are not too high

Direct and bank lending

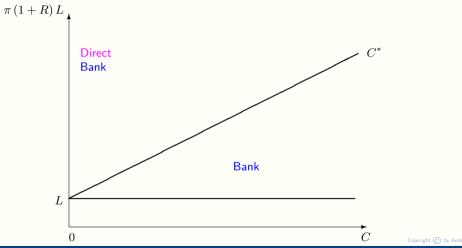
Market structure 00000000 Summary 0000

Feasibility of co-existence of direct and bank loans

Copyright (C) by Andreas Krause

Chapter 2.1: Negotiation costs Theoretical Foundations of Banking Slide 21 of 32

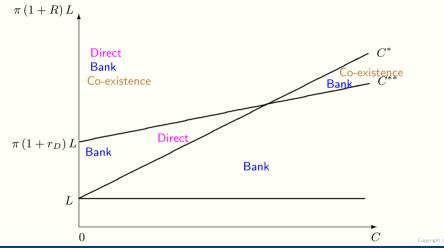
Feasibility of co-existence of direct and bank loans



Chapter 2.1: Negotiation costs Theoretical Foundations of Banking

Summary 0000

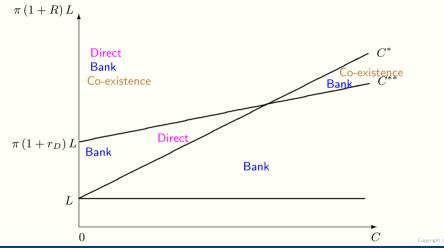
Feasibility of co-existence of direct and bank loans



Chapter 2.1: Negotiation costs Theoretical Foundations of Banking

Summary 0000

Feasibility of co-existence of direct and bank loans



Chapter 2.1: Negotiation costs Theoretical Foundations of Banking

		Market structure ●0000000	

Problem and model assumptions

Direct lending only

Bank lending only

Direct and bank lending

Market structure

Summary

Copyright (C) by Andreas Krause

Chapter 2.1: Negotiation costs Theoretical Foundations of Banking

irect lending only

Bank lending on

Direct and bank lending

Market structure 0●000000

Summary 0000

Comparing direct and bank lending

Copyright 🔘 by Andreas Krause

Chapter 2.1: Negotiation costs Theoretical Foundations of Banking

Bank lending o

Direct and bank lending

Market structure 0000000 Summary 0000

Comparing direct and bank lending

▶ Bank lending only is preferred over direct lending only if $\Pi_C = \Pi_D \ge \hat{\Pi}_C = \hat{\Pi}_D$

Copyright 🔘 by Andreas Krause

Bank lending o

Direct and bank lending

Market structure 0000000 Summary 0000

Comparing direct and bank lending

► Bank lending only is preferred over direct lending only if $\Pi_C = \Pi_D \ge \hat{\Pi}_C = \hat{\Pi}_D$ ⇒ $C \le C^{***} = \frac{1}{6} (\pi (1 + R) - 1) L$

Comparing direct and bank lending

▶ Bank lending only is preferred over direct lending only if $\Pi_C = \Pi_D \ge \hat{\Pi}_C = \hat{\Pi}_D$

$$\Rightarrow C \le C^{***} = \frac{1}{6} \left(\pi \left(1 + R \right) - 1 \right) L$$

Bank lending is preferred if negotiation costs are not too high

Comparing direct and bank lending

Bank lending only is preferred over direct lending only if $\Pi_C = \Pi_D \ge \hat{\Pi}_C = \hat{\Pi}_D$

$$\Rightarrow C \le C^{***} = \frac{1}{6} \left(\pi \left(1 + R \right) - 1 \right) L$$

Bank lending is preferred if negotiation costs are not too high

Firect lending only

Bank lending only 00000 Direct and bank lending

Market structure 00●00000

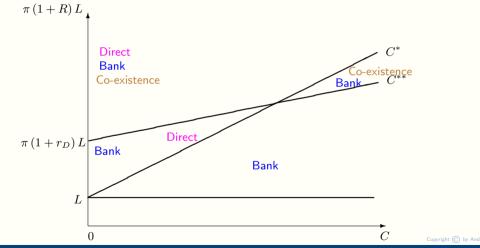
Summary 0000

Preferred market structure

Copyright 🔘 by Andreas Krause

		Market structure 00●00000	

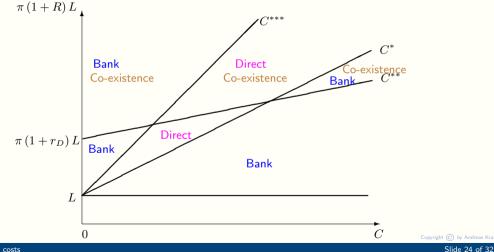
Preferred market structure



Chapter 2.1: Negotiation costs Theoretical Foundations of Banking

000 000000 000000 000000 00000 00000

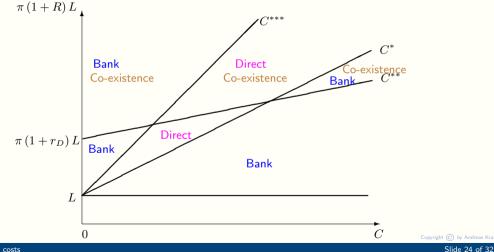
Preferred market structure



Chapter 2.1: Negotiation costs Theoretical Foundations of Banking

000 000000 000000 000000 00000 00000

Preferred market structure



Chapter 2.1: Negotiation costs Theoretical Foundations of Banking irect lending only

Bank lending only 00000 Direct and bank lending

Market structure

Summary 0000

Preferred direct lending

Copyright 🔘 by Andreas Krause

			Market structure 000●0000	Summary 0000
Preferred direct le	ending			

Direct lending is preferred to the co-existence of bank and direct lending if the profits to depositors and companies are higher

			Market structure 000●0000	Summary 0000
Preferred direct le	ending			

- Direct lending is preferred to the co-existence of bank and direct lending if the profits to depositors and companies are higher
- Depositors: $\frac{1}{2} (\pi (1+R) 1) L C \ge \pi (1+r_D) L L$

			Market structure 000●0000	Summary 0000
Preferred direct le	ending			

- Direct lending is preferred to the co-existence of bank and direct lending if the profits to depositors and companies are higher
- Depositors: $\frac{1}{2} (\pi (1+R) 1) L C \ge \pi (1+r_D) L L$
- $\Rightarrow \pi (1 + r_D) L \leq \frac{1}{2} (\pi (1 + R) + 1) L C$

			Market structure 000●0000	Summary 0000
Preferred direct le	ending			

- Direct lending is preferred to the co-existence of bank and direct lending if the profits to depositors and companies are higher
- Depositors: $\frac{1}{2} (\pi (1+R) 1) L C \ge \pi (1+r_D) L L$

$$\Rightarrow \pi (1+r_D) L \le \frac{1}{2} (\pi (1+R) + 1) L - C$$

• Companies: $\frac{1}{2} (\pi (1+R) - 1) L - C \ge \pi (1+R) L - \pi (1+r_D) L - \frac{2}{3}C$

			Market structure 000●0000	
Droforrad direct 1	anding			

- Direct lending is preferred to the co-existence of bank and direct lending if the profits to depositors and companies are higher
- Depositors: $\frac{1}{2} (\pi (1+R) 1) L C \ge \pi (1+r_D) L L$

$$\Rightarrow \pi (1+r_D) L \le \frac{1}{2} (\pi (1+R) + 1) L - C$$

Companies: $\frac{1}{2} (\pi (1+R) - 1) L - C \ge \pi (1+R) L - \pi (1+r_D) L - \frac{2}{3}C$ $\Rightarrow \pi (1+r_D) L \ge \frac{1}{2} \pi (1+R) L + \frac{1}{2}L + \frac{1}{2}C$

			Market structure 000●0000	
Dueferment altiment 1	e se el l'an es			

Direct lending is preferred to the co-existence of bank and direct lending if the profits to depositors and companies are higher

• Depositors:
$$\frac{1}{2} (\pi (1+R) - 1) L - C \ge \pi (1+r_D) L - L$$

$$\Rightarrow \pi (1+r_D) L \le \frac{1}{2} (\pi (1+R) + 1) L - C$$

• Companies:
$$\frac{1}{2} (\pi (1+R) - 1) L - C \ge \pi (1+R) L - \pi (1+r_D) L - \frac{2}{3}C$$

$$\Rightarrow \pi (1+r_D) L \ge \frac{1}{2}\pi (1+R) L + \frac{1}{2}L + \frac{1}{3}C$$

These conditions are incompatible

- Direct lending is preferred to the co-existence of bank and direct lending if the profits to depositors and companies are higher
- Depositors: $\frac{1}{2} (\pi (1+R) 1) L C \ge \pi (1+r_D) L L$

$$\Rightarrow \pi (1 + r_D) L \le \frac{1}{2} (\pi (1 + R) + 1) L - C$$

- Companies: $\frac{1}{2} (\pi (1+R) 1) L C \ge \pi (1+R) L \pi (1+r_D) L \frac{2}{3}C$
- $\Rightarrow \pi (1 + r_D) L \ge \frac{1}{2}\pi (1 + R) L + \frac{1}{2}L + \frac{1}{3}C$
- These conditions are incompatible
- Companies and lenders have a conflict of interest on whether to prefer direct lending or the co-existence of direct and bank lending

- Direct lending is preferred to the co-existence of bank and direct lending if the profits to depositors and companies are higher
- Depositors: $\frac{1}{2} (\pi (1+R) 1) L C \ge \pi (1+r_D) L L$

$$\Rightarrow \pi (1 + r_D) L \le \frac{1}{2} (\pi (1 + R) + 1) L - C$$

- Companies: $\frac{1}{2} (\pi (1+R) 1) L C \ge \pi (1+R) L \pi (1+r_D) L \frac{2}{3}C$
- $\Rightarrow \pi (1 + r_D) L \ge \frac{1}{2}\pi (1 + R) L + \frac{1}{2}L + \frac{1}{3}C$
- These conditions are incompatible
- Companies and lenders have a conflict of interest on whether to prefer direct lending or the co-existence of direct and bank lending

Virect lending only

Bank lending only 00000 Direct and bank lending

Market structure 0000●000

Summary 0000

Preferred bank lending

Copyright 🔘 by Andreas Krause

			Market structure 0000●000	Summary 0000
Preferred bank le	nding			

Bank lending is preferred to the co-existence of bank and direct lending if the profits to depositors and companies are higher

			Market structure 0000€000	Summary 0000
Preferred bank lei	nding			

- Bank lending is preferred to the co-existence of bank and direct lending if the profits to depositors and companies are higher
- Depositors: $\frac{1}{3} (\pi (1+R) 1) L \ge \pi (1+r_D) L L$

			Market structure 0000●000	Summary 0000
Preferred bank le	nding			

- Bank lending is preferred to the co-existence of bank and direct lending if the profits to depositors and companies are higher
- Depositors: $\frac{1}{3} (\pi (1+R) 1) L \ge \pi (1+r_D) L L$

 $\Rightarrow \pi (1 + r_D) L \leq \frac{1}{3} \pi (1 + R) L + \frac{2}{3} L$

			Market structure 0000●000	Summary 0000
Preferred bank lei	nding			

- Bank lending is preferred to the co-existence of bank and direct lending if the profits to depositors and companies are higher
- Depositors: $\frac{1}{3} (\pi (1+R) 1) L \ge \pi (1+r_D) L L$

$$\Rightarrow \pi (1 + r_D) L \le \frac{1}{3}\pi (1 + R) L + \frac{2}{3}L$$

• Companies: $\frac{1}{3} (\pi (1+R) - 1) L \ge \pi (1+R) L - \pi (1+r_D) L - \frac{2}{3}C$

			Market structure 0000€000	Summary 0000
Preferred bank le	nding			

Bank lending is preferred to the co-existence of bank and direct lending if the profits to depositors and companies are higher

• Depositors:
$$\frac{1}{3} (\pi (1+R) - 1) L \ge \pi (1+r_D) L - L$$

$$\Rightarrow \pi (1+r_D) L \le \frac{1}{3}\pi (1+R) L + \frac{2}{3}L$$

Companies:
$$\frac{1}{3} (\pi (1+R) - 1) L \ge \pi (1+R) L - \pi (1+r_D) L - \frac{2}{3}C$$

$$\Rightarrow \pi (1+r_D) L \ge \frac{2}{3}\pi (1+R) L + \frac{1}{3}L - \frac{2}{3}C$$

			Market structure 0000●000	Summary 0000
Preferred bank le	nding			

- Bank lending is preferred to the co-existence of bank and direct lending if the profits to depositors and companies are higher
- Depositors: $\frac{1}{3} (\pi (1+R) 1) L \ge \pi (1+r_D) L L$

$$\Rightarrow \pi (1 + r_D) L \le \frac{1}{3}\pi (1 + R) L + \frac{2}{3}L$$

- Companies: $\frac{1}{3} (\pi (1+R) 1) L \ge \pi (1+R) L \pi (1+r_D) L \frac{2}{3}C$
- $\Rightarrow \pi (1 + r_D) L \ge \frac{2}{3}\pi (1 + R) L + \frac{1}{3}L \frac{2}{3}C$
- ▶ These conditions are compatible if $C \ge C^*$ and bank lending will be preferred

		Market structure 0000●000	

Preferred bank lending

- Bank lending is preferred to the co-existence of bank and direct lending if the profits to depositors and companies are higher
- Depositors: $\frac{1}{3} (\pi (1+R) 1) L \ge \pi (1+r_D) L L$

$$\Rightarrow \pi (1 + r_D) L \le \frac{1}{3}\pi (1 + R) L + \frac{2}{3}L$$

- Companies: $\frac{1}{3} (\pi (1+R) 1) L \ge \pi (1+R) L \pi (1+r_D) L \frac{2}{3}C$
- $\Rightarrow \pi (1 + r_D) L \ge \frac{2}{3}\pi (1 + R) L + \frac{1}{3}L \frac{2}{3}C$
- \blacktriangleright These conditions are compatible if $C \geq C^*$ and bank lending will be preferred
- ► If C < C*, a conflict of interest between companies and depositors emerges on the optimal market structure

		Market structure 0000●000	

Preferred bank lending

- Bank lending is preferred to the co-existence of bank and direct lending if the profits to depositors and companies are higher
- Depositors: $\frac{1}{3} (\pi (1+R) 1) L \ge \pi (1+r_D) L L$

$$\Rightarrow \pi (1 + r_D) L \le \frac{1}{3}\pi (1 + R) L + \frac{2}{3}L$$

- Companies: $\frac{1}{3} (\pi (1+R) 1) L \ge \pi (1+R) L \pi (1+r_D) L \frac{2}{3}C$
- $\Rightarrow \pi (1 + r_D) L \ge \frac{2}{3}\pi (1 + R) L + \frac{1}{3}L \frac{2}{3}C$
- \blacktriangleright These conditions are compatible if $C \geq C^*$ and bank lending will be preferred
- ▶ If $C < C^*$, a conflict of interest between companies and depositors emerges on the optimal market structure

Bank lending onl

Direct and bank lending

Market structure

Summary 0000

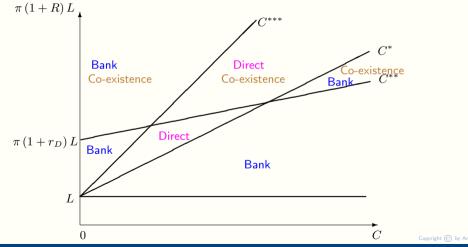
Preferred market structure of depositors and companies

Copyright (C) by Andreas Krause

Chapter 2.1: Negotiation costs Theoretical Foundations of Banking



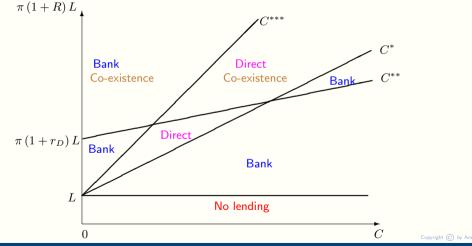
Preferred market structure of depositors and companies



Chapter 2.1: Negotiation costs Theoretical Foundations of Banking



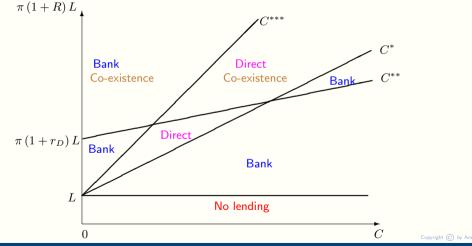
Preferred market structure of depositors and companies



Chapter 2.1: Negotiation costs Theoretical Foundations of Banking



Preferred market structure of depositors and companies



Chapter 2.1: Negotiation costs Theoretical Foundations of Banking

Firect lending only

Bank lending or

Direct and bank lending

Market structure 00000000

Summary 0000

Widespread preference for banks

Copyright (C) by Andreas Krause

► High negotiation costs will favour bank lending over direct lending

Copyright 🔘 by Andreas Krause

- High negotiation costs will favour bank lending over direct lending
- With lower negotiation costs, direct lending is preferred

- ► High negotiation costs will favour bank lending over direct lending
- With lower negotiation costs, direct lending is preferred as in this case banks are not extracting some of the surplus

- High negotiation costs will favour bank lending over direct lending
- With lower negotiation costs, direct lending is preferred as in this case banks are not extracting some of the surplus
- Very low negotiation costs favour bank lending again

- High negotiation costs will favour bank lending over direct lending
- With lower negotiation costs, direct lending is preferred as in this case banks are not extracting some of the surplus
- Very low negotiation costs favour bank lending again as banks cannot extract much profits, but reduce negotiation costs

- High negotiation costs will favour bank lending over direct lending
- With lower negotiation costs, direct lending is preferred as in this case banks are not extracting some of the surplus
- Very low negotiation costs favour bank lending again as banks cannot extract much profits, but reduce negotiation costs
- High investment returns would allow banks to extract high profits

- ► High negotiation costs will favour bank lending over direct lending
- With lower negotiation costs, direct lending is preferred as in this case banks are not extracting some of the surplus
- Very low negotiation costs favour bank lending again as banks cannot extract much profits, but reduce negotiation costs
- High investment returns would allow banks to extract high profits, this is mitigated by the co-existence of bank and direct lending

- High negotiation costs will favour bank lending over direct lending
- With lower negotiation costs, direct lending is preferred as in this case banks are not extracting some of the surplus
- Very low negotiation costs favour bank lending again as banks cannot extract much profits, but reduce negotiation costs
- High investment returns would allow banks to extract high profits, this is mitigated by the co-existence of bank and direct lending, which increases competition through profitable outside options

- ► High negotiation costs will favour bank lending over direct lending
- With lower negotiation costs, direct lending is preferred as in this case banks are not extracting some of the surplus
- Very low negotiation costs favour bank lending again as banks cannot extract much profits, but reduce negotiation costs
- High investment returns would allow banks to extract high profits, this is mitigated by the co-existence of bank and direct lending, which increases competition through profitable outside options
- If direct and bank lending co-exist, bank lending will be chosen

- High negotiation costs will favour bank lending over direct lending
- With lower negotiation costs, direct lending is preferred as in this case banks are not extracting some of the surplus
- Very low negotiation costs favour bank lending again as banks cannot extract much profits, but reduce negotiation costs
- High investment returns would allow banks to extract high profits, this is mitigated by the co-existence of bank and direct lending, which increases competition through profitable outside options
- If direct and bank lending co-exist, bank lending will be chosen, making direct lending less commonly observed than bank lending

- ► High negotiation costs will favour bank lending over direct lending
- With lower negotiation costs, direct lending is preferred as in this case banks are not extracting some of the surplus
- Very low negotiation costs favour bank lending again as banks cannot extract much profits, but reduce negotiation costs
- High investment returns would allow banks to extract high profits, this is mitigated by the co-existence of bank and direct lending, which increases competition through profitable outside options
- If direct and bank lending co-exist, bank lending will be chosen, making direct lending less commonly observed than bank lending

Direct lending only 00000 Bank lending onl

Direct and bank lending

Market structure

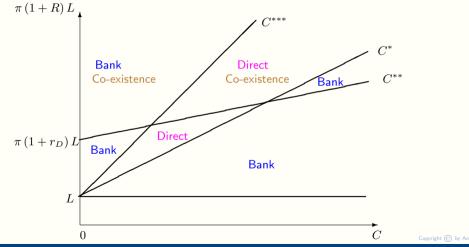
Summary 0000

Observed lending

Copyright 🔘 by Andreas Krause

		Market structure 0000000●	

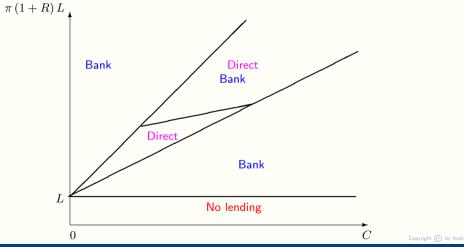
Observed lending



Chapter 2.1: Negotiation costs Theoretical Foundations of Banking Slide 29 of 32

		Market structure 000000●	

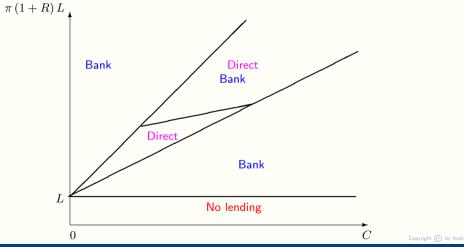
Observed lending



Chapter 2.1: Negotiation costs Theoretical Foundations of Banking

		Market structure 000000●	

Observed lending



Chapter 2.1: Negotiation costs Theoretical Foundations of Banking

		Summary ●000

Problem and model assumptions

Direct lending only

Bank lending only

Direct and bank lending

Market structure

Summary

Copyright 🔘 by Andreas Krause

Chapter 2.1: Negotiation costs Theoretical Foundations of Banking irect lending only

Bank lending on

Direct and bank lending

Market structure

Summary 0●00

Dominance of bank lending

Copyright (C) by Andreas Krause

Chapter 2.1: Negotiation costs Theoretical Foundations of Banking Slide 31 of 32



Depositors and companies favour bank lending in most cases

- Depositors and companies favour bank lending in most cases
- The reduction in negotiation costs provides banks with an inherent advantage

- Depositors and companies favour bank lending in most cases
- The reduction in negotiation costs provides banks with an inherent advantage, even if extracting some of the surplus generated

Summary

- Depositors and companies favour bank lending in most cases
- The reduction in negotiation costs provides banks with an inherent advantage, even if extracting some of the surplus generated
- Direct lending is preferred only for companies if negotiation costs are neither high nor low

- Depositors and companies favour bank lending in most cases
- The reduction in negotiation costs provides banks with an inherent advantage, even if extracting some of the surplus generated
- Direct lending is preferred only for companies if negotiation costs are neither high nor low
- High investment returns make bank lending feasible even for mid-range negotiation costs

- Depositors and companies favour bank lending in most cases
- The reduction in negotiation costs provides banks with an inherent advantage, even if extracting some of the surplus generated
- Direct lending is preferred only for companies if negotiation costs are neither high nor low
- High investment returns make bank lending feasible even for mid-range negotiation costs

Copyright 🔘 by Andreas Krause

Chapter 2.1: Negotiation costs Theoretical Foundations of Banking Slide 32 of 32

Summary

The expertise and economies of scale by banks in negotiating loan agreements makes their existence preferable to direct lending in most cases

- The expertise and economies of scale by banks in negotiating loan agreements makes their existence preferable to direct lending in most cases
- This advantage of banks make them specialist intermediaries that benefit the economy

- The expertise and economies of scale by banks in negotiating loan agreements makes their existence preferable to direct lending in most cases
- This advantage of banks make them specialist intermediaries that benefit the economy
- The advantages are limited by their ability to extract a surplus from depositors and companies

- The expertise and economies of scale by banks in negotiating loan agreements makes their existence preferable to direct lending in most cases
- This advantage of banks make them specialist intermediaries that benefit the economy
- The advantages are limited by their ability to extract a surplus from depositors and companies, such that in some cases direct lending is preferred

- The expertise and economies of scale by banks in negotiating loan agreements makes their existence preferable to direct lending in most cases
- This advantage of banks make them specialist intermediaries that benefit the economy
- The advantages are limited by their ability to extract a surplus from depositors and companies, such that in some cases direct lending is preferred



This presentation is based on Andreas Krause: Theoretical Foundations of Banking, 2025

Copyright () by Andreas Krause

Picture credits:

Cover: Bernard Spragg, NZ from Christchurch, New Zealand, CCO, via Wikimedia Commons, https://commons.wikimedia.org/wiki/File-Bank.of.China.Hong.Kong.(9832283389).jpg Back: Florian Lindner, CC BY 2.5 https://creativecommons.org/licenses/by/2.5 via Wikimedia Commons, https://commons.wikimedia.org/wiki/File-Hong.Kong.Panorama.at.night.jpg

Andreas Krause Department of Economics University of Bath Claverton Down Bath BA2 7AY United Kingdom

E-mail: mnsak@bath.ac.uk