Andreas Krause

Chapter 2.1

Negotiation costs

Outline

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- The benefit for depositors of a bank is that they do not need to negotiate a large number of loans with different borrowers, but instead only need to agree with the bank on the terms of the deposit.
- Similarly, borrowers benefit from bank in that they do not need to negotiate with many lenders, but only with the bank.
- Thus both, borrowers and lenders, can save on negotiation costs due to the existence of banks.
- We will look at how this reduction in negotiation costs may benefit banks, but will also look at the effect this has on loan and deposit rates

Outline

- We will look at a range of scenarios and compare the profits for borrowers and lenders,
- We will look at a situation where no bank is present, where lending can only be done through banks, and where both lending forms co-exist.
- We will then determine the equilibrium market structure that will be observed.

- We will first set out the basic environment in which the model is set and then discuss the specific assumptions we make.

Cost advantage of banks

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→ Using banks can reduce the negotiation costs compared to negotiating between multiple borrowers and lenders.

- In general negotiations between parties are costly, the require time and the collection as well as analysis of information.
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  - An advantage banks have is that they will have standard procedures established and through experience can focus on key aspects important to the agreement.
  - This experience and focus on few aspects will reduce the costs of negotiations.
- Hence these costs will affect loans, given directly and through banks. It will also affect deposits, which we can interpret as a loan to the bank.

→ We can now set out the process of bargaining between borrowers and lenders.

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- Direct negotiations between borrowers and lenders on loan conditions are costly

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Nash bargaining

Nash bargaining

→ We assume that borrowers and lenders are negotiating the terms of the loan rather than the terms being imposed by one party. We assume that this negiatioation is done using Nash bargaining.

- We assume that any direct negotiation between borrowers and lenders imposes a fixed costs on both parties.
  - This costs have to be borne even if the negotiations fail; they are treated as sunk costs.
- In contrast we assume that negotiations with banks are free due to the experience of banks.
- We assume that Nash bargaining is applied in all negotiations.
  - The negotiation will be limited to interest rates, with all other terms and conditions agreed at no costs. Such terms might include the time to maturity, the amount, any collateral.
- If any direct negotiation between borrowers and lenders fail, both parties can negotiate with a bank. If the negotiation with a bank fails, borrowers and lenders can negotiate directly. These alternatives are known as the outside option in Nash bargaining.

→ Using Nash bargaining we can now determine the interest rates that are agreed and from these obtain the profits borrowers, lenders, and banks make.

Nash bargaining

- Negotiating between borrowers and lenders directly imposes costs C

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- Negotiation between banks and borrowers/depositors are free

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- All participants engage in Nash bargaining

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- We will first look at the case where no bank is available with borrowers and lenders only able to negotiate directly.

Profit functions

Profit functions

→ We can now first determine the profits of borrowers and lenders

- The borrower (company) and the lender (depositors) are negotiating directly with other facing the fixed sunk costs. There is no bank available in this initial scenario.
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  - We assume that the investment the company makes with the proceeds of the loan is successful with some probability. If the investment is not successful, we assume that no return is obtained. As companies have limited liability, they will repay their loan only if they have the resources to do so; this here requires the investment to be successful.
  - The return on a successful investment is fixed and we assume that the investment is fully financed by the loan.
  - From the successful investment, the company will repay the loan, including its interest. It is this interest that is negotiated.
- The company profits are reduced by the negotiation costs.
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  - The depositors (lenders) have their loan returned including interest.
  - The loan is only repaid if the investment is successful, as otherwise companies do not have the necessary funds available.
  - The profits of the depositors has to take into account the initial investment; we assume that there are no costs involved in this initial investment, including no opportunity costs.
- The depositor profits are reduced by the negotiation costs.

→ Having obtained the profits of the two parties negotiating, we can now apply Nash bargaining to obtain the loan rate that is agreed.

Profit functions

- Company and 'depositor' face negotiation costs of C each
- Company profits: $\hat{\Pi}_C =$ $- C$

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Profit functions

- Company and 'depositor' face negotiation costs of C each
- Investment of company succeeds with probability π
- Company profits: $\hat{\Pi}_C = \pi\,(\qquad\qquad\qquad) - C$

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Profit functions

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

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

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Profit functions

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

Profit functions

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- Investment 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: $\hat{\Pi}_D = \quad (1+r_C)\,L \qquad - C$

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- Depositors obtain the loan with interest if the investment is successful and have an outlay of the initial loan
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Optimal loan rate

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→ We can now obtain the optimal loan rate by applying Nash bargaining.

- In Nash bargaining we have to consider the profits of any outside option. The outside option here is to not provide a lon or accept a loan after the negotiation. Thus will imply that both parties have to bear their negotiation costs, giving them profits of $-C$. For Nash bargaining we consider the difference of the profits from an agreement and the profits if no agreement is reached.
- The objective function in Nash bargaining is the product of these two profit differentials. We will maximize this expression over the loan rate.
- Taking the first derivative, setting it equal to zero and solving the resulting equation, gives us that the profits of the company and depositor are equal.
- Using this equality of profits, we can solve for the loan rate and obtain the *formula*.

→ Using this result, we can now determine the profits of the company and the depositor.

Optimal loan rate

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

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- This gives $\hat{\Pi}_D = \hat{\Pi}_C$

Optimal loan rate

→ We can now obtain the optimal loan rate by applying Nash bargaining.

- In Nash bargaining we have to consider the profits of any outside option. The outside option here is to not provide a lon or accept a loan after the negotiation. Thus will imply that both parties have to bear their negotiation costs, giving them profits of $-C$. For Nash bargaining we consider the difference of the profits from an agreement and the profits if no agreement is reached.
- The objective function in Nash bargaining is the product of these two profit differentials. We will maximize this expression over the loan rate.
- Taking the first derivative, setting it equal to zero and solving the resulting equation, gives us that the profits of the company and depositor are equal.
- Using this equality of profits, we can solve for the loan rate and obtain the *formula*.

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→ We can use the profits of the company and the depositor to determine whether the negotiation is profitable.
- We can insert the loan rate into the profits of the company and depositor and obtain the *formula*.
- Borrowers will only demand a loan and depositors only provide a loan if the profits from doing so are positive.

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- This implies that negotiation costs must not exceed a certain value as given in the *formula*.

→ We have thus established the under which condition direct lending is feasible.

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

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→ This feasibility of direct lending can now be analysed graphically.
- We look at the combination of negotiation costs and profitability of the investment.
- We can plot the line implied by the condition on the maximum negotiation costs.
- We see that direct lending is feasible if the combination of these parameters is to the upper left of this line. On the lower right direct lending is not feasible.

→ This result will now be compared with that of banks being present in the market.

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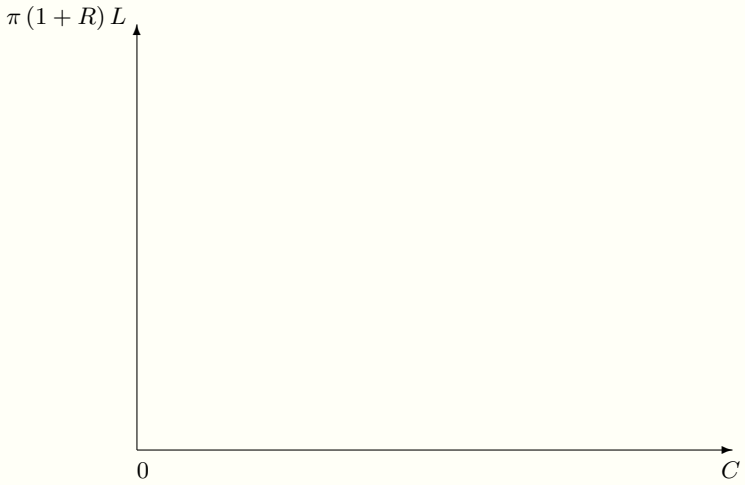

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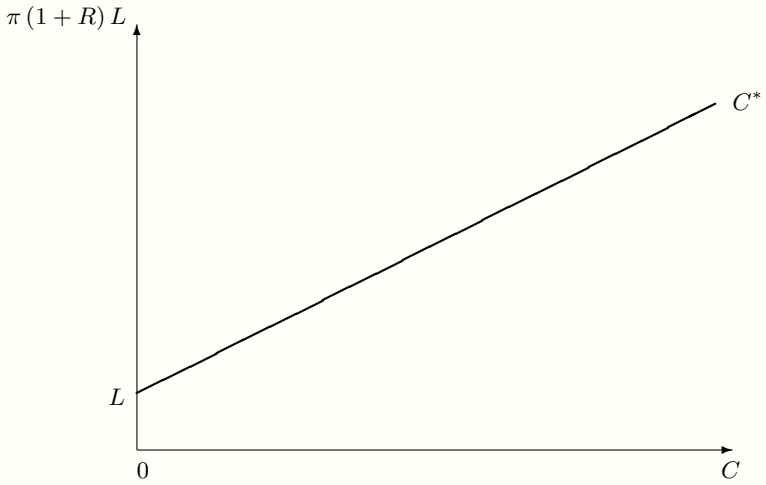

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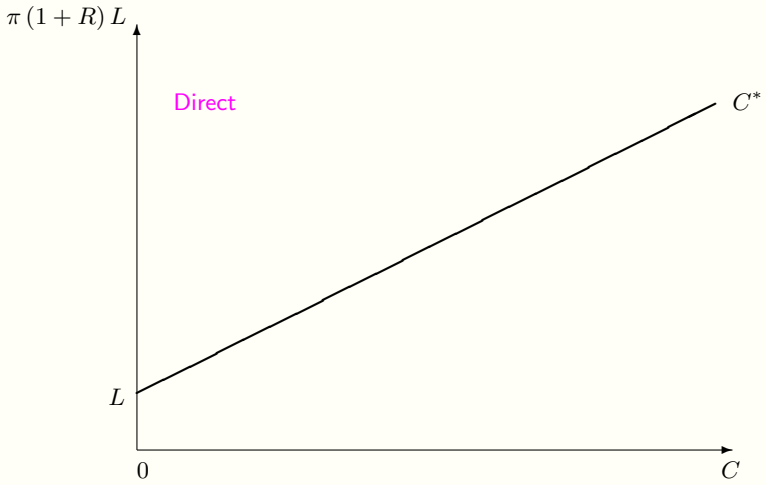

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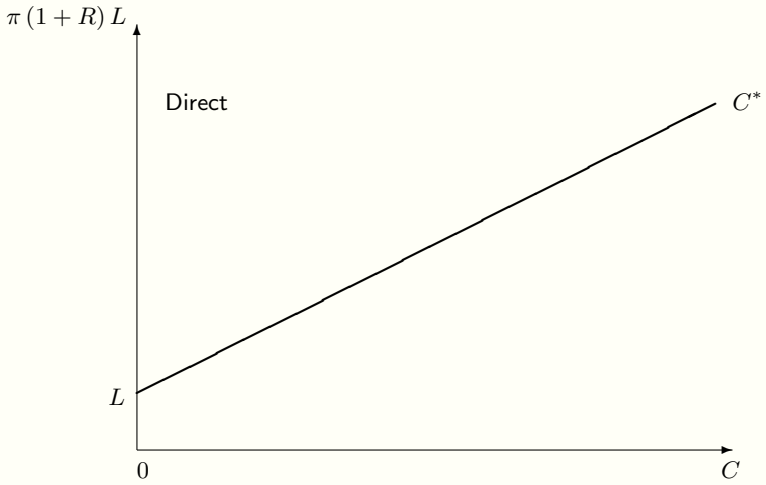

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- Rather than allowing only for direct lending, we will now assume that only banks can provide loans and all depositors will have to use banks.

Profit functions

Profit functions

→ As before, we first determine the profits functions of depositors, companies, and the bank.

- We have assumed that negotiations with banks are not incurring any costs, hence we can neglect that term.
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  - The company and depositor profits are essentially given as before.
  - There are no negotiation costs to be taken into account.
  - We now have different loan and deposit rates as banks are acting as an intermediary.
- In line with the profits from direct lending, company profits are given in this *formula*.
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- Banks also have limited liability and will only repay depositors if they are repaid the loan they have given, which happens if the investment by the company if successful. In this case the bank obtains the repayment from the loan and uses these proceeds to repay depositors, giving the profits as in the *formula*

→ We can now use these profits to use Nash bargaining and obtain the optimal loan and deposit rates.

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Nash bargaining

Nash bargaining

→ We will consider the negotiations between companies, depositors, and banks.

- We now have Nash bargaining between the bank and the company about the loan rate.
- In addition we will have a second Nash bargaining between the bank and the depositor about the deposit rate.

- As there are no negotiation costs, the outside option is to not agree a loan or deposit rate, respectively, and in this case no profits are generated.
- The objective function of the negotiation between the bank and company is then given by the product of the two profits.
- The objective function of the negotiation between the bank and depositor is then given by the product of the two profits.

→ We can now solve this bargaining problem for the optimal loan and deposit rates.

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Optimal loan and deposit rates

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→ We now maximize the objective functions and solve for the loan and deposit rates emerging.

- If we maximize the bank/company objective function of the loan rate and the bank/depositor for deposit rate and solve the resulting first order condition, we see that all profits are equal.

⇒ These two equalities can be solved for the optimal loan rate.
Similar do we obtain the optimal deposit rate.

⇒ Inserting these expressions back into the profit functions, we obtain profits as given in the *formula*.

- Bank lending is only feasible if companies make a profit to demand loans, depositors make profits to provide deposits, and banks make profits to fulfill their role as intermediary.

⇒ This condition implies that the profitability of the company investment must be above a certain threshold.

→ We can compare this result with the feasibility of direct lending.

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

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$\Rightarrow$ Loan rate: $\pi\,(1 + r_L)\,L = \frac{2}{3}\pi\,(1 + R) + \frac{1}{3}$

Optimal loan and deposit rates

→ We now maximize the objective functions and solve for the loan and deposit rates emerging.

- If we maximize the bank/company objective function of the loan rate and the bank/depositor for deposit rate and solve the resulting first order condition, we see that all profits are equal.
- [⇒] These two equalities can be solved for the optimal loan rate.

Similar do we obtain the optimal deposit rate.

⇒ Inserting these expressions back into the profit functions, we obtain profits as given in the *formula*.

- Bank lending is only feasible if companies make a profit to demand loans, depositors make profits to provide deposits, and banks make profits to fulfill their role as intermediary.

⇒ This condition implies that the profitability of the company investment must be above a certain threshold.

→ We can compare this result with the feasibility of direct lending.

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Feasibility of bank lending

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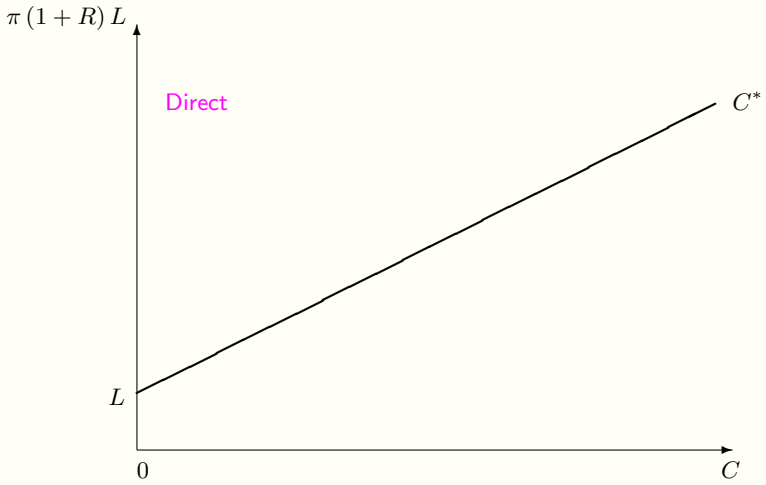
→ We will be looking at the feasibility of bank lending compared to direct lending. As before, we will look at the relationship between negotiation costs and profitability of the company investment.

- As with banks there are no negotiation costs, the condition will be horizontal.
- Bank lending will be feasible if the company investment is sufficiently profitable, independent of the negotiation costs in direct lending.

→ The possibility of lending has been extended now to cases with higher negotiation costs, and where negotiation costs were low enough to support direct lending, bank lending would also be feasible.

Feasibility of bank lending



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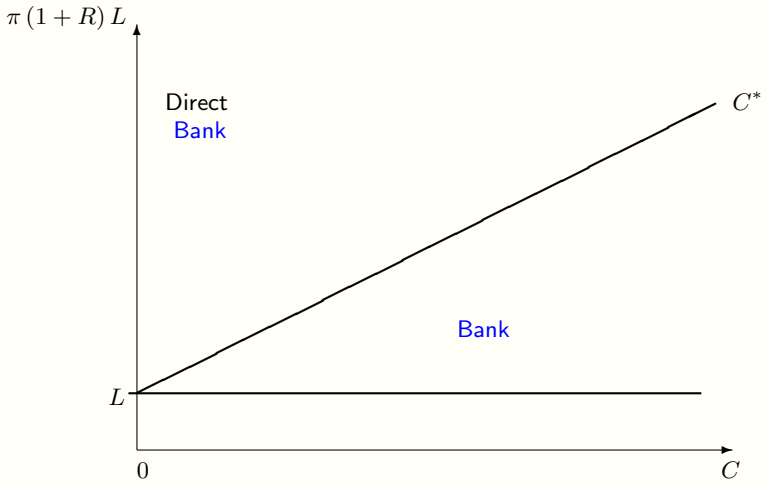

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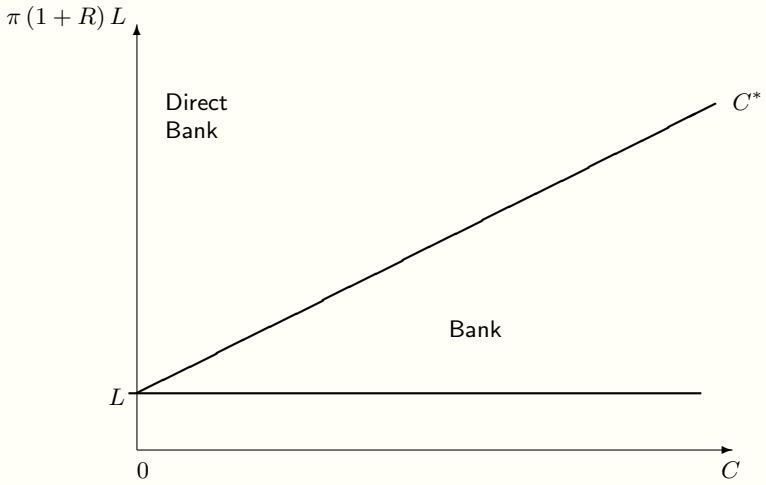

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- Having investigated direct lending and bank lending as the only options, we now look at the case where both lending forms can co-exist.

Outside options

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→ Having both lending form available will mostly affect the outside options the depositors and companies have.

- If companies are depositors can not agree their respective interest rates, a loan can still be agreed.
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Optimal loan, deposit and direct lending rates

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→ We now determine simultaneously the loan and deposit rates with banks and the direct lending rate by maximizing these expressions over the interest rates.

- Solving these three equations, we see that the differences in profits between bank lending/deposits and direct lending are identical for depositors and lenders, and this in turn is equal to the bank profits. We can solve these two equation for the three variables required.

⇒ We obtain the loan rate as an expression of the deposit rate.
We obtain the direct lending rate as an expression of the deposit rate.

⇒ We can determine the deposit rate freely as we only had two equations, but three interest to determine.

→ Based on this result, we can now determine the profits of all market participants.

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→ We have to distinguish between profits from direct lending and bank lending/deposits

- Inserting results, we see that banks profits are given by this *formula* and are always positive.
  - Positive profits for banks implies that banks are always willing to lend
- Depositors with banks make the profits as indicated in this *formula*.
- Companies borrowing from banks make the profits as indicated in this *formula*.
- For direct lending, depositors obtain the profits as indicated in this *formula*.
  - As these profits are smaller than in bank lending, they would prefer to deposit their funds with banks rather than lend directly.
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- The reason for the attractiveness of bank lending is that banks have the benefits of lower negotiation costs, it save the costs to companies and depositors.
  - These benefits are distributed equally between the three market participants, making them better off with the involvement of banks.

→ Hence, if both bank and direct lending, is available, bank lending will be chosen.

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

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- $\Pi_B = \frac{2}{3}C > 0$: banks are always willing to lend
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→ While it might be more beneficial to choose bank lending or deposits over direct lending, both depositors and companies must be willing to use banks, thus is must be profitable.

- For depositors to provide deposits, their profits need to be positive.

⇒ This implies that the return on deposits must the sufficiently high.

- For companies to demand loans, their profits need to be positive.

⇒ This requires negotiation costs, which are included into the loan rate, to be sufficiently low.

- Overall, if the negotiation costs are not too high, bank lending is feasible.

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Feasibility of co-existence of direct and bank loans

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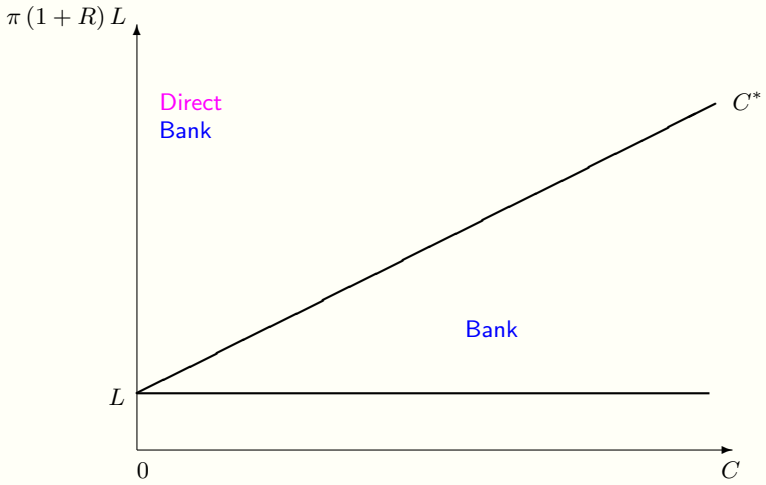
→ We will be looking at the feasibility of bank lending if direct lending is an alternative and compare this to the case where direct lending only was possible, or bank lending only. As before, we will look at the relationship between negotiation costs and profitability of the company investment.

- The condition on the feasibility of bank lending has a lower slope, but a higher starting point.
- Above this line bank lending and direct lending can co-exist, although we know that only bank lending will be chosen; direct lending is only used as an outside option in the negotiations with the ban to extract better conditions.

→ Knowing under which conditions lending is feasible, we can now establish which market structure is preferred.

Feasibility of co-existence of direct and bank loans



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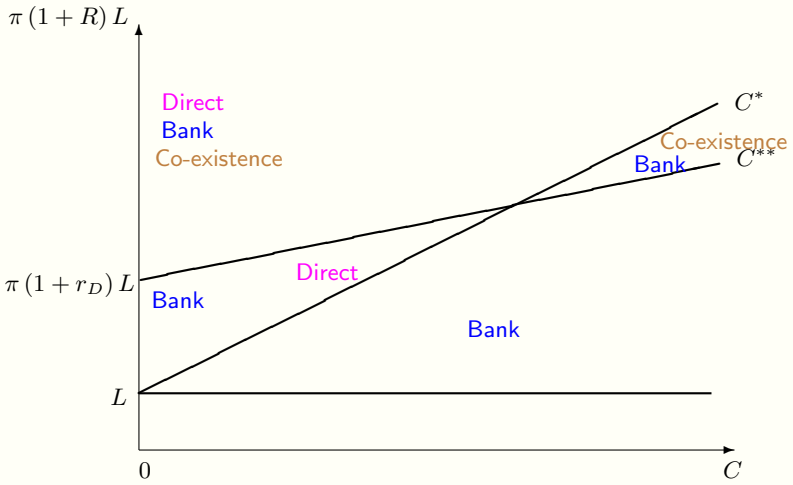

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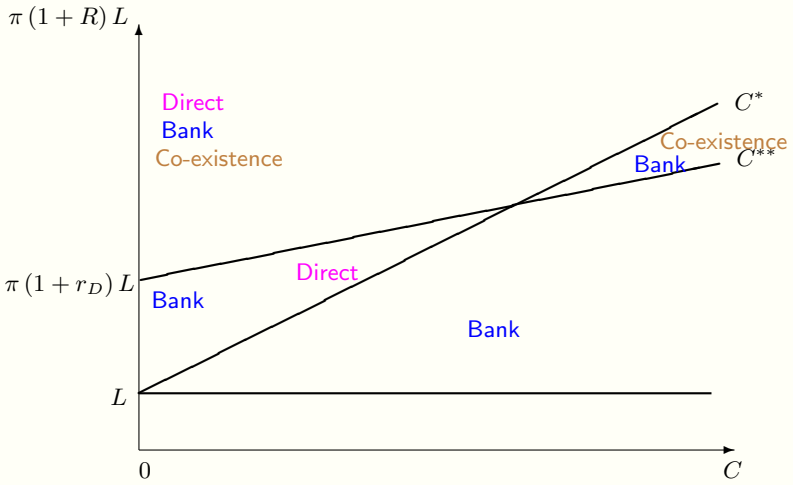

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- We have established under which conditions lending is feasible in the different scenarios of directly lending only being possible, only bank lending being possible, or bank lending and direct lending co-existing.
- We can now determined which of these scenarios is optimal and would be preferred by market participants.

Comparing direct and bank lending

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→ We first compare direct and bank landing to see which is preferred by depositors and companies.

- For bank lending to be preferred, we need the profits of bank lending to exceed those of direct lending. As the profits of depositors and companies are identical, they will both have the same preferences.

⇒ The condition of bank lending being more profitable results in this *formula*.

- If the negotiation costs are sufficiently small, bank lending is preferred. If negotiation costs are high, banks can extract surplus from depositors and companies, while in direct lending the high costs of failure lead to better conditions between depositors and lenders without the bank extracting any profits.

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→ While so far we have been concerned with the feasibility of lending in different scenarios, we now establish which of these feasible market forms are preferred.

- We have the feasible market structures as before.
- Adding the constraint on bank lending being preferred in, we obtain a more complex structure of market structures that would emerge.

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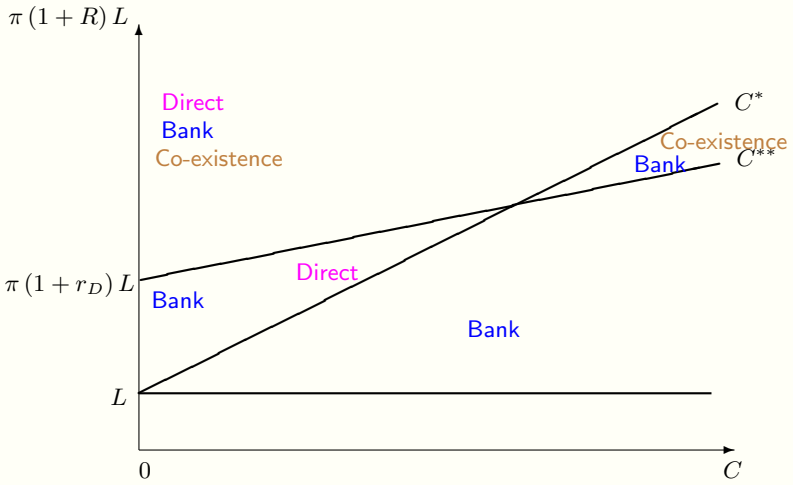
Preferred market structure



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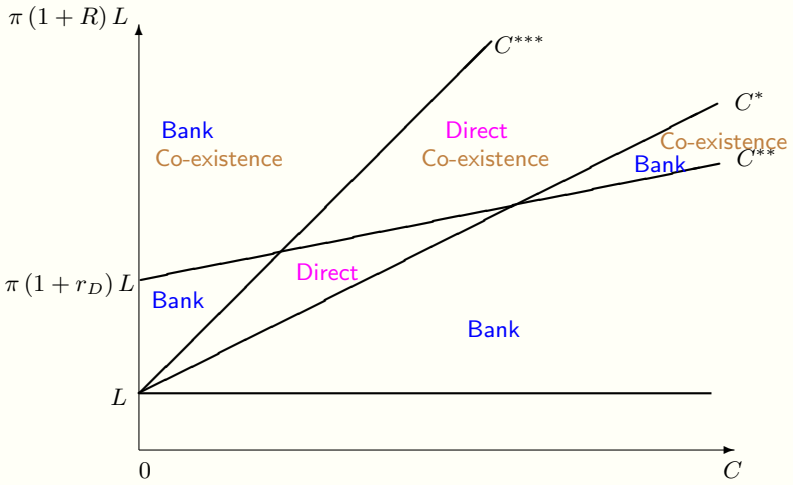

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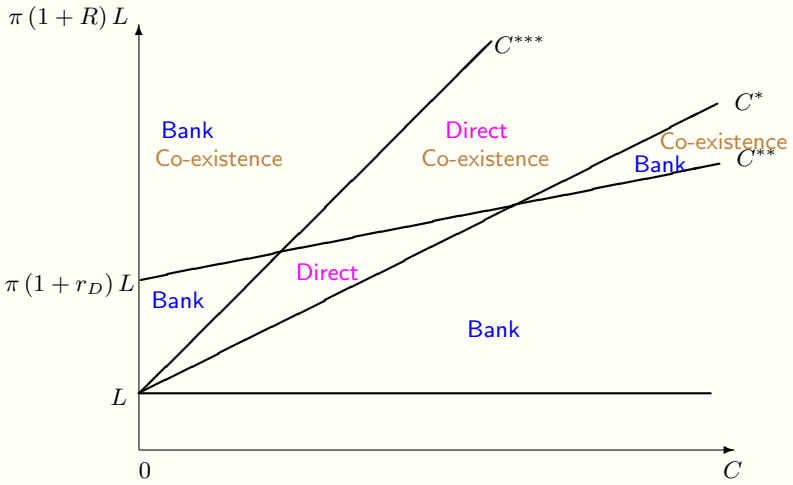

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Preferred direct lending

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- If we compare the conditions for depositors and companies, we see that they cannot be fulfilled at the same time.
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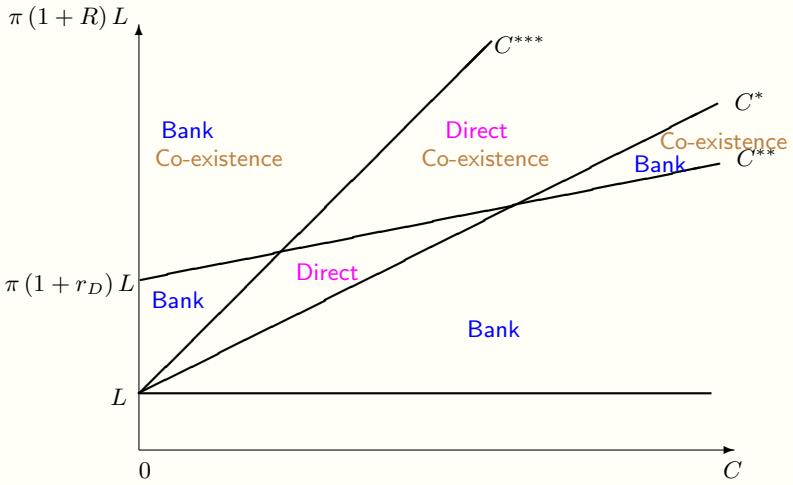

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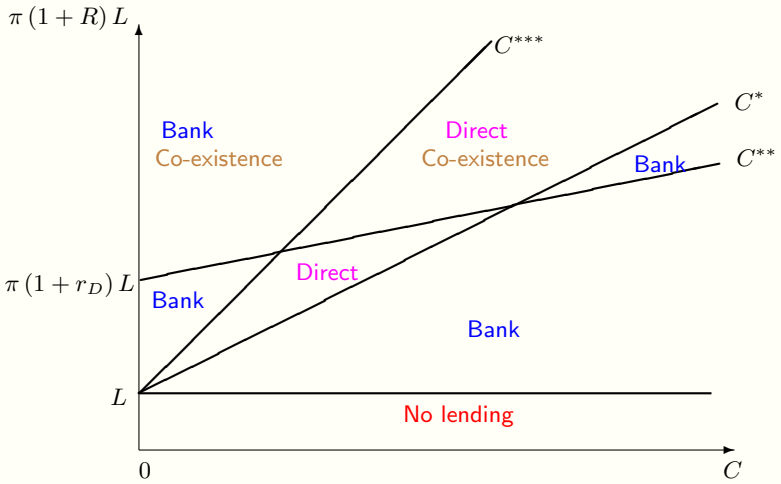

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- We can only exclude the desirability of the co-existence of bank and direct lending for high negotiation costs and mid-sized returns on the company investment.

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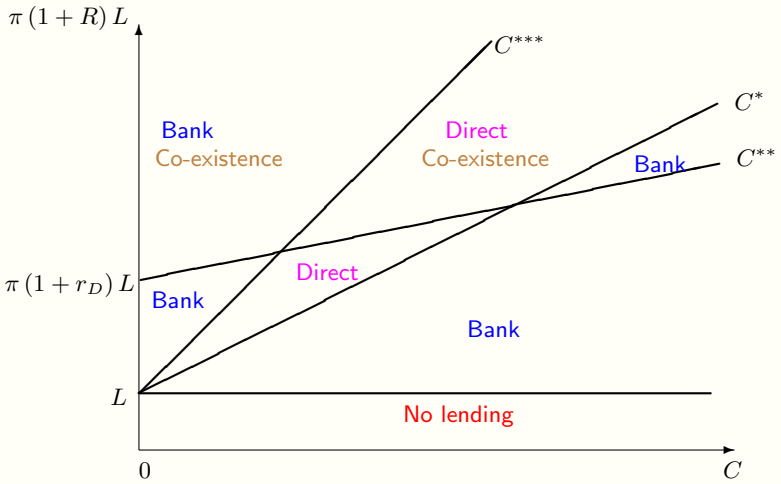

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Widespread preference for banks

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→ Rather than focussing on market structures, we now focus on the observed type of lending.

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- As we know that in the case co-existence of both lending forms, bank lending is preferred by companies and depositors, we can now focus on the lending we will actually see.

→ We see that direct lending might be observed only in an intermediate range of negotiation costs. Overall, bank lending will dominate due the lower negotiation costs. However there is a place for low return investments with intermediate negotiation costs, most likely high-risk investments arranged by knowledgeable 'depositors', where only direct lending is feasible. Higher expected returns would see competition from bank loan to such 'depositors' lending directly.

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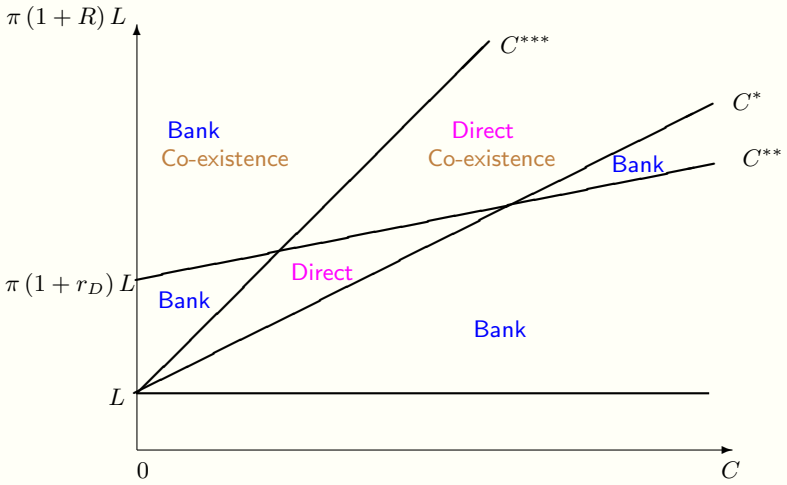

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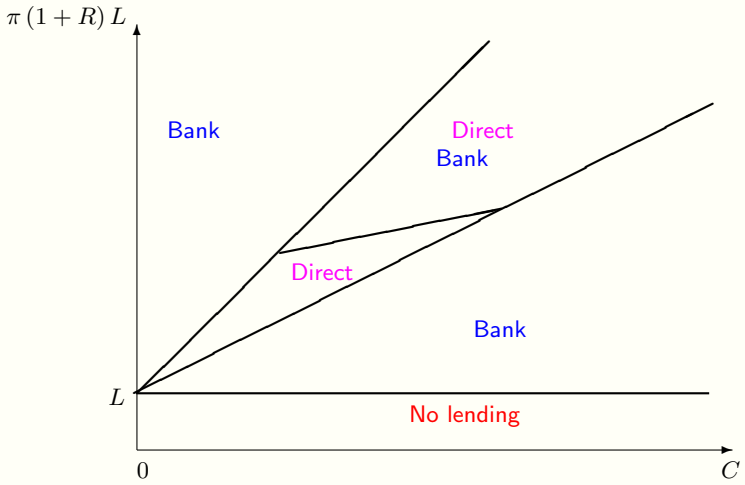

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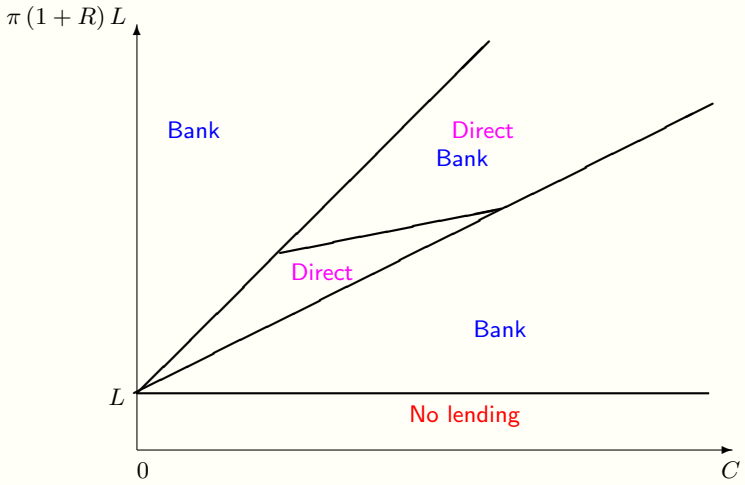

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- We can now summarize the finding of this model.

Dominance of bank lending

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→ We have seen that overall bank lending will be the most common form of lending.

- In most cases, except for a small range of intermediate negotiation costs, bank lending is preferred.
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  - The lower negotiation costs with banks makes them more attractive as their use reduces the costs to companies and depositors.
  - This holds even if banks extract some of these additional profits from companies and depositors; the benefits of not having to incur negotiation costs are shared between all market participants.
- If negotiation costs are in an intermediate range, direct lending can be feasible. This would most likely by experienced investors providing such loans directly on the one side, but also companies experienced in negotiating loans on the other hand.
- High investment returns make bank loans compete with direct lending as the high profits of companies make it feasible for the bank to extract only a small part of this surplus while reducing negotiation costs.

→ Overall, bank lending will dominate the loan market, except in some specific circumstances.

Dominance of bank lending

- Depositors and companies favour bank lending in most cases

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- 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

Dominance of bank lending

→ We have seen that overall bank lending will be the most common form of lending.

- In most cases, except for a small range of intermediate negotiation costs, bank lending is preferred.
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  - The lower negotiation costs with banks makes them more attractive as their use reduces the costs to companies and depositors.
  - This holds even if banks extract some of these additional profits from companies and depositors; the benefits of not having to incur negotiation costs are shared between all market participants.
- If negotiation costs are in an intermediate range, direct lending can be feasible. This would most likely by experienced investors providing such loans directly on the one side, but also companies experienced in negotiating loans on the other hand.
- High investment returns make bank loans compete with direct lending as the high profits of companies make it feasible for the bank to extract only a small part of this surplus while reducing negotiation costs.

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Advantage of banks

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→ Bank lending dominates the market and this is due to the reduced transaction costs of banks.

- Banks have the advantage of having the knowledge and experience in providing loans; assessing companies and risks will be conducted in an efficient way. Even if they make profits and thereby reduce the profits of companies and depositors, the lower costs will outweigh these losses in most cases.
- As companies and depositors are better off, banks enhance the welfare in the economy.
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  - In some cases these advantages of banks are not sufficient to compensate for the extraction of surplus.
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→ Banks are beneficial due to their lower transaction costs, despite making a profits for themselves.

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This presentation is based on
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