Development Economics

Slides 16

Debraj Ray, NYU

Credit Markets

- **Formal sector**:

- State or commercial banks.
- Require collateral, business plan
- Usually lend to registered firms or small businesses
- Usually charge the lowest rates of interest
- Often give directed credit to “priority sectors”:
- (exports, agriculture, small business)

Credit Markets

- **Informal sector**:

- Moneylender, trader, landlord, shopkeeper …
- Better information, better enforcement capabilities (multi-market)
- Specific abilities to take certain types of collateral
- Can price out distortions via multi-market contact

Credit Markets

- **Informal sector**:
  - Moneylender, trader, landlord, shopkeeper …
  - Better information, better enforcement capabilities (multi-market)
  - Specific abilities to take certain types of collateral
  - Can price out distortions via multi-market contact
- **Quasi-formal organizations**:
  - Grameen Bank, microfinance NGOs
  - Sometimes use group liability to avoid default
  - Rigid repayment schedules
  - Working capital rather than fixed capital loans

The Fundamental Imperfections of Credit Markets

- **Limited collateral implies limited liability**:
  - affects who seeks credit (adverse selection)
  - affects how credit is used (moral hazard)
  - affects repayment incentives (strategic default)
  - affects lender-borrower combinations (segmentation)

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- **An Example**.
  - Projects A and B, startup cost 100,000.
  - Rates of return 5% and 20% (revenues 105,000 and 120,000).
  - Bank rate of interest 10%
  - Perfect coincidence of interest between bank and borrower.

The Fundamental Imperfections of Credit Markets

- **Example**, contd.
- Change A to: 140,000 w.prob. $3/4$, 0 w.prob. $1/4$.
- Expected return is just the same as before: 5%.
- Assume limited liability (effectively same as limited collateral).
- Now bank strictly prefers Project B.
- But the borrower strictly prefers Project A! (Why?)
- Problem goes away if borrower fully repays in every contingency.

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- **Example**, contd.
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  - Now bank strictly prefers Project B.
  - But the borrower strictly prefers Project A! (Why?)
  - Problem goes away if borrower fully repays in every contingency.
- **Two interpretations** of the example:
  - The bank attracts type A borrowers (adverse selection)
  - The borrower diverts money to type A projects (moral hazard)

Risk Premia

- **How about charging higher interest rates to compensate?**

- Say $p =$ prob. repay, $r =$ interest rate, $i =$ safe rate:

- Then $p(1 + r) = 1 + i$, or

$$r = \frac{1 + i}{p} - 1.$$

The problem is that r affects the repayment probability!

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- **Digression**: In fact, sometimes a deliberate ploy by lender.

- Lender valuation of collateral V_ℓ, borrower valuation V_b.

- Borrower prefers to repay if $L(1+r) < V_b + D$,

  where $L =$ loan size, $r =$ interest rate, $D =$ default cost.

- **Digression**, contd.

- Lender wants his money back if

$$L(1+r) > V_\ell$$

- Thus loan repayment in the interest of both parties if

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- On the other hand, if

$$V_b + D < V_\ell,$$

  then interest rate may be adjusted to facilitate collateral seizure.

- (Note: analysis works best for inelastic loans.)

- **The choice of the interest rate affects default itself.**

Adverse Selection Over Borrower Projects

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- So borrower's return if project pays off Y is given by

$$\pi_b(Y, r) \equiv \max\{Y - (1 + r)L, -C\},$$

- and lender's return is given by

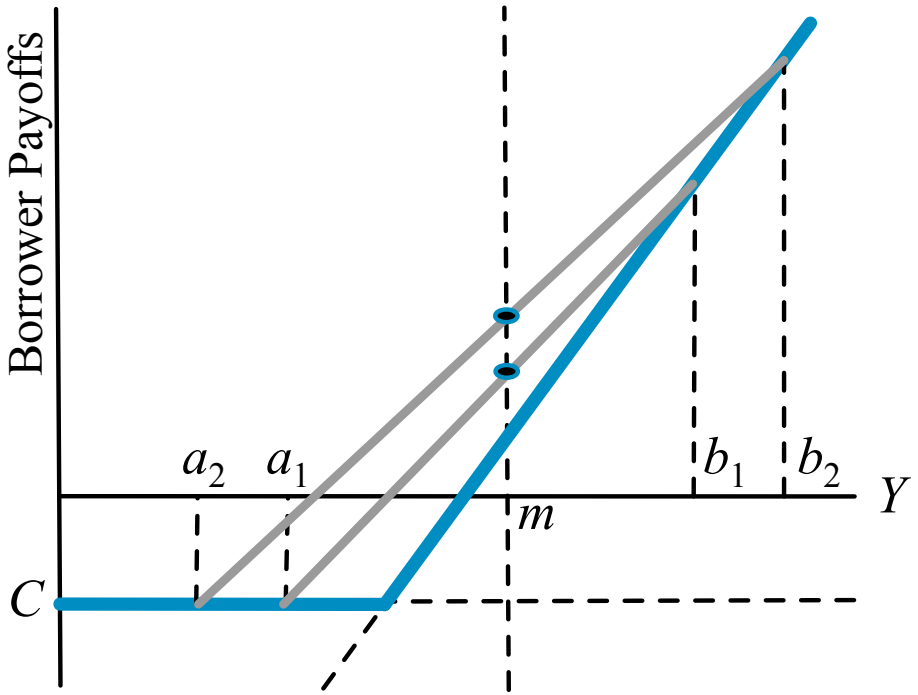
$$\pi_\ell(Y, r) \equiv \min\{Y + C, L(1 + r)\}.$$

Adverse Selection Over Borrower Projects

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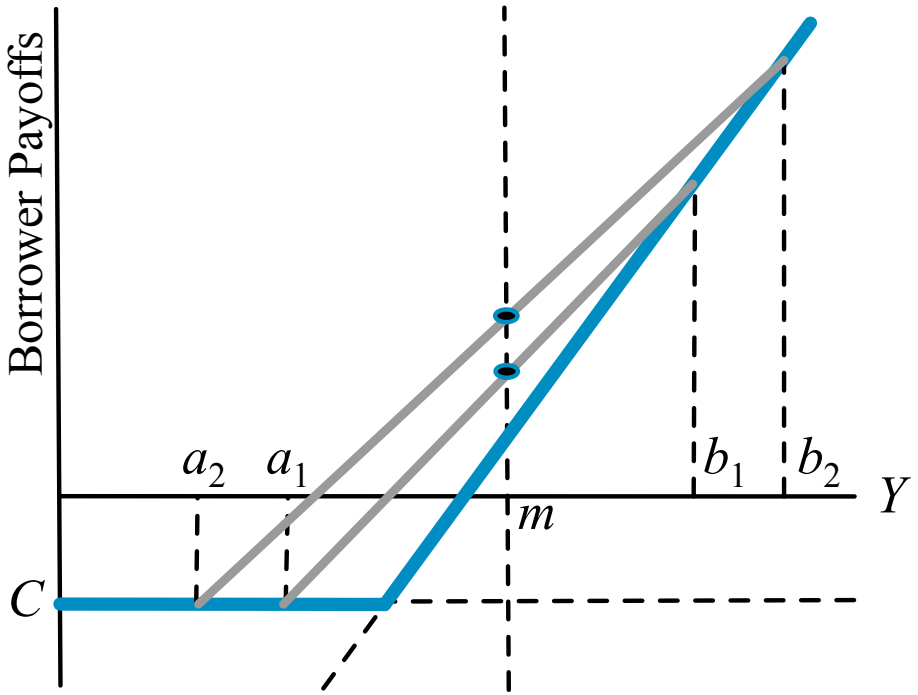
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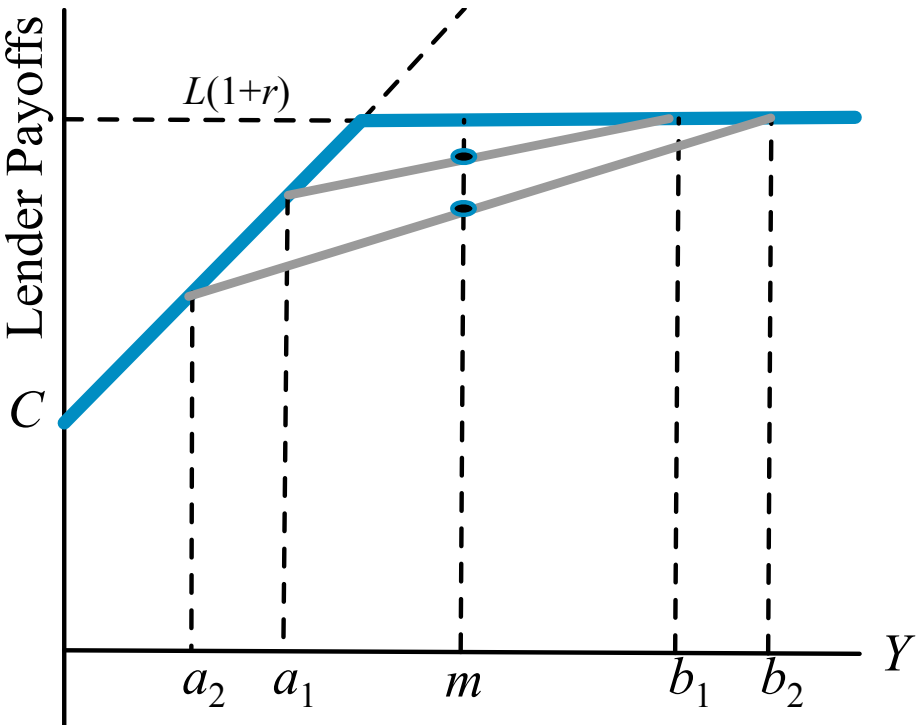
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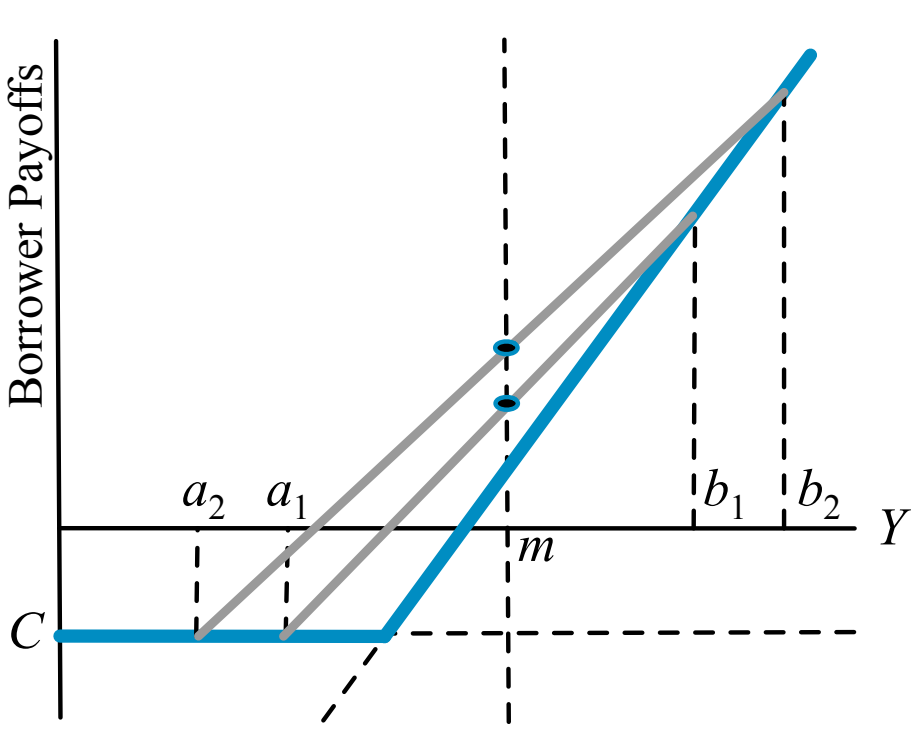
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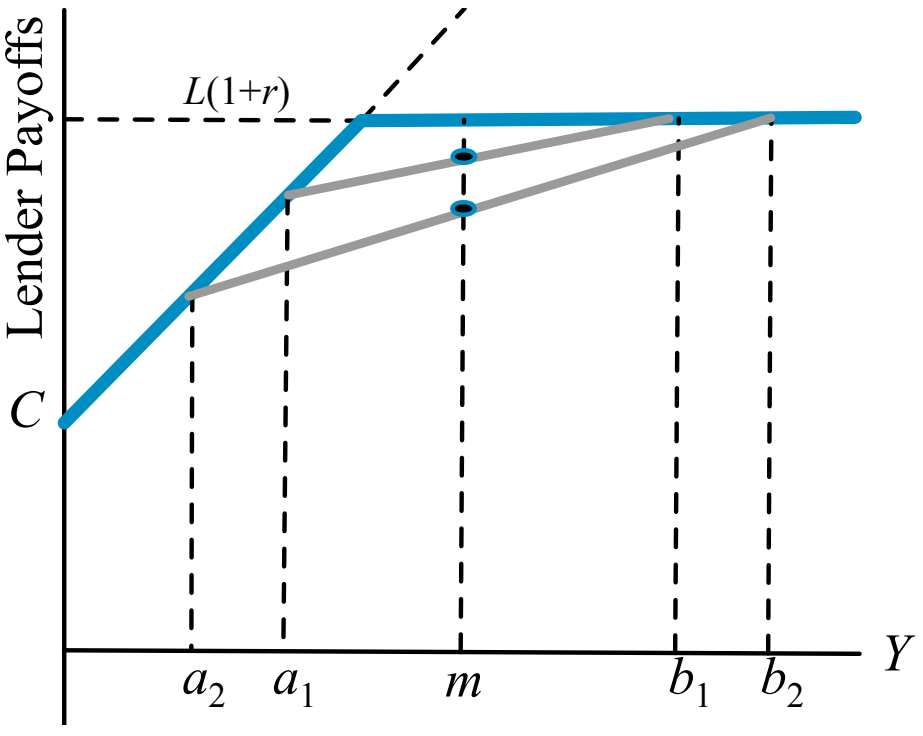




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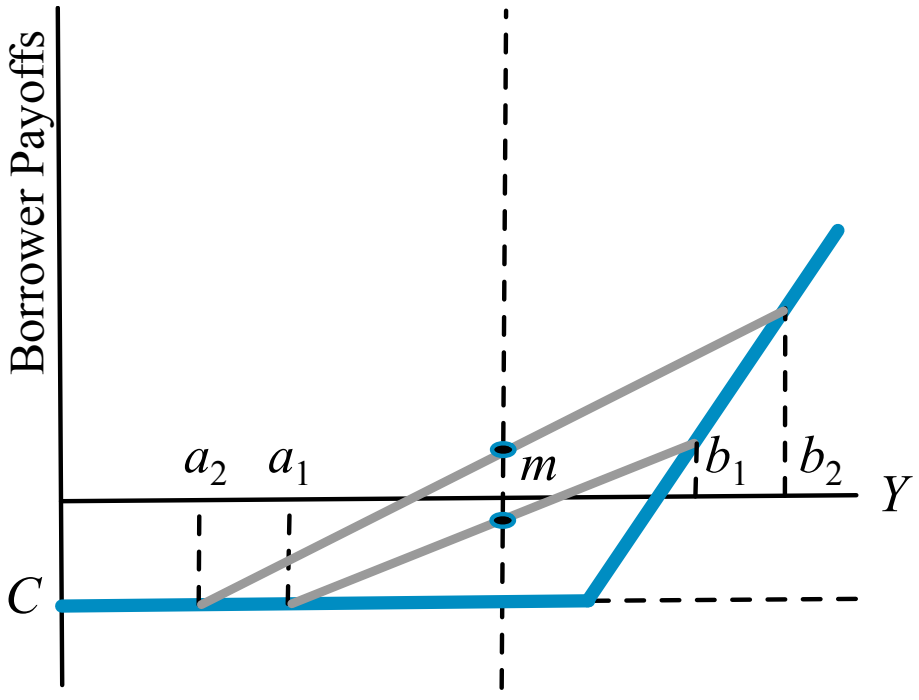
- If riskiness not observed, borrower quality will degrade in r.

Adverse Selection Over Borrower Projects

- **A higher interest rate can degrade the borrower pool**:

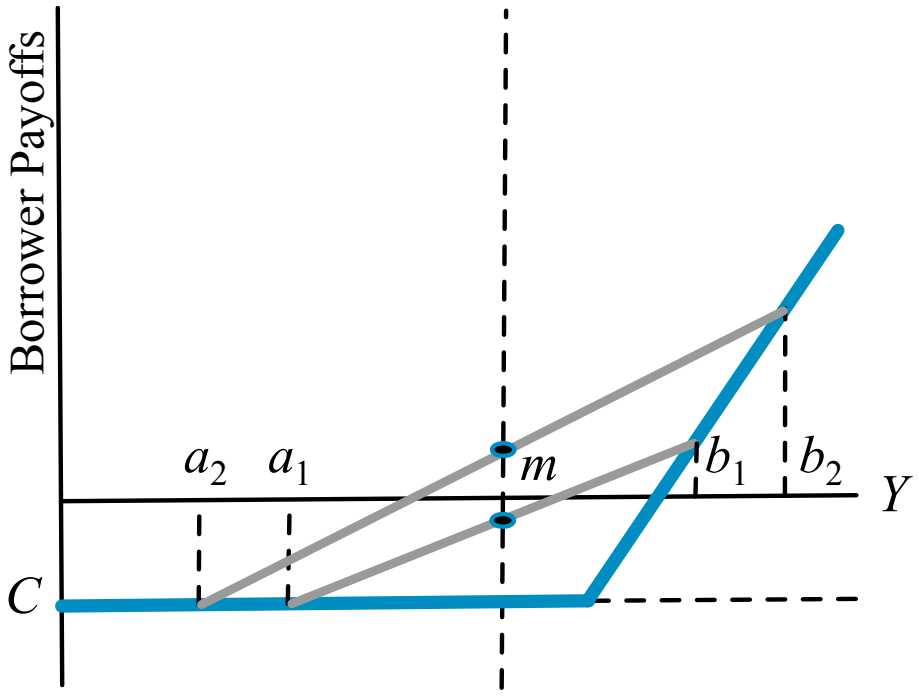
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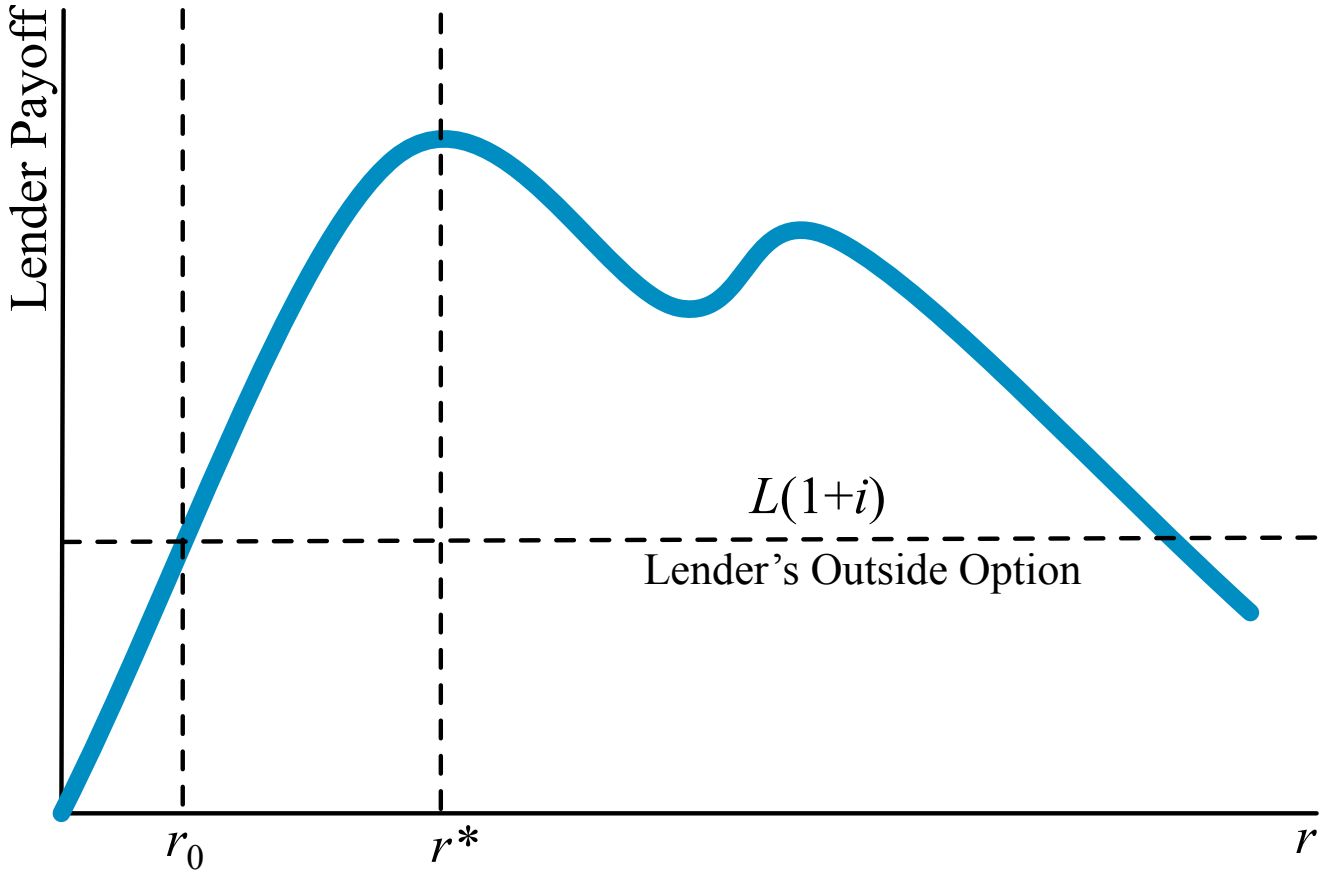
- **A higher interest rate can degrade the borrower pool**:



- **Two opposing effects** of the interest rate:
  - Increases repayment conditional on occurring
  - Worsens the risk composition

Adverse Selection Over Borrower Projects

- So lender's return typically non-monotonic in r.



- **The interest rate bounded by r^* even if borrowers willing to pay more.**

Moral Hazard and the Debt Overhang

- **Costly effort can influence success probabilities.**
  - Startup loan L, output is either Y (good) or 0 (bad).
  - Probability of good output is $p(e)$, where $e =$ agent effort.

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$$\text{Own Return = Social Surplus } = p(e)Y - e - L(1+i),$$

where i is the safe rate of return.

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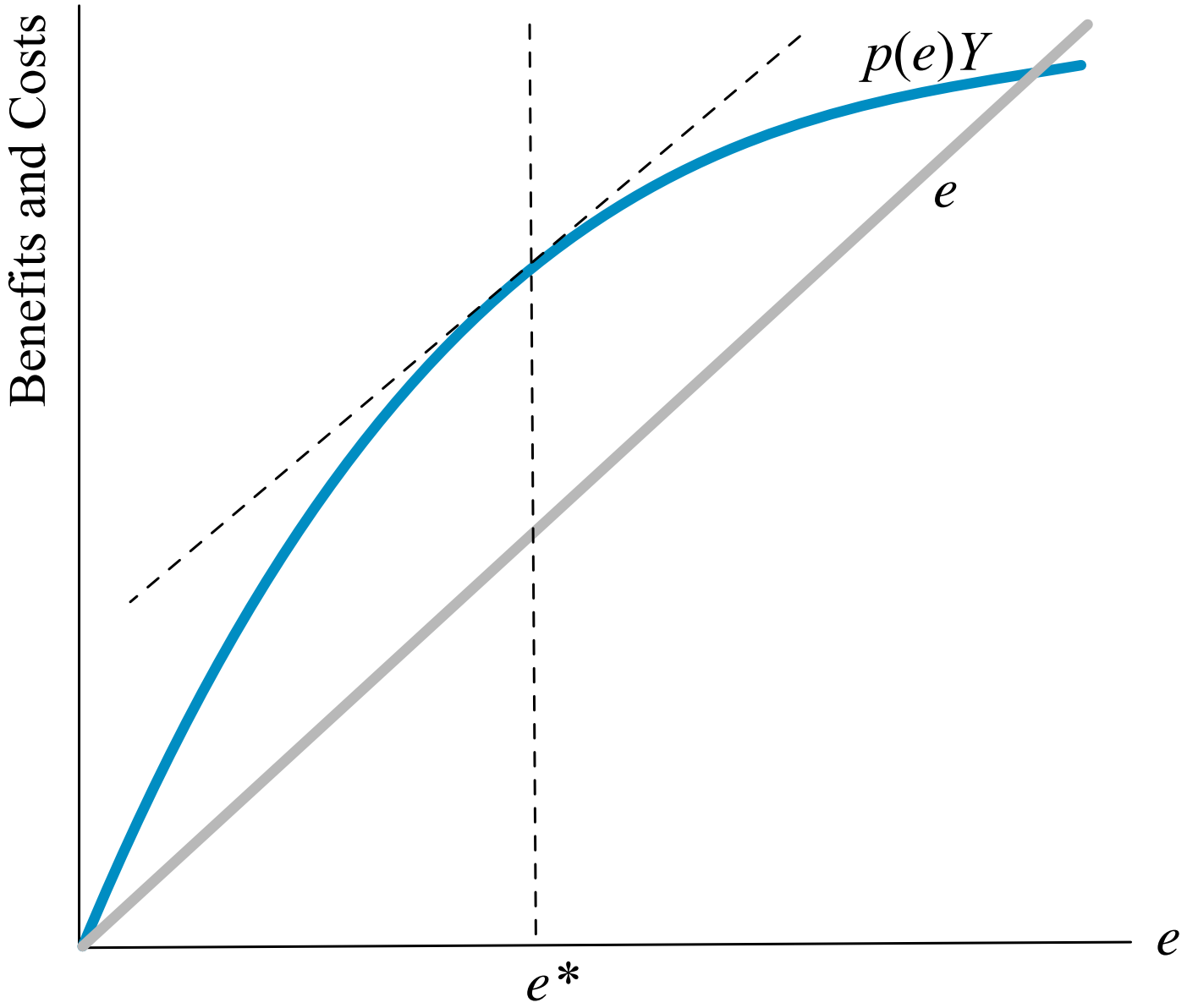
where i is the safe rate of return.

- Assume unique choice e^*; described by the first-order condition

$$p'(e^*)Y = 1$$

- This is the efficient, or **first-best** level of effort.

Moral Hazard and the Debt Overhang



Moral Hazard and the Debt Overhang

- **Debt financing**: $R = (1 + r)L$ is total debt, $C < L$ is collateral.

- Now the effort choice of a borrower facing a debt R given by

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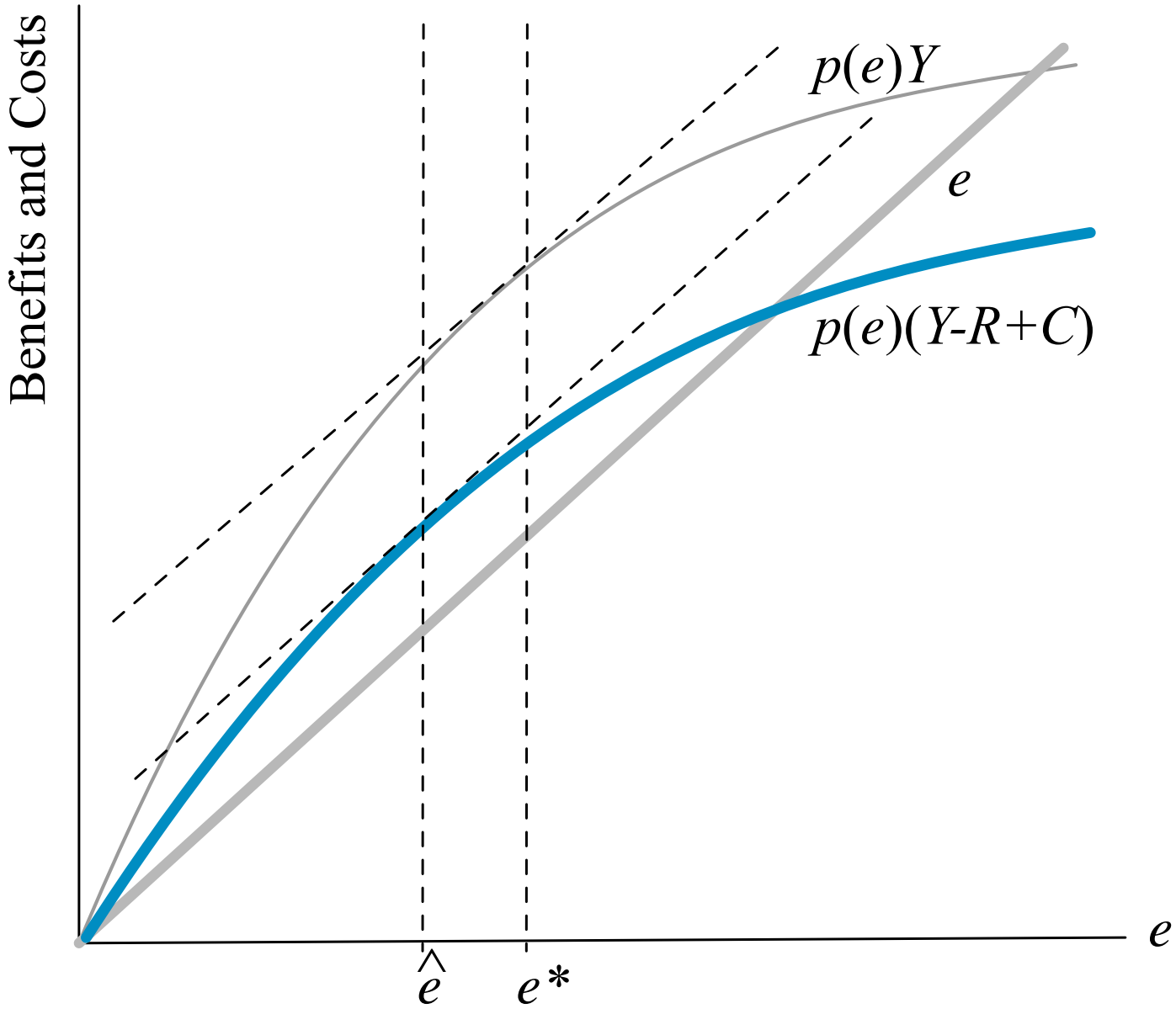
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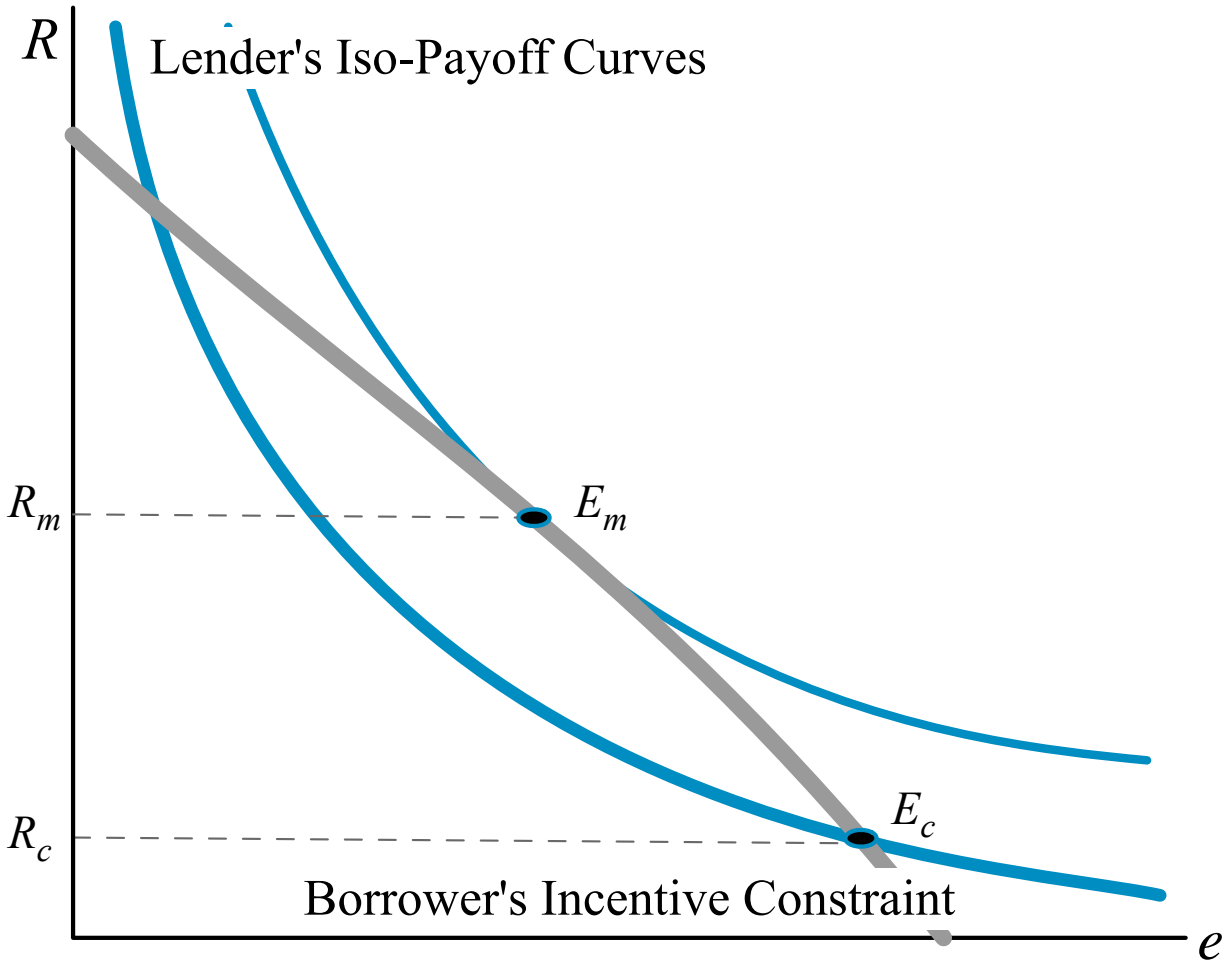
- $\hat{e} < e^*$.
- $\hat{e}$ is decreasing in R and increasing in C.
- This is the **debt overhang**.
- Lender return given by $\pi_\ell = p(e)R + [1 - p(e)]C$,

  where we've left out the (fixed) cost of giving the loan.

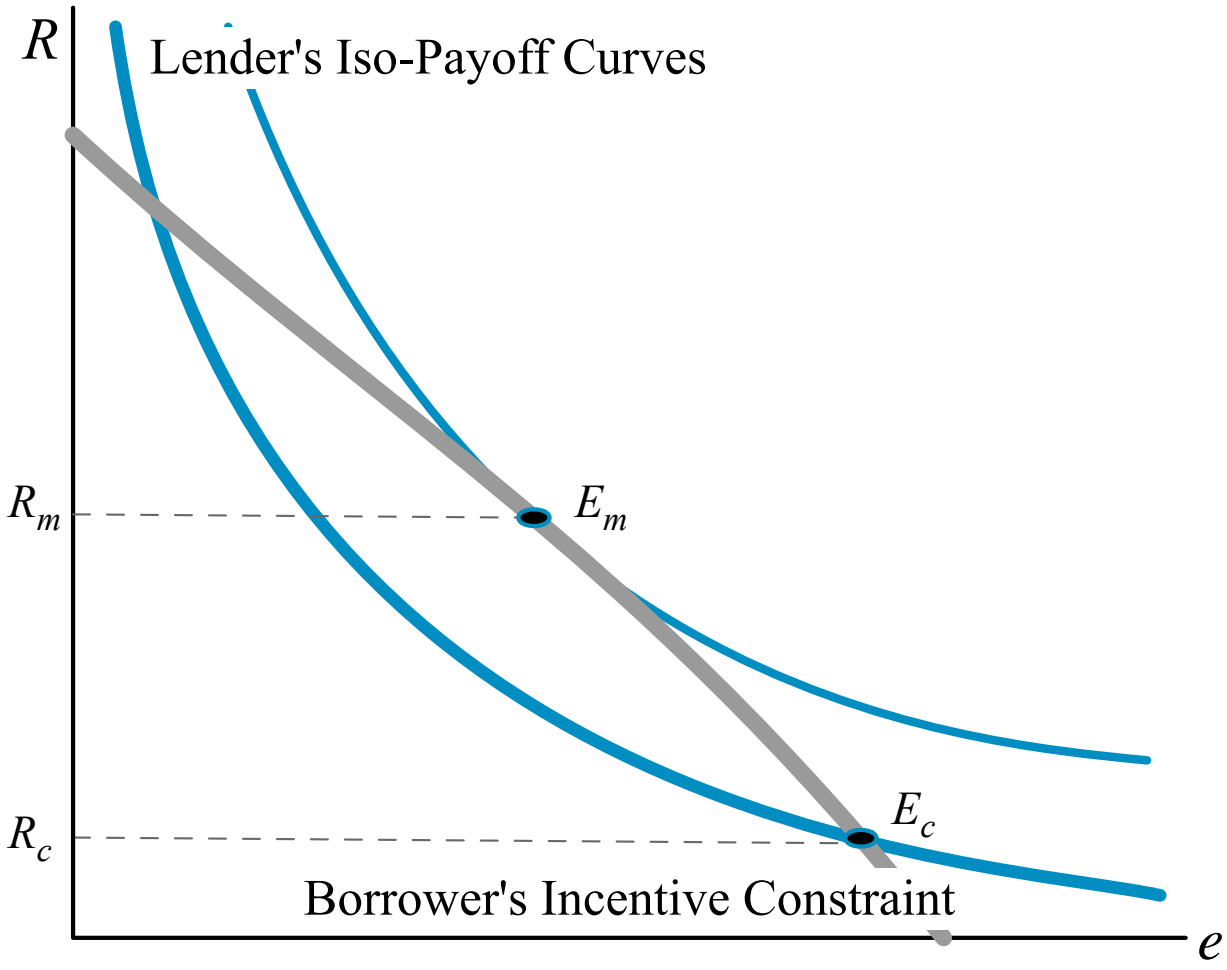
Moral Hazard and the Debt Overhang



Equilibrium Under the Debt Overhang



Equilibrium Under the Debt Overhang



- Equilibrium is at E_c under competition, E_m under monopoly.

Social Surplus and Lender Power

- **Social surplus:**

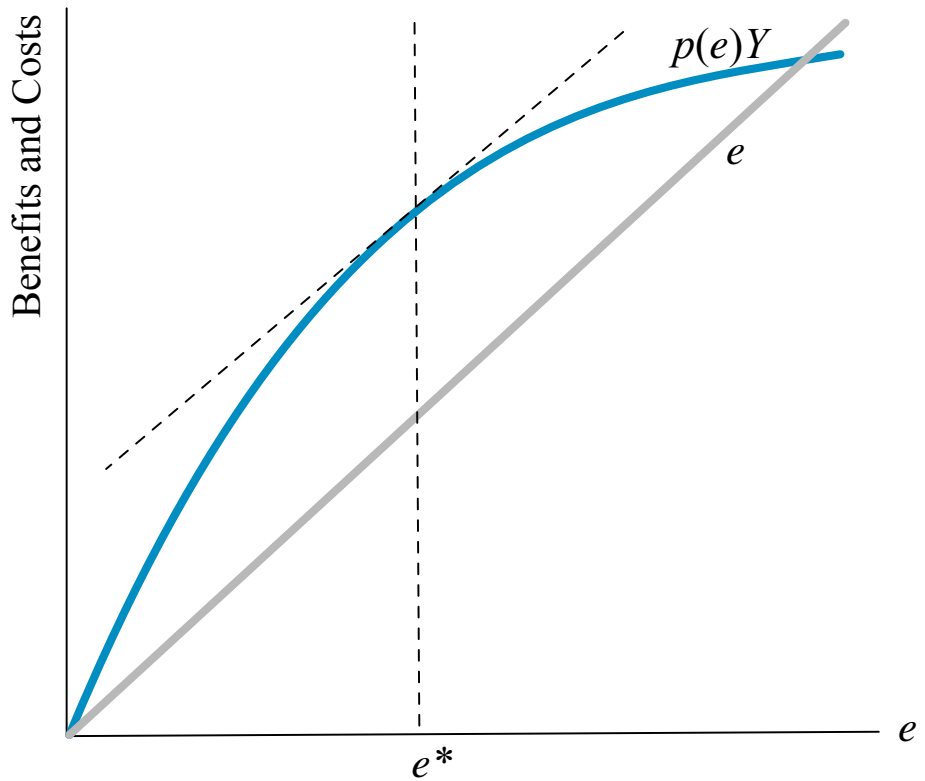
$$S \equiv \underbrace{p(e)(Y-R)-(1-p(e))C-e}_{\text{Borrower payoff}} + \underbrace{p(e)R+(1-p(e))C}_{\text{Lender payoff}} = p(e)Y-e.$$

Social Surplus and Lender Power

Social surplus:

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- Note: social surplus rises as e rises to e^*, then falls again.

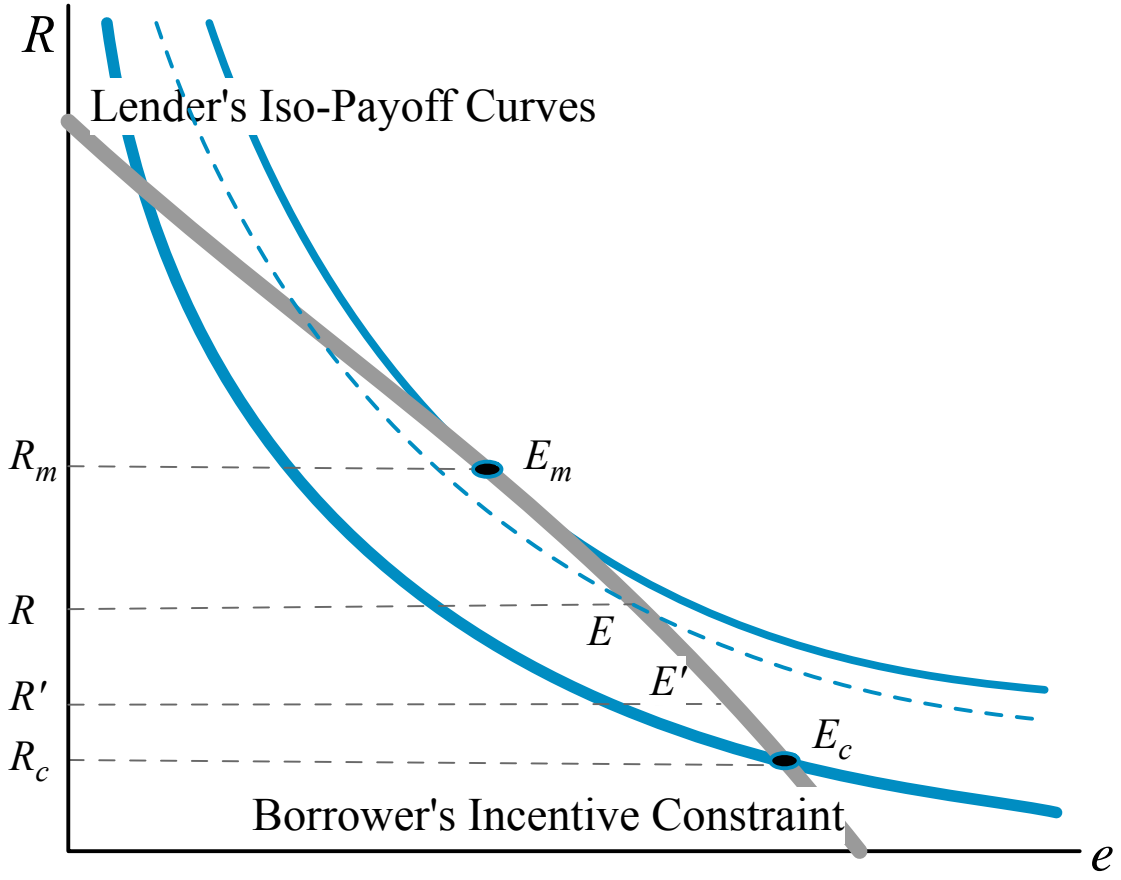


Social Surplus and Lender Power

- Equilibria with higher lender profits involve higher interest rates (though with a ceiling even at full monopoly) but lower levels of effort and social surplus, the latter given by $p(e)Y - e$.

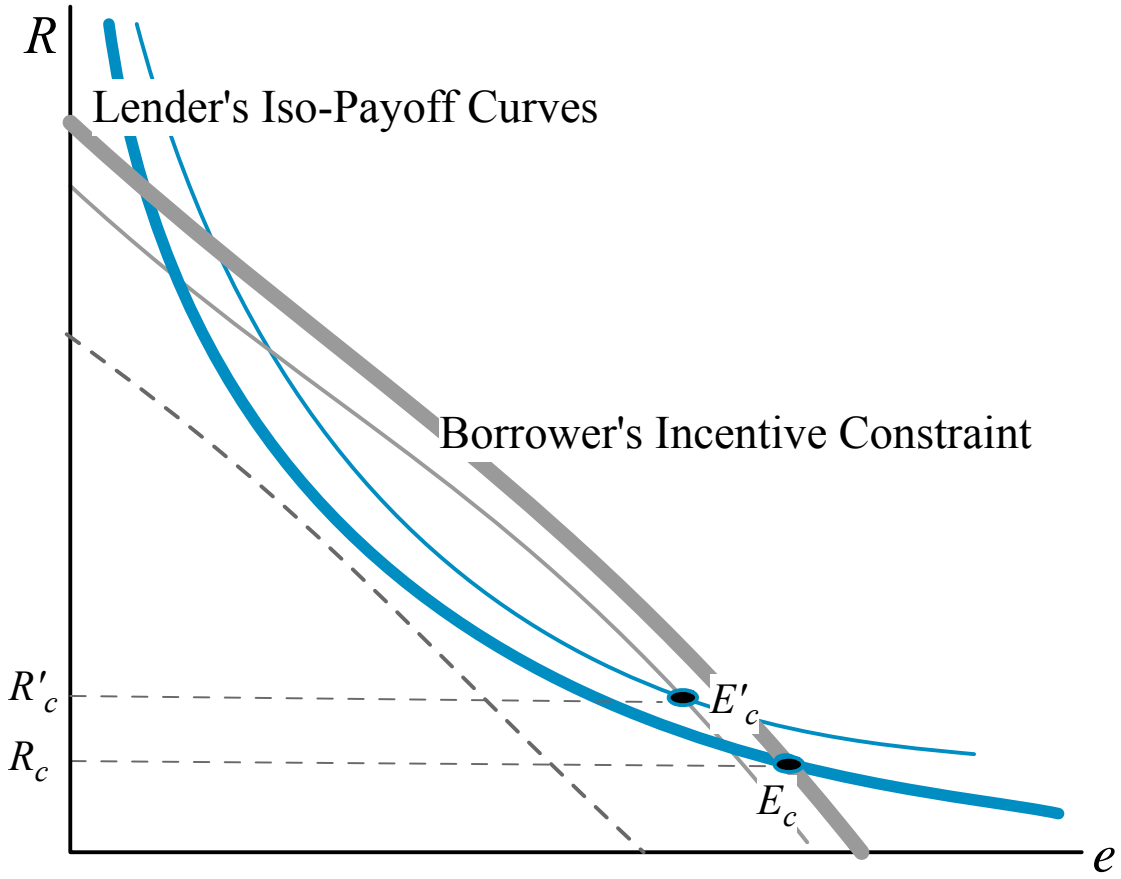
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The Effect of Borrower Collateral

- Reduced collateral / poorer borrower; same level of lender payoff



- Under competition: worse terms, lower effort.

Strategic Default in Credit Markets

- **Focus in this section: outside options, variable loan size**

- $Y = F(L)$

- Borrow L repeatedly (working capital)

- Stationary contract (L, R).

Strategic Default in Credit Markets

- **Focus in this section: outside options, variable loan size**
- $Y = F(L)$
- Borrow L repeatedly (working capital)
- Stationary contract (L, R).
- **To repay or not to repay?**
- If repay, get $[F(L) - R]/(1 - \delta)$.
- If default, get $F(L)$ today and v per period starting tomorrow.

$$F(L) + \delta \frac{v}{1 - \delta}.$$

Strategic Default in Credit Markets

- The **no-default constraint** or **self-enforcement constraint**:

$$\frac{F(L) - R}{1 - \delta} \geq F(L) + \delta \frac{v}{1 - \delta};$$

- which simplifies to

$$\delta[F(L) - v] \geq R.$$

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- **Interpretations of v:**

  - Alternative lenders:

$$v = F(\hat{L}) - \hat{R} \text{ for other lenders } (\hat{L}, \hat{R}).$$

  - Solitary operations: $v = F(0)$.

  - Occupation changes: $v =$ wages.

Lender's Payoff and the Self-Enforcement Constraint

- Lender's net payoff is

$$R - L(1 + i),$$

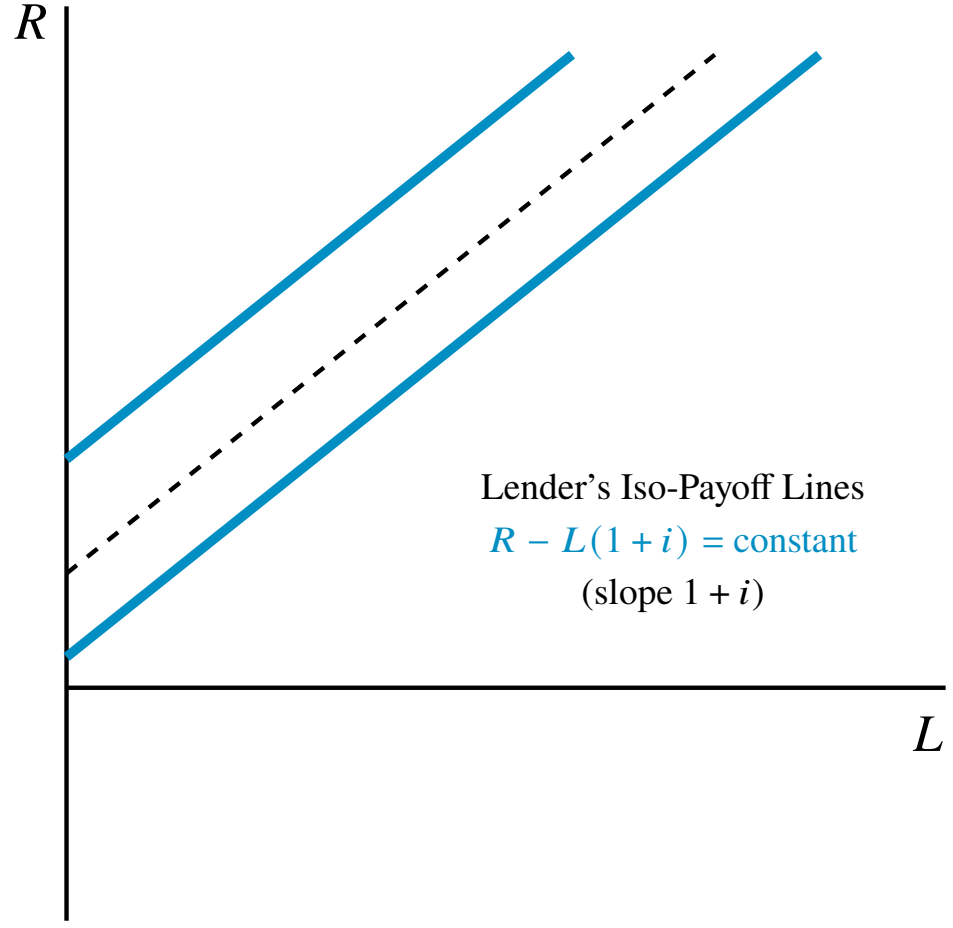
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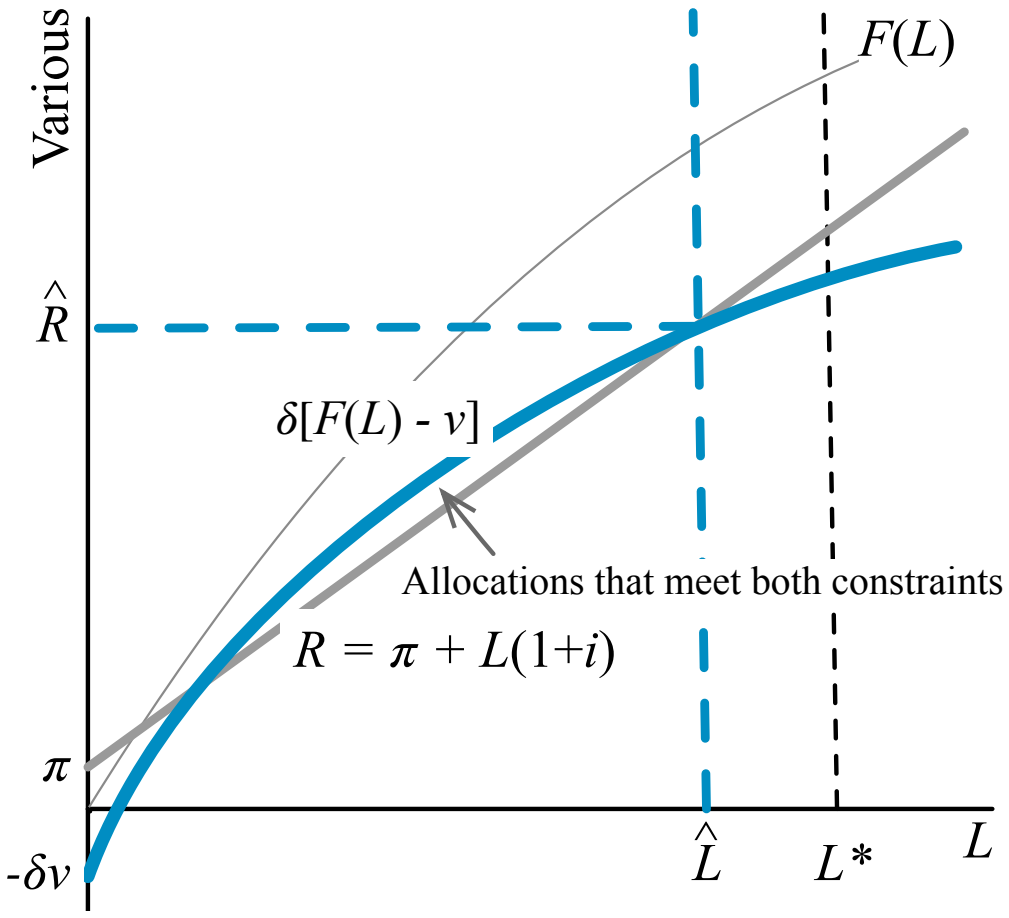
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Lender's Payoff and the Self-Enforcement Constraint

- Combine with δ times $F(L)$ to get no-default constraint $\delta[F(L) - v] \geq R$.



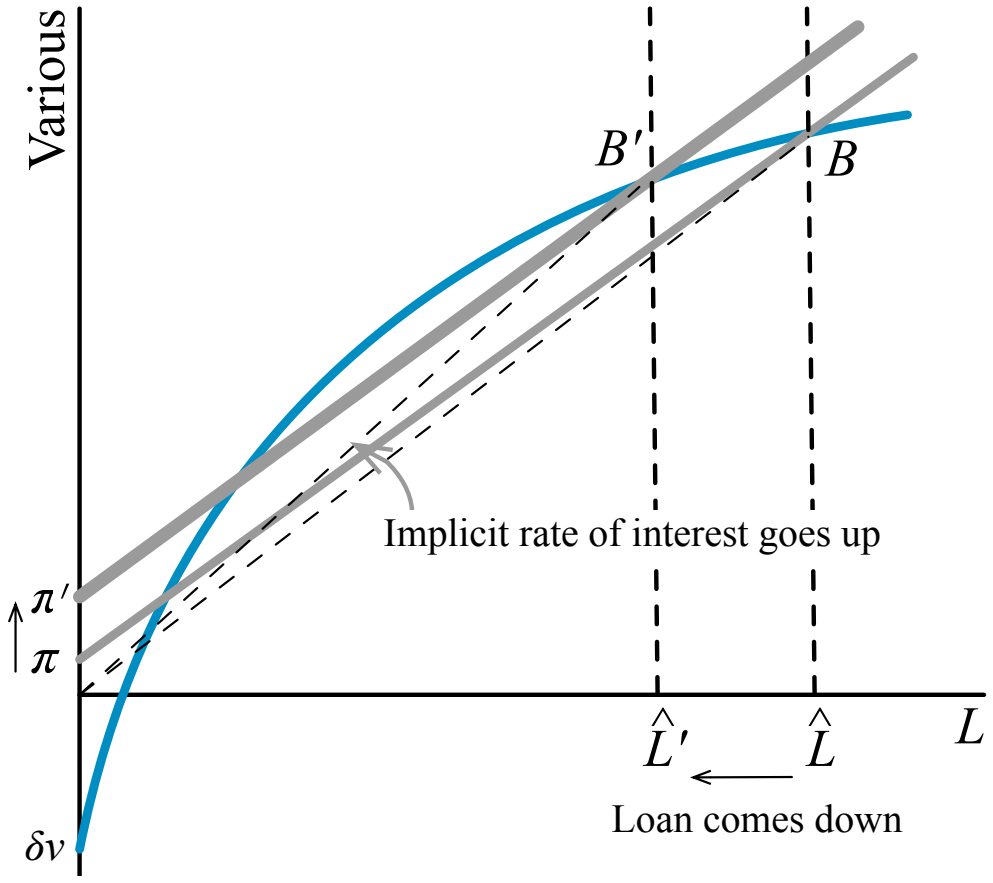
The Social Surplus

- Borrower's payoff is $F(L) - R$, lender's payoff is $R - L(1+i)$,
- Therefore **total surplus** $= F(L) - L(1+i)$.
- This is maximized when $L = L^*$, where $F'(L^*) = 1 + i$.

The Social Surplus

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- This is maximized when $L = L^*$, where $F'(L^*) = 1 + i$.
- We presume that L^* is too big to be self-enforceable.
- Ideally, we'd like to get as close to L^* as we can.

Lender Power

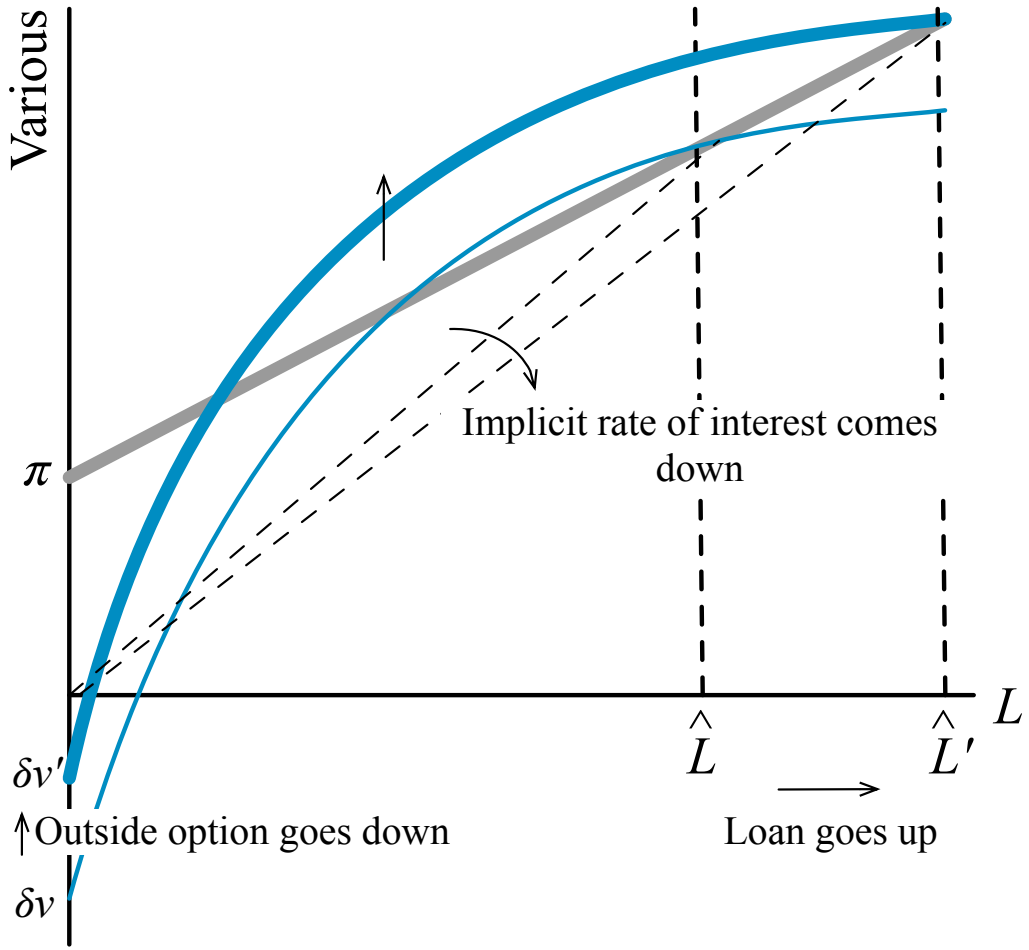


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Outside Options

Effect of a fall in outside option v.

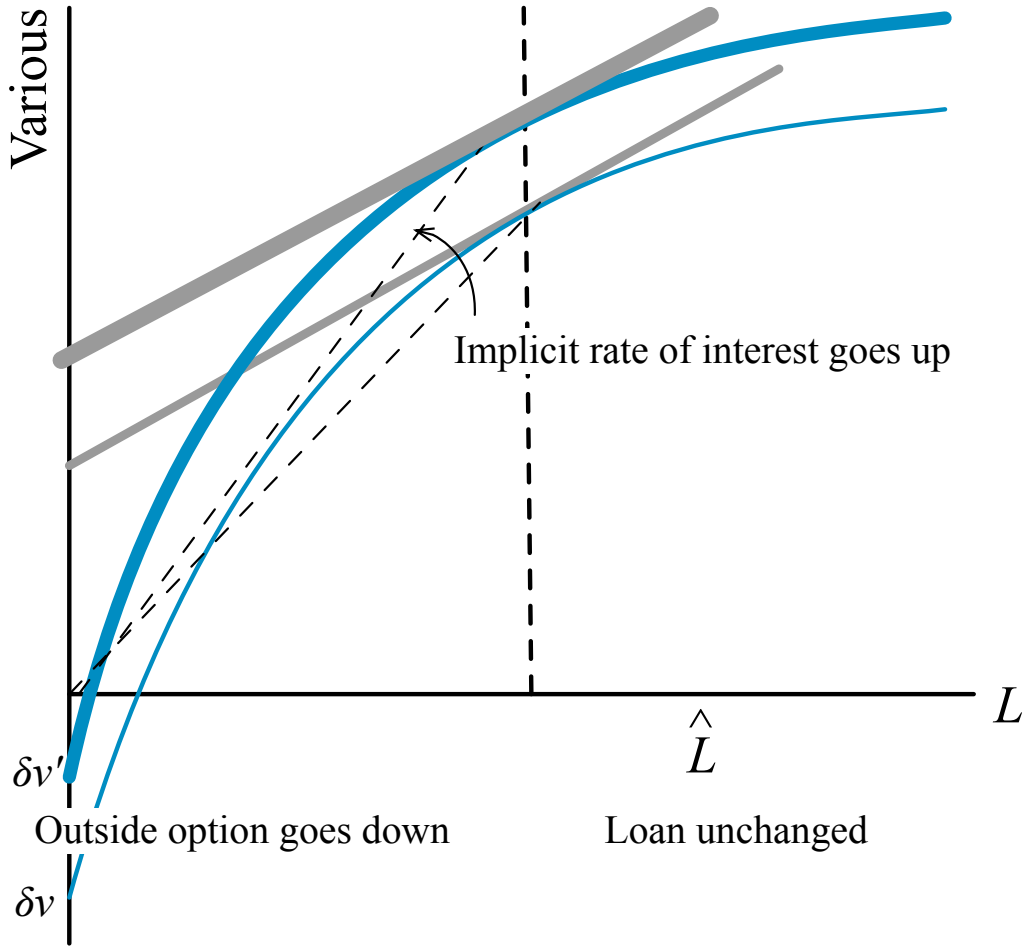
- **Competition**: $L \uparrow$, implicit interest rate $\downarrow$.



Outside Options

Effect of a fall in outside option v.

- **Monopoly**: interest rate ↑, L unchanged.



Two Credit Variants Special to Developing Countries

A. Microfinance.

- All our ideas apply to microfinance:
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Two Credit Variants Special to Developing Countries

- **A. Microfinance.**

- All our ideas apply to microfinance:
- adverse selection, moral hazard, strategic default.
- Microfinance organizations use several devices to get around these problems:
- group lending to figure out whom to lend to
- frequent meetings and repayments
- restricting loans to working capital to avoid strategic default

Two Credit Variants Special to Developing Countries

- **B. Interlinked Contracts.**
- Market segmentation:
  - Landlord lends to tenant, the trader to farmers, etc.

Two Credit Variants Special to Developing Countries

- **B. Interlinked Contracts.**
- Market segmentation:
  - Landlord lends to tenant, the trader to farmers, etc.
- **Reasons for interlinkage:**
  - Nonmarketable Collateral. Easier to accept if it matches occupation.
  - Enforcement. Double threats; e.g., remove tenancy + future loans.
  - Covering Fixed Costs. Promise of output sales covers fixed trading costs.
  - Removal of Distortions. Multi-dimensional pricing.

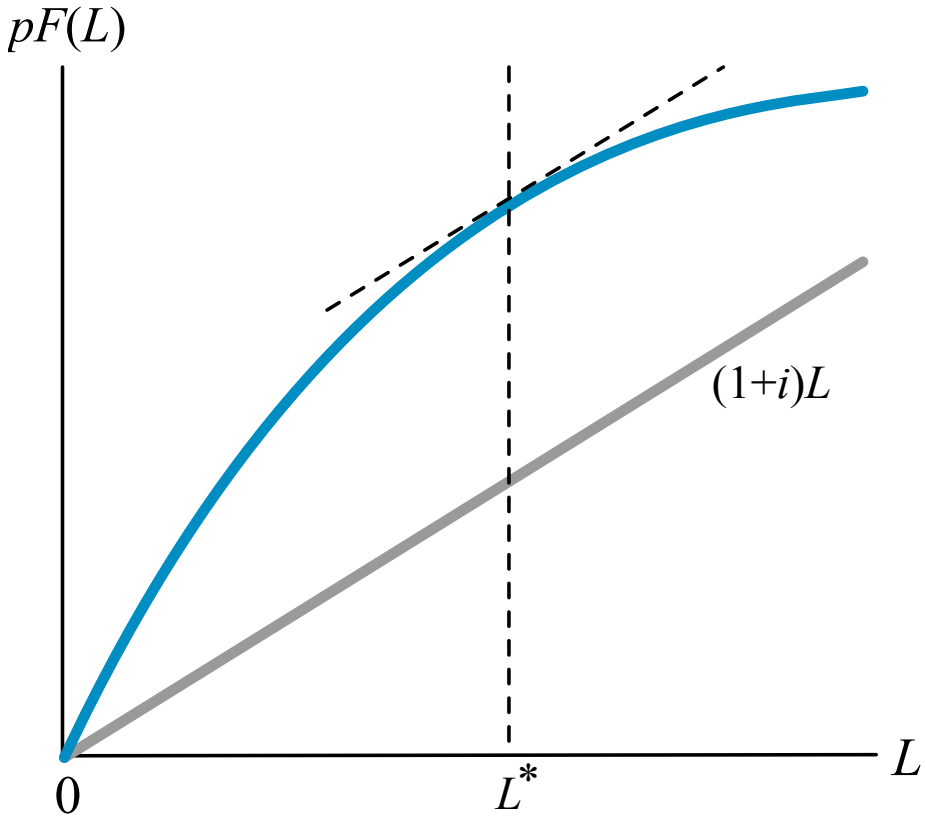
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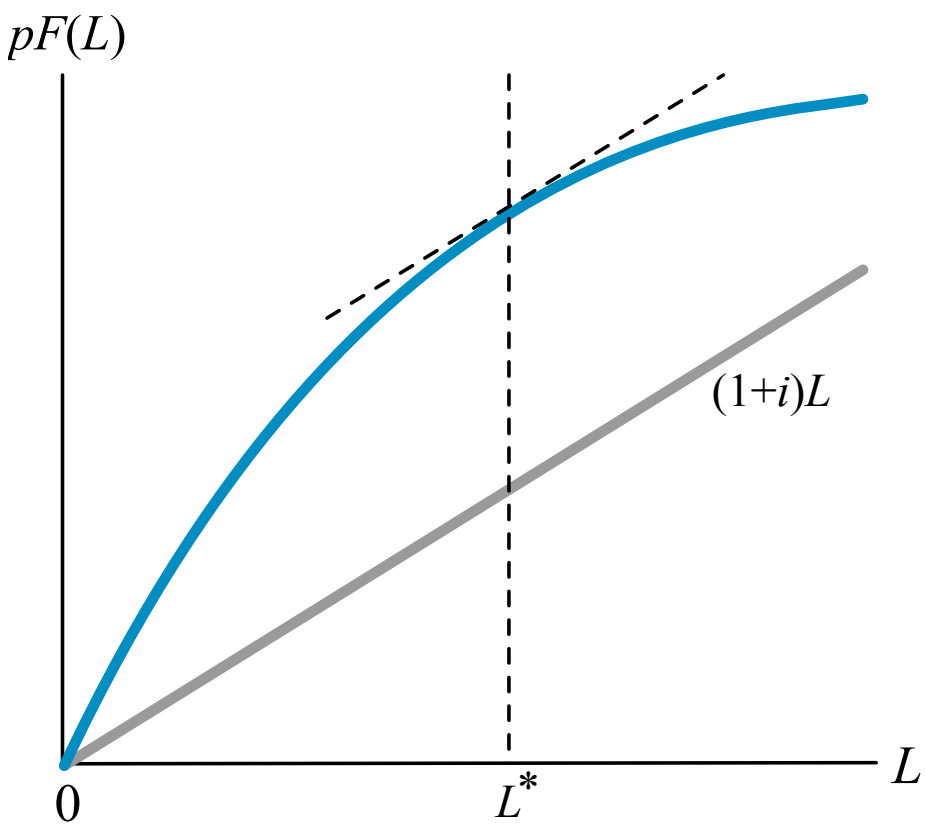
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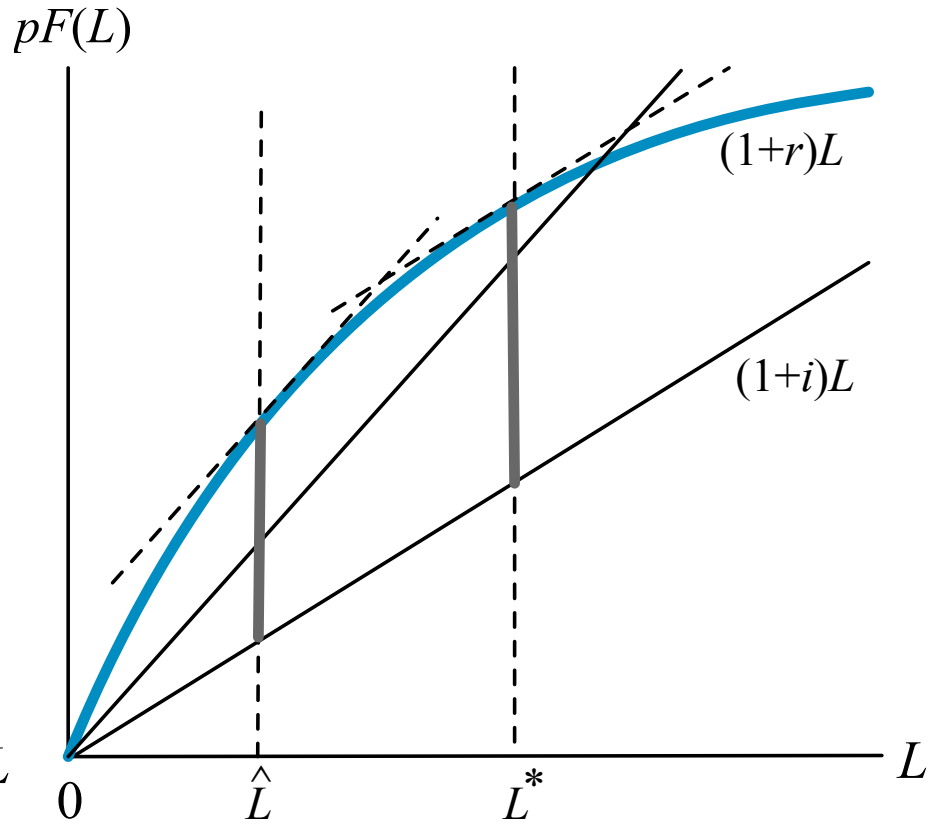
- Borrower borrows L, produces rice $Q = F(L)$.
- Market price of rice is p.
- Lender charges interest rate r, i is his safe opportunity rate.
- The borrower *chooses* L (a different kind of moral hazard).
- Lender cannot “force” borrower to borrow more than he wants.

Why Pure Moneylending is Inefficient

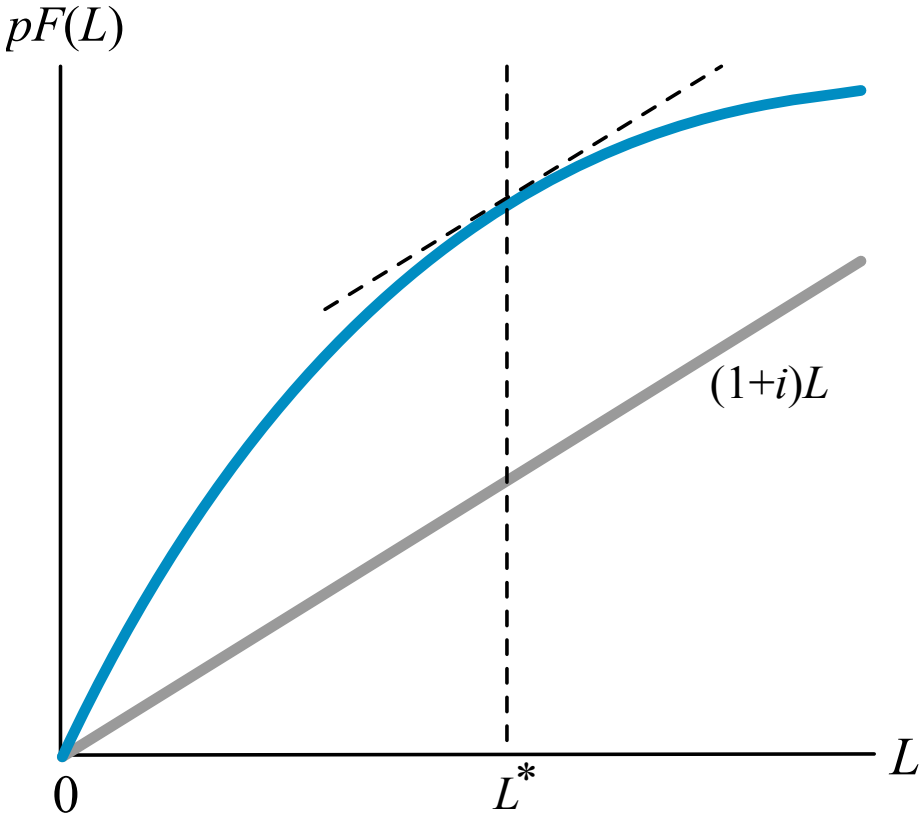


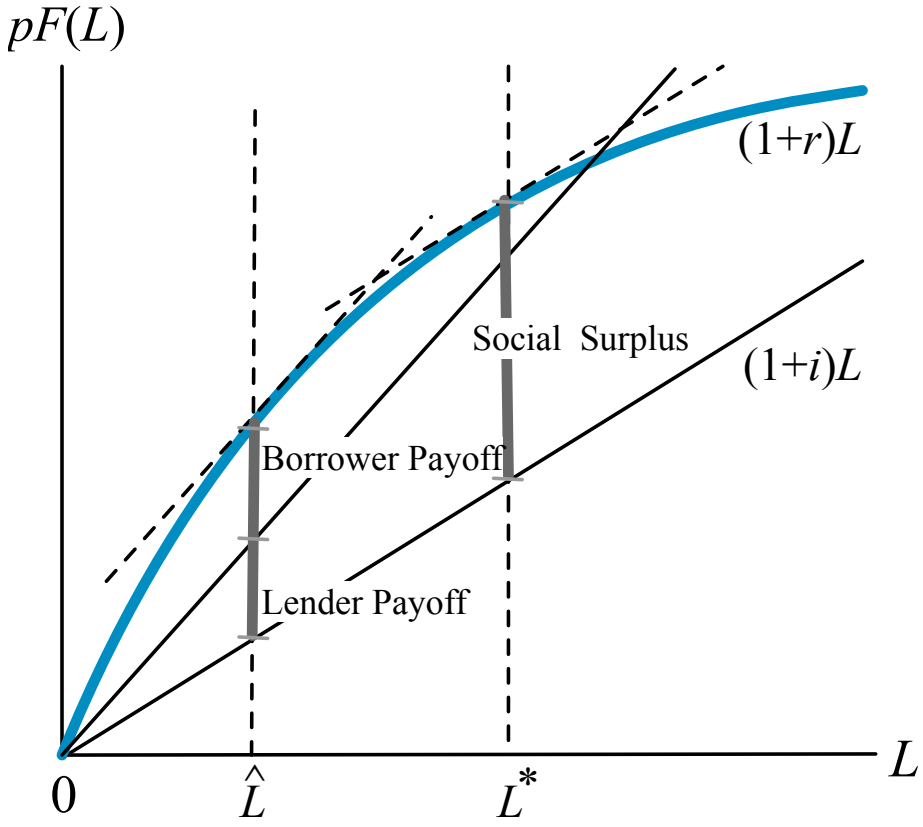
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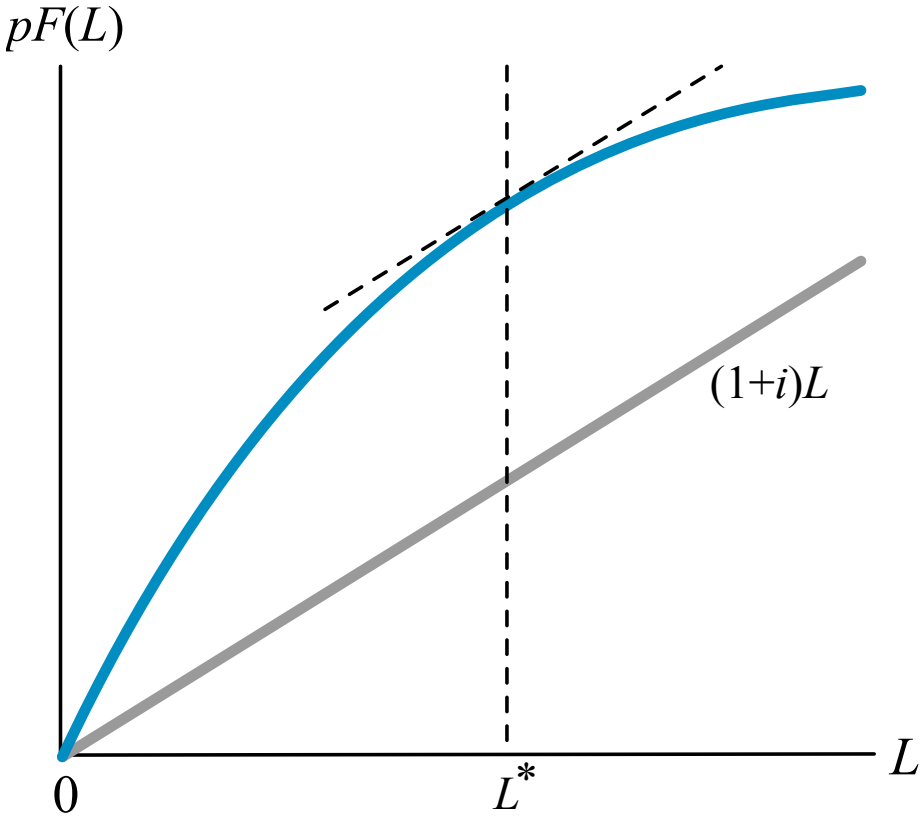


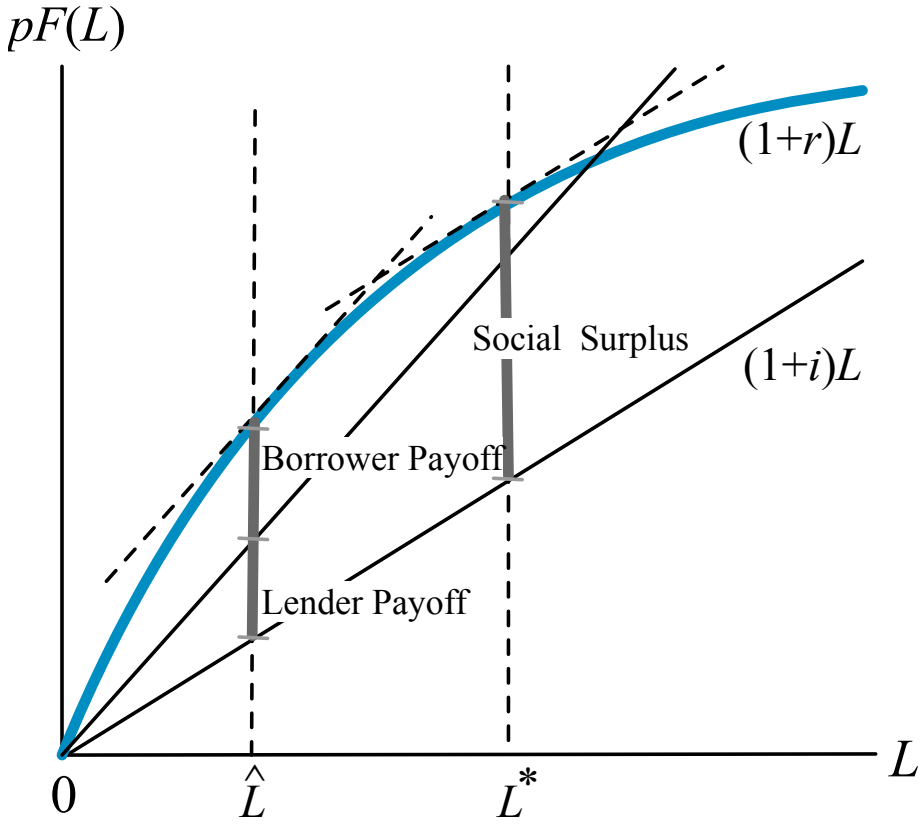
Why Pure Moneylending is Inefficient





Why Pure Moneylending is Inefficient





- Lender chooses r to max $(r-i)L$.
- Borrower chooses L to max $pF(L)-(1+r)L$.
- **underborrows relative to L^*.**

The Optimal Interlinked Contract

Trader-lender:

- Can buy crop at price q and charge rate r.
- Chooses (q, r) to maximize $(p - q)F(L) + (r - i)L$
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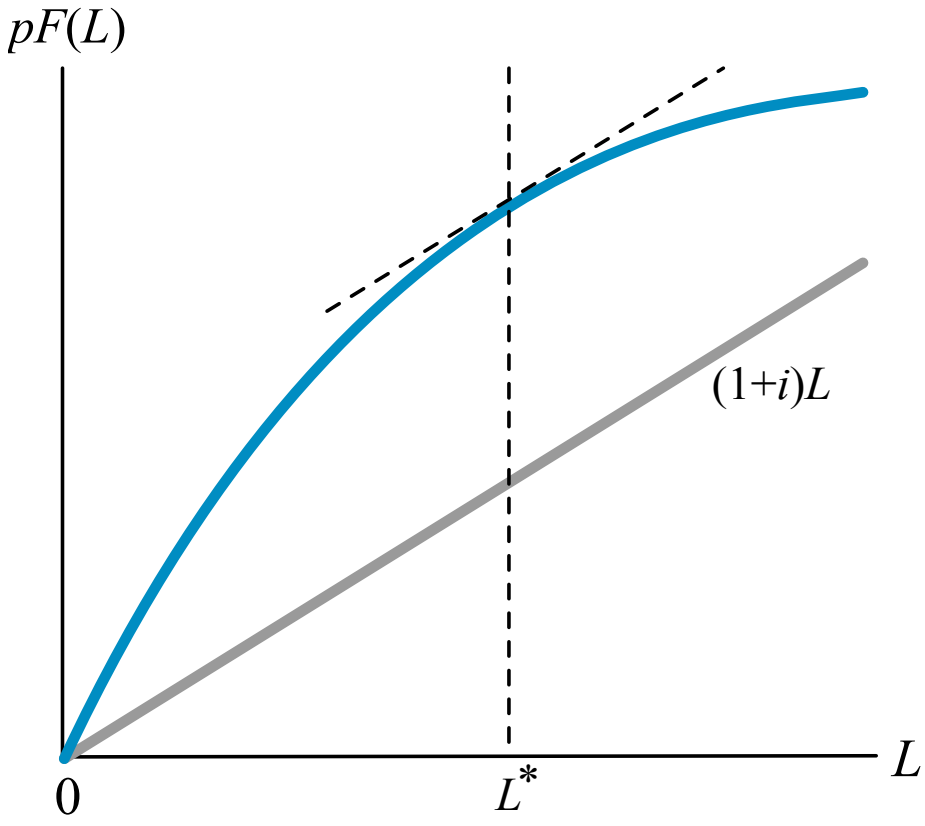
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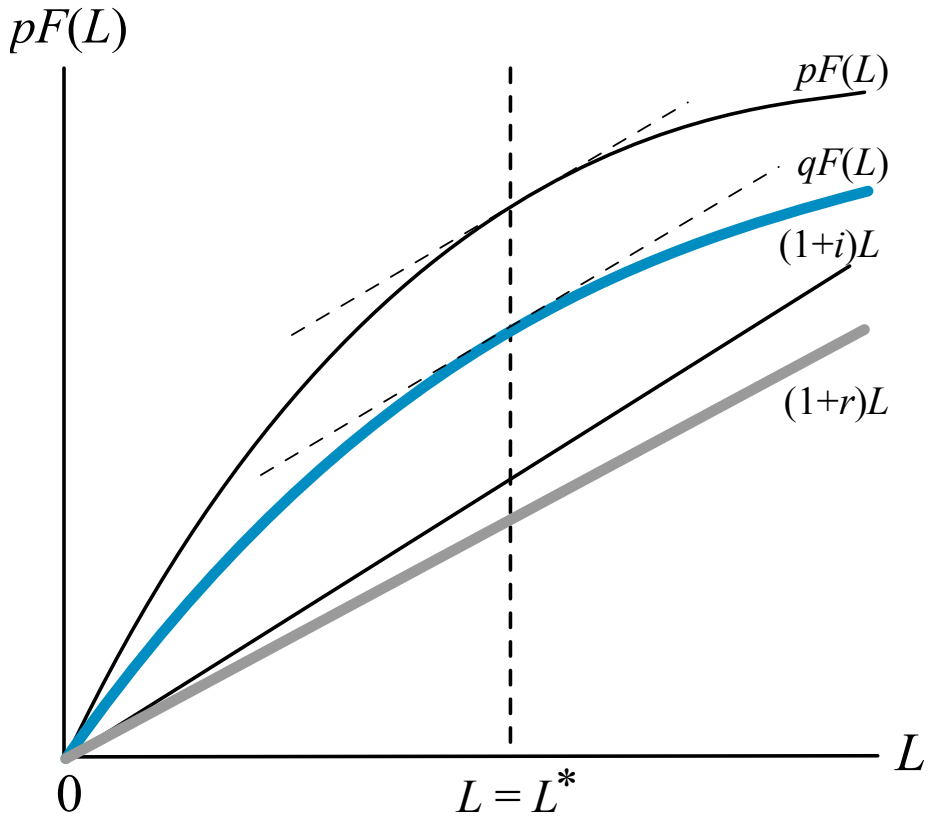
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Must be optimal if implementable:

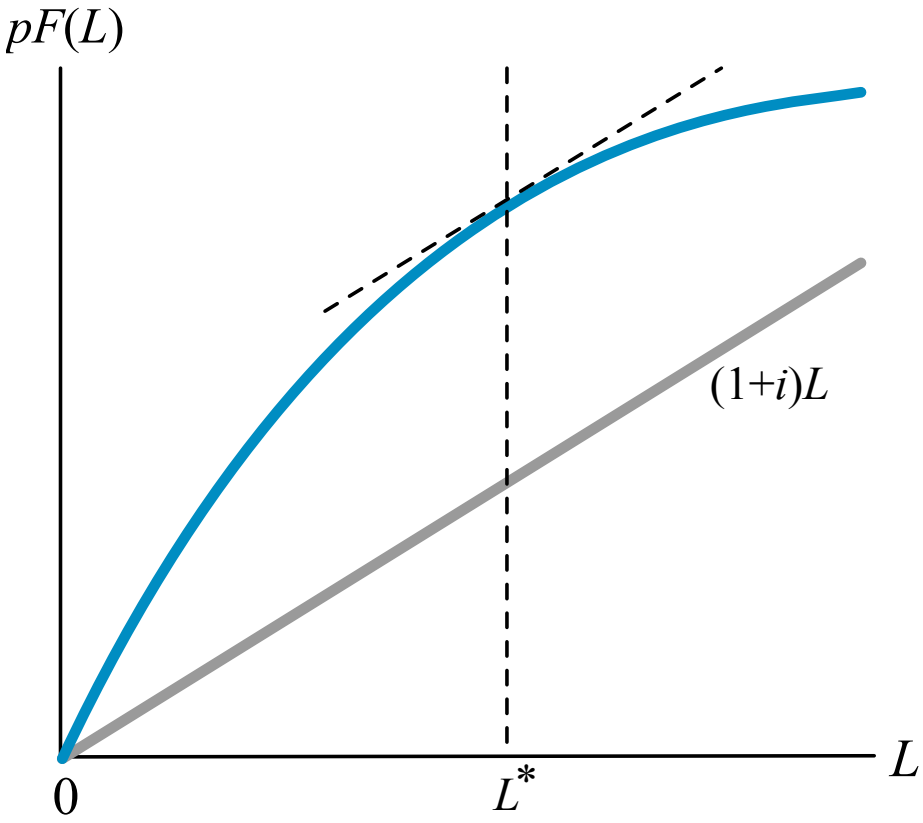
- But it is implementable by setting $q = (1 - t)p$ and $(1 + r) = (1 - t)(1 + i)$!

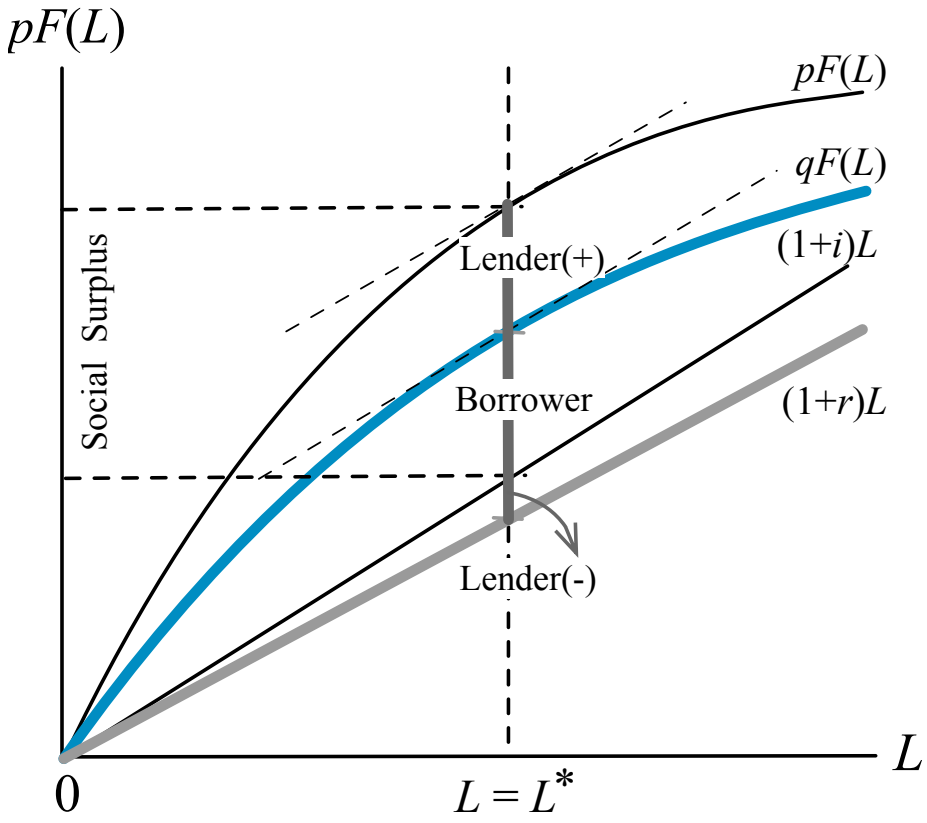
The Optimal Interlinked Contract





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- **Outcomes typically inefficient**, with credit rationing
  - Inefficiencies exacerbated when lender has more monopoly power.