

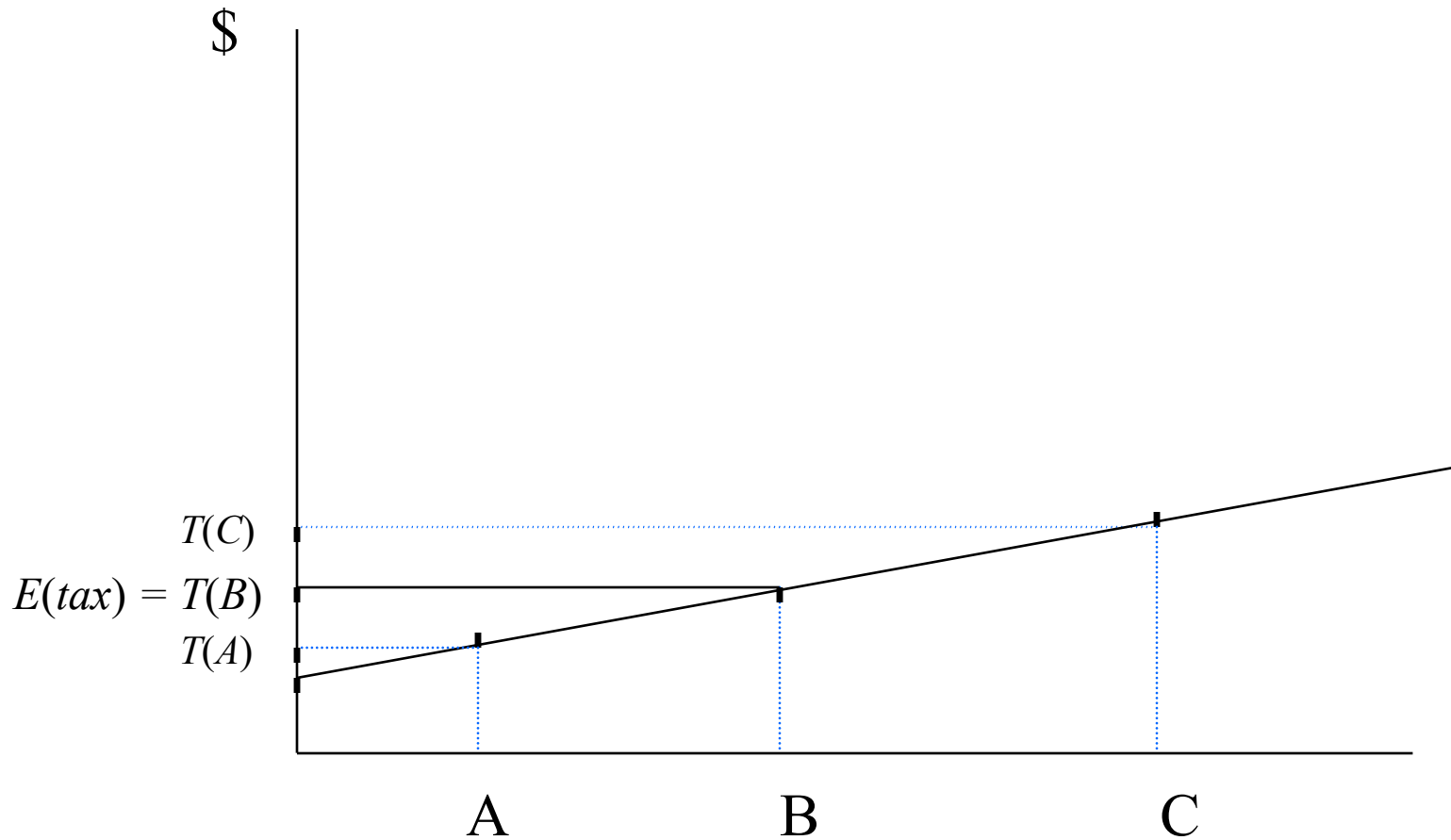
# CHAPTER 7

## Why is Risk Costly to Firms?

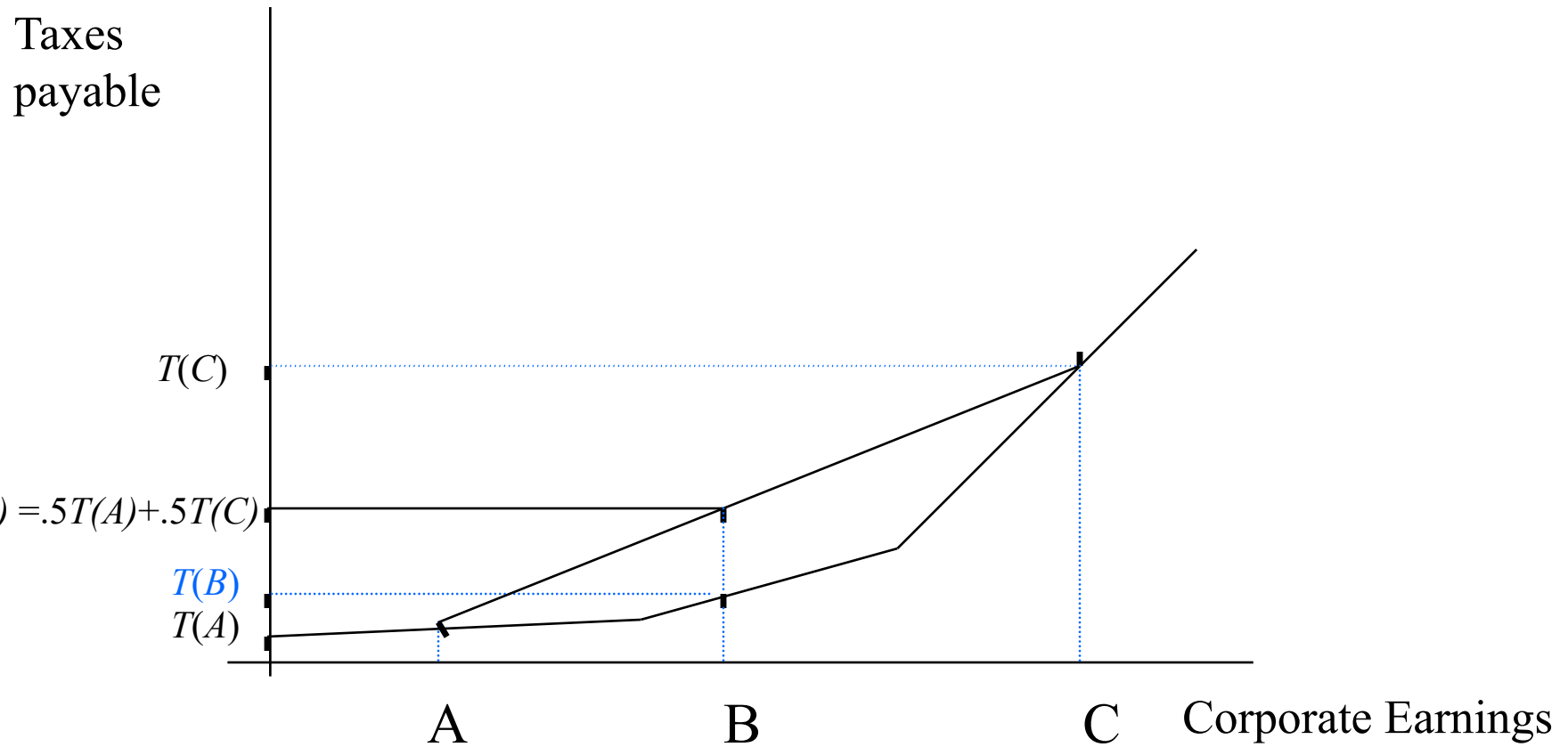
# Tax Incentives for risk management

- Linear versus Asymmetric Taxes
  - Taxes are “linear” if the same tax rate applies to *all* levels of income.
  - Asymmetric (non-linear) taxes
    - Progressive tax rates
    - Incomplete tax-loss offsets

# Linear Taxes and Risk



# Non-linear Taxes and Risk



# Incomplete Tax Loss Offset

**Table 1:** The Levered, *Uninsured* Firm ( $B=\$200, \tau = 35\%$ )

| State   | $p_s$ | $V$    | $L_s$ | $V - L_s$ | $D_s$ | $Dep$ | $T_s$ | $S_s$ |
|---------|-------|--------|-------|-----------|-------|-------|-------|-------|
| no loss | 50%   | \$1000 | \$0   | \$1000    | \$200 | \$400 | \$140 | \$660 |
| Loss    | 50%   | \$1000 | \$800 | \$200     | \$200 | \$400 | \$0   | \$0   |
| value   |       | \$1000 | \$400 | \$600     | \$200 | \$400 | \$70  | \$330 |

**Table 2:** The Levered, *Insured* Firm

| State   | $p_s$ | $V$    | $L_s$ | $V - p$ | $D_s$ | $Dep$ | $T_s$ | $S_s$ |
|---------|-------|--------|-------|---------|-------|-------|-------|-------|
| no loss | 50%   | \$1000 | \$0   | \$600   | \$200 | \$400 | \$0   | \$400 |
| loss    | 50%   | \$1000 | \$800 | \$600   | \$200 | \$400 | \$0   | \$400 |
| value   |       | \$1000 | \$400 | \$600   | \$200 | \$400 | \$0   | \$400 |

# Limited Liability & the Creditor-Owner Relationship

- Limited liability implies risk sharing between creditors and owners of firm.
- Risk sharing implies (the possibility of) moral hazard.
- We'll look at a specific type of moral hazard: the so-called "underinvestment" problem.

# The Underinvestment Problem

## The Unlevered, Uninsured Firm

| State            | Pr(s) | $\Pi$  | L(s)  | $V^u(s)=\Pi-L(s)$ | I(s)  | $V^r(s)=\Pi-I(s)$ |
|------------------|-------|--------|-------|-------------------|-------|-------------------|
| <i>no loss</i>   | 50%   | \$1000 | \$0   | \$1000            | \$0   | \$1000            |
| <i>loss</i>      | 50%   | \$1000 | \$800 | \$200             | \$600 | \$400             |
| <i>value now</i> |       | \$1000 | \$400 | \$600             | \$300 | \$700             |

# The Underinvestment Problem

The Levered, Uninsured Firm ( $B = \$700$ )

| State            | Pr(s) | $\Pi$  | L(s)  | $D^u(s)$ | $S^u(s)$ | I(s)  | $D^r(s)$ | $S^r(s)$ |
|------------------|-------|--------|-------|----------|----------|-------|----------|----------|
| <i>no loss</i>   | 50%   | \$1000 | \$0   | \$700    | \$300    | \$0   | \$700    | \$300    |
| <i>loss</i>      | 50%   | \$1000 | \$800 | \$200    | \$0      | \$600 | \$400    | \$0      |
| <i>value now</i> |       | \$1000 | \$400 | \$450    | \$150    | \$300 | \$550    | \$150    |



# The Underinvestment Problem

Levered, Insured Firm ( $B^c = \$500$  &  $d = \$500$ )

| State            | Pr(s) | $\Pi$   | L(s)  | I(s)  | $p^c(s) = \max[I(s)-d,0]$ | $\Pi^* = \Pi - I(s) + p^c(s)$ | $D^c(s)$ | $S^c(s)$ |
|------------------|-------|---------|-------|-------|---------------------------|-------------------------------|----------|----------|
| <i>no loss</i>   | 50%   | \$1,000 | \$0   | \$0   | \$0                       | \$1,000                       | \$500    | \$500    |
| <i>loss</i>      | 50%   | \$1,000 | \$800 | \$600 | \$100                     | \$500                         | \$500    | \$0      |
| <i>value now</i> |       | \$1,000 | \$400 | \$300 | \$50                      | \$750                         | \$500    | \$250    |

# Bankruptcy Costs

- If a firm goes bankrupt under U.S. Bankruptcy law, *ex post* costs of distributing assets are borne by firm's creditors.
- Direct costs include lawyers' and accountants' fees, other professional fees, court costs, and value of managerial time spent administering the bankruptcy.

# Bankruptcy Costs

- Indirect costs of bankruptcy
  - Revenue losses may occur because customers prefer to do business with a solvent rather than bankrupt company.
  - Incentives for other stakeholders (e.g., vendors, managers, and employees) also undergo adverse changes; e.g., trade credit terms deteriorate, managers and employees leave the firm, etc.
- Direct and indirect *ex post* costs are reflected *ex ante* in the form of higher interest rates paid to creditors.

# Pecking Order Theory

- Adverse selection in equity markets
  - Announcement of a secondary stock offering drives down the prices of currently outstanding shares because investors believe managers are more likely to issue equity when existing shares are overpriced.
  - This represents an adverse selection cost in the equity market!

# Pecking Order Theory

- Firms prefer internal equity since funds can be raised without conveying adverse signals; internal equity is a *cheaper* source of financing than external equity.
- If external financing is required, firms issue debt first and equity as a last resort, thereby minimizing adverse selection costs.

# Pecking Order Theory of Risk Mgmt.

- Suppose an unhedged firm suffers a loss of liquidity (e.g., a major manufacturing facility is destroyed).
- The loss in liquidity curtails the firm's internally financed investment projects, thereby resulting in a real economic loss to the firm.
- Hedging such a risk would ensure that the company has the cash available to fund value-enhancing investments which might otherwise be foregone.

# Conclusions

- Risk management adds value by reducing (the expected value of) taxes.
- Risk management adds value by reducing the (the expected value of) financial distress costs.
- Risk management adds value by facilitating optimal investment.