Part 4: Market Failure II – Asymmetric Information, Moral Hazard

Hidden Action, Moral Hazard, Incentives,
Agency, Principal-Agent

July 2016

Moral Hazard in the Insurance Market

Introduction

- "moral hazard" = increased risk ('hazard') of bad ('immoral') behavior due to being insured against the negative consequences of such behavior

Introduction

- "moral hazard" = increased risk ('hazard') of bad ('immoral') behavior due to being insured against the negative consequences of such behavior
- Examples:
  - fire insurance results in more arson
  - insurance against theft and accidents decreases precaution
  - unemployment insurance decreases job search

Introduction

- "moral hazard" = increased risk ('hazard') of bad ('immoral') behavior due to being insured against the negative consequences of such behavior
- Examples:
  - fire insurance results in more arson
  - insurance against theft and accidents decreases precaution
  - unemployment insurance decreases job search
- actions are **not observable**; otherwise, coverage could be contingent on action and moral hazard could be avoided

Introduction

- "moral hazard" = increased risk ('hazard') of bad ('immoral') behavior due to being insured against the negative consequences of such behavior
- Examples:
  - fire insurance results in more arson
  - insurance against theft and accidents decreases precaution
  - unemployment insurance decreases job search
- actions are **not observable**; otherwise, coverage could be contingent on action and moral hazard could be avoided
- indirect way of punishing bad behavior by decreasing coverage $\rightarrow$ less than full insurance

Introduction

- "moral hazard" = increased risk ('hazard') of bad ('immoral') behavior due to being insured against the negative consequences of such behavior
- Examples:
  - fire insurance results in more arson
  - insurance against theft and accidents decreases precaution
  - unemployment insurance decreases job search
- actions are **not observable**; otherwise, coverage could be contingent on action and moral hazard could be avoided
- indirect way of punishing bad behavior by decreasing coverage $\rightarrow$ less than full insurance

$\Rightarrow$ **better incentives** but inefficient outcome

An Example

- two parties: car driver D and insurer I

An Example

- two parties: car driver D and insurer I
- car accidents cause loss L; occur with probability

An Example

- two parties: car driver D and insurer I
- car accidents cause loss L; occur with probability
  - $p = p_L$ if driver is careful

An Example

- two parties: car driver D and insurer I
- car accidents cause loss L; occur with probability
  - $p = p_L$ if driver is careful
  - $p = p_H$ if driver is careless

with $p_L < p_H$

An Example

- two parties: car driver D and insurer I
- car accidents cause loss L; occur with probability
  - $p = p_L$ if driver is careful
  - $p = p_H$ if driver is careless

  with $p_L < p_H$
- insurance offers actuarially fair rates;
  price per $ coverage is p
- careful driving (accident prevention) costs disutility c

An Example

- two parties: car driver D and insurer I
- car accidents cause loss L; occur with probability
  - $p = p_L$ if driver is careful
  - $p = p_H$ if driver is careless

  with $p_L < p_H$
- insurance offers actuarially fair rates;
  price per $ coverage is p
- careful driving (accident prevention) costs disutility c
  careless driving costs nothing

An Example

- two parties: car driver D and insurer I
- car accidents cause loss L; occur with probability
  - $p = p_L$ if driver is careful
  - $p = p_H$ if driver is careless

with $p_L < p_H$

- insurance offers actuarially fair rates;
  price per $ coverage is p
- careful driving (accident prevention) costs disutility c
  careless driving costs nothing
- assume $c < L(p_H - p_L)$

An Example

- two parties: car driver D and insurer I
- car accidents cause loss L; occur with probability
  - $p = p_L$ if driver is careful
  - $p = p_H$ if driver is careless

  with $p_L < p_H$

- insurance offers actuarially fair rates;
  price per $ coverage is p
- careful driving (accident prevention) costs disutility c
  careless driving costs nothing
- assume $c < L(p_H - p_L)$

$\rightarrow$ careful driving is efficient

Full Insurance Leads to Moral Hazard

- suppose insurance company offers full insurance

Full Insurance Leads to Moral Hazard

- suppose insurance company offers full insurance

  $\rightarrow$ total premium at **actuarially fair** rates is

Full Insurance Leads to Moral Hazard

- suppose insurance company offers full insurance

  $\rightarrow$ total premium at **actuarially fair** rates is

  - $\pi = p_L L$ if I thinks D will be careful

Full Insurance Leads to Moral Hazard

- suppose insurance company offers full insurance

  $\rightarrow$ total premium at **actuarially fair** rates is

  - $\pi = p_L L$ if I thinks D will be careful
  - $\pi = p_H L$ if I thinks D will be careless

$\rightarrow$ but after signing contract driver's income is $y - \pi$

Full Insurance Leads to Moral Hazard

- suppose insurance company offers full insurance

  $\rightarrow$ total premium at **actuarially fair** rates is

  - $\pi = p_L L$ if I thinks D will be careful
  - $\pi = p_H L$ if I thinks D will be careless

$\rightarrow$ but after signing contract driver's income is $y - \pi$ regardless whether gets into accident or not

Full Insurance Leads to Moral Hazard

- suppose insurance company offers full insurance

  $\rightarrow$ total premium at **actuarially fair** rates is

  - $\pi = p_L L$ if I thinks D will be careful
  - $\pi = p_H L$ if I thinks D will be careless

$\rightarrow$ but after signing contract driver's income is $y - \pi$ regardless whether gets into accident or not

$\Rightarrow$ D does not take care since

$$u^{takecare} = y - \pi - c < y - \pi = u^{careless}$$

Full Insurance Leads to Moral Hazard

- suppose insurance company offers full insurance

  $\rightarrow$ total premium at **actuarially fair** rates is

  - $\pi = p_L L$ if I thinks D will be careful
  - $\pi = p_H L$ if I thinks D will be careless

$\rightarrow$ but after signing contract driver's income is $y - \pi$ regardless whether gets into accident or not

$\Rightarrow$ D does not take care since

$$u^{takecare} = y - \pi - c < y - \pi = u^{careless}$$

- insurer will anticipate this moral hazard behavior

Full Insurance Leads to Moral Hazard

- suppose insurance company offers full insurance

  $\rightarrow$ total premium at **actuarially fair** rates is

  - $\pi = p_L L$ if I thinks D will be careful
  - $\pi = p_H L$ if I thinks D will be careless

$\rightarrow$ but after signing contract driver's income is $y - \pi$ regardless whether gets into accident or not

$\Rightarrow$ D does not take care since

$$u^{takecare} = y - \pi - c < y - \pi = u^{careless}$$

- insurer will anticipate this moral hazard behavior

  $\rightarrow$ sets $\pi = p_H L$ and D is worse off!

Full Insurance Leads to Moral Hazard

- suppose insurance company offers full insurance

  → total premium at **actuarially fair** rates is

  - $\pi = p_L L$ if I thinks D will be careful
  - $\pi = p_H L$ if I thinks D will be careless

→ but after signing contract driver's income is $y - \pi$ regardless whether gets into accident or not

⇒ D does not take care since

$$u^{takecare} = y - \pi - c < y - \pi = u^{careless}$$

- insurer will anticipate this moral hazard behavior

  → sets $\pi = p_H L$ and D is worse off!

moral hazard increases the insurance premium; if the driver could credibly promise to be careful, he would be better off

Moral Hazard in Agency

Moral Hazard

- in general: moral hazard problem arises in agency relationships where parties sign an an agreement/contract but

Moral Hazard

- in general: moral hazard problem arises in agency relationships where parties sign an an agreement/contract but
  - interest diverge

Moral Hazard

- in general: moral hazard problem arises in agency relationships where parties sign an an agreement/contract but
  - interest diverge
  - some actions are not observable

Moral Hazard

- in general: moral hazard problem arises in agency relationships where parties sign an an agreement/contract but
  - interest diverge
  - some actions are not observable

$\rightarrow$ opportunistic behavior **after** contract is signed

Moral Hazard

- in general: moral hazard problem arises in agency relationships where parties sign an an agreement/contract but
  - interest diverge
  - some actions are not observable

$\rightarrow$ opportunistic behavior **after** contract is signed

$\Rightarrow$ need for (monetary) incentives based on observable indicators

Moral Hazard

- in general: moral hazard problem arises in agency relationships where parties sign an an agreement/contract but
  - interest diverge
  - some actions are not observable

$\rightarrow$ opportunistic behavior **after** contract is signed

$\Rightarrow$ need for (monetary) incentives based on observable indicators

- Examples

Moral Hazard

- in general: moral hazard problem arises in agency relationships where parties sign an an agreement/contract but
  - interest diverge
  - some actions are not observable

$\rightarrow$ opportunistic behavior **after** contract is signed

$\Rightarrow$ need for (monetary) incentives based on observable indicators

- Examples
  - performance-based pay in employment (commissions, piece rates)

Moral Hazard

- in general: moral hazard problem arises in agency relationships where parties sign an an agreement/contract but
  - interest diverge
  - some actions are not observable

$\rightarrow$ opportunistic behavior **after** contract is signed

$\Rightarrow$ need for (monetary) incentives based on observable indicators

- Examples
  - performance-based pay in employment (commissions, piece rates)
  - deductibles in insurance

Moral Hazard

- in general: moral hazard problem arises in agency relationships where parties sign an an agreement/contract but
  - interest diverge
  - some actions are not observable

$\rightarrow$ opportunistic behavior **after** contract is signed

$\Rightarrow$ need for (monetary) incentives based on observable indicators

- Examples
  - performance-based pay in employment (commissions, piece rates)
  - deductibles in insurance
  - warranties in business

Moral Hazard

- in general: moral hazard problem arises in agency relationships where parties sign an an agreement/contract but
  - interest diverge
  - some actions are not observable

$\rightarrow$ opportunistic behavior **after** contract is signed

$\Rightarrow$ need for (monetary) incentives based on observable indicators

- Examples
  - performance-based pay in employment (commissions, piece rates)
  - deductibles in insurance
  - warranties in business
  - stock-option plans in corporate governance

Moral Hazard

- in general: moral hazard problem arises in agency relationships where parties sign an an agreement/contract but
  - interest diverge
  - some actions are not observable

$\rightarrow$ opportunistic behavior **after** contract is signed

$\Rightarrow$ need for (monetary) incentives based on observable indicators

- Examples
  - performance-based pay in employment (commissions, piece rates)
  - deductibles in insurance
  - warranties in business
  - stock-option plans in corporate governance
  - bonus pay for professional athletes and lawyers

A Model of Hidden Action

- a principal P (shareholder) hires an agent (manager) to work on project on her behalf

A Model of Hidden Action

- a principal P (shareholder) hires an agent (manager) to work on project on her behalf
- return from project is uncertain, can be success (S) or failure (F)

A Model of Hidden Action

- a principal P (shareholder) hires an agent (manager) to work on project on her behalf
- return from project is uncertain, can be success (S) or failure (F)
- A can exert unobservable effort $e \in \{0, 1\}$ at cost $c(e)$
  with $c(1) = c_1 > c_0 = c(0)$

A Model of Hidden Action

- a principal P (shareholder) hires an agent (manager) to work on project on her behalf
- return from project is uncertain, can be success (S) or failure (F)
- A can exert unobservable effort $e \in \{0, 1\}$ at cost $c(e)$ with $c(1) = c_1 > c_0 = c(0)$
- if A works hard ($e = 1$), project is successful with probability $1/2$

A Model of Hidden Action

- a principal P (shareholder) hires an agent (manager) to work on project on her behalf
- return from project is uncertain, can be success (S) or failure (F)
- A can exert unobservable effort $e \in \{0, 1\}$ at cost $c(e)$ with $c(1) = c_1 > c_0 = c(0)$
- if A works hard $(e = 1)$, project is successful with probability $1/2$
  is lazy $(e = 0)$, project always fails

A Model of Hidden Action

- a principal P (shareholder) hires an agent (manager) to work on project on her behalf
- return from project is uncertain, can be success (S) or failure (F)
- A can exert unobservable effort $e \in \{0, 1\}$ at cost $c(e)$
  with $c(1) = c_1 > c_0 = c(0)$
- if A works hard ($e = 1$), project is successful with probability $1/2$
  is lazy ($e = 0$), project always fails
- P prefers success to failure, wants A to work hard

A Model of Hidden Action

- a principal P (shareholder) hires an agent (manager) to work on project on her behalf
- return from project is uncertain, can be success (S) or failure (F)
- A can exert unobservable effort $e \in \{0, 1\}$ at cost $c(e)$ with $c(1) = c_1 > c_0 = c(0)$
- if A works hard ($e = 1$), project is successful with probability $1/2$
  is lazy ($e = 0$), project always fails
- P prefers success to failure, wants A to work hard

A Model of Hidden Action

- but if effort is **unobservable**, wage cannot depend on e

$\Rightarrow$ for a **fixed** wage w, agent chooses $e = 0$ since

$w - c_1 > w - c_0$ regardless of w

a fixed salary gives no incentives; the agent will not work hard but be lazy (moral hazard problem)

Solving the Moral Hazard Problem with Incentives

- solution: use output-based performance schemes

Solving the Moral Hazard Problem with Incentives

- solution: use output-based performance schemes
- suppose P pays w_S if project is success

  w_F if project fails with $w_S > w_F$

Solving the Moral Hazard Problem with Incentives

- solution: use output-based performance schemes
- suppose P pays w_S if project is success

  w_F if project fails with $w_S > w_F$
- agent chooses

Solving the Moral Hazard Problem with Incentives

- solution: use output-based performance schemes
- suppose P pays w_S if project is success

  w_F if project fails with $w_S > w_F$

- agent chooses $e = 1$ if

$$\frac{1}{2}w_S + \frac{1}{2}w_F - c_1 > w_F - c_0$$

Solving the Moral Hazard Problem with Incentives

- solution: use output-based performance schemes
- suppose P pays w_S if project is success

  w_F if project fails with $w_S > w_F$

- agent chooses $e = 1$ if

$$\frac{1}{2}w_S + \frac{1}{2}w_F - c_1 > w_F - c_0$$

$\Rightarrow$ agent will work hard if

$$w_S - w_F > 2[c_1 - c_0]$$

Solving the Moral Hazard Problem with Incentives

- solution: use output-based performance schemes
- suppose P pays w_S if project is success

w_F if project fails with $w_S > w_F$

- agent chooses $e = 1$ if

$$\frac{1}{2}w_S + \frac{1}{2}w_F - c_1 > w_F - c_0$$

$\Rightarrow$ agent will work hard if

$$w_S - w_F > 2[c_1 - c_0]$$

variable pay (bonuses, piece rates, profit shares, deductibles) solves the moral hazard problem

Solving the Moral Hazard Problem with Incentives

- solution: use output-based performance schemes
- suppose P pays w_S if project is success

  w_F if project fails with $w_S > w_F$

- agent chooses $e = 1$ if

$$\frac{1}{2}w_S + \frac{1}{2}w_F - c_1 > w_F - c_0$$

$\Rightarrow$ agent will work hard if

$$w_S - w_F > 2[c_1 - c_0]$$

variable pay (bonuses, piece rates, profit shares, deductibles) solves the moral hazard problem

- **but**: variable pay means agent exposed to risk $\rightarrow$ inefficient risk bearing

Summary

- moral hazard problems emerge if the parties to an agreement

Summary

- moral hazard problems emerge if the parties to an agreement
  - have diverging interests

Summary

- moral hazard problems emerge if the parties to an agreement
  - have diverging interests
  - can take hidden actions that change the value of the agreement

Summary

- moral hazard problems emerge if the parties to an agreement
  - have diverging interests
  - can take hidden actions that change the value of the agreement
- solutions to the moral hazard problem

Summary

- moral hazard problems emerge if the parties to an agreement
  - have diverging interests
  - can take hidden actions that change the value of the agreement
- solutions to the moral hazard problem
  - indirect monetary incentives (performance-based pay, bonus pay, promotions, deductibles)

Summary

- moral hazard problems emerge if the parties to an agreement
  - have diverging interests
  - can take hidden actions that change the value of the agreement
- solutions to the moral hazard problem
  - indirect monetary incentives (performance-based pay, bonus pay, promotions, deductibles)
  - direct monitoring of actions (input-based pay, penalties and fines in law enforcement)

Summary

- moral hazard problems emerge if the parties to an agreement
  - have diverging interests
  - can take hidden actions that change the value of the agreement
- solutions to the moral hazard problem
  - indirect monetary incentives (performance-based pay, bonus pay, promotions, deductibles)
  - direct monitoring of actions (input-based pay, penalties and fines in law enforcement)
  - transfer of ownership

Summary

- moral hazard problems emerge if the parties to an agreement
  - have diverging interests
  - can take hidden actions that change the value of the agreement
- solutions to the moral hazard problem
  - indirect monetary incentives (performance-based pay, bonus pay, promotions, deductibles)
  - direct monitoring of actions (input-based pay, penalties and fines in law enforcement)
  - transfer of ownership
  - repeated interaction (implicit contracts)

Summary

- moral hazard problems emerge if the parties to an agreement
  - have diverging interests
  - can take hidden actions that change the value of the agreement
- solutions to the moral hazard problem
  - indirect monetary incentives (performance-based pay, bonus pay, promotions, deductibles)
  - direct monitoring of actions (input-based pay, penalties and fines in law enforcement)
  - transfer of ownership
  - repeated interaction (implicit contracts)
- but: outcome may still be inefficient
  e.g. because of inefficient exposure to risk

Moral Hazard vs Adverse Selection

- adverse selection = **hidden information**

Moral Hazard vs Adverse Selection

- adverse selection = **hidden information**

  arises from costs of distinguishing among individuals with different characteristics

Moral Hazard vs Adverse Selection

- adverse selection = **hidden information**

  arises from costs of distinguishing among individuals with different characteristics

- moral hazard = **hidden action**

Moral Hazard vs Adverse Selection

- adverse selection = **hidden information**

  arises from costs of distinguishing among individuals with different characteristics

- moral hazard = **hidden action**

  arises from costs of measuring and controlling different behavior of individuals

Moral Hazard vs Adverse Selection

- adverse selection = **hidden information**

  arises from costs of distinguishing among individuals with different characteristics

- moral hazard = **hidden action**

  arises from costs of measuring and controlling different behavior of individuals

- both problems can cause **market failure**

Moral Hazard vs Adverse Selection

- adverse selection = **hidden information**

  arises from costs of distinguishing among individuals with different characteristics

- moral hazard = **hidden action**

  arises from costs of measuring and controlling different behavior of individuals

- both problems can cause **market failure**
- in practice: both problems relevant

Moral Hazard vs Adverse Selection

- adverse selection = **hidden information**

  arises from costs of distinguishing among individuals with different characteristics

- moral hazard = **hidden action**

  arises from costs of measuring and controlling different behavior of individuals

- both problems can cause **market failure**
- in practice: both problems relevant
- which dominates depends on circumstances (compare health insurance with fire insurance)