ECO 317 – Economics of Uncertainty – Fall Term 2009
Slides to accompany

# 15. Adverse Selection in Insurance Markets

## ADVERSE SELECTION – GENERAL ISSUES

One party in a trade or contract has advance private information
that it can use for its own benefit / the other's detriment
The other side knows the situation, so wary to trade

Akerlof's example of market collapse: Private used car market
In population of used cars, qualities (measured in dollars)
uniformly distributed over $[a, b]$. Distribution is common knowledge,
but the actual realization for any single car is private info of owner
So price of individual car cannot be contingent on quality
If common price is $p$, only those in $[a, p]$ will sell
Potential buyers will recognize this, and condition on it:
Average quality in the market will be $\frac{1}{2}(a + p)$
For equilibrium, $p = \frac{1}{2}(a + p)$.
So $p = a$, and only the worst cars will trade.

Solution requires conveying credible information about
qualities of individual cars. Works in two ways:

Signaling – action taken by informed party (owner)

Screening – action required / initiated by uninformed (prospective buyer)

(i) direct inspection at a cost

(ii) mechanism using informed player's self-selecting (info. revealing) action

Direct inspection (get car checked by professional, give test to job applicant or check-up to health/life insurance applicant)

Possible but costly, imperfect; ignore these here and focus on other actions.

General idea – action should be optimal if information is "good" but not if it is "bad", so wrong type won't imitate, pretend to be good.

Signaling example – seller offers warranty on car, but is this credible?

Screening by self-selection example – restricted fares on airlines

We will develop three examples (models) in detail:

[1] Rothschild-Stiglitz (QJE 1976): competitive screening in insurance (today)

[2] Spence (QJE 1973): job market signaling (later)

[3] Pricing policy of monopolist facing unknown demand (later)
(version of Baron-Myerson Econometrica 82,Mussa-Rosen JET 1978)

PERFECT INSURANCE – Reminder From Handout 9, pp. 1-4

Initial wealth $W_0$, loss $L$ in state 2; probability of loss $\pi$

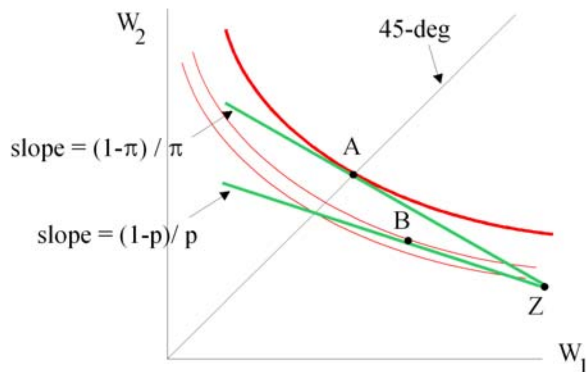
Can choose level of insurance; $p =$ premium per dollar of coverage (indemnity)

Budget line in state-contingent wealth space $(W_1, W_2)$:

$$(1-p)\ W_1 + p\ W_2 = (1-p)\ W_0 + p\ (W_0 - L)$$

Slope of budget line $= (1-p)/p$

$$EU = (1-\pi)\ u(W_1) + \pi\ u(W_2)$$




Slope of indiff. curve on 45-degree line $= (1-\pi)/\pi$.

If statistically fair insurance is available in competitive market, then $p = \pi$; tangency on 45-degree line, customer buys full coverage.

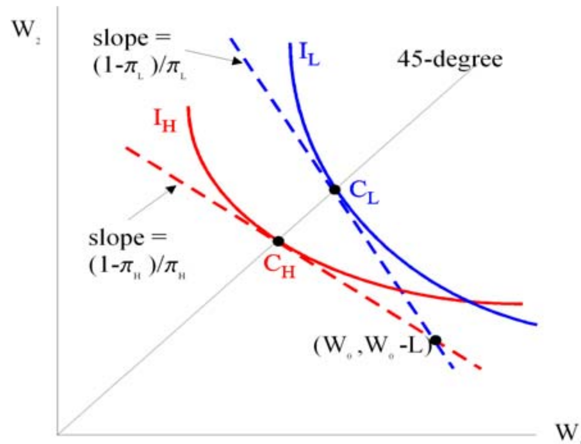
Fair budget line is also insurance company's zero-profit line.

Contract below it gives positive profit; above, makes a loss.

## TWO RISK TYPES, SYMMETRIC INFORMATION

Loss probabilities $\pi_L < \pi_H$
MRS for type $i$ in $(W_1, W_2)$ space is

$$-\left.\frac{dW_2}{dW_1}\right|_{EU=\text{const}} = \frac{\partial EU/\partial W_1}{\partial EU/\partial W_2} = \frac{1-\pi_i}{\pi_i}\,\frac{u'(W_1)}{u'(W_2)}$$




At any $(W_1, W_2)$, indifference curve of L-type is steeper than that of H-type

Similar conditions appear in all signaling/screening models. Crucial for separation of types. Called Mirrlees-Spence single-crossing property.

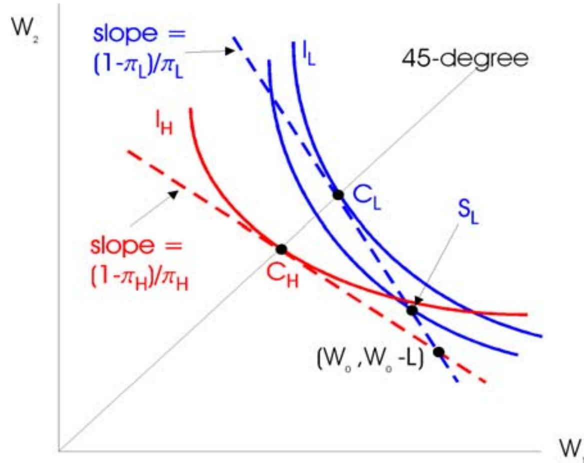
So without information asymmetry, in competitive market, each type can get separate contract with fair premium, and chooses full coverage.

ASYMMETRIC INFO – SEPARATING EQUILIBRIUM

Each firm offers one contract
Free entry; firms compete in contracts
In equilibrium, each has zero expected profit
Ignore other costs, so a contract with
only type-L customers must be on
fair premium line of slope $(1-\pi_L)/\pi_L$;
if only H-types,line of slope $(1-\pi_H)/\pi_H$.

Full fair coverage contracts $C_H$, $C_L$ are
not incentive-compatible: $H$ will take up $C_L$
Must restrict coverage available to L-types

Can at best offer $S_L$, so H-types
only just prefer $C_H$ to $S_L$.
Then single-crossing property ensures
that L-types definitely prefer $S_L$ to $C_H$




So separation by self-selection (screening). But at a cost: L-types can't get full coverage.
H-types' existence exerts a kind of negative externality on L-types.

ASYMMETRIC INFORMATION – POOLING?

Separation may be Pareto inferior if there are very few H-types in population

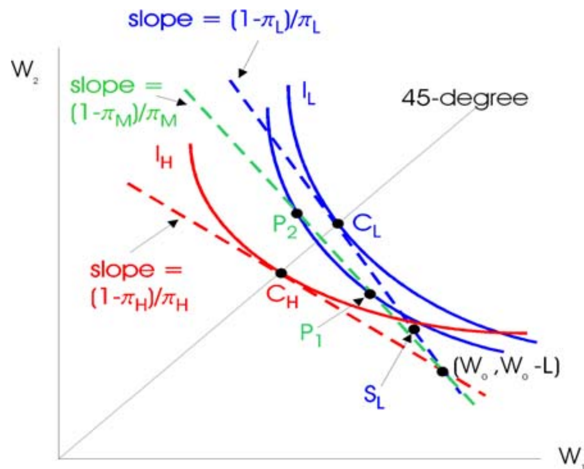
Population proportions $\theta_H$, $\theta_L$ population average loss probability is

$\pi_M = \theta_H \pi_H + \theta_L \pi_L$

Contract with randomly drawn customers from whole population has zero profit line of slope $= (1 - \pi_M)/\pi_M$

On it, any point between $P_1$ and $P_2$ is Pareto-better than the contracts $C_H$, $S_L$ of separating "equilibrium"

Segment $P_1 P_2$ exists when $\pi_M$ is close to $\pi_L$, i.e. $\theta_H$ is small



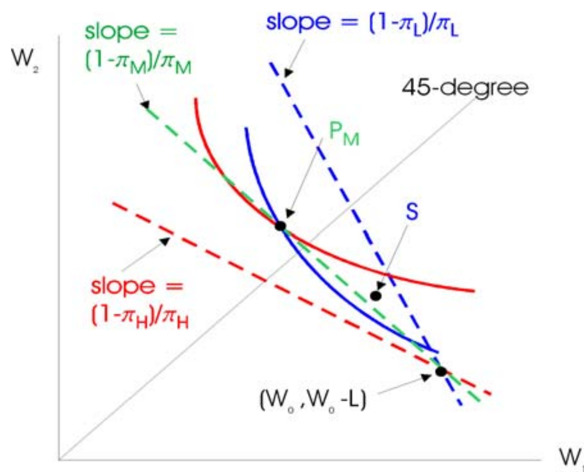

Then new firm can offer contract just below segment $P_1 P_2$.

This will attract full sample of pop'n and make profit.

Then the original separating contracts $C_H$, $S_L$ cannot be an equilibrium.

But can pooling itself be a (Nash) equilibrium? No.
Consider any point $P_M$ on population-average zero-profit line
By single-crossing property can find $S$ that appeals only to L-types and is below zero-profit line for contracts with only L-type customers
So company offering S makes positive profit
Entry of such insurers will destroy pooling

Then equilibrium may not exist at all – competition can generate cycles between separation and pooling.




More complex notions of equilibrium (where entrants anticipate effects of incumbents' responses to entry) can allow pooling to be sustained in equilibrium.

Also government can play a role: can make joining pool compulsory, thereby preventing the harmful "cream-skimming" competition.

Of course a government-run pool can have its own problems.