A monopoly insurer under adverse selection

So far we analyzed a perfectly competitive insurance market. What are the differences if there is a sole monopoly insurer supplying insurance cover?

Consider a situation where we have a continuum of buyers with mass 1. The insurer can set premium P_i and the amount of cover ϕ_i. Thus the insurer's problem takes the following form:

$$\max_{P_l,P_h,\phi_l,\phi_h} \Pi = \lambda(P_l - \pi_l\phi_l) + (1-\lambda)(P_h - \pi_h\phi_h)$$

s.t.

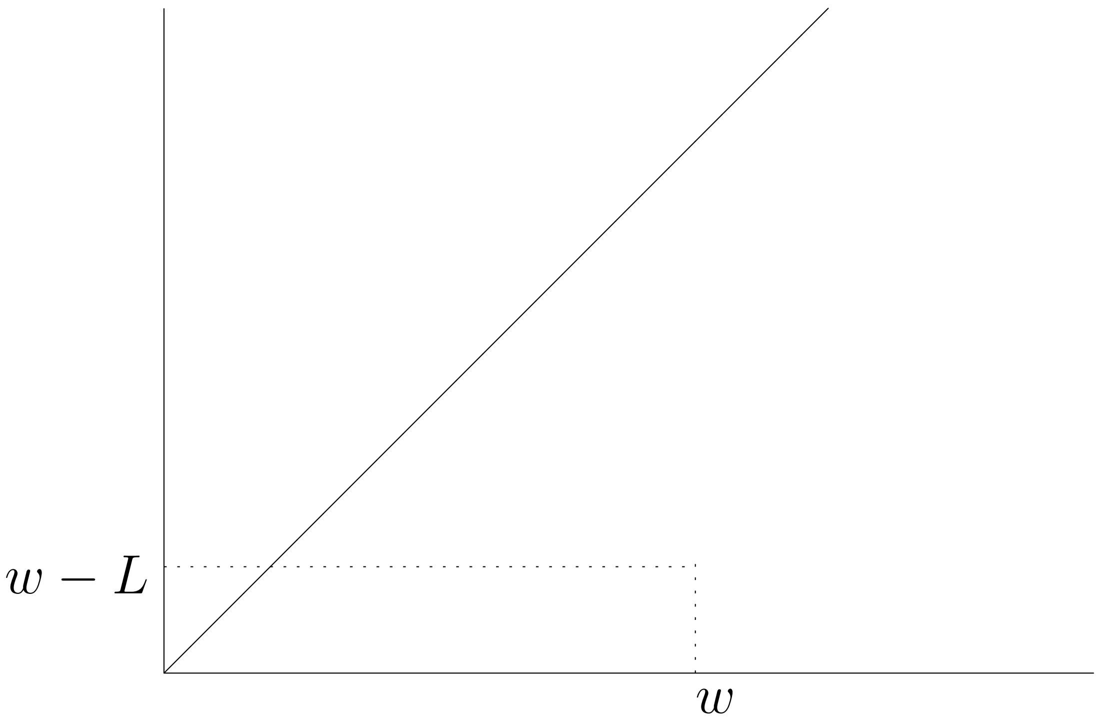
PC (h) $\quad EU_h(P_h, \phi_h) \geq \bar{U}_h$

PC (l) $\quad EU_l(P_l, \phi_l) \geq \bar{U}_l$

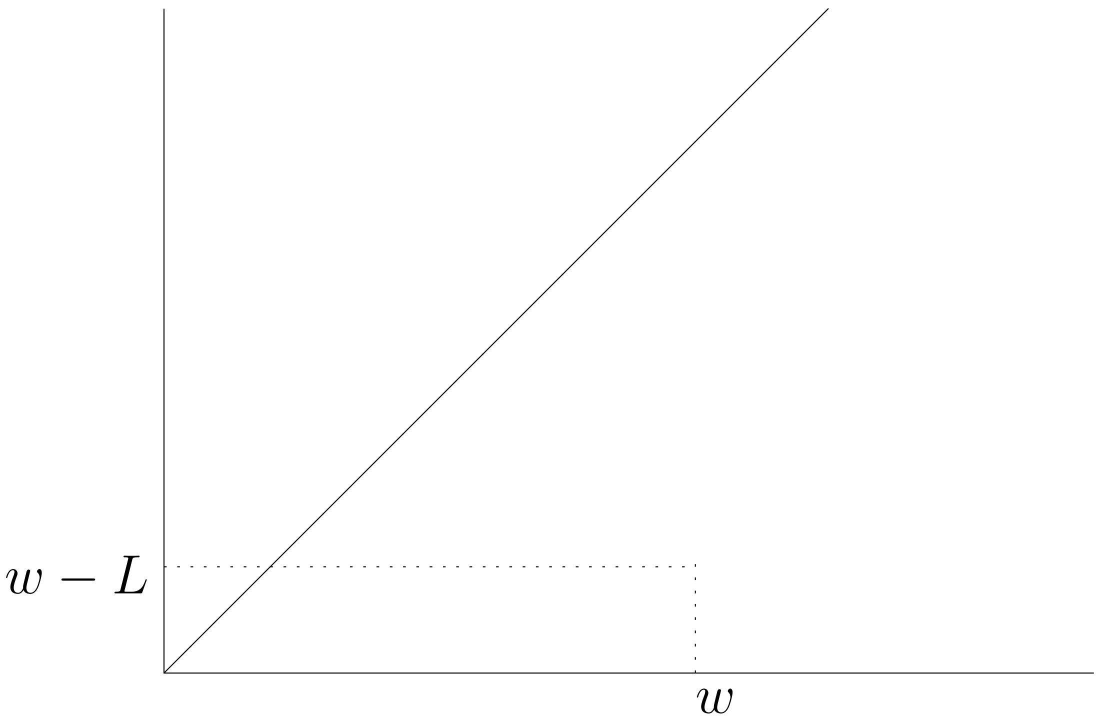
IC (h) $\quad EU_h(P_h, \phi_h) \geq EU_h(P_l, \phi_l)$

IC (l) $\quad EU_l(P_l, \phi_l) \geq EU_l(P_h, \phi_h)$.

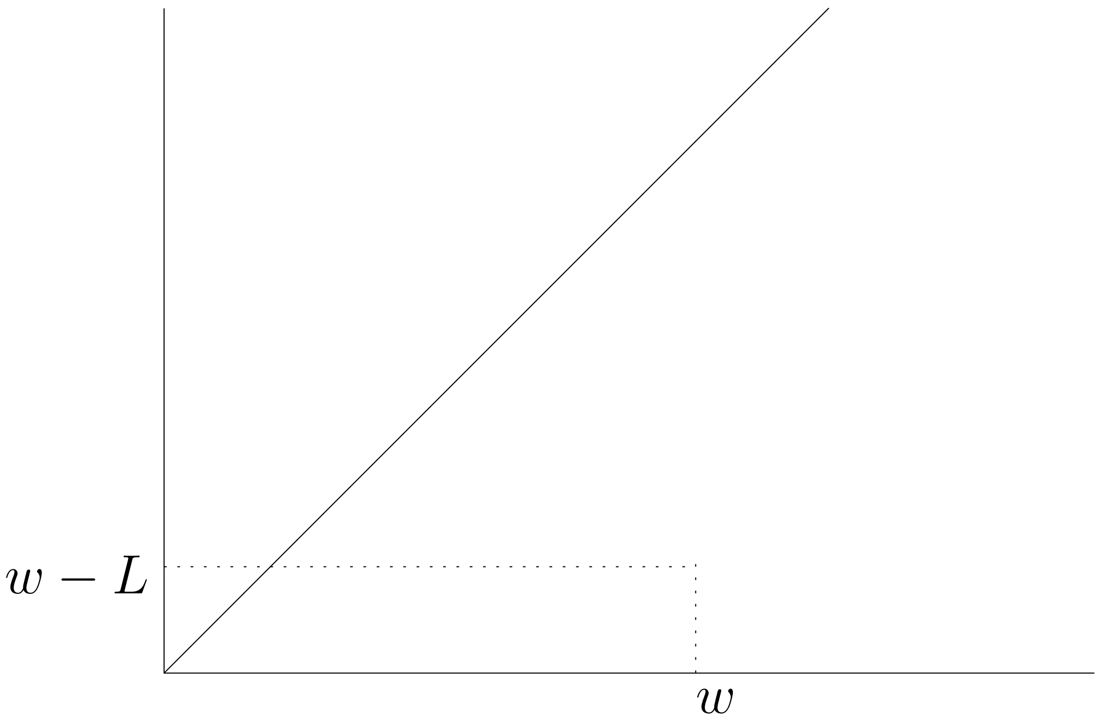
PC (h), the participation constraint for the high risk types, is not binding. We can see that easily from the figure, because for any contract where income is shifted into the "loss" state the low risk type's outside option indifference curve lies above the h type's outside option indifference curve. Any contract for the l types gives the h types a rent.



PC (l), the participation constraint for the low risk types, is binding. If it were not binding we could always find contracts that would be acceptable for h and l types and would yield higher profits.



IC (l), the incentive constraint for the low risk types, is not binding. We know that the l types do not get a rent. So if IC (l) were binding the contract for the h types were on the l type's outside option indifference curve. We can easily find contracts for the h types that yield higher profit while not violating any constraint.



IC (h), the incentive constraint for the high risk types, is binding. If it were not the problem would coincide with the one under symmetric information. There a menu of contracts not satisfying IC (h) is optimal. Thus IC (h) has to be binding.

Now the problem is reduced to a simple Lagrange problem:

$$\max_{P_l, P_h, \phi_l, \phi_h} \Pi = \lambda(P_l - \pi_l \phi_l) + (1-\lambda)(P_h - \pi_h \phi_h)$$

s.t.

PC (l) $\quad EU_l(P_l, \phi_l) = \bar{U}_l$

IC (h) $\quad EU_h(P_h, \phi_h) = EU_h(P_l, \phi_l).$

From the first order conditions with respect to P_h and ϕ_h one can see that marginal utility, and thus final wealth, for the h types are equal in both states of the world, i.e. h types get fully insured. (check that)

From the first order conditions with respect to P_l and ϕ_l we can see that for the low risk types marginal utility in the "loss" state is higher, i.e. their final wealth in this state is lower. Thus low risks receive only partial insurance. (check that)

Monopoly under Adverse Selection – Summary

(1) Pooling is never optimal.

(2) High risks receive a rent and are fully insured.

(3) Low risks receive no rent and are only partially insured. The level of partial insurance depends on the share of high risks in the population. Note that the monopolist has to leave a rent to the h types in order to separate the types. Now if there are only few l types in the population the monopolist will forego any rents from the l types but extract all the rent from the h types. They then get the full insurance contract where their outside option indifference curve is tangential to their fair insurance line.

Note: If the insurer has additional instruments/information to discriminate between h and l types she will use them. We will cover the issues of categorial discrimination (problem 6–2) and endogenous discrimination (problem 6–3) in class.

Longterm contracts – Basic idea

Now we consider a longer time horizon. The loss probabilities are to be interpreted as per period loss probabilities. As the risk type of an insuree is exogenously given we will learn over time his true risk type.

So the question arises whether the insurer can do better by writing longterm/multi-period contracts. Now she can condition the contract (premium and cover) on the previous track record of the insuree.

Examples:

- Unemployment insurance: The payment decreases in the duration of unemployment.
- Car insurance: Premium depends on the number of previous accidents. (experience rating, bonus–malus–system)

Longterm contracts – Basic structure

For a start consider the following simple model:

- 2 periods
- same initial income in periods 1 and 2; no savings
- premium in period 2 (P^2) conditional on loss in period 1
- cover in period 2 (ϕ^2) conditional on loss in period 1

Contract for h types:

$$P_h^1 = P_h^2(Loss) = P_h^2(NoLoss)$$

and

$$\phi_h^1 = \phi_h^2(Loss) = \phi_h^2(NoLoss)$$

$\Rightarrow$ High risks are fully insured. The longterm contract is just a replication of two short term contracts.

<u>Contract for l types:</u>

$$P_l^2(NoLoss) < P_l^1 < P_l^2(Loss)$$

and

$$\phi_l^2(NoLoss) > \phi_l^1 > \phi_l^2(Loss)$$

$\Rightarrow$ Low risks are not fully insured. They face a risk over time and are rewarded if there was no loss but punished if there was a loss. The h types for whom this risk is higher will not choose the low risk type's contract.

<u>More than 2 periods</u>

P_l^T increases in the number of losses
ϕ_l^T decreases in the number of losses

For $T \to \infty$ we converge to the FB solution as the per period "punishment" can be arbitrarily small.

Note: It is important that there is no saving. If the insurees could insure themselves via unobservable savings the problem is more subtle.

Renegotiation

Idea: Over time the insurer learns about the insuree's true type. This information could be used to design a more efficient contract (for the l types).

Or: Longterm contracts are prohibited by law.

Renegotiation before contract starts

By choosing the respective separating contracts we know the buyers types for sure. So we could do better and offer the l type, directly after the initial l contract is signed, a full insurance contract for the fair l premium.

What would happen? The h types would anticipate this and would pick the l contract in the first place.
$\Rightarrow$ Problem ...

Renegotiation later on

From the observation in period 1 the insurer receives additional information on the true risk type of a buyer. Now she can offer a better contract for period 2. An interesting question is whether to make profits in the beginning and losses later on (theoretical suggestion) or vice versa (empirically backed suggestion, “low-balling”). Note that in equilibrium renegotiation will not occur. But the mere possibility changes the nature of the problem.