Health Insurance and Redistribution

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Plan of the presentation:

- Introduction to health insurance
- Market failures in health insurance
    - adverse selection
    - *ex-ante* moral hazard
    - *ex-post* moral hazard
- Public provision of health insurance
- Public health insurance and redistribution
    - Socio-economic status and health
    - Public and private health insurance without moral-hazard
    - Public and private health insurance with moral-hazard

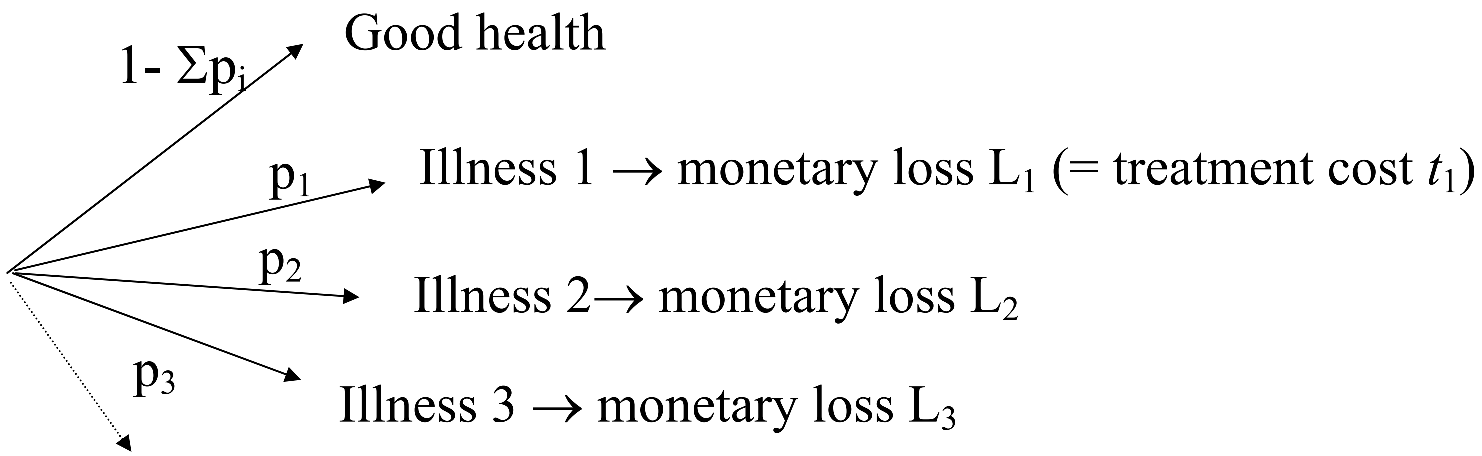
Why health insurance?

- Health shocks are uncertain and unpredictable
- Medical care are expensive, sometimes unaffordable
- treatment effectiveness is uncertain
- recovery is uncertain (long term care)

Health insurance insures against the *financial risk* associated with buying medical care. Health insurance covers a *derived risk*. (We do not possess the technology to insure health directly)

By investigating the health insurance market we focus on the *financing* of health care expenses.

Consumer's lottery:



Suppose only one illness (and only one treatment) is possible, consumer's expected utility is:

EU = $p\,U(W - L) + (1- p)U(W)$

With insurance:

P = insurance premium

q = insurance reimbursement

Consumer's program:

$$\begin{cases} \max\limits_{P,q} EU(P,q) = pU(W-P-L+q) + (1-p)U(W-P) \\ s.t.\;\; P \geq pq \end{cases}$$

Thus, expected utility is maximized for:

P = *pq* (premium is *fair*) and *q*=*L* (coverage is *complete)*

This occurs if the health status can be observed (without any cost) by the insurer. If the loss (treatment cost) is fixed. If the probability of illness is exogenous.

The market for (health) insurance

Insurance markets use the Law of large numbers:

If an event of probability p is observed repeatedly during independent repetitions, the ratio of the observed frequency of that event to the total number of repetitions converges towards p as the number of repetitions becomes arbitrarily large.

This law forms the basis for the *statistical expectation of loss* upon which premium rates for insurance policies are calculated: the greater the number of policyholders, the less the deviation of the actual losses from the expected losses.
Thus, insurance firms do not know ***who*** will incur in a loss, however they know the ***percentage*** of people who will do.

Health insurance redistributes resources from healthy individuals to ill ones.

Market failures in health insurance

- Caused by **information asymmetry** between insurer and individuals.

1) **Adverse selection**: individuals characterized by different risks. They observe their own risk of illness, insurers do not. Thus, when insurers offer complete coverage at fair premium for low-risk, high-risk mimic low-risk. See below.

2) **Moral hazard**: insurers do not observe an action chosen by individuals. A) *Ex-ante*: the probability of illness is endogenous. B) *Ex-post*: treatment cost is endogenous. See below.

Market failures in health insurance (cndt)

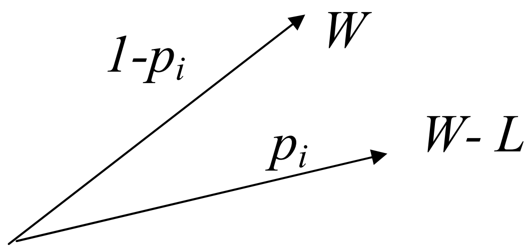
- When *probability* of illness of some individuals is *very high*, insurance becomes unaffordable. These individuals cannot purchase health insurance. Related problem in a dynamic context: time-inconsistency in health insurance (Cochrane 1995), need for insurance against the risk to become high-risk.

- The *uninsured* problem. Some people (young and low revenue) choose not to buy health insurance. Emergency care as a Samaritan's dilemma.

- Externalities. Ex: transmissible diseases, vaccines. The choice of insurance (and treatment) can be sub-optimal.

The market for (health) insurance with adverse selection

Risk-neutral insurance firms sell insurance policies in the market. Individuals have private information on their probability of illness. Two types of individuals exist, with $p_1 > p_2$ and mass λ_1 and λ_2.



Expected utility: $EU_i = p_i U(W - P_i - L + q_i) + (1 - p_i)U(W - P_i)$

Insurance profit on contract (P_i, q_i): $P_i - p_i q_i$

Different equilibrium concepts:

Price equilibrium (linear pricing). Π is the unit price of coverage q. Contracts are defined as: $(\Pi q_i, q_i)$. The equilibrium price is such that insurance supply ($Q^S(\Pi)$) and demand for insurance ($Q^D(\Pi)$) are equal.

Free entry equilibrium (or Rothschild - Stiglitz equilibrium) (non-linear pricing). Contracts are defined as: (P_i, q_i). The equilibrium is an allocation such that no firm can enter and make positive profits.

Under **full information** both equilibrium concepts gives the same result:

- There exist a unique **price equilibrium** such that $Q_i^S(\Pi_i^*) = Q_i^D(\Pi_i^*)$ with $\Pi_i^* = p_i$ (different prices for different individuals are possible: no uniformity constraint). Complete coverage for both types: $q_i = L$. Firms make zero profits.

- There exist a unique **free entry equilibrium**. Each type purchases complete coverage: ($P_i = p_i t$, $q_i = L$). Firms make zero profits.

Under **adverse selection**:

- The Spence-Mirrlees condition is verified (single-crossing property).
- The self-selection constraint must be verified.
- The individual rationality constraint must be verified.
- Non-negative profits constraint:

  Global non-negative constraint (for price equilibrium)

  $$\lambda_1(\Pi q_1 - p_1 q_1) + \lambda_2(\Pi q_2 - p_2 q_2) \geq 0$$

  Non-negative constraint on each contract (for the free entry equilibrium:

  $$P_i - p_i q_i \geq 0 \quad \forall i$$

- Price equilibrium. In the same line of Akerlof's *market for lemons*: $p_1 > \Pi > p_M$ *and* $q_1 > L > q_2 \geq 0$. Moreover firms make zero profits. [See the figure]
  Note that incentive compatibility is verified, there is cross-subsidisation between contracts. The allocation is not efficient. [See the figure]

- Free entry equilibrium: If such equilibrium exists, then it is the unique allocation verifying:

  - *high-type purchases (p_1L,L)*

  - *high-type is indifferent between the two contracts*

  - *low-type is under-insured and $P_2 = p_2q_2$*

  [See the figure]

  Existence: the eq. exists if and only if λ_1/λ_2 is sufficiently high

  Efficiency: the eq. is efficient if and only if λ_1/λ_2 is even higher

The market for (health) insurance with moral hazard

Ex-ante moral hazard

Ex-ante individuals can take some **actions that affect the insurance contract**. In health insurance:

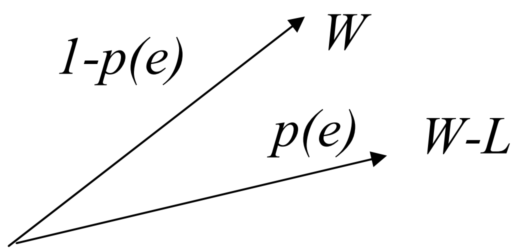
Primary prevention measures

Individuals take actions that affect the probability of the loss due to illness (self-protection). Ex: life-style (not observable) and vaccines (observable). When they are not observable, they represent the standard case of ***ex-ante* moral hazard**

Secondary prevention measures

Ex-ante individuals take actions that affect the loss due to illness (self-insurance). Ex: screening tests and medical checks. These measures allow early detection of disease.

Risk-neutral insurance firms sell insurance policies in a market with free entry. Individuals choose an action which affects their risk of illness: $p'(e)<0$.



Expected utility: EU= $p(e)\, U(W - P - L + q) + (1 - p(e))U(W - P) - C(e)$

Insurance profits: $P - p(e)q$ (go to zero because of competition)

Under **full information** complete coverage (*q* = *L*) is optimal**:**

$$\begin{cases} \max\limits_{e,P,q} EU(e,P,q) \\ s.t.\ \ P = p(e)q \end{cases}$$

The optimal effort is such that:

$$-\ p'(e^*)\left[U(W'_{\text{health}}) - U(W'_{\text{illness}}) + qEU(W')\right] = C'(e^*)$$

When *e* is an **hidden action**:

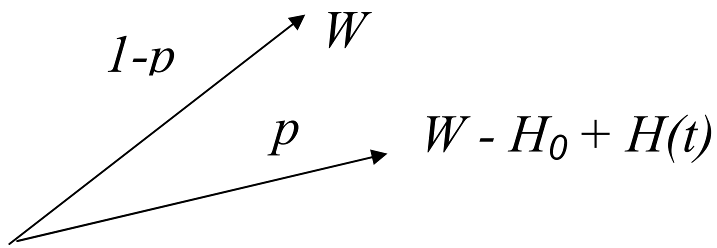
- Individuals choose *e* taking *P* and *q* as given
- Insurers anticipate the action chosen by individuals, and solve:

$$\begin{cases} \max_{P,q} EU(\tilde{e}, P, q) \\ s.t. \;\; P = p(\tilde{e})q \\ \qquad \tilde{e} \; s.t.: \;\; -p'(\tilde{e})\left[U(W'_{\text{health}}) - U(W'_{\text{illness}})\right] = C'(\tilde{e}) \end{cases}$$

- Individuals do not internalise that effort *e* makes the premium *P* decrease.
- Complete coverage would lead to zero effort.

Ex-post moral hazard

Risk-neutral insurance firms sell insurance policies in a market with free entry. Individuals choose (ex-post) an action which affects the size of the loss in the event of illness.



Possible interpretation: $L(t) = H_0 - H(t)$. Here the action is treatment choice. Treatment *t* is an input in the health recovery function.

H_0 = monetary equivalent of the negative health shock

$H(t)$= monetary equivalent of the health recovery function

$H_0 - H(t) \geq 0$

Now the contract is (P, α)

where α (≤1) is the co-insurance parameter.

Expected utility: EU = $p\,U(W - P - H_0 + H(t) - t + \alpha t) + (1 - p)U(W - P)$

Where $(1-\alpha)t$ = out of pocket expenses

Insurance profits: $P - p\alpha t$ (go to zero because of competition)

α distorts the price of treatment: $(1-\alpha)$ = consumption price

FOC *t*: $H'(t) = 1-\alpha$

Thus, ***ex-post moral hazard*** *is over-consumption due to health insurance. Insurance coverage reduces the marginal cost of treatment such that individuals purchase too much treatment.*

Treatment demand: $t=t(\alpha)$

Insurance coverage acts as a subsidy to treatment: the higher price elasticity of treatment demand, the higher *ex-post* moral hazard. Thus, *the higher price elasticity of treatment demand, the less treatment should be covered*.

Empirical studies on *price elasticity of treatment demand*:

The RAND health insurance study used an experimental design to investigate how people reacted to different patterns of co-payments (Manning *et al.* 1987).

Result: *on average the price elasticity of demand for care has been estimated within the range [-0.1, -0.2]. According to intuition, price elasticity is higher for out-patient care, lower for in-patient ones.*

- Individuals take P and α as given and choose treatment t
- Insurers anticipate the treatment chosen by individuals, and solve:

$$\begin{cases} \max\limits_{P,\alpha} EU(\tilde{t}, \alpha, P) \\ s.t.\ \ P = p\alpha\tilde{t} \\ \qquad \tilde{t}\ s.t.:\ \ H'(\tilde{t}) = 1\text{-}\alpha \end{cases}$$

- Individuals do not internalise that treatment *t* makes the premium *P* increase.

- Complete coverage ($\alpha = 1$) would lead to excessive over-consumption.

Summarising, with both *ex-ante* and *ex-post* moral hazard:

Trade-off between risk-sharing (complete coverage would be optimal for risk-averse individuals) and incentives (to exert primary prevention or to buy the appropriate amount of treatment).

Individuals' health status is not perfectly observable. Different illness are possible, different treatment for the same illness are available. Thus:

treatment is ex-post verifiable but *not* contractible

So, what is the **first-best** in a model with *ex-post* moral hazard?

If the amount of treatment necessary in ill health was contractible (or, if insurers could observe without cost the individuals' health status), the insurers would provide a cash reimbursement in the case of illness. The price of treatment would not be distorted ($\alpha = 0$, $P_{\text{illness}} \neq P_{\text{health}}$).

Alternatively the insurer could directly provide the necessary amount of treatment (in-kind reimbursement).

Note that insurance reimbursement can be such that:

- It regulates the price of treatment: over-consumption of treatment because of *ex-post* moral hazard.

- It regulates the quantity of treatment (in-kind provision of care in vertically integrated structure → NHS type organisations or HMOs in US): quantity constraints (ceiling), less flexibility, lack of consumers' sovereignty when consumers are heterogeneous.

Government intervention in health insurance

- Whatever the size of the Welfare State, in all industrialised countries a substantial proportion of health care expenditures are financed by the government.
- Government intervention in health insurance is justified on grounds of both efficiency and equity

- **Efficiency**: market failures as adverse selection, the uninsured (voluntary or not) problem and positive externalities can be solved by government provision of health insurance (compulsory and universal public health insurance).
- However, public insurance is not a solution for the issue of moral-hazard (both *ex-ante* and *ex-post*).

Government intervention in health insurance (cndt)

- Moreover, transaction costs (private insurance exhibits higher transaction costs than public insurance).

- Very special nature of health care $\Rightarrow$ **equity** concerns.

- Horizontal equity (equal treatment for equal need). The *norm of equal access to health care* is easily assured by a public health insurance (in alternative: “vouchers” system)

- Related to efficiency. When *redistribution* is a government priority and (income) taxes are distortionary, health insurance is a desirable redistribution device if risk and ability are negatively correlated, that is if the poor face higher risks on average.

Public health insurance and redistribution

Rochet (1991), Cremer and Pestieau (1996), Henriet and Rochet (2004) consider together the distortionary Income Taxation model and the Rothschild-Stiglitz Insurance model to investigate the role of public health insurance as a redistributive mechanism.

The individuals have two unobservable characteristics: **ability** (wage rate) and **probability of illness**.

The private market for insurance is efficient.

The model set-up:

Instruments of the government:

- (Distortionary) taxes (linear or non-linear)
- Uniform insurance coverage α (in the form of a cost-sharing parameter). The premium is uniform as well: $p_M \alpha L$.

Aggregate consumption with a linear income tax when healthy *and* ill (always complete coverage):

$(1-\tau) w_i l_i + G - p_M \alpha L - (1-\alpha)\, p_i L$

τ tax rate

G uniform lump-sum transfer

Results:

- Even in the presence of an efficient market for private health insurance, public health coverage is welfare improving provided ability and probability of illness are negatively correlated.
- Optimal public health insurance is complete $\alpha = 1$. (No role for private insurance)

Intuition. When ability and probability of illness are negatively correlated, health insurance implies redistribution from high to low wages. In fact, on average the poor become ill and buy health care more frequently. Redistribution through health insurance is welfare improving because it is not distortionary (it does not affect labour supply).

Aggregate consumption:

$(1-\tau)w_i l_i + G - p_M \alpha L - (1-\alpha)\, p_i L$

- linear income tax redistributes from the rich to the poor but τ reduces labour supply
- public coverage redistributes from healthy to ill individuals
- on average the healthy are also the rich, thus public coverage allows the same redistribution level with a lower τ
- $\alpha = 1$ is optimal

Empirical studies on the correlation between SES (socio-economic status = income, wealth, education and work) and morbidity and mortality:

Over a wide range of data and populations morbidity and mortality rates are lower among those from higher SES groups.

Smith (1999), Hurt *et al.* (2000), Adams *et al.* (2003)…

What about causality?

Still open the debate about the direction of causation and about why the association between morbidity and SES arises.

3 views exist:

- Medical scientists believe that the casual path is:

  SES $\Rightarrow$ access to medical care + environmental/occupational hazards $\Rightarrow$ morbidity and mortality

- Economists postulated the opposite path:

  Morbidity $\Rightarrow$ work-limiting disability + medical expenses $\Rightarrow$ SES

  (In middle and later ages the mechanism runs largely from health to SES)

More recently: correlation between SES and morbidity/mortality could be ecological:

Genetic and *behavioural* (tastes for work and for clean living) factors influence both health and the ability to accumulate assets.

Long run effects from childhood: morbidity and mortality are largely determined early in life. Importance of both *in utero* conditions (birth weight) and early childhood conditions. Health at birth seems for important part to be determined by parental health and there is no causal effect of parental income or education. Importance of child education (the causality probably is: poor child health $\Rightarrow$ poor later health and worse education).

Sum-up:

- Empirical studies show that SES and morbidity/mortality rate are negatively correlated.
- Public health systems should be a good redistributive instrument.

The end of the story?

What about health care consumption?

Empirical evidence: *richer people (although in better health) tend to consume more health services than the poor,*
this occurs also where health systems are characterized by public health insurance.

Doorslaer *et al.* (2000), Atherly (2002), Buchmueller *et al.* (2002) document serious inequities in the access and delivery of medical care in Finland, France, Sweden, the UK and the US (for Medicare patients).
Private supplementary coverage is indicated as a possible cause.

We forgot *ex-post* moral-hazard:

In the real world public health coverage is not complete: $\alpha<1$. Often individuals purchase also **private health insurance coverage.**

Mixed health insurance systems

Private and public insurance coexist.

- Opting-out systems (Germany, Ireland, the Netherland): people can purchase private insurance and opt out of the public sector.
- Topping-up systems (Finland, France, Belgium, Sweden, the UK, Canada, Australia): people can supplement public health coverage with a private policy.

Effects of topping-up systems on *ex-post* moral hazard:

the same health services are covered twice:

FOC t: $H'(t) = 1 - \alpha - \beta_i$

Over-consumption of care increases

Public health insurance with *ex-post* moral hazard

Petretto (1999), Boadway *et al.* (2004) and (2006)

Timing of the model:

1) government sets linear taxation and public coverage (τ, G, α),
2) private insurance firms set private policy $(P_{\beta i}, \beta_i)$
3) individuals choose labour supply l_i and **treatment** t_i,

Note: here public coverage is financed by income taxation.

Aggregate consumption when ill:

$(1-\tau)w_i l_i + G - P_{\beta i}, - H_0 + H(t_i) - (1-\alpha-\beta_i)t_i$

Result:

- Public health coverage is still a desirable redistribution device, provided negative correlation between ability and probability of illness is sufficiently high.
- As we expected, optimal public coverage is partial: $\alpha<1$.

What does it happen when negative correlation between ability and probability of illness is **not** sufficiently high?

Assume that $w_h > w_l$ *and* $p_h = p_l$

Results (Barigozzi 2005):

- Given partial public coverage, all individuals purchase private coverage.
- If price elasticity of care is sufficiently high, the rich purchase more private coverage than the poor: $\beta_h > \beta_l$ (insurance coverage is a normal good), the rich over-consume more than the poor.
- The optimal public coverage is **negative**: $\alpha < 0$. Health care expenses are taxed.
- The rich and the poor are both under-insured.

Intuition

1) Since the rich purchase more private coverage and over-consume more than the poor, health care consumption is taxed in order to indirectly tax private coverage and redistribute from the rich to the poor.

2) Consumption smoothing is provided by the private market (that is more efficient since it offers type-dependent coverage).

Note that income effects reinforces this result.

To sum-up:

- Empirical evidence shows that, in mixed health insurance systems, richer people (although in better health) tend to consume more health services than the poor.
- In these mixed systems a uniform (and positive) partial public coverage is financed by progressive taxation and rich people supplement public coverage with a private policy.
- If the negative correlation between health risk and wage rate is not sufficiently high and *ex-post* moral hazard is high enough, a positive public coverage redistributes from the poor to the rich. The negative effect of supplementary insurance on redistribution can more than compensate the positive effect due to the negative correlation between risk of illness and wage rate.

- **Reverse redistribution** can arise: the rich net contribution to health care financing (the fiscal revenue raised from the rich minus the health care subsidy paid to them) can be lower than the poor one.

$$\tau w_h l_h - p_h \alpha t_h \leq \tau w_l l_l - p_l \alpha t_l$$

Conclusion

- Previous literature has stressed the "double" *ex-post* moral-hazard effect of supplementary insurance.
- More important is how supplementary insurance affects the redistributive role of public health insurance.
- Policy implications. The social planner should:
  - either increase the progressivity of contributions to public coverage to compensate the regressive effect of supplementary coverage
  - or redefine supplementary insurance. It should not reimburse co-payments required by the public coverage. Supplementary insurance should cover *different* services.