Public Economics

Lecture 7: Social insurance

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Definition

- Social insurance consists in transfers based on events such as unemployment, disability, or aging.
- Different from welfare programs based on means-tested transfers.

Main questions

- Why have social (as opposed to private, or any) insurance?
- How should we design the social insurance system to maximize social welfare?
- Trade-off between two forces:
  - Benefits from the system, i.e. reducing risk;
  - Distortions, i.e. changing individuals' incentives.
- End up with second-best solutions.
- "Optimal" policy can be identified using theoretical models and empirical evidence on programs' effects.

Why have social insurance?

- Basic motivation: reduce risk for risk-averse individuals.
    - Unemployment insurance: risk of involuntary unemployment;
    - Workers' compensation and disability insurance: risk of injuries or disabilities;
    - Old-age insurance: risk of living too long.
- But why is government intervention needed?
- Market failures:
    - Informational problems such as adverse selection;
    - Individual optimization failures such as myopia or improper planning;
    - Unexpected macroeconomic shocks.

Adverse selection

Rothschild, Michael & Stiglitz, Joseph E, 1976. "Equilibrium in Competitive Insurance Markets: An Essay on the Economics of Imperfect Information," The Quarterly Journal of Economics, MIT Press, vol. 90(4), pages 630-49, November.

- Model with information asymmetries. For example, individuals know their risk of losing job, but the insurer does not.
- Main results: this market failure can lead to a situation where there is no equilibrium that supports provision of insurance.
- In such a case, government intervention through public mandatory insurance can increase welfare.

Setting of the model

- Economy with two types of agents: low-risk (L) and high-risk (H).
- Fraction f of individuals are high-risk, $1 - f$ are low-risk.
- Type L individuals have a probability p_L of becoming unemployed.
- Type H individuals have a probability p_H of becoming unemployed, with $p_H > p_L$.
- When employed, individuals get income w. When unemployed, they get zero.
- Static model with perfect competition and without moral hazard (agents choose insurance contract but make no choices after signing a contract).

Insurance contract

- An insurance contract is described by a vector $\alpha = (\alpha_1, \alpha_2)$ such that employed individuals get

$$w - \alpha_1,$$

and unemployed individuals get

$$\alpha_2.$$

- When facing contract α, type i's expected utility is:

$$V_i(\alpha) = (1 - p_i)u\left(w - \alpha_1\right) + p_i u\left(\alpha_2\right),$$

where $u(.)$ is the utility function.

- Perfect competition implies the following zero-profit condition for insurers:

$$\alpha_2 = \frac{1-p}{p}\alpha_1,$$

where p is the risk rate of those who purchase the contract.

Equilibrium

- An equilibrium situation is defined by a set of insurance contracts such that:
  - Individuals optimize: both types cannot find a better contract that the ones they choose;
  - Insurers optimize: all firms earn zero profits.
- Two types of equilibrium:
  - Pooling: both types are offered the same contract α.
  - Separating: high-risk individuals choose contract α_H while low-risk individuals choose a different contract α_L.

First best solution: perfect information

- If information is perfect, then insurers can distinguish between the two types of workers and the equilibrium will be separating.
- Equilibrium contracts are such that each type of individuals maximizes its expected utility subject to the zero profit condition. That is, type *i* individuals "choose" α_1 that to maximizes:

$$V_i(\alpha) = (1 - p_i)u(w - \alpha_1) + p_i u\left(\frac{1 - p_i}{p_i}\alpha_1\right).$$

- First order condition leads to:

$$u'(w - \alpha_1) = u'\left(\frac{1 - p_i}{p_i}\alpha_1\right).$$

- Both types are perfectly insured and receive their expected income $(1 - p_i)w$ in both situations.

Second best solution: imperfect information

- In practice, firms cannot distinguish between types. Either because they cannot determine true layoff risks or because they are not allowed to discriminate.
- If insurers offer the previous contracts, high-risk individuals will buy the low risk's contract and insurers will go bankrupt.
- Need to design different contracts.

- Zero profit condition for firms implies that a pooling contract will be such that:
$$\alpha_2 = \frac{1-\bar{p}}{\bar{p}}\alpha_1,$$
with:
$$\bar{p} = (1-f)p_L + fp_H \text{ and } p_L < \bar{p} < p_H.$$
- With such a contract, high-risk individuals are better off than in first best and low-risk are worse off: they lose money in expectation.
- Thus, there is a opportunity for a new insurer to enter the market and offer a contract with slightly less insurance.
- Only low risk individuals will switch to this new contract.
- As a result, there exist no pooling equilibrium.

- The separating equilibrium must be such that each type optimally chooses a different contract and high-risk do not have incentives to pretend they are low-risk.
- That is, the equilibrium is made of two contracts:

$$\alpha_H = (\alpha_1^H, \alpha_2^H) \text{ and } \alpha_L = (\alpha_1^L, \alpha_2^L),$$

with the following zero-profit conditions:

$$\alpha_2^H = \frac{1-p_H}{p_H}\alpha_1^H \text{ and } \alpha_2^L = \frac{1-p_L}{p_L}\alpha_1^L,$$

and the incentive constraints:

$$V_H(\alpha^H) > V_H(\alpha_L) \text{ and } V_L(\alpha^L) > V_L(\alpha_H).$$

- In such an equilibrium, high-risk individuals will obtain full insurance and low-risk ones will be under-insured.
- Intuition:
  - In any separating equilibrium, both types receive financially fair insurance because of the zero-profit condition of firms.
  - For high-risk individuals, there is not cost to insurers in providing full insurance, as the worst that could happen is that low-risk would join the pool.
  - For low-risk individuals, full insurance would create an incentive for high-risk to buy this cheaper contract, pushing the firm into negative profits.
  - In equilibrium, low-risks individuals get as much as possible without inducing high-risk individuals to deviate an buy the contract designed for low-risk individuals.

Room for public insurance

- Assume $w = 100$, $u(x) = \sqrt{x}$, $p_L = \frac{1}{4}$, $p_H = \frac{3}{4}$, $f = 0.1$.
- In a candidate separating equilibrium, high-risk individuals get perfect insurance, that is:

$$V_H(\alpha^H) = u\left(w\left[1 - p_H\right]\right) = \sqrt{100\frac{1}{4}} = 5.$$

- Low-risk individuals get as much insurance as possible without making the contract attractive for high-risk individuals:

$$V_H(\alpha^H) \geq V_H(\alpha_L), \text{ with } \alpha_2^L = \frac{1 - p_L}{p_L}\alpha_1^L.$$

- The previous condition can be rewritten as:

$$(1-p_H)\sqrt{100-\alpha_1^L}+p_H\sqrt{\frac{1-p_L}{p_L}\alpha_1^L}\leq 5.$$

- Solving for α_1^L gives:

$$\alpha_1^L \approx 3.85 \text{ and } \alpha_2^L \approx 11.55.$$

- Low-risk individuals are far from the perfect insurance situation.
- Their expected utility is:

$$V^L(\alpha_L)=\frac{3}{4}\sqrt{100-3.85}+\frac{1}{4}\sqrt{11.55}=8.2.$$

Welfare improving public insurance

- Assume that the government create a zero-profit mandatory insurance such that consumption is equal in both states.
- The corresponding insurance solves:

$$100 - \alpha_1 = \frac{1 - \bar{p}}{\bar{p}} \alpha_1,$$

with

$$\bar{p} = f p_H + (1 - f) p_L = 0.1 \frac{3}{4} + 0.9 \frac{1}{4} = 0.3.$$

- We get:

$$\alpha_1 = 30 \text{ and } \alpha_2 = 70.$$

- High-risk individuals benefit from being pooled with less risky people.
- Low-risk individuals benefit too as $\sqrt{70} > 8.2$.

General mechanism

- Consider an economy in which people differ in their risks (of becoming unemployed).
- Adverse selection can destabilize the market:
  - Firm provides insurance but lowest-risk (tenured people) drop out, so insurance prices increase.
  - Then, even moderate-risk types opt out, so prices increase further, leading others to drop out.
  - Could drive the situation up to the point where virtually no one is insured by private market.
  - A public insurance program that pools everyone can lead to *ex-ante* welfare improvements.
- Here, the key feature of public intervention is the ability to mandate.

Individual failures

- Given adverse selection, we expect individuals to “self-insure” against temporary idiosyncratic shocks by using savings.
- If individuals act so, then there is no need for large safety nets to insure people against temporary shocks (such as unemployment).
- In practice, individuals appear not to have enough assets to face such shocks.
- In other words, the first welfare theorem doe not holds due to individual optimization failures:
  - Individuals may misperceive the probability of a layoff;
  - Firms may not be able to provide correcting information.

Aggregate shocks

- Private insurance (cross-sectional pooling) relies on idiosyncratic risks: those who are well off can pay those who are poor.
- Government is the only entity able to coordinate risk-sharing across different groups that are all affected by negative shocks.
- Inter-generational (or inter-temporal) risk sharing is required if everyone is poor at the same time.
- Particularly relevant for unemployment insurance. Maybe less so for health-related shocks.

Optimal social insurance

- Assume that private market does not provide insurance for some reason.
- How should we design optimal social insurance policies?
- In the simple model by Rothschild and Stiglitz (1976), perfect insurance is optimal.
- But this abstracts from the core moral hazard problem: individuals have no incentives to work if unemployment insurance is perfect.
- Optimal social insurance has to take this distortion into account.

Benefits and distortions from unemployment insurance

Potential benefits:

- Smoother consumption path for individuals;
- Better job matches.

Potential distortions:

- Less job search, higher unemployment rate;
- Workers' preferences distorted toward unstable jobs;
- Shirking induced by the reduction of the cost of job loss;
- Lower savings.

Optimal unemployment insurance

- Standard measure of program's size is its replacement rate:

$$\text{Replacement rate} = \frac{\text{Net benefit}}{\text{Net wage}}.$$

Baily, Martin Neil, 1978. "Some aspects of optimal unemployment insurance," Journal of Public Economics, Elsevier, vol. 10(3), pages 379-402, December.

Chetty, Raj, 2006. "A general formula for the optimal level of social insurance," Journal of Public Economics, Elsevier, vol. 90(10-11), pages 1879-1901, November.

- Simple static model that allow to derive optimal benefit level.

Setting of the model

- Fixed wages, no general equilibrium effects. No distortions to firms' behavior.
- Static model with two states: high (employed) and low (unemployed).
- w_h is individual's income in the high state, $w_l < w_h$ is income in the low state.
- c_k is consumption in state $k = h, l$.
- The representative agent is initially unemployed and can control the probability of being in a bad state by exerting search effort e at cost $\Phi(e)$.
- When exerting effort e, the probability of being in the good state is $p(e) = e$.

- The unemployment insurance system pays constant benefit b to unemployed agents.
- Benefits are financed by a lump-sum tax t paid by agents in the high state.
- The system's balanced budget constraint can be written as:

$$et = (1 - e)b.$$

- Let $u(.)$ denote utility over consumption.
- Agent's expected utility is:

$$e \times u\left(w_h - t\right) + (1 - e) \times u\left(w_l + b\right) - \Phi(e).$$

First best problem

- In first best situation, there is no moral hazard problem.
- Optimal unemployment insurance system is obtained when the government chooses b and e in order to maximize:

$$\begin{aligned} & e \times u\left(w_h - t\right) + (1-e) \times u\left(w_l + b\right) - \Phi(e), \\ & \text{s.t. } et = (1-e)b. \end{aligned}$$

- The solution of this problem leads to:

$$u'(c_h) = u'(c_l).$$

- There is full insurance.

Second best problem

- In practice, we cannot eliminate the moral hazard problem because effort is unobserved by the insurance's provider.
- The problem is that individuals only consider *private* marginal cost and benefit when choosing e:
  - *Social* marginal benefit of work is w, but *private* marginal benefit is $w - b$.
  - Thus, agents search too little from a social welfare perspective, leading to efficiency losses.

- The representative agent takes b and t as given and chooses e in order to maximize its expected utility.
- The solution to this problem defines an indirect expected utility denoted by $V(b, t)$.
- The government chooses b and t in order to maximize individual's utility and keeping the budget balanced.

- The optimal social insurance system is thus characterized by b^* that is solution of:

$$\begin{aligned}
&\max && V\left(b,t\right), \\
&\text{s.t.} && t=\tfrac{1-e(b)}{e(b)}b, \\
&\text{with} && e(b)=\arg\ \max\ eu\left(w_h-t\right)+(1-e)u\left(w_l+b\right)-\Phi(e).
\end{aligned}$$

- At an interior optimum, the optimal benefit b^* must satisfy:

$$\frac{dV}{db}(b^*)=0.$$

- Rewrite the indirect utility function as:

$$V(b) = \max_{e} eu(w_h - t(b)) + (1-e)u(w_l + b) - \Phi(e),$$

where $t(b)$ is defined by the budget constraint.

- The envelope theorem implies:

$$\begin{aligned} \frac{dV}{db} = \; & \frac{\partial e}{\partial b}u(w_h - t(b)) - eu'(w_h - t(b))\frac{\partial t}{\partial b} \\ & - \frac{\partial e}{\partial b}u(w_l + b) + (1-e)u'(w_l + b) - \frac{\partial e}{\partial b}\Phi'(e). \end{aligned}$$

- From the agent's optimization we know:

$$\frac{\partial V}{\partial e} = 0 \Leftrightarrow u\left(w_h - t(b)\right) - u\left(w_l + b\right) - \Phi'(e) = 0.$$

  Thus, we can drop $\frac{\partial e}{\partial b}$ terms.

- Finally, we get:

$$\frac{dV}{db} = (1-e)u'\left(w_l + b\right) - eu'\left(w_h - t(b)\right)\frac{\partial t}{\partial b}.$$

- The budget constraint implies:

$$\frac{\partial t}{\partial b} = \frac{1-e}{e} - \frac{b}{e^2}\frac{\partial e}{\partial b} = \frac{1-e}{e}\left(1-\kappa(e)\right),$$

where

$$\kappa(e) = \frac{1}{1-e}\frac{de/e}{db/b}.$$

- Thus, we get:

$$\frac{dV}{db} = (1-e)\left\{u'(c_l) - (1-\kappa(e))u'(c_h)\right\}.$$

- Optimal benefit is defined by $\frac{dV}{db} = 0$, that is:

$$\frac{u'(c_h) - u'(c_l)}{u'(c_h)} = \kappa(e).$$

Optimal benefit formula

$$\frac{u'(c_l) - u'(c_h)}{u'(c_h)} = \kappa(e).$$

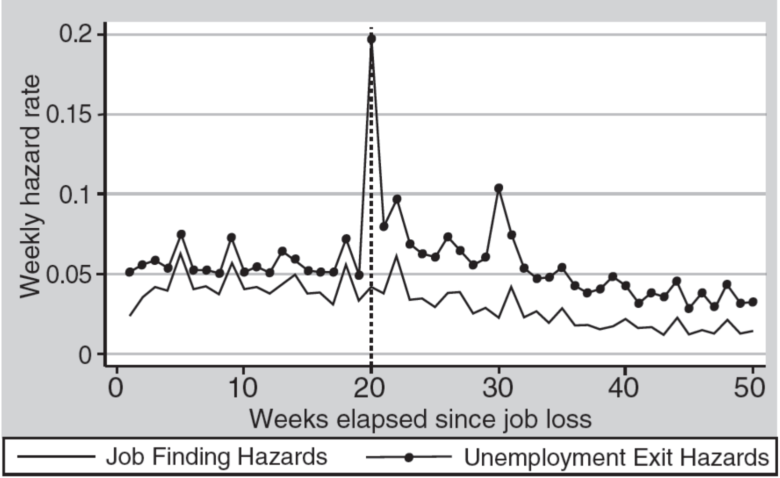
- Left-hand side:
  Benefit of transferring 1€ from high to low state.
- Right-hand side:
  Cost of transferring 1€ due to the behavioral response.
- Both side of the expression can be estimated empirically.

Empirical evidence on behavioral responses

- Most striking evidence for distortionary effects of social insurance is the existence of a "spike" in hazard rate at benefits' exhaustion.
- Traditional measure of hazard: exiting the unemployment insurance system.
- Preferred measure based on theory: Finding a job.
- The two could differ if workers transit out of unemployment insurance but are still jobless.

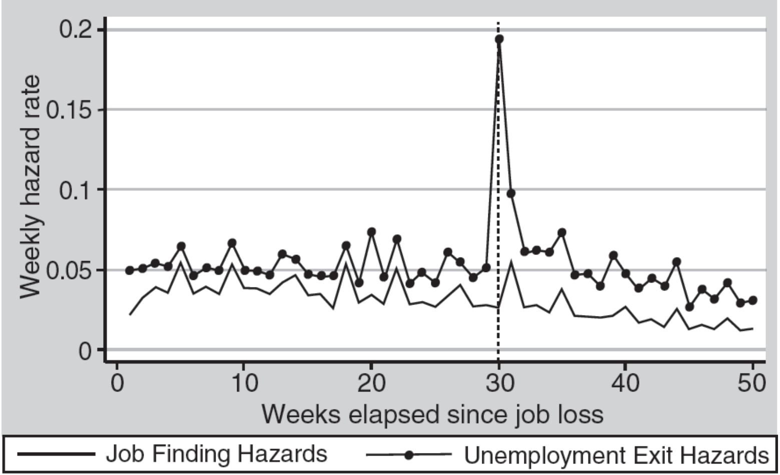
David Card & Raj Chetty & Andrea Weber, 2007. "The Spike at Benefit Exhaustion: Leaving the Unemployment System or Starting a New Job?," American Economic Review, American Economic Association, vol. 97(2), pages 113-118, May.

- Shed new light on this issue.



A. Job Finding versus Unemployment Exit Hazards: 20-Week UI

Source: Card, Chetty and Weber (2007)



B. Job Finding versus Unemployment Exit Hazards: 30-Week UI

Source: Card, Chetty and Weber (2007)

Other aspects of unemployment insurance

At least two other important features of unemployment insurance not covered here:

- Behavioral responses by firms;
- General equilibrium effects (for example, workers' insurance may favor the provision of more risky jobs).

Workers' compensation

- Insurance against injury at work.
- Covers both lost wages and medical benefits.
- Rationales for public intervention:
  - Market may fail due to adverse selection;
  - Workers may be unaware of risks on the job.
- Theoretical analysis is very similar to the unemployment insurance theory.
- So, this literature is mostly empirical.

Impact on workers' behavior

- The existence of workers' compensation may consciously or unconsciously relax worker's attention and increase the number of claims or the duration of injuries.
- It may also increase claims from non-work injuries.

Meyer, Bruce D & Viscusi, W Kip & Durbin, David L, 1995. "Workers' Compensation and Injury Duration: Evidence from a Natural Experiment," American Economic Review, American Economic Association, vol. 85(3), pages 322-40, June.

- Implement a difference in differences analysis to investigate the effect of workers' compensation on injury duration.
- Find pretty large effects on injuries' duration using reforms in Kentucky and Michigan.

- In Kentucky in 1980 and in Michigan in 1982, the maximum weekly benefit increased while the maximum replacement rate remained constant. This leads to an increase in effective replacement rate for high-income earners, but not for low-income earners.
- Identification:
  Compare the behavior of high-income earners before and after the reform, taking low-income earners as control group.

TABLE 1—REPLACEMENT RATES, EARNINGS, AND DEMOGRAPHIC CHARACTERISTICS DURING THE YEARS BEFORE AND AFTER BENEFIT INCREASES

	Kentucky			Michigan		
Variable	Before increase (1)	After increase (2)	Percentage change (3)	Before increase (4)	After increase (5)	Percentage change (6)
Maximum benefit ($)	131.00	217.00	65.65	181.00	307.00	69.61
Replacement rate, high earnings (percent)	32.70 (0.25)	51.02 (0.37)	56.02 (1.65)	30.01 (0.35)	44.15 (0.48)	47.14 (2.33)
Replacement rate, low earnings (percent)	66.42 (0.20)	66.66 (0.22)	0.36 (0.44)	66.64 (0.24)	66.35 (0.30)	−0.45 (0.58)

Source: Meyer, Viscusi and Durbin (1995)

TABLE 4—KENTUCKY AND MICHIGAN: DURATION AND MEDICAL COSTS OF TEMPORARY TOTAL DISABILITIES DURING THE YEARS BEFORE AND AFTER BENEFIT INCREASES

	High earnings		Low earnings		Differences		Difference in differences
Variable	Before increase (1)	After increase (2)	Before increase (3)	After increase (4)	[(2)−(1)] (5)	[(4)−(3)] (6)	[(5)−(6)] (7)
Median duration (weeks)							
Kentucky	4.00	5.00	3.00	3.00	1.00	0.00	1.00
	(0.14)	(0.20)	(0.11)	(0.12)	(0.25)	(0.16)	(0.29)
Michigan	5.00	7.00	4.00	4.00	2.00	0.00	2.00
	(0.45)	(0.67)	(0.22)	(0.28)	(0.81)	(0.35)	(0.89)
Median medical cost (dollars)							
Kentucky	393.51	411.49	238.96	254.40	17.98	15.44	2.55
	(19.29)	(22.72)	(8.48)	(9.11)	(29.80)	(12.44)	(32.30)
Michigan	689.73	765.00	390.63	435.00	75.27	44.38	30.89
	(77.30)	(134.53)	(32.80)	(33.09)	(155.16)	(46.59)	(162.00)

Source: Meyer, Viscusi and Durbin (1995)

Impact on firms' behavior

- The existence of workers' compensation may change incentives of firms to guarantee their employees' safety.
- Self-insured firms have stronger incentives to improve safety as they bear the full cost of injuries. They also have incentives to ensure that workers return to work quickly.

Krueger, Alan B., 1990. "Incentive effects of workers' compensation insurance," Journal of Public Economics, Elsevier, vol. 41(1), pages 73-99, February.

- Compares the behavior of self-insured firms with others.
- Self-insured firms have 10% shorter durations (but these firms may be very different from others).

Effect on equilibrium wage

- Workers compensation is a mandated benefit: When firms hire, they adjust wage offered to workers downwards because they realize they must finally pay the benefit.
- If workers value benefits at cost, they bear the full incidence.
- If they do not value it, same effect and dead-weight loss as a tax.
- Empirical evidence:
  - $85-100\%$ of workers' compensation cost is shifted to workers. No significant employment effect.
  - Suggest that benefits are valued close to cost.

Theory of disability insurance

- Disability insurance insure against long-term shocks that affect individuals at home or at work.
- Eligible individuals are those who are unable to "engage in substantial gainful activity" because of physical or mental impairment over a certain period of time (typically, more than one year).
- Theoretical analysis similar to the one of unemployment insurance, but adding screening and waiting periods.
- Screening and waiting are less relevant for unemployment because it is easier to identify who has a job and who does not.

Diamond, Peter & Sheshinski, Eytan, 1995. "Economic aspects of optimal disability benefits," Journal of Public Economics, Elsevier, vol. 57(1), pages 1-23, May.

- Model with screening that allows to characterize the properties of optimal disability insurance.
- Assume that individuals have different disutilities of working ϕ_i.
- To maximize social welfare, it is not desirable for those with high ϕ to work. In first best situation, those who work are such that:

$$\text{Marginal production } > \phi_i.$$

- But the government can only observe ϕ imperfectly and will set a higher threshold for disability.
- Main result:
  Disability benefit will be lower if screening mechanism has a large noise to signal ratio, i.e. if screening is difficult.

Some empirics around disability insurance

Classics questions about:

- Moral hazard;
- Behavioral responses.

Jonathan Gruber, 2000. "Disability Insurance Benefits and Labor Supply," Journal of Political Economy, University of Chicago Press, vol. 108(6), pages 1162-1183, December.

- Estimates the effect of disability insurance benefits on labor supply.
- In 1987, there has been a 36% increase in disability benefits in all Canadian provinces but Quebec.
- Identification strategy:
  Compare labor supply before and after the reform in all Canadian provinces but Quebec, using Quebec as control group.
- Effect is estimated using a difference in differences for men aged $45 - 59$.

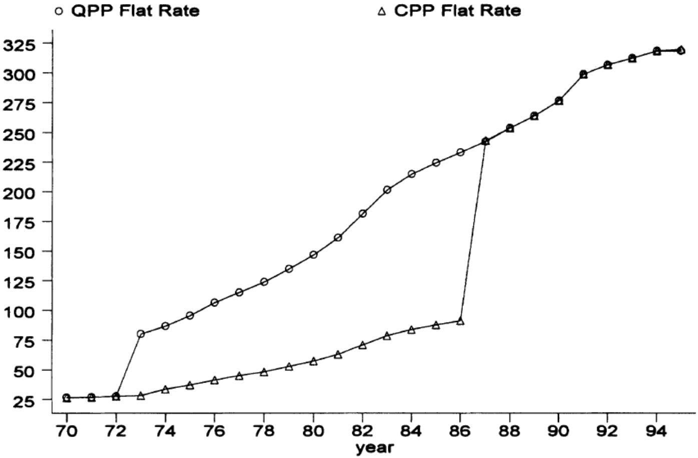


FIG. 1.—Flat-rate portion in Quebec and the rest of Canada

Source: Gruber (2000)

TABLE 1
MEANS

	CPP		QPP		DIFERENCE IN DIFFERENCE
	Before (1)	After (2)	Before (3)	After (4)	(5)
Benefits	5,134	7,776	6,878	7,852	1,668 (17)
Replacement rate	.245	.328	.336	.331	.088 (.003)
Not employed last week	.200	.217	.256	.246	.027 (.013)

Source: Gruber (2000)

- Health expenditure is around $15 - 20\%$ of GDP in developped countries.
- Constant growth:
  - Fundamentals of supply and demand;
  - Price distortions;
  - Regulatory distortions.

Growing health expenditure

Fundamentals of supply and demand.

- Demand side: Income effect
  - As you get richer, you want to live longer, not to consume more goods because marginal utility of consumption declines.
  - More sushi dinners, not more sushi per dinner.
- Supply side: Expensive technological progress
  - New technology are most of the time less invasive but more expansive (e.g. surgery methods).
  - Technological progress in health industry is most of the time made of more expansive methods. This is radically different from "classic" technological progress in other industries.

Price distortions.

- Demand side:
  Public subsidies for healthcare and health insurance programs lower effective prices faced by individuals and lead to over-consumption.
- Supply side:
  Fee-for-service payment schemes (payment of physicians for additional tasks) lead to overproduction.

Regulatory distortions.

- Supply of healthcare:
  Fear of lawsuits may lead to higher prices and excess supply by physicians (not so much relevant for the French case).
- Supply of physicians:
  Restrictions on the number of physicians through medical school seats or licensing lead to a lower supply of physicians with higher wages and higher input costs.

Market failures and government interventions

- Externalities:
  Tax alcohol or cigarettes.
- Consumers' myopia:
  Tax subsidies for health insurance or publicly provided health insurance.
- Consumers' lack of information (suppliers have to choose the level of consumption):
  Public provision of healthcare, or regulation of private provision by licensed physicians and a legal system.
- Heterogeneity of risk types leading to adverse selection on insurance market.
- Equity concerns: Health inequality may directly enter the social welfare function.
- Solutions to many of these points call for publicly provided health insurance or healthcare.

Measuring health

- Before discussing optimal insurance, it is useful to define a measure of health consumption.
- Higher medical expenditure is not equivalent to more "health".
- Starting point is mortality.
- Need a monetary measure that measures the value of life.
- Literature estimates this using many methods:
    - Contingent valuation;
    - Wage premium for risky jobs;
    - Price of smoke detectors.
- Commonly used figure: around $\$100,000$ per year of healthy life.
- There are also other methods to "measure" health.

Viscusi, W Kip & Aldy, Joseph E, 2003. "The Value of a Statistical Life: A Critical Review of Market Estimates throughout the World," Journal of Risk and Uncertainty, Springer, vol. 27(1), pages 5-76, August.

Optimal public intervention in health insurance

- What is the optimal design of government health insurance policies?
- Differences relative to other social insurance programs:
  - Importance of provider side incentives;
  - Interaction between private and public insurance (crowding-out).
- Start with a pure demand side model and then consider a supply side model.

Demand for medical care

- Price of medical care is 1, total wealth of consumer is y.
- Let s be disease severity (distributed following $f(s)$) and m be the amount of medical care purchased.
- $c(m)$ is patient's co-payment and π is the insurance premium.
- $H(s, m)$ is health as a function of s and m, with H concave in m.
- $u(y - \pi - c(m), H)$ is the utility function over non-medical consumption and health. Assume that marginal utility of non-medical consumption is independent of health state.

- The representative individual takes π as given and chooses m in order to maximize its expected utility:

$$\int \{u\left[y-\pi-c(m(s)), H(s,m(s))\right]\} f(s)ds.$$

- At an interior solution, the individual will act such that:

$$\forall s,\ H_m(m) = c'(m)\frac{u_x}{u_h},$$

where U_x is the marginal utility of non-medical consumption.

- Insurer sets premium to cover expected costs, that is:

$$\pi = \int \{m(s) - c\left(m(s)\right)\} f(s)ds.$$

First best solution

- In first best situation, individuals internalize costs imposed on insurer. So, they choose m knowing that $c'(m) = 1$ and we get:
$$H_m(m) = \frac{u_x}{u_h}.$$
- In such a situation, optimal co-payment is zero in all states.

- In practice, individual only internalize the co-payment.
- They consume more medical care because $c'(m) < 1$ and H is concave.
- The resulting welfare loss from second best insurance is analogous to that caused by overconsumption of a good because of a subsidy.
- Optimal co-payment can be determined using tools analogous to that in optimal unemployment insurance model.
- Once again, there is a trade-off between risk and moral hazard.
- All in all, the academic literature suggests that the optimal health insurance should allow for lower co-payment as shocks become large.

Supply of medical care

- The previous analysis implicitly assumed a passive physician.
- In practice, physicians have more information and are more likely than the patient to choose m (in reality, both play a role).
- When physicians choose m, physician compensation scheme determines the efficiency of m.
- High co-payments for patients may not solve the problem.

Ellis, Randall P. & McGuire, Thomas G., 1986. "Provider behavior under prospective reimbursement : Cost sharing and supply," Journal of Health Economics, Elsevier, vol. 5(2), pages 129-151, June.

- Analyze optimal physicians' payment system.
- The payment for physician services is

$$P = \alpha + \beta c,$$

where α is a fixed payment for practice and β is a payment for proportional costs.

Compensation schemes

- Various methods of payment are available:
  - Fee-for-service: $\alpha = 0$ and $\beta > 1$.
    No fixed payment, but the insurance company pays full cost of all visits and a “bonus”.
  - Salary: $\alpha > 0$ and $\beta = 1$.
    Practice costs paid for as well as marginal costs of treatment.
  - Capitation: $\alpha > 0$ and $\beta = 0$.
    Varying by type and number of patient, but not by services.
- General trend has been toward higher α and lower β.
- Lower β provides incentives for doctors to provide less services, but they may provide too little. This may endanger the quality of care.

Optimal payment scheme

- Physician's utility function:

$$u = \theta\pi + (1-\theta)q,$$

  where π is (monetary) profit and q is the quality of the care (benefit to the patient).
- With any payment scheme (α, β), physician's profit can be written as:

$$\pi = \alpha + \beta c(q) - c(q).$$

- Doctors choose q in order to maximize:

$$\theta\left[\alpha + \beta c(q) - c(q)\right] + (1-\theta)q.$$

- The first order condition implies:

$$c'(q^d) = \frac{1-\theta}{\theta(1-\beta)},$$

where q^d is the level chosen by doctors.

- Society's problem is to maximize the quality of care net of costs, i.e. to choose q in order to maximize:

$$q - c(q).$$

- The socially optimal quality is q^* such that:

$$c'(q^*) = 1.$$

- In order to get the doctor to choose the socially optimal quality, we need to set β such that $q^d = q^*$. That is:

$$1 = c'(q^*) = c'(q^d) = \frac{1-\theta}{\theta(1-\beta)}.$$

- We get:

$$\beta^* = 2 - \frac{1}{\theta}.$$

- Optimal degree of incentive pay is increasing in θ:
If doctor is selfish (high θ), reimburse him for costs of provision so that he does not under-provide service to patients. But if he is benevolent (altruistic), reduce the amount he gets paid for provision as he will naturally get benefits from taking care of patient and would over-provide if he is paid for it too.

Limitation and other aspects

- The previous analysis is static (without incentives to innovate) and assume risk-neutral doctors.
- The formula for β^* is not empirically implementable.
- In practice, both private and public health insurance coexist in most developed countries (crowding-out effects).

End of lecture.

Lectures of this course are inspired from those taught by R. Chetty, G. Fields, N. Gravel, H. Hoynes, and E. Saez.