PRINCIPLES OF HEALTH ECONOMICS
for non-economists

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MOVE Markets, Organizations and Votes in Economics
UAB Universitat Autònoma de Barcelona
CODE
Center for the study of Organizations and Decisions in Economics

HEALTH ECONOMICS

1. **Economics and Health Economics**
   - 1.1 What is economics about?
   - 1.2 What is health economics? Elements of HE; Organization, actors of the health care market; Structure of a health care system
2. **The agents of the economy**
   - 2.1 Demand: consumers, patients, elasticity
   - 2.2 Supply: firms, hospitals physicians; Efficiency, Efficacy, Effectiveness, Equity, Opportunity cost
   - 2.3 Insurers
3. **The market and the health care market**
   - 3.1 Why is the health care market different?
   - 3.2 Perfectly competitive markets
4. **Regulation**
   - 4.1 The public sector
   - 4.2 Mechanisms of regulation
   - 4.3 Reasons for regulation
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5. **Public goods**
6. **Nonprofit organizations**
   - 6.1 Why do nonprofit enterprises exist?
   - 6.2 Modeling a nonprofit hospital
7. **A health policy exercise**

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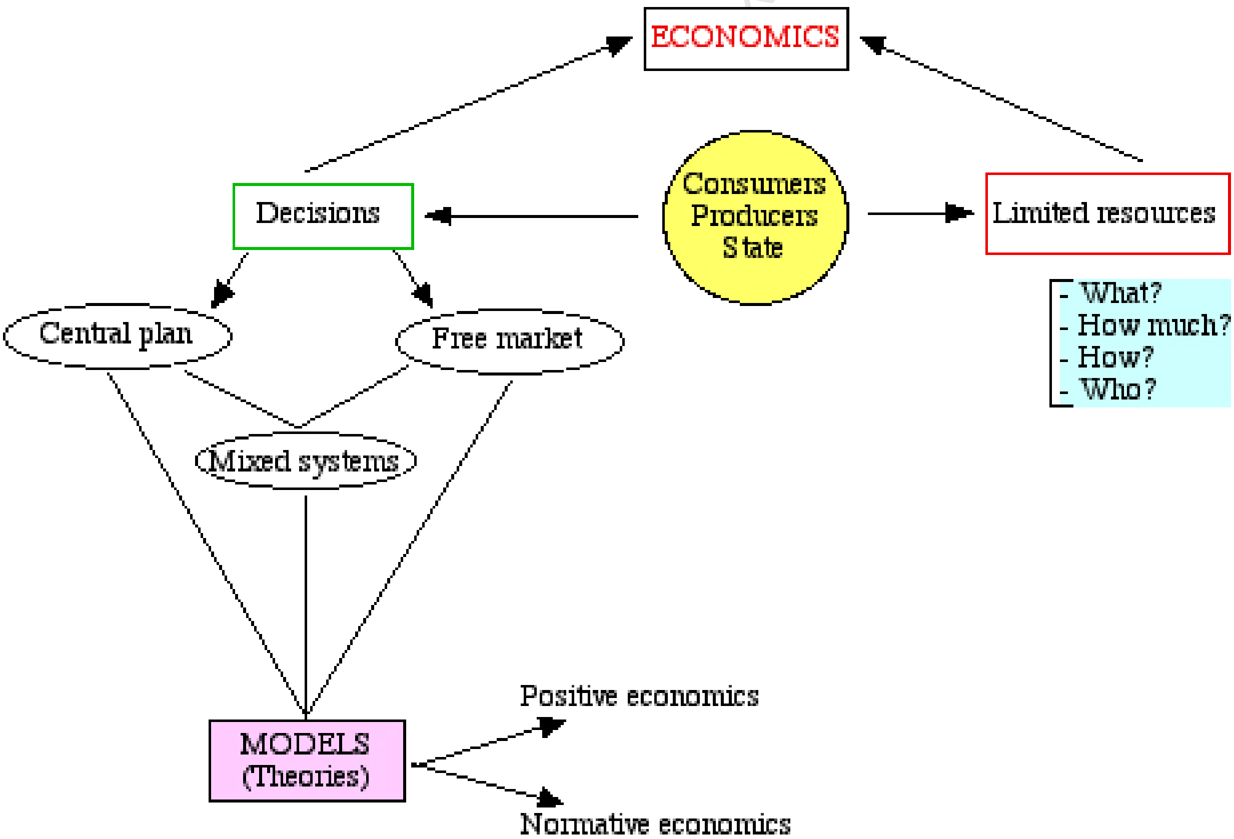
HEALTH ECONOMICS

1. Economics and Health Economics

Economics. What is this?



Economics: Study of the way in which economic agents take their decisions regarding the use (allocation) of *scarce* resources.

Economic agents: Decision makers in the economy. Individuals, households, enterprises (for profit, non-profit; production, distribution), State.

Decisions:

- what to produce/consume?

- how much to produce/consume?

- How to produce/consume?

- Who produces/consumes?

Answers to these questions depend on the organization of the economy: central plan, free market, mixed systems.

Reality too complex. Study of an economy by means of models (theories): set of assumptions providing a simplified representation of reality capturing the fundamental relationships among economic agents [$\rightarrow$ road map vs. road network].

Two (complementary) uses of models:

- description of decision making process $\rightarrow$ positive economics

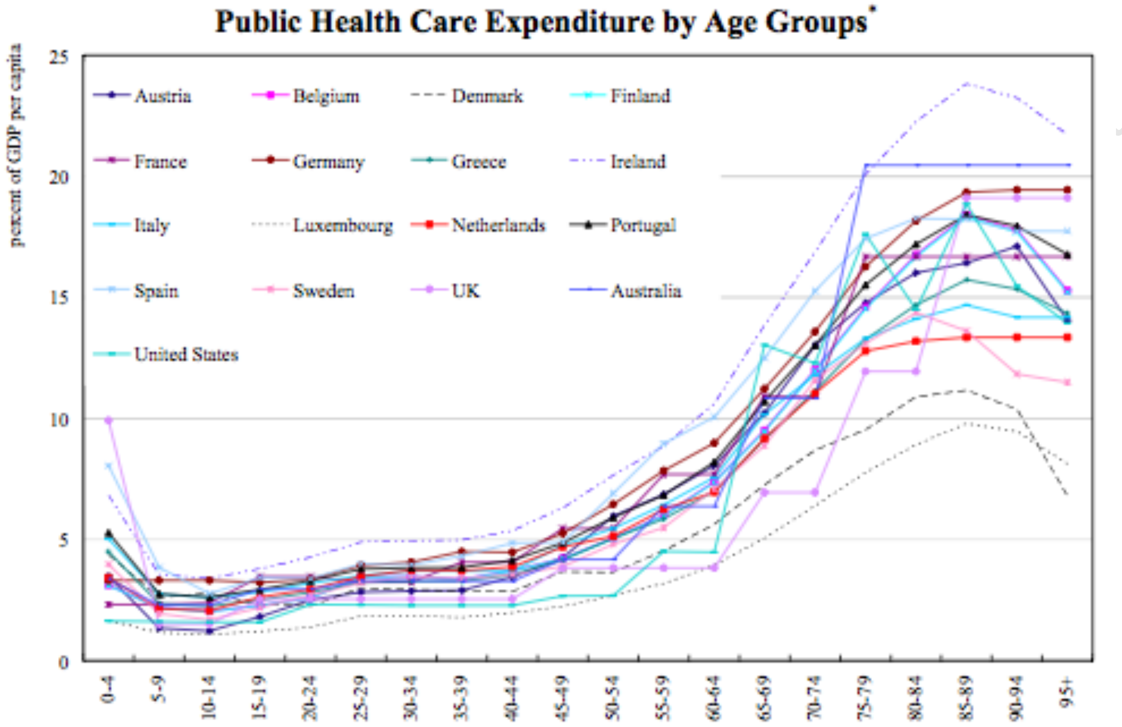
- policy design (control and improvement of decision making) $\rightarrow$ normative economics

Scarcity: wants vs. limited resources

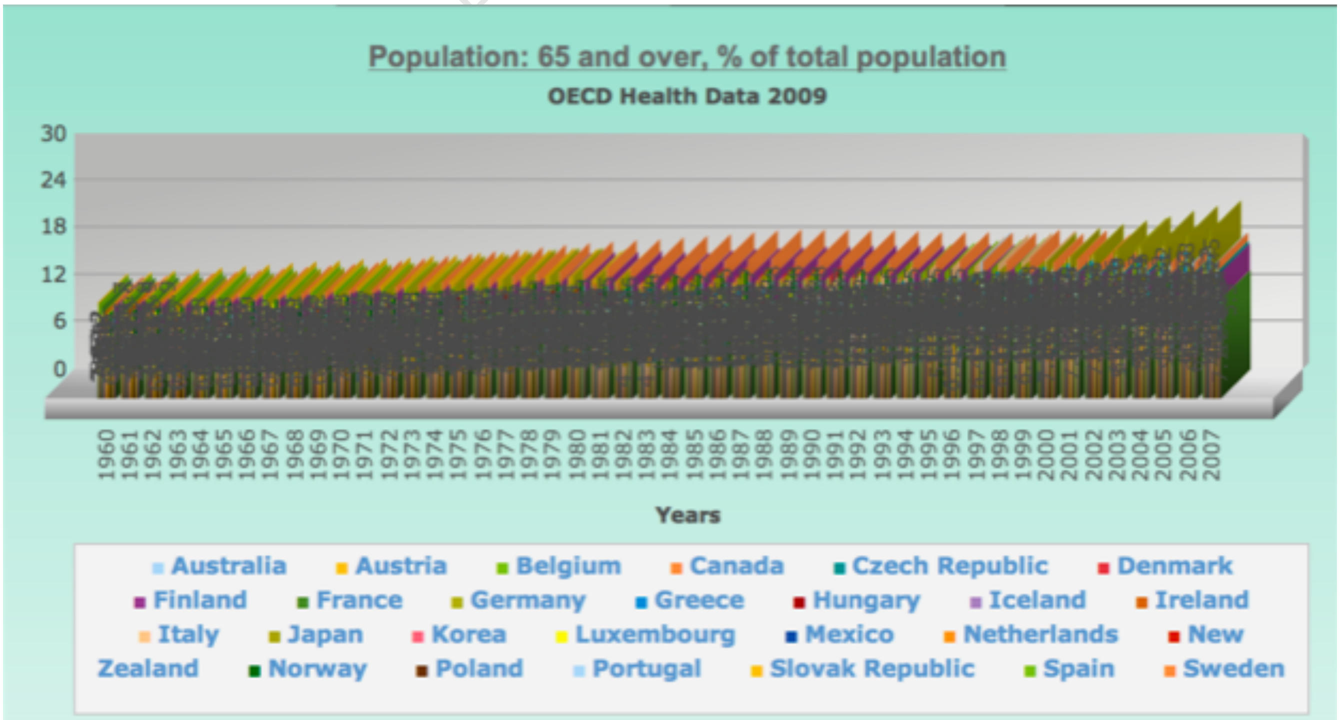
★ Why do people demand (want) health care?

(i) Healthy status $\rightarrow$ $\triangle$ income $\rightarrow$ $\triangle$ leisure

(ii) Population aging.



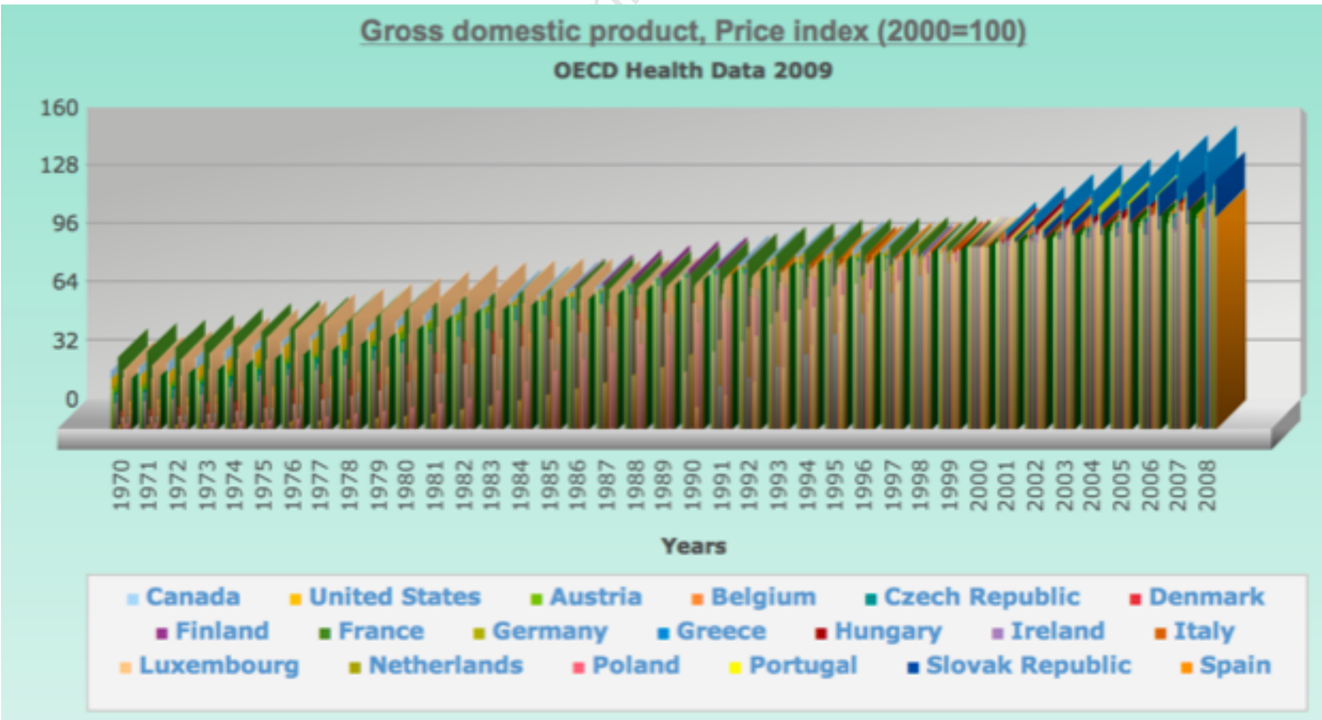
* Expenditure per capita in each age group divided GDP per capita.
Source: ENPRI-AGIR, national authorities and Secretariat calculations.



(iii) Increasing real income

- People with mild osteoarthritis of the knee often have an operation than give up golf.

- $\triangle$ income $\rightarrow$ $\triangle$ people's expectations of health care: less prepared to put up pain, discomfort, lack of mobility, ...



(iv) Improvement in medical technology:

- Technology increases range of possible treatments.

- Newer technology, more expensive

e.g. kidney dialysis $\rightarrow$ prevent people dying from kidney failure $\Rightarrow$ machine is expensive, there are more patients (population aging) and they are treated longer (extended life expectancy).

Reading:

Cutler, D., E. Glaeser, and A. Rosen, 2007, Is the U.S. Population Behaving Healthier?, NBER Working Paper No. 13013

[http://www.nber.org/papers/w13013]

Is the U.S. Population Behaving Healthier?

" Reduced smoking, better control of medical risk factors such as hypertension and cholesterol, and better education among the older population have been more important for mortality than the substantial increase in obesity."

Knowing whether health behaviors are improving over time is important in forecasting medical costs. And, a population that behaves in a healthier way will have a higher quality of life than one with a more adverse behavioral profile, even given length of life. In **Is the U.S. Population Behaving Healthier?** (NBER Working Paper No. 13013), authors **David Cutler**, **Edward Glaeser**, and **Allison Rosen** consider what has happened to the population's health behaviors over time and what the future may hold.

They find that the impact on longevity of trends in health behavior has not been uniform across different behaviors over the past three decades. For example, while fewer people smoke than used to, more people are obese. Examining these factors as a whole, the authors find significant improvement in the health-risk profile of the U.S. population between the early 1970s and the early 2000s. Reduced smoking, better control of medical risk factors such as hypertension and cholesterol, and better education among the older population have been more important for mortality than the substantial increase in obesity.

The results suggest substantial caution about the future, though. Where reductions in smoking can be expected to have a continued impact on improved health, future changes in obesity might more than overwhelm this trend. Two-thirds of the U.S. population is now overweight or obese. As a result, continued increases in weight from current levels will have a bigger impact on health than did increases in weight from lower levels of Body Mass Index (BMI).

A large part of the impact of BMI is moderated through its effect on hypertension and high cholesterol. Given that not everyone with these conditions takes medications, or is controlled by the medication they do take, the resulting impact of rising weight on health can be significant. The optimistic side of this picture, however, is the potential for better control of obesity. If the effectiveness of risk-factor control can be increased, through more people taking medication and those taking it using it more regularly, much of the impact of obesity on mortality risk can be blunted, according to the authors.

Understanding how to improve utilization of and adherence to recommended medications are key issues in health outcomes. The research to date has focused on two possible avenues. The first is performance-based payment: physicians are now paid for office visits, but not for ensuring follow-up with their recommendations. The idea behind pay-for-performance systems is to reward physicians (or insurance companies) for successful efforts to increase utilization and possibly adherence. Such efforts might involve having nurse outreach, automatic medication refills, or more convenient office hours to monitor side effects.

The second strategy involves use of information technology. Patients can receive electronic reminders about medication goals, information such as blood pressure can be transmitted and monitored electronically, and automated decision tools can help with dosing and medication switches. Whether these or other strategies offer the greatest promise of improved adherence is uncertain. The authors' results suggest that evaluating these strategies in practice is a high research priority.

The authors use as their primary data source the National Health and Nutrition Examination Survey (NHANES). In the United States, it is the leading survey and includes both physical examination and laboratory measurements. The authors use two NHANES surveys, the first from 1971-5 (NHANES I) and the second from 1999-2002 (NHANES IV). Their analysis begins with NHANES I because it is the first population health survey that asked about smoking status, a key variable in health risk.

-- Les Picker

★ Resources: inputs, factors of production.
- land (physical resources of the planet)
- labor (human resources)
- capital (resources created by human to aid in production: tools, machinery, factories, ...)

enterprise: organization of resources to produce goods and services.

★ Main concepts related with scarcity:

Efficiency

Opportunity cost

Production Possibility Frontier

What is Health Economics?

Allocation of resources within the health system in the economy, as well as the functioning of the health care markets.

health system: set of interrelated elements (environment, education, labor conditions, etc) having as objective the transformation of some sanitary resources (inputs) into a health status (final output) through the production of health care services (intermediate output).

Health vs. Health care:
Health is lack of illness $\rightarrow$ illness: restrictions imposed on the development of daily activities $\Rightarrow$ value in use but no value in exchange.
Health care: provision of services to improve health status of individuals $\Rightarrow$ intermediate output. Can be traded.

healthcare market: interaction between providers and consumers of health care services (and insurers).

Organization of HC market $\rightarrow$ crucial element of analysis of HC system.

Readings:

Rout, H.S., and P.K. Panda, 2007, Health and Health Economics: A conceptual framework, in *Health Economics in India*, edited by H.S. Rout, and P.K. Panda, New Century Publications, New Delhi: 13-29.

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[http://ideas.repec.org/p/col/000179/004687.html]

Health economics

- Descriptive studies: long tradition

- Analytic studies: (relatively) recent. Stimulated by
  - (EU) Maastricht: $\triangle$ difficulties finance universal public health systems
  - (US) Efforts extend coverage beyond *Medicaid* and *Medicare* - Clinton+Obama administration

$$\Downarrow$$

Restructure health care systems via
- stimulating competition
- incentives: principals, agents, payment systems, insurance, risk, etc.

Taking into account the characterisitics of the health care system. (see p. 2n)

Consequences

Health economics as separate discipline from Industrial economics:

- scientific journals

- huge volume of resources

Why has Health Economics developed into a discipline itself?

Size and differential characteristics of health care sector in the economy.

Size

OECD Health Data:

(a) Health expenditure

(b) Pharma expenditure

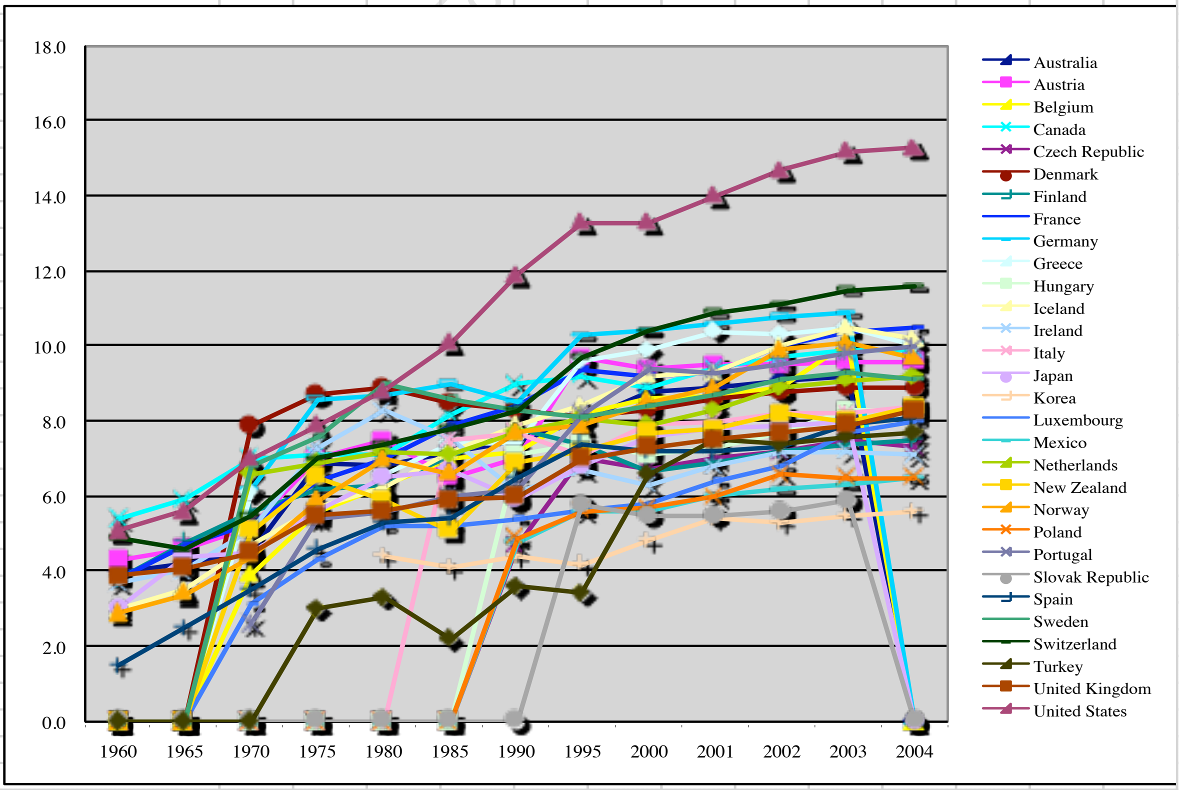
(c) Health financing

(d) Population

Total expenditure on health - % of gross domestic product

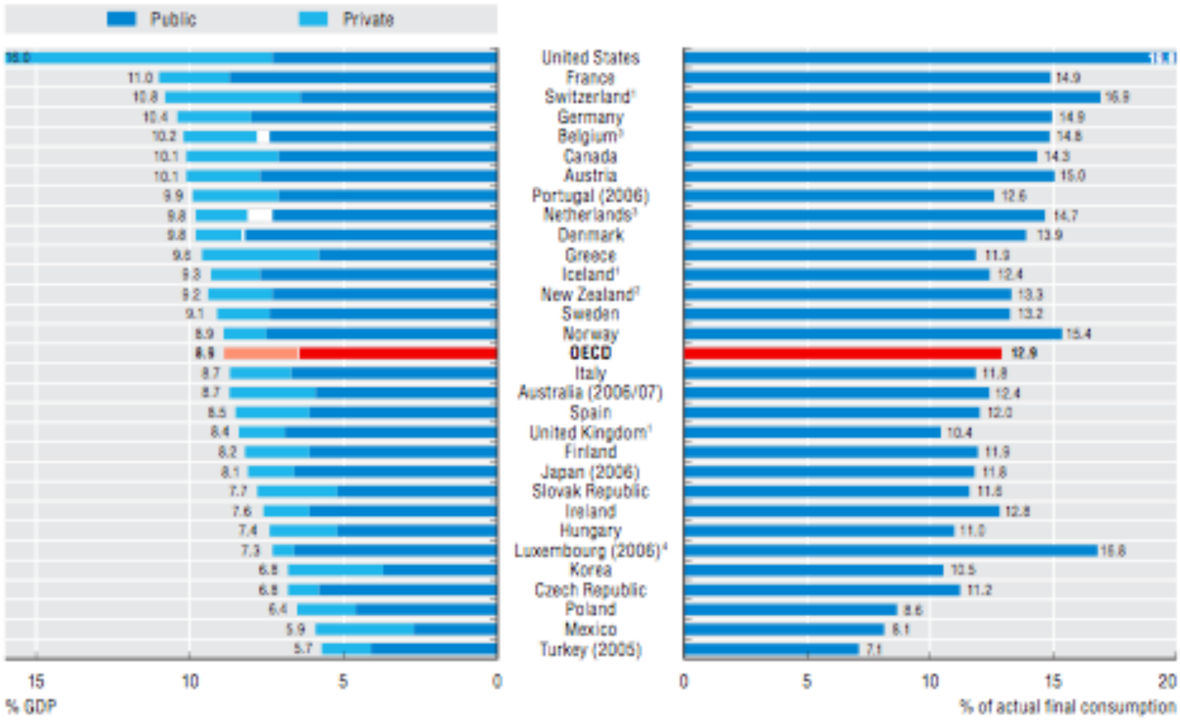
	1960	1965	1970	1975	1980	1985	1990	1995	2000	2001	2002	2003	2004
Australia	4.0	4.2	4.5	6.9	6.8	7.2	7.5	8.0	8.8	8.9	9.1	9.2	..
Austria	4.3	4.6	5.2	7.0	7.5	6.5	7.0	9.7	9.4	9.5	9.5	9.6	9.6
Belgium	..	..	3.9	5.6	6.3	7.0	7.2	8.2	8.6	8.7	8.9	10.1	..
Canada	5.4	5.9	7.0	7.1	7.1	8.2	9.0	9.2	8.9	9.4	9.7	9.9	9.9
Czech Republic	..	..	..	..	..	..	4.7	7.0	6.7	7.0	7.2	7.5	7.3
Denmark	..	..	7.9	8.7	8.9	8.5	8.3	8.1	8.3	8.6	8.8	8.9	8.9
Finland	3.8	4.8	5.6	6.2	6.3	7.1	7.8	7.4	6.7	6.9	7.2	7.4	7.5
France	3.8	4.7	5.3	6.4	7.0	7.9	8.4	9.4	9.2	9.3	10.0	10.4	10.5
Germany	..	..	6.2	8.6	8.7	9.0	8.5	10.3	10.4	10.6	10.8	10.9	..
Greece	..	..	6.1		6.6	7.4	7.4	9.6	9.9	10.4	10.3	10.5	10.0
Hungary	..	..	..	..	..	..	7.1	7.4	7.1	7.3	7.7	8.3	8.3
Iceland	3.0	3.5	4.7	5.7	6.2	7.2	7.9	8.4	9.2	9.3	10.0	10.5	10.2
Ireland	3.7	4.0	5.1	7.3	8.3	7.5	6.1	6.7	6.3	6.8	7.2	7.2	7.1
Italy	..	..	..	..	..	7.5	7.7	7.1	7.9	8.0	8.2	8.2	8.4
Japan	3.0	4.4	4.5	5.6	6.5	6.7	5.9	6.8	7.6	7.8	7.9	8.0	..
Korea	..	..			4.4	4.1	4.4	4.2	4.8	5.4	5.3	5.5	5.6
Luxembourg	..	..	3.1	4.3	5.2	5.2	5.4	5.6	5.8	6.4	6.8	7.7	8.0
Mexico	..	..	..	..	..	..	4.8	5.6	5.6	6.0	6.2	6.3	6.5
Netherlands	..	..	6.6	6.9	7.2	7.1	7.7	8.1	7.9	8.3	8.9	9.1	9.2
New Zealand	..	..	5.1	6.5	5.9	5.1	6.9	7.2	7.7	7.8	8.2	8.0	8.4
Norway	2.9	3.4	4.4	5.9	7.0	6.6	7.7	7.9	8.5	8.9	9.9	10.1	9.7
Poland	..	..	..	..	..	..	4.9	5.6	5.7	6.0	6.6	6.5	6.5
Portugal			2.6	5.4	5.6	6.0	6.2	8.2	9.4	9.3	9.5	9.8	10.0
Slovak Republic	..	..	..	..	..	..	..	5.8	5.5	5.5	5.6	5.9	..
Spain	1.5	2.5	3.5	4.6	5.3	5.4	6.5	7.4	7.2	7.2	7.3	7.9	8.1
Sweden	..	..	6.8	7.6	9.0	8.6	8.3	8.1	8.4	8.7	9.1	9.3	9.1
Switzerland	4.9	4.6	5.5	7.0	7.4	7.8	8.3	9.7	10.4	10.9	11.1	11.5	11.6
Turkey	..	..	..	3.0	3.3	2.2	3.6	3.4	6.6	7.5	7.4	7.6	7.7
United Kingdom	3.9	4.1	4.5	5.5	5.6	5.9	6.0	7.0	7.3	7.5	7.7	7.9	8.3
United States	5.1	5.6	7.0	7.9	8.8	10.1	11.9	13.3	13.3	14.0	14.7	15.2	15.3

Source: OECD HEALTH DATA 2006



7.2.1 Total health expenditure as a share of GDP, 2007

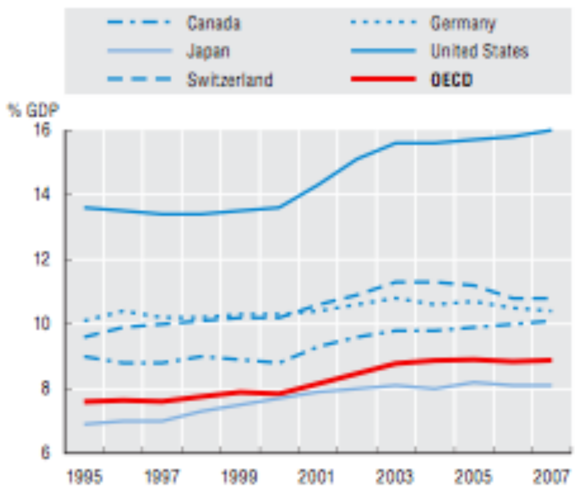
7.2.2 Current health expenditure as a share of household consumption, 2007



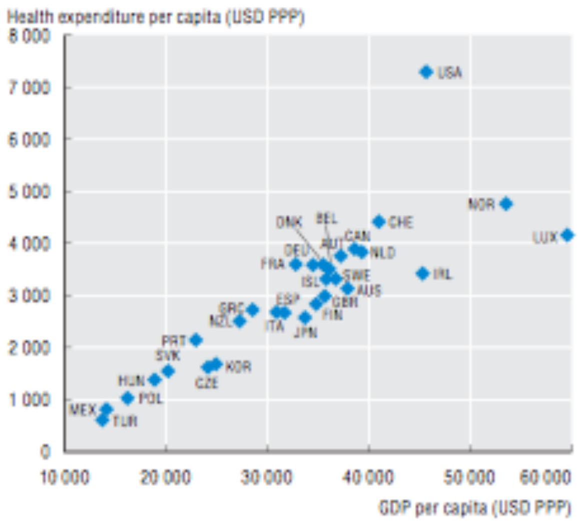
1. Total expenditure on health in both figures. 2. Current expenditure on health in both figures. 3. Public and private expenditures are current expenditures (excluding investments). 4. Health expenditure is for the insured population rather than resident population.

7.2.3 Total health expenditure as a share of GDP, 1995-2007

Selected OECD countries



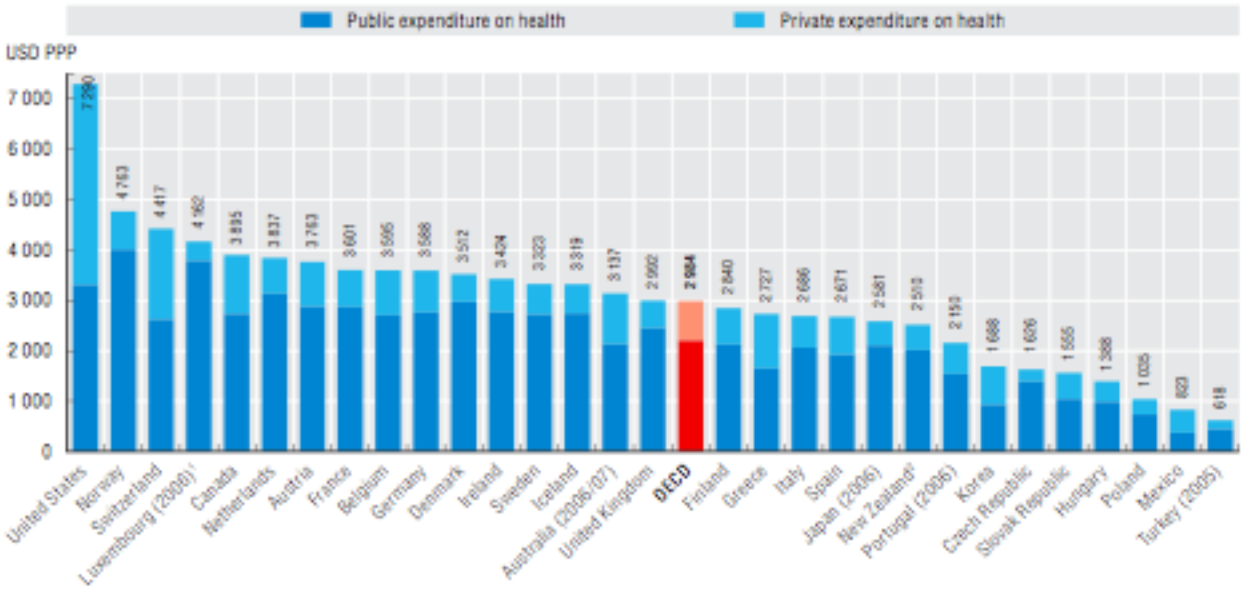
7.2.4 Total health expenditure per capita and GDP per capita, 2007



Source: OECD Health Data 2009.

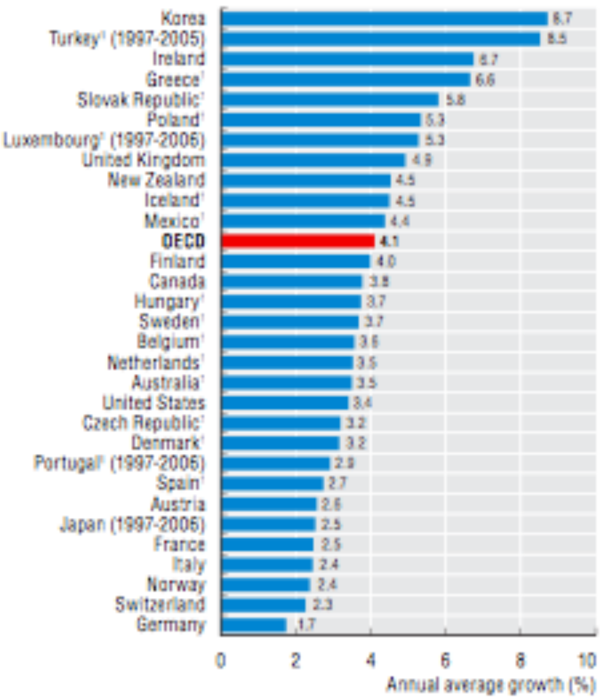
StatLink http://dx.doi.org/10.1787/720325225770

7.1.1 Total health expenditure per capita, public and private, 2007



1. Health expenditure is for the insured population rather than resident population. 2. Current health expenditure.

7.1.2 Annual average real growth in per capita health expenditure, 1997-2007



7.1.3 Annual average real growth in per capita health expenditure and GDP, 1997-2007

1. Growth rates adjusted. See box "Definition and deviations".

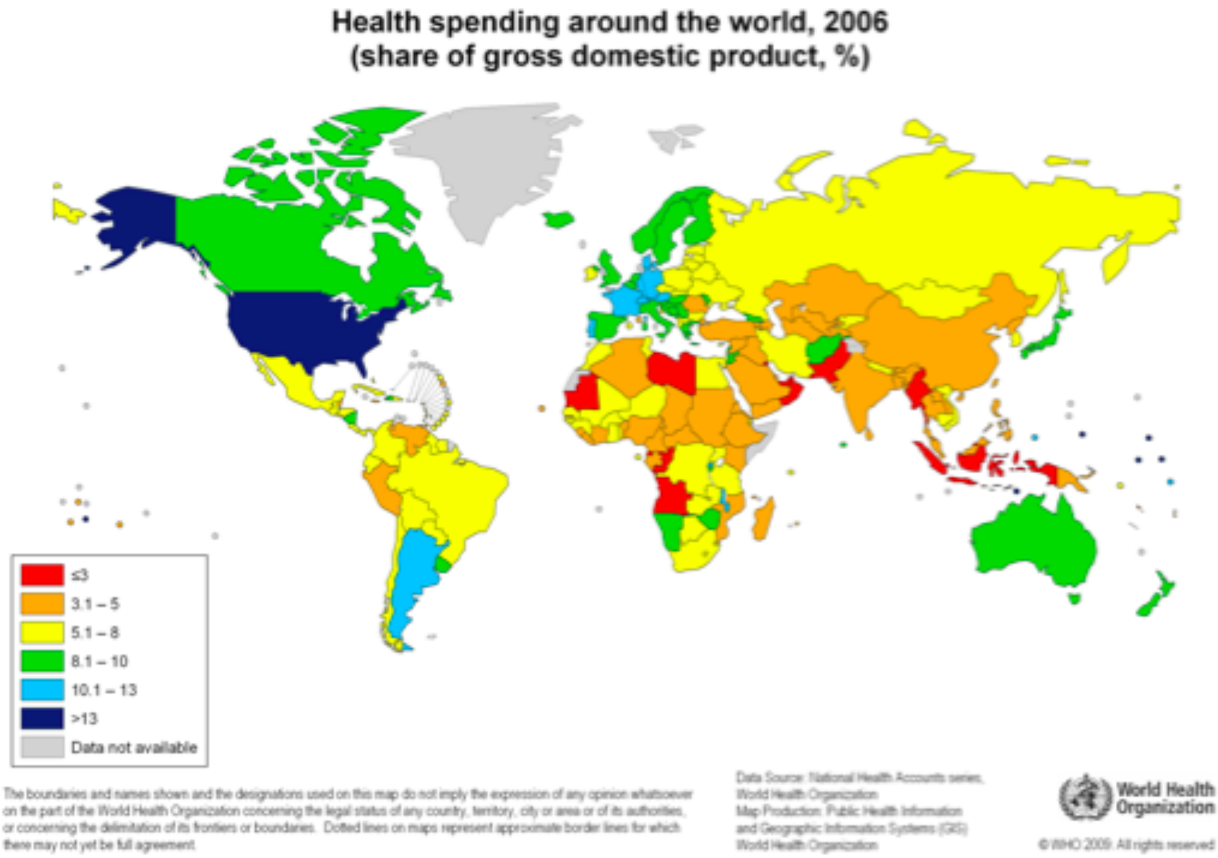
Source: OECD Health Data 2009.

StatLink http://dx.doi.org/10.1787/720324283737

HEALTH: SPENDING AND RESOURCES

	Health spending and financing								
	Total expenditure as % of GDP		Public expenditure as % of total expenditure on health		Average growth rate	Health expenditure Per capita USD PPP		Pharmaceutical expenditure as % of total expenditure on health	
	2003	1993	2003	1993	1998-2003	2003	1993	2003	1993
Australia[1]	9.3 [a]	8.2	68 [a]	66	4.1 [d]	2 699 [a]	1 542	14 [e]	10
Austria	7.6 [a]	7.8	70 [a]	74	1.8 [d]	2 280 [a]	1 669	16 [a]	11 [h]
Belgium	9.6	8.1	..	..	4.2	2 827	1 601	17 [f]	17
Canada	9.9 [b]	9.9	70 [b]	73	4.2	3 003 [b]	2 014	17	13
Czech Republic	7.5	6.7	90	95	5.4	1 298	760	22	19
Denmark	9	8.8	83	83	2.8	2 763	1 763	9.8	8.5
Finland	7.4	8.3 [I]	77	76 [I]	4.1	2 118	1 430 [I]	16	12
France	10 [b]	9.4	76 [b]	77	3.5	2 903 [b]	1 878	21	18
Germany	11	9.9	78	80	1.8	2 996	1 988	15	13
Greece	9.9	8.8	51 [b]	55	4.9	2 011	1 077	16	17
Hungary	7.8 [a]	7.7	70 [a]	87	6 [I]	1 115 [a]	638	28 [a]	28
Iceland	11 [b]	8.4	84 [b]	83	5.9	3 115 [b]	1 745	15	12
Ireland	7.3 [a]	7	75 [a]	73	11 [I]	2 386 [a]	1 039	11 [a]	11
Italy	8.4	8	75	76	3.1	2 258	1 529	22	20
Japan	7.9 [a,b]	6.5	82 [a,b]	79	3 [I]	2 139 [a,b]	1 365	18 [a]	22
Korea	5.6	4.3	49	36	10	1 074	453	29	31
Luxembourg	6.1 [a]	6.2	85 [a]	93	5.3 [I]	3 190 [a]	1 891	12 [a]	12 [i]
Mexico	6.2	5.8	46	43	4	583	397	21	..
Netherlands	9.8	8.6	62	74	4.6	2 976	1 701	11	11
New Zealand	8.1	7.2	79	77	3.4	1 886	1 115	14 [f]	15
Norway	10 [b]	8	84 [b]	85	5.3	3 807 [b]	1 695	9.4 [a]	9.6
Poland	6 [a]	5.9	72 [a]	74	3 [I]	677 [a]	378	..	..
Portugal	9.6	7.3	70	63	3.7	1 797	881	23 [g]	26
Slovak Republic	5.9	..	88	..	4.1	777	..	39	..
Spain	7.7	7.5	71	77	2.6	1 835	1 089	22	19 [h]
Sweden	9.2 [a]	8.6 [I]	85 [a]	87 [I]	5.4 [I]	2 594 [a]	1 644 [I]	13 [a]	11
Switzerland	12 [b]	9.4	59 [b]	54	2.8	3 781 [b]	2 401	11	9.7
Turkey	6.6 [c]	3.7	63 [c]	66	..	452 [c]	200	25 [c]	32 [i]
United Kingdom	7.7 [a]	6.9	83 [a]	85	5.7 [I]	2 231 [a]	1 232	16 [f]	15
United States[2]	15	13	44	43	4.6	5 635	3 357	13	8.6

Source:: OECD Health Data 2005


Health spending around the world, 2006
(share of gross domestic product, %)
≤3
3.1 – 5
5.1 – 8
8.1 – 10
10.1 – 13
>13
Data not available
The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted lines on maps represent approximate border lines for which there may not yet be full agreement.
Data Source: National Health Accounts series, World Health Organization
Map Production: Public Health Information and Geographic Information Systems (GIS) World Health Organization
World Health Organization
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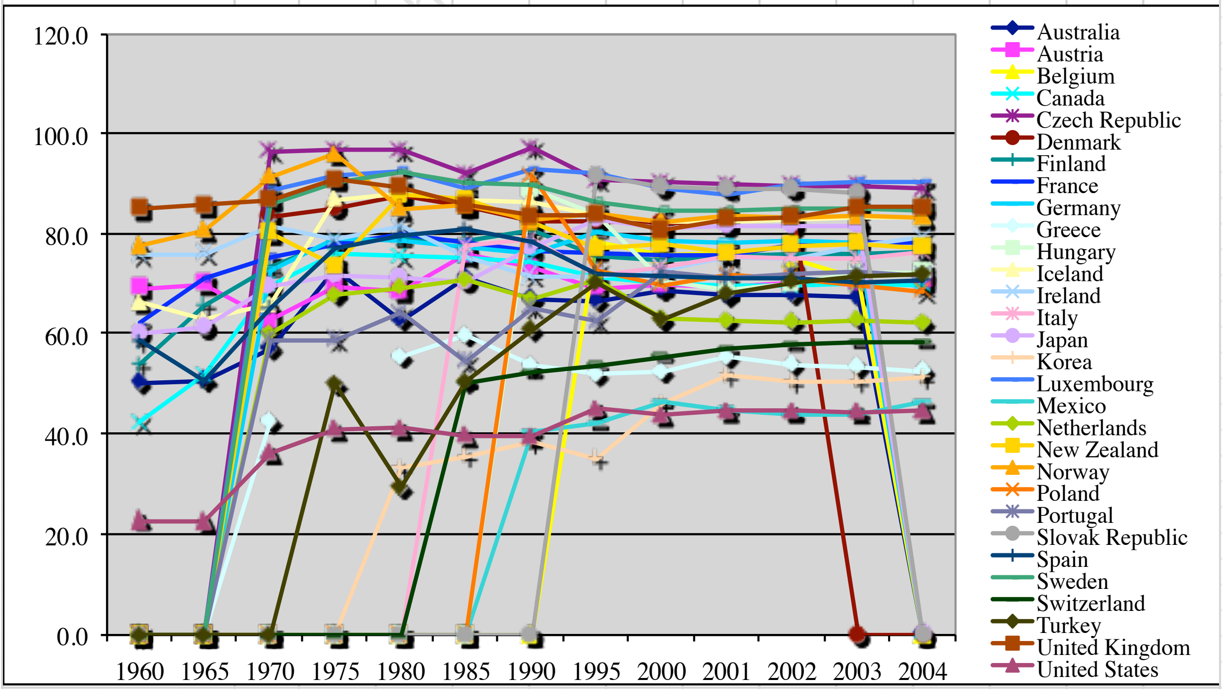
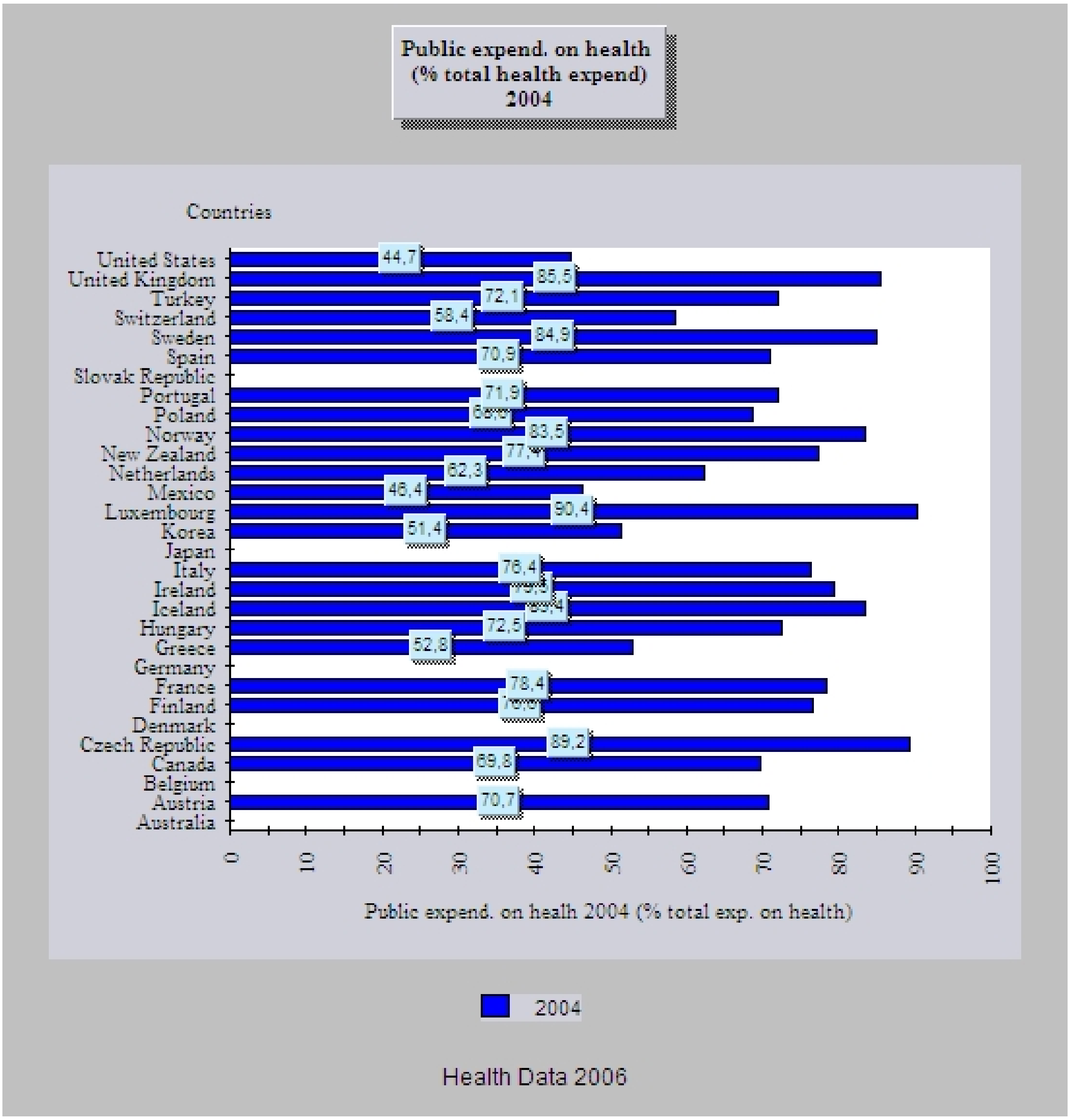
Public expenditure on health, % total expenditure on health

	1960	1965	1970	1975	1980	1985	1990	1995	2000	2001	2002	2003	2004
Australia	50.4	50.9	57.2	73.1	63.0	71.4	67.1	66.7	68.9	67.8	68.1	67.5	..
Austria	69.4	70.3	63.0	69.6	68.8	76.1	73.5	69.3	69.9	69.5	70.5	70.3	70.7
Belgium	..	..	..	..	..	..	..	78.5	75.8	76.4	75.0	71.1	..
Canada	42.6	51.9	69.9	76.2	75.6	75.5	74.5	71.4	70.3	69.9	69.6	70.1	69.8
Czech Republic	..	..	96.6	96.9	96.8	92.2	97.4	90.9	90.5	89.9	89.7	89.8	89.2
Denmark	..	..	83.7	85.4	87.8	85.6	82.7	82.5	82.4	82.7	82.9	..	..
Finland	54.1	66.0	73.8	78.6	79.0	78.6	80.9	75.6	75.1	75.9	76.1	76.2	76.6
France	62.4	71.2	75.5	78.0	80.1	78.5	76.6	76.3	75.8	75.9	78.1	78.3	78.4
Germany	..	..	72.8	79.0	78.7	77.4	76.2	80.5	78.6	78.4	78.6	78.2	..
Greece	..	..	42.6		55.6	59.9	53.7	52.0	52.6	55.5	54.1	53.6	52.8
Hungary	..	..	..	..	..	..	89.1	84.0	70.7	69.0	70.2	72.4	72.5
Iceland	66.7	63.1	66.2	87.1	88.2	87.0	86.6	83.9	82.6	82.7	83.2	83.5	83.4
Ireland	76.0	76.2	81.7	79.0	81.6	75.7	71.9	71.6	73.3	75.6	75.2	78.0	79.5
Italy	..	..	..	..	..	77.6	79.1	71.9	73.5	75.8	75.4	75.1	76.4
Japan	60.4	61.4	69.8	72.0	71.3	70.7	77.6	83.0	81.3	81.7	81.5	81.5	..
Korea	..	..	..	..	33.4	35.8	38.5	35.3	46.2	51.9	50.6	50.7	51.4
Luxembourg	..	..	88.9	91.8	92.8	89.2	93.1	92.4	89.3	87.9	90.3	90.6	90.4
Mexico	..	..	..	..	..	..	40.4	42.1	46.6	44.9	43.9	44.1	46.4
Netherlands	..	..	60.2	67.9	69.4	70.8	67.1	71.0	63.1	62.8	62.5	63.0	62.3
New Zealand	..	..	80.3	73.7	88.0	87.0	82.4	77.2	78.0	76.4	77.9	78.3	77.4
Norway	77.8	80.9	91.6	96.2	85.1	85.8	82.8	84.2	82.5	83.6	83.5	83.7	83.5
Poland	..	..	..	..	..	..	91.7	72.9	70.0	71.9	71.2	69.9	68.6
Portugal	..	..	59.0	58.9	64.3	54.6	65.5	62.6	72.5	71.5	72.2	72.6	71.9
Slovak Republic	..	..	..	..	..	..	..	91.7	89.4	89.3	89.1	88.3	..
Spain	58.7	50.8	65.4	77.4	79.9	81.1	78.7	72.2	71.6	71.2	71.3	70.4	70.9
Sweden	..	..	86.0	90.2	92.5	90.4	89.9	86.6	84.9	84.9	85.1	85.4	84.9
Switzerland	..	..	..	..	..	50.3	52.4	53.8	55.6	57.1	57.9	58.5	58.4
Turkey	..	..	..	50.0	29.4	50.6	61.0	70.3	62.9	68.2	70.4	71.6	72.1
United Kingdom	85.2	85.8	87.0	91.1	89.4	85.8	83.6	83.9	80.9	83.0	83.4	85.4	85.5
United States	23.4	22.7	36.5	41.1	41.3	39.8	39.7	45.3	44.0	44.8	44.8	44.6	44.7

Source: OECD HEALTH DATA 2006



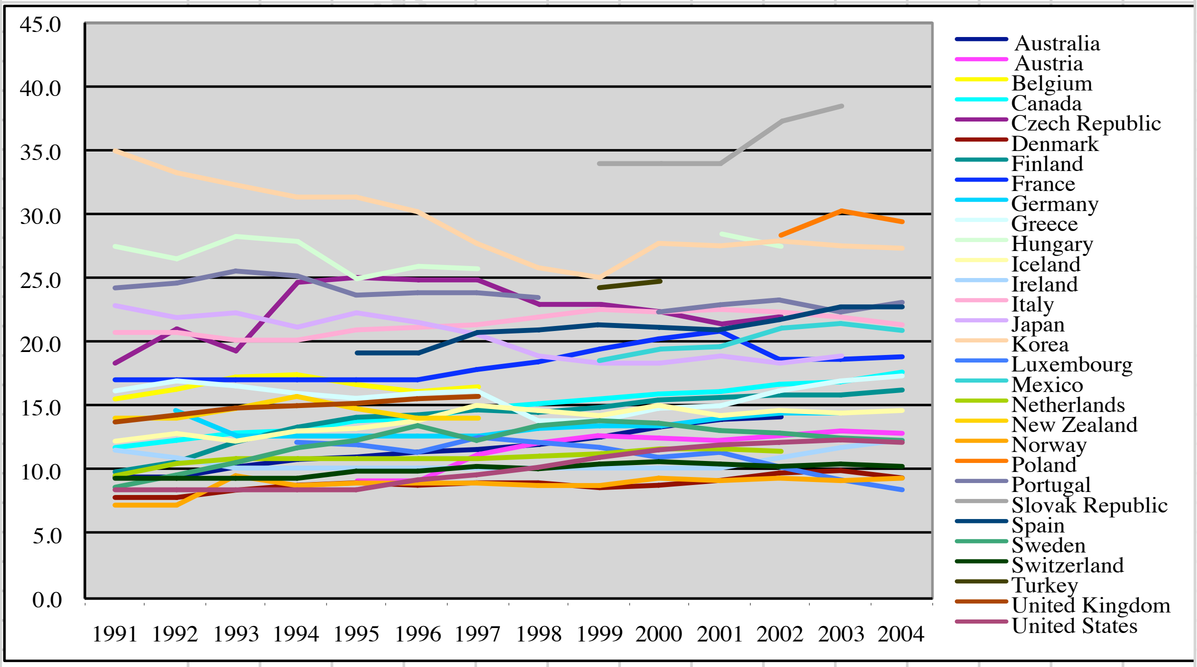


Public expend. on health
(% total health expend)
2004
Countries
United States
United Kingdom
Turkey
Switzerland
Sweden
Spain
Slovak Republic
Portugal
Poland
Norway
New Zealand
Netherlands
Mexico
Luxembourg
Korea
Japan
Italy
Ireland
Iceland
Hungary
Greece
Germany
France
Finland
Denmark
Czech Republic
Canada
Belgium
Austria
Australia
44,7
85,5
72,1
58,4
84,9
70,9
71,9
83,5
62,3
46,4
90,4
51,4
76,4
72,5
52,8
78,4
89,2
69,8
70,7
0
10
20
30
40
50
60
70
80
90
100
Public expend. on healh 2004 (% total exp. on health)
2004
Health Data 2006

Total expenditure on pharmaceuticals (% TEH)

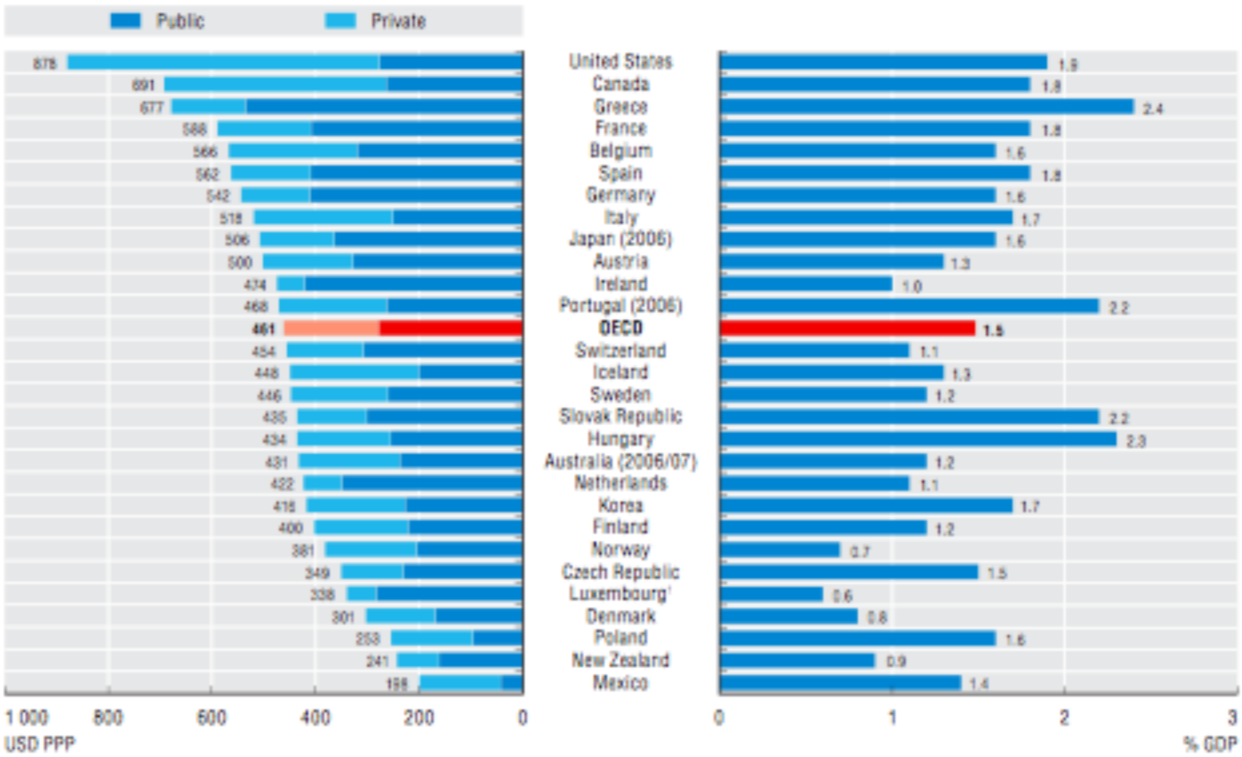
	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Australia	9.5	9.9	10.4	11.0	11.2	11.5	11.7	12.0	12.6	13.5	14.0	14.2		
Austria					9.2	9.3	11.1	12.1	12.7	12.6	12.3	12.8	13.1	13.0
Belgium	15.6	16.3	17.4	17.5	16.8	16.2	16.5						11.3	
Canada	11.8	12.4	13.0	13.1	13.8	14.0	14.8	15.2	15.5	15.9	16.2	16.7	17.0	17.7
Czech Republic	18.4	21.1	19.4	24.7	25.1	25.0	24.9	22.9	23.0	22.4	21.5	22.0		
Denmark	8.0	7.9	8.5	8.8	9.1	8.9	9.0	9.0	8.7	8.8	9.2	9.8	10.0	9.4
Finland	9.9	10.8	12.3	13.4	14.1	14.4	14.8	14.6	15.0	15.5	15.8	16.0	16.0	16.3
France	17.2	17.1	17.5	17.4	17.6	17.6	18.0	18.6	19.5	20.3	20.9	18.7	18.8	18.9
Germany		14.7	13.2	12.9	12.7	12.8	12.9	13.4	13.5	13.6	14.2	14.5	14.6	
Greece	16.3	17.0	16.6	16.1	15.7	16.1	16.2	13.9	14.4	15.0	15.1	16.2	17.1	17.4
Hungary	27.6	26.5	28.4	28.0	25.0	26.0	25.9				28.5	27.6		
Iceland	12.3	13.0	12.4	13.1	13.4	14.0	15.1	14.8	14.3	15.1	14.4	14.7	14.5	14.8
Ireland	11.6	11.1	10.7	10.6	10.4	10.5	10.2	10.4	10.5	10.6	10.3	11.0	11.8	12.4
Italy	20.8	20.8	20.2	20.3	21.1	21.3	21.5	22.0	22.6	22.4	22.6	22.5	22.1	21.4
Japan	22.9	22.0	22.3	21.1	22.3	21.6	20.6	18.9	18.4	18.7	18.8	18.4	18.9	
Korea	35.0	33.3	32.3	31.3	31.4	30.2	27.7	25.8	25.1	27.8	27.6	27.9	27.6	27.4
Luxembourg	15.0			12.2	12.0	11.5	12.6	12.3	11.9	11.0	11.5	10.3	9.4	8.5
Mexico									18.6	19.4	19.6	21.2	21.5	20.9
Netherlands	9.6	10.5	11.0	10.9	11.0	11.0	11.0	11.2	11.4	11.7	11.7	11.5		
New Zealand	14.1	14.2	14.9	15.8	14.8	14.5	14.4							
Norway	7.3	7.5	9.6	8.8	9.0	9.1	9.1	8.9	8.9	9.5	9.3	9.4	9.2	9.5
Poland												28.4	30.3	29.6
Portugal	24.3	24.7	25.6	25.2	23.6	23.8	23.8	23.4		22.4	23.0	23.3	22.6	23.2
Slovak Republic									34.0	34.0	34.0	37.3	38.5	
Spain					19.2	19.8	20.8	21.0	21.5	21.3	21.1	21.8	22.8	22.8
Sweden	8.7	9.7	10.7	11.8	12.3	13.6	12.4	13.6	13.9	13.8	13.2	13.0	12.6	12.3
Switzerland	9.8	9.4	9.7	9.8	10.0	10.0	10.3	10.2	10.5	10.7	10.6	10.3	10.5	10.4
Turkey				31.6					24.3	24.8				
United Kingdom	13.8	14.2	14.8	15.1	15.3	15.6	15.8							
United States	9.0	8.7	8.5	8.5	8.9	9.3	9.7	10.3	11.1	11.7	12.0	12.3	12.4	12.3

Source: OECD HEALTH DATA 2006



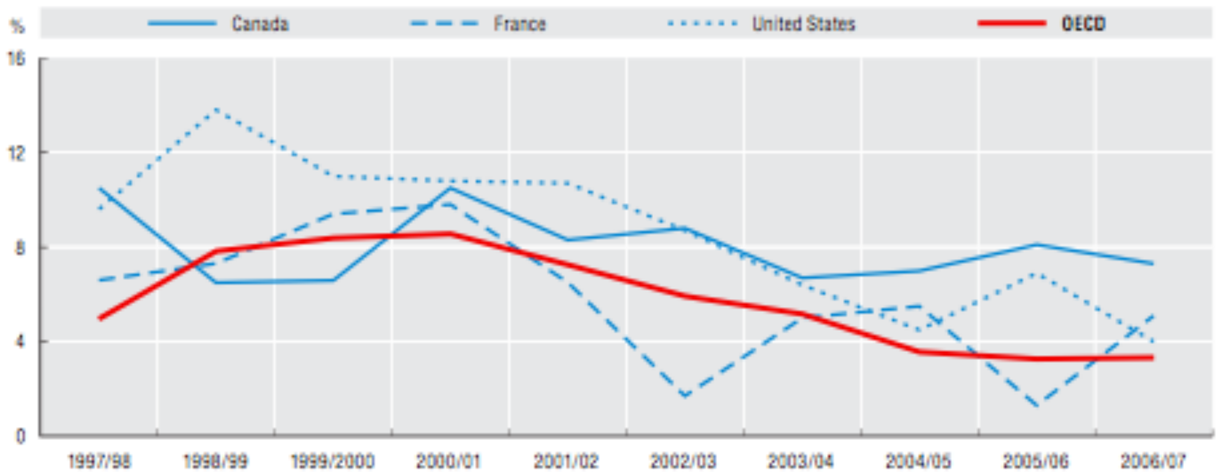
7.4.1 Expenditure on pharmaceuticals per capita, 2007

7.4.2 Expenditure on pharmaceuticals as share of GDP, 2007



1. Prescribed medicines only.

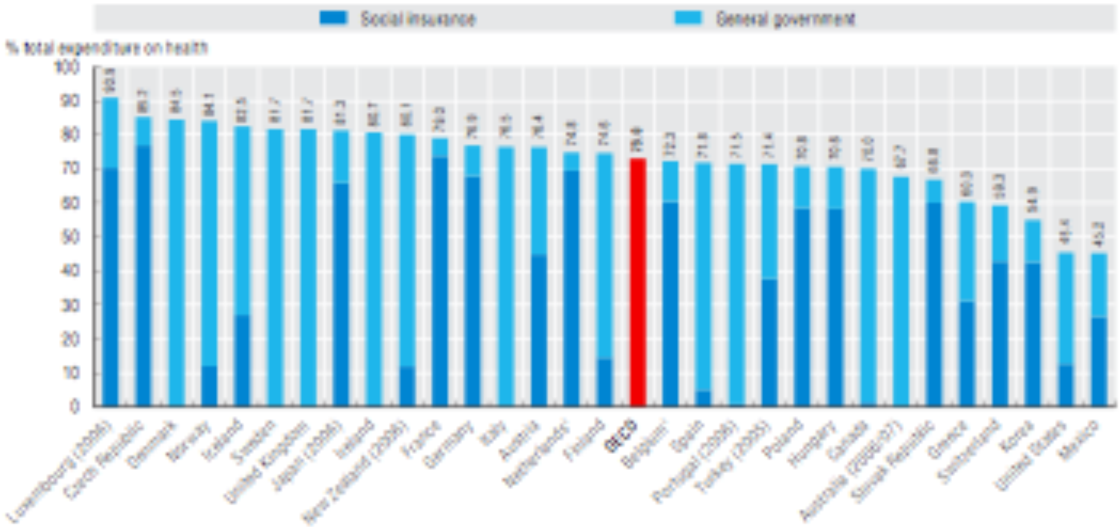
7.4.3 Annual growth in pharmaceutical expenditure, 1997-2007



Source: *OECD Health Data 2009.*

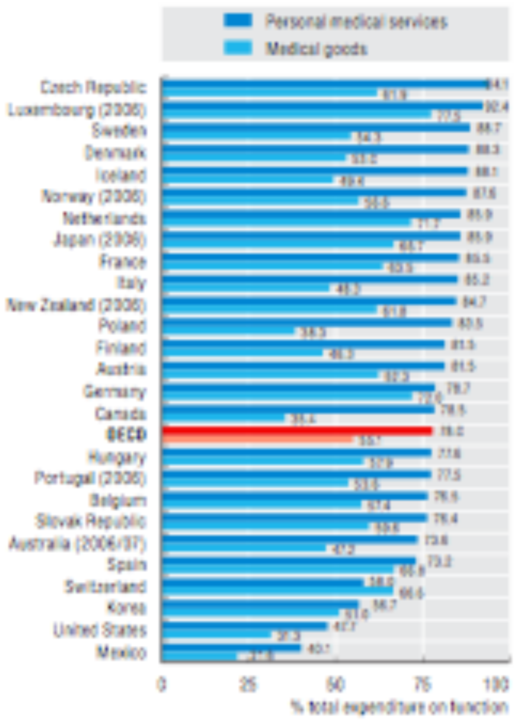
StatLink http://dx.doi.org/10.1787/720463218860

7.6.1 Public share of total expenditure on health, 2007

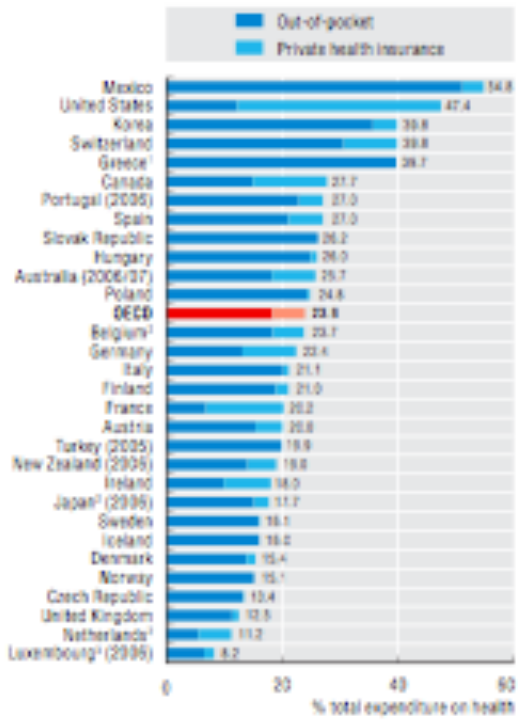


1. Share of current health expenditure.

7.6.2 Public share of expenditure on medical services and goods, 2007



7.6.3 Out-of-pocket and private health insurance expenditure, 2007



1. Total private expenditure. 2. Current expenditure. 3. Cost-sharing only.

Source: OECD Health Data 2009.

StatLink http://dx.doi.org/10.1787/720482364801

Reading:

Doyle, J., 2007, Returns to Local-Area Health Care Spending: Using health stocks to patients far from home, NBER WP 13301

[http://www.nber.org/papers/w13301]

National Bureau of Economic Research
HTTP://WWW.NBER.ORG/

Higher Health Spending Saves Lives

"A typical comparison of a high-spending area and a low-spending one means a 50 percent difference in health care spending intensity�This disparity is associated with a 1.6 percentage-point lower mortality rate among heart emergency patients. Based on that estimate, the additional cost of a statistical life-year-saved is on the order of $50,000."

Health care spending is a major concern in the United States, amounting to over $2 trillion per year or 16 percent of GDP. These figures are expected to increase with the aging of the population and are likely to strain government budgets and private-sector profitability. And, there is controversy over exactly what we are getting for that health care spending.

Among counties or regions within the United States, there are large disparities in spending, yet health outcomes are remarkably similar. One study of Medicare data found that end-of-life spending levels -- a measure of treatment intensity that controls for the health outcome -- are 60 percent higher in high spending areas of the United States than in low spending areas. Yet there is no difference across regions in five-year mortality rates after such health events as heart attacks or hip fractures.

One difficulty that arises when comparing regions is that populations in worse health may receive greater levels of treatment. For example, at the individual level higher spending is strongly associated with higher mortality rates, because more is spent on sicker patients. At the regional level, long-term investments in capital and labor also may reflect the underlying health of the population.

In **Returns to Local-Area Health Care Spending: Using Health Shocks to Patients Far From Home** (NBER Working Paper No. 13301), author **Joseph Doyle** compares outcomes of patients who are exposed to different health care systems that were not designed for them: patients who are far from home when a health emergency strikes. These visitors vacation in areas that provide different levels of health care. They may have a health emergency in an area that spends a great deal on patients or in one that tends to spend less. By comparing similar visitors across these locations, Doyle is able to use differences in health outcomes to shed light on the returns to health care spending, at least in emergency situations.

He finds that if the medical emergency occurred in a high-spending area, the patient was significantly more likely to survive. This result comes from analyzing groups of counties with similar lodging prices that are also popular tourist destinations -- areas that are likely to be close substitutes in terms of vacations, and that provide credible variation in health care systems.

In particular, Doyle uses data from hospital discharges in the state of Florida -- one of the most frequently visited states, which also gathers a wealth of data on patient characteristics. A typical comparison of a high-spending area and a low-spending one means a 50 percent difference in health care spending intensity. Doyle finds that this disparity is associated with a 1.6 percentage-point lower mortality rate among heart emergency patients. Based on that estimate, the additional cost of a statistical life-year-saved is on the order of $50,000 -- similar to the estimate from health improvements over time, and well below the typical value of a life-year-saved of $100,000.

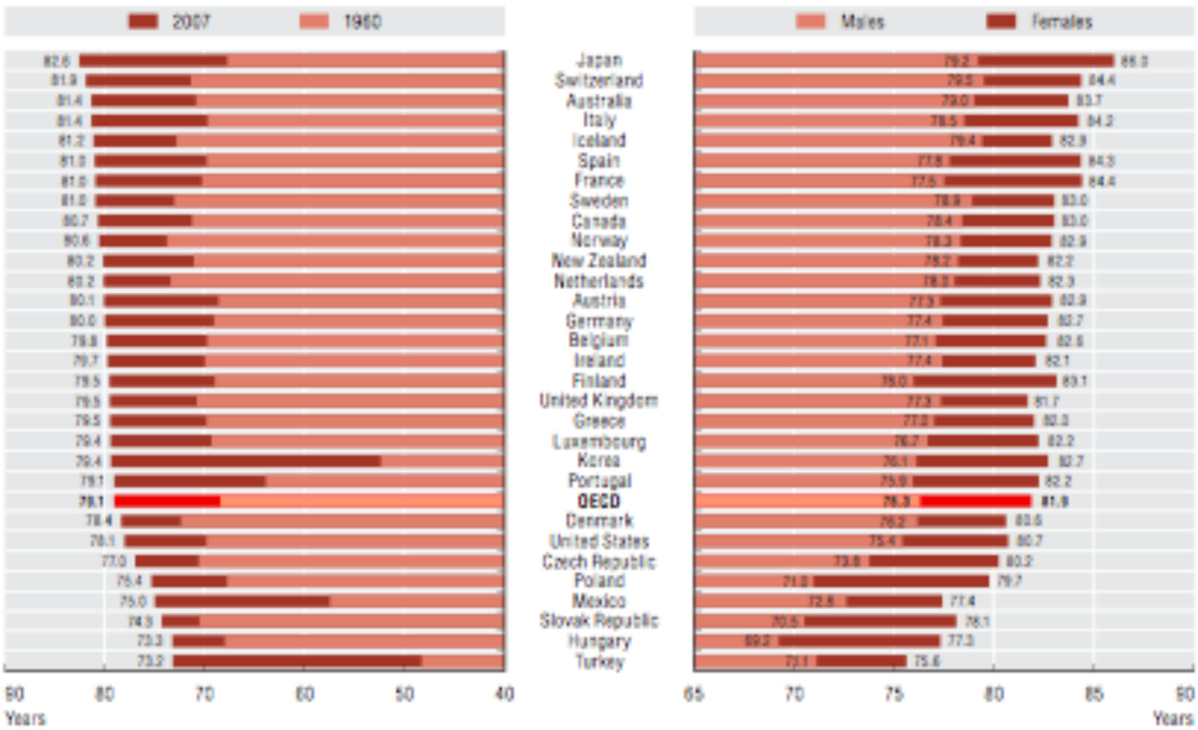
Doyle's results also confirm earlier findings of little relationship between spending and mortality among the populations the health care systems are designed to serve. Instead, those who have a serious health emergency far from home are exposed to different health care systems, but they are unlikely to affect the resources available in the systems.

Doyle points out that visitors choose their destinations, and if relatively healthy individuals were to choose high-spending areas, then his main results would reflect these differences. However, his estimates are robust across different types of patients, including those with various income levels, and within groups of destinations that can be characterized as close substitutes. The returns to spending are lower in places where the visitors were more likely to select the destination with the health care system in mind -- this suggests that Doyle's main results may understate the benefits of health care spending.

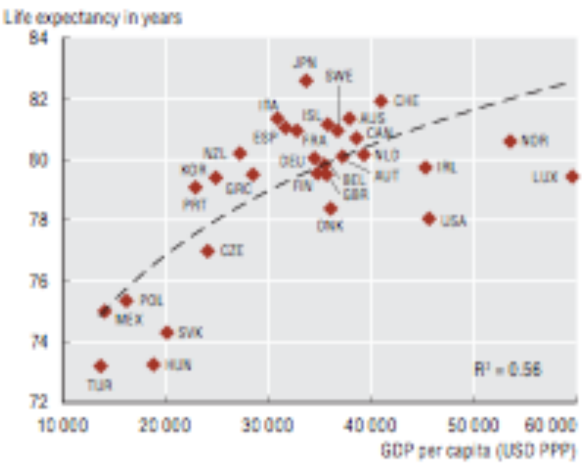
-- Les Picker

1.1.1 Life expectancy at birth, total population, 1960 and 2007 (or latest year available)

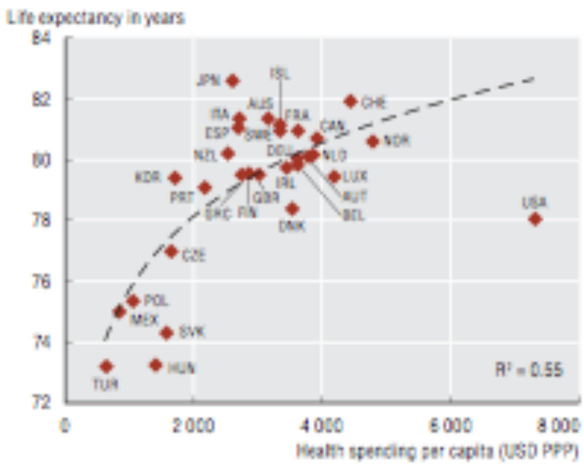
1.1.2 Life expectancy at birth, by gender, 2007 (or latest year available)



1.1.3 Life expectancy at birth and GDP per capita, 2007 (or latest year available)



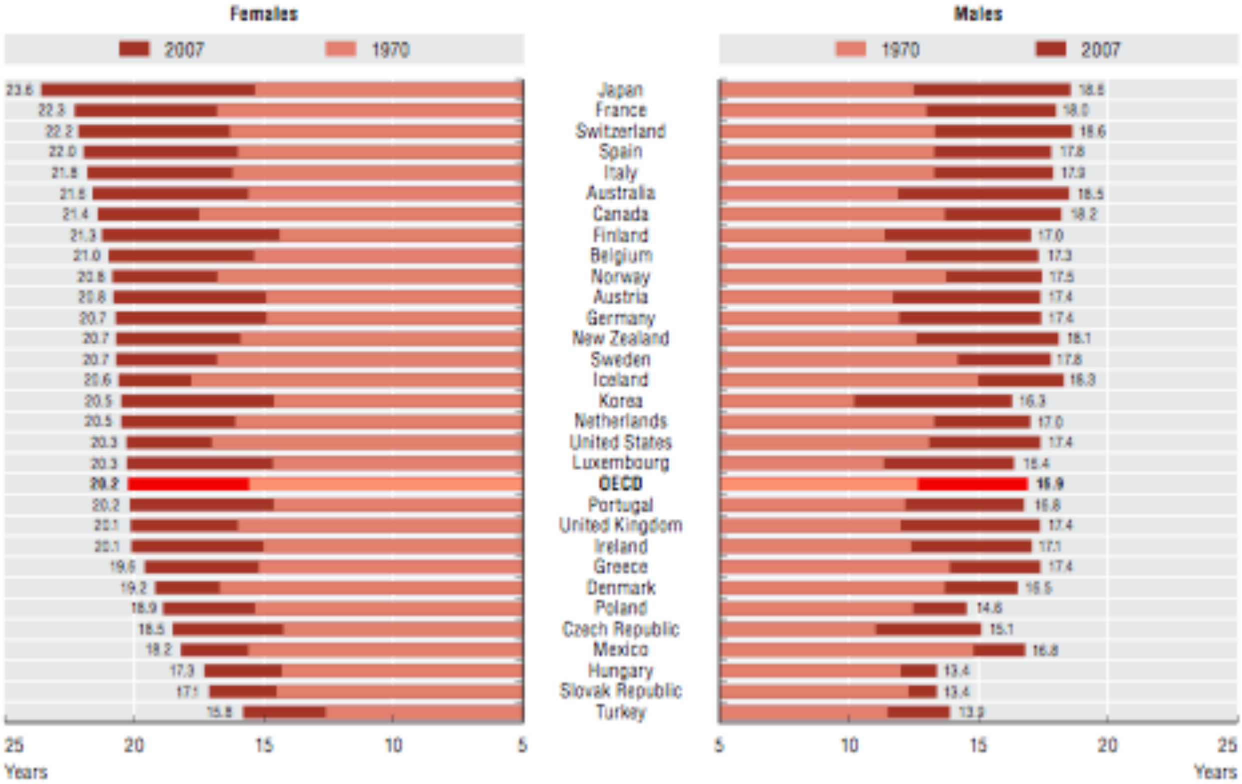
1.1.4 Life expectancy at birth and health spending per capita, 2007 (or latest year available)



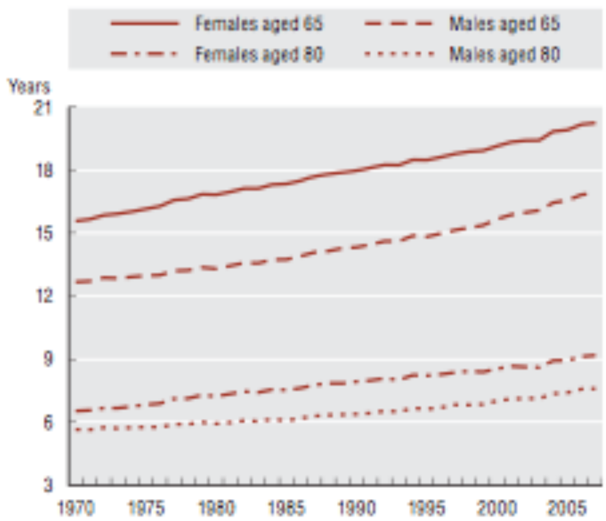
Source: OECD Health Data 2009.

StatLink http://dx.doi.org/10.1787/717383404708

1.2.1 Life expectancy at age 65 by gender, 1970 and 2007 (or nearest year available)

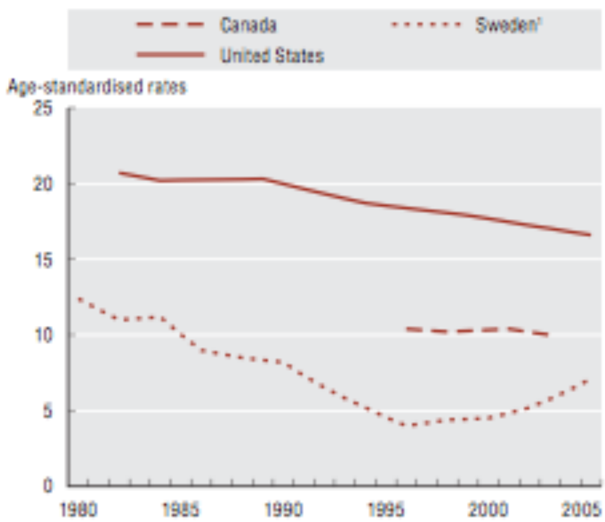


1.2.2 Trends in life expectancy at age 65 and at age 80, males and females, OECD average, 1970-2007



Source: *OECD Health Data 2009.*

1.2.3 Trends in severe disability among the population aged 65 and over, selected OECD countries, 1980-2005



1. For Sweden, the data relate only to the population aged 65-84.

Source: Lafortune et al. (2007).

Why is the health care market different?

$\oplus$ difference between the health status a consumer wants and the level of medical care that is able to buy;
$\ominus$ difficulty to measure the product and its costs;
$\otimes$ patient does not decide treatment. Physician acts on his behalf (consumer's agent)
$\otimes$ patient does not pay treatment $\rightarrow$ health insurance
$\oslash$ traditional mechanisms to limit market power of suppliers do not work because

$\star$ possibility of insurance (moral hazard and adverse selection)

$\star$ entry barriers (professional associations, exams to access specialized practice, ...).

Also, external factors contribute:

† population aging,

‡ technological development.

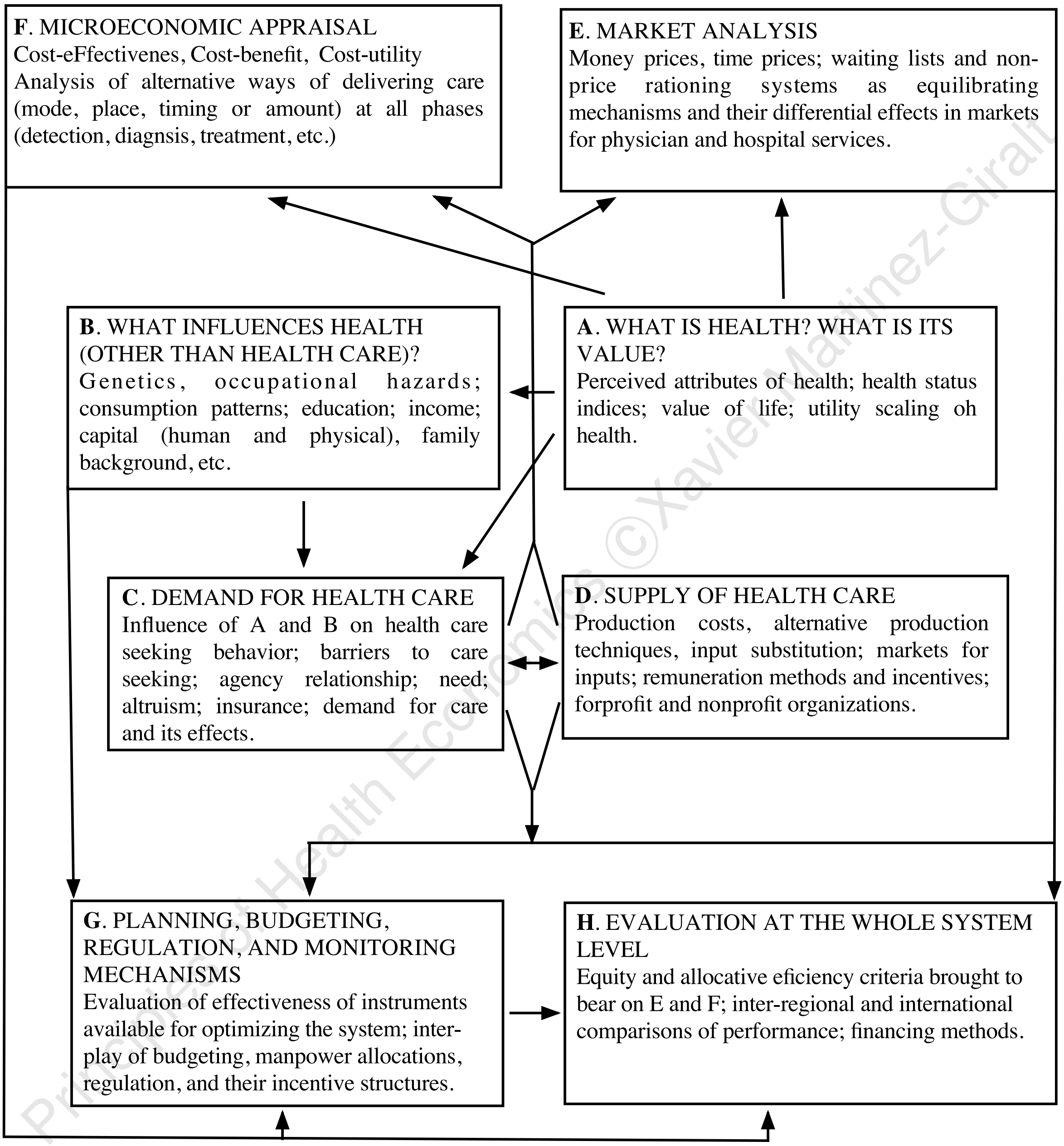
Consequence: MARKET INTERVENTION. [$\longrightarrow$no guarantee of proper behavior!!]

Differential characteristics

- presence of uncertainty - (sec. 8)
- relevance of insurance - (sec 9)
- presence of asymmetric information - (sec 9)
- role of non-profit institutions - (sec 6)
- extent of regulation in the market - (sec 4)
- existence of “need”
- public provision and financing of health care services
- presence of externalities and ”merit goods” - (sec 4)

- (moral issue) universal access to the health care system

The elements of health economics

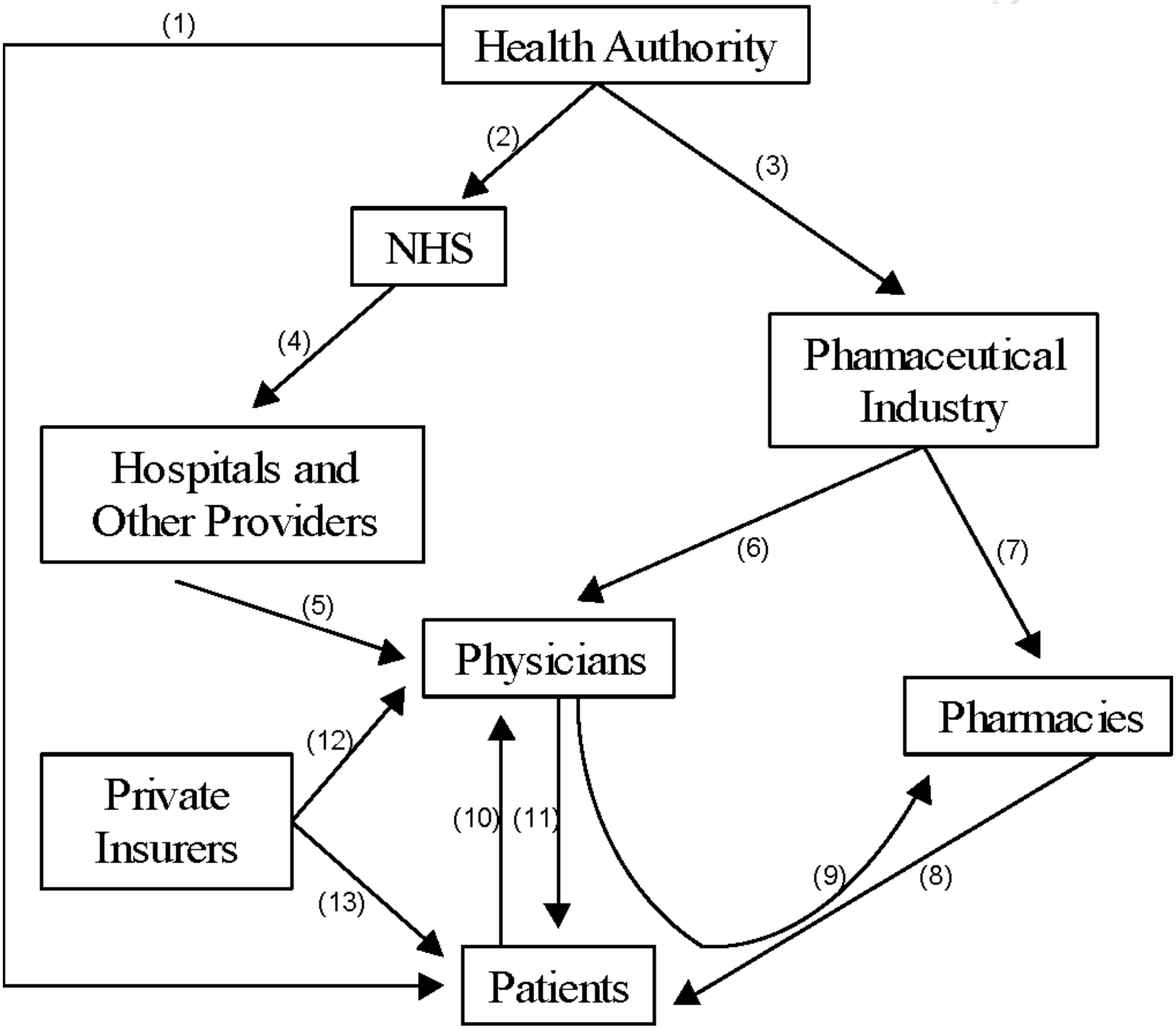


Economic analysis: Starting point: $A \rightarrow$

Demand side	Supply side	Equilibrium
C (with B)	D	E (from B, C)

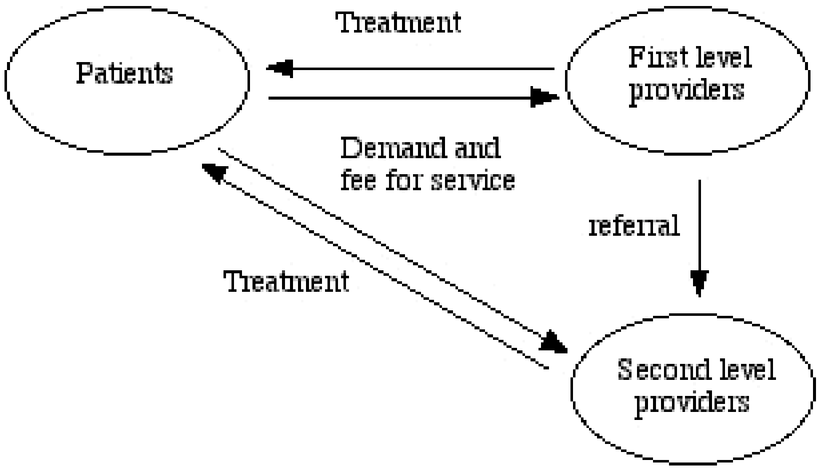
Economic evaluation: microlevel (F), macrolevel (G)
Policy analysis: H

The organization of the health care market

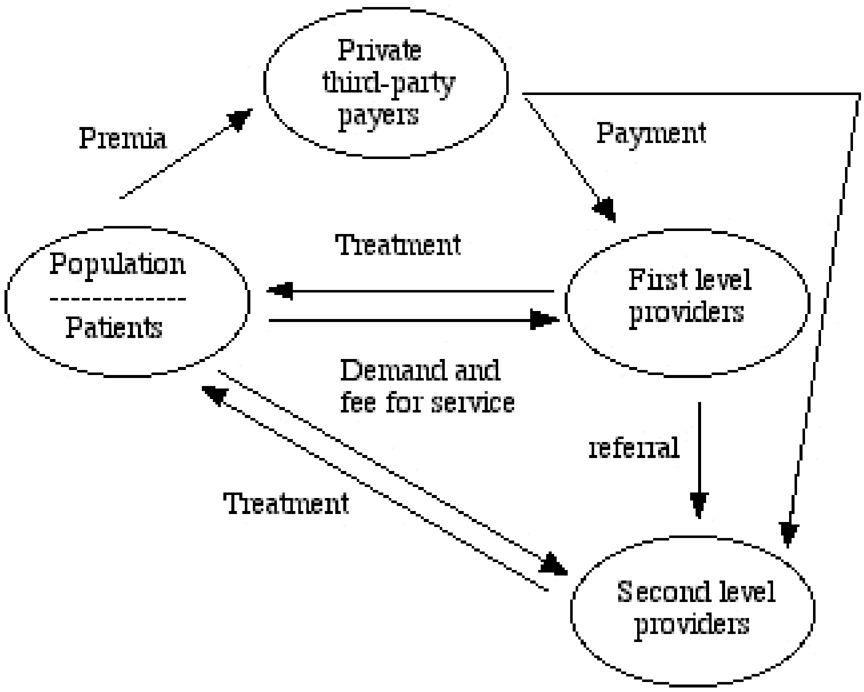


The agents in a health care system

Structure of the health care system



(a) System without insurance



(b) Private insurance model

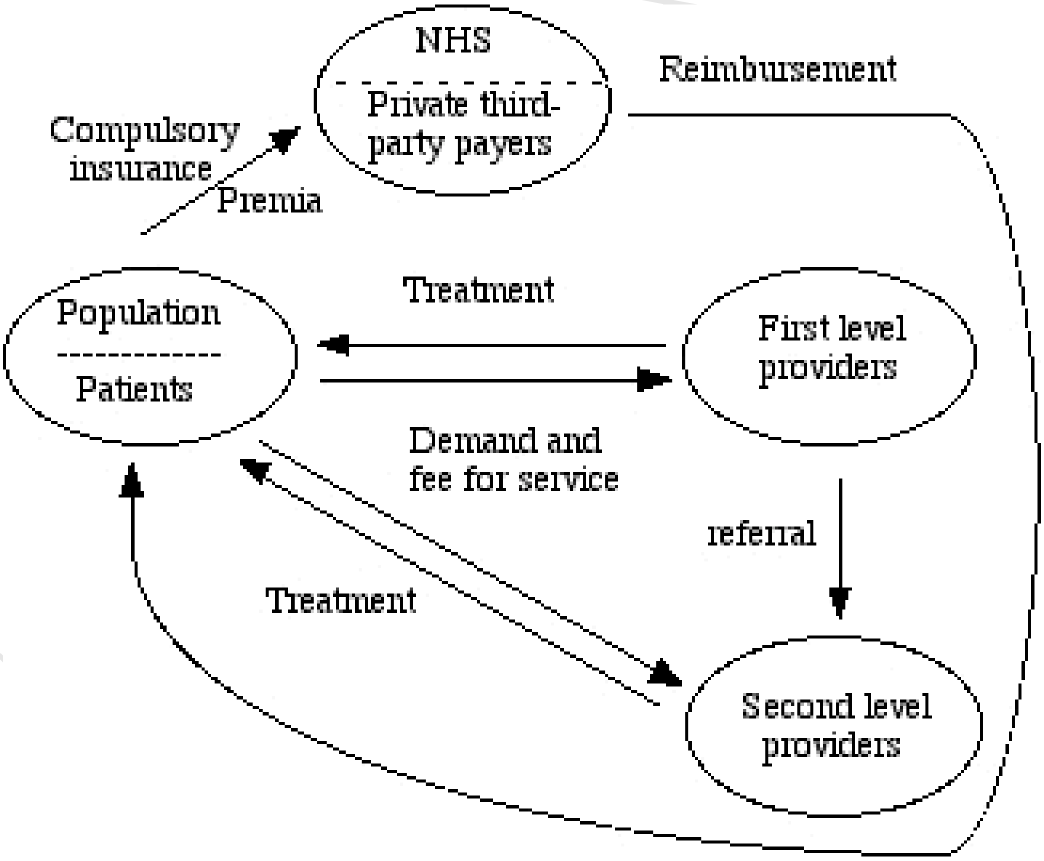
Private provision with and without insurance

The reimbursement model

Public version (France) and private version (UK, The Netherlands).

Separation between providers and 3PP.

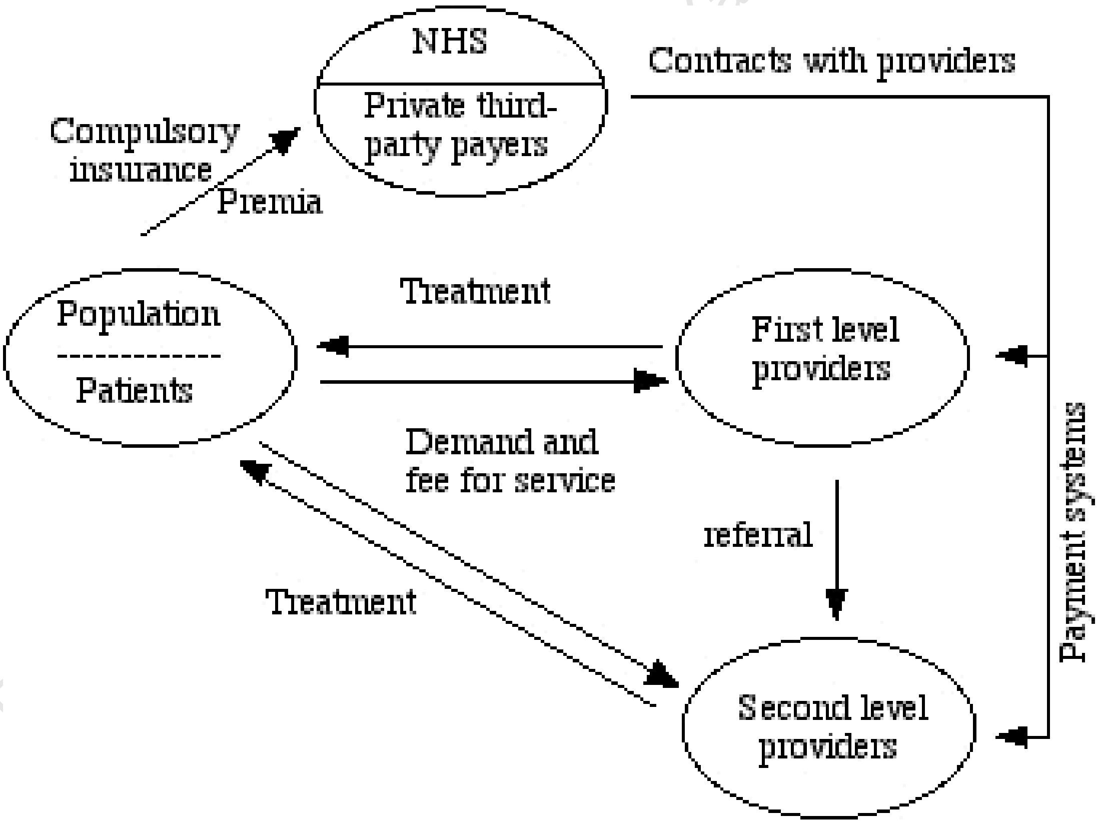
Patient advances payment and is reimbursed (partially or totally) by 3PP .



The reimbursement model

The contract model

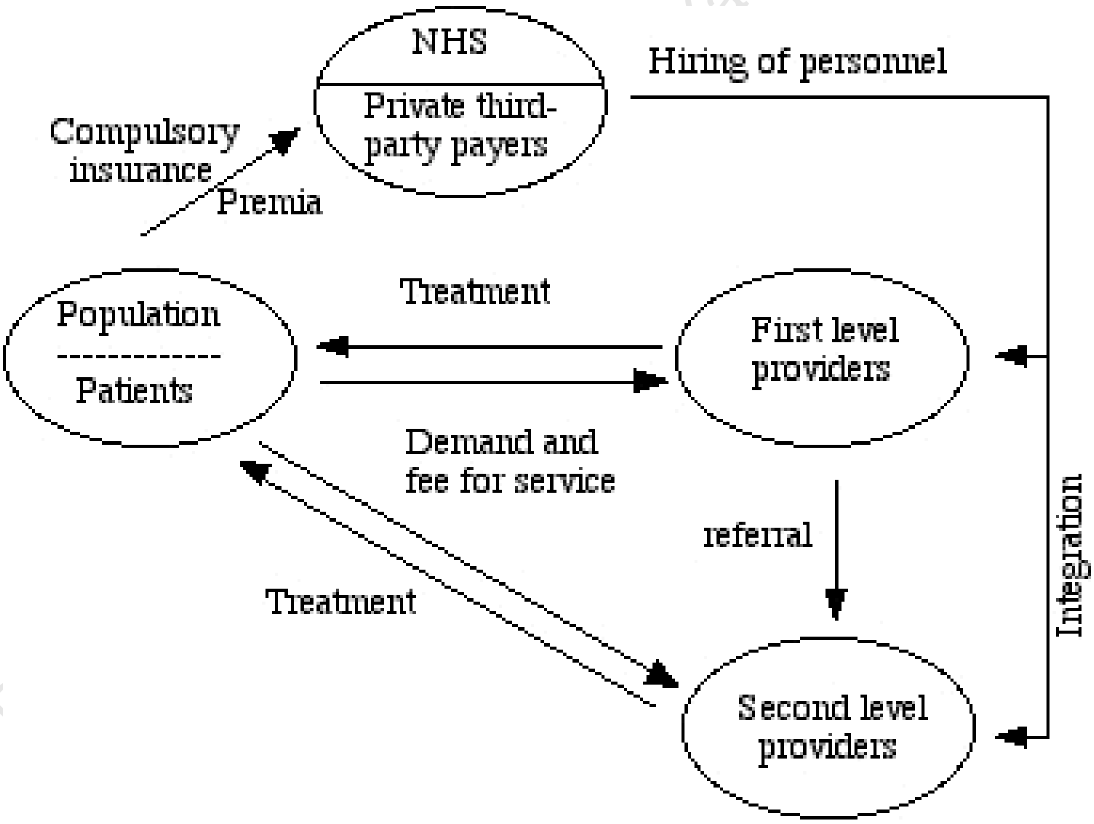
Link between providers and 3PP.
Public version (primary care UK, Ireland, Germany, Netherlands) and private version.
Patients choose providers among in-plan providers.



The contract model

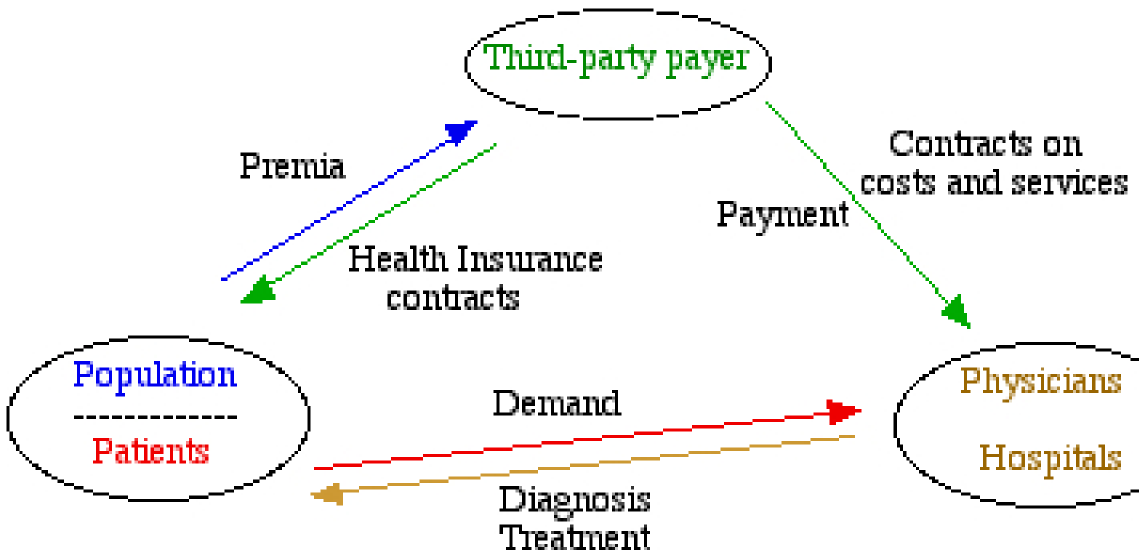
The integrated model

Integration of providers and 3PP.
3PP contract physicians and own hospitals.
Public version (Spain, Portugal, Ireland, hosp. care UK), and private version (US-HMOs).



The integrated model

The actors of the health care market



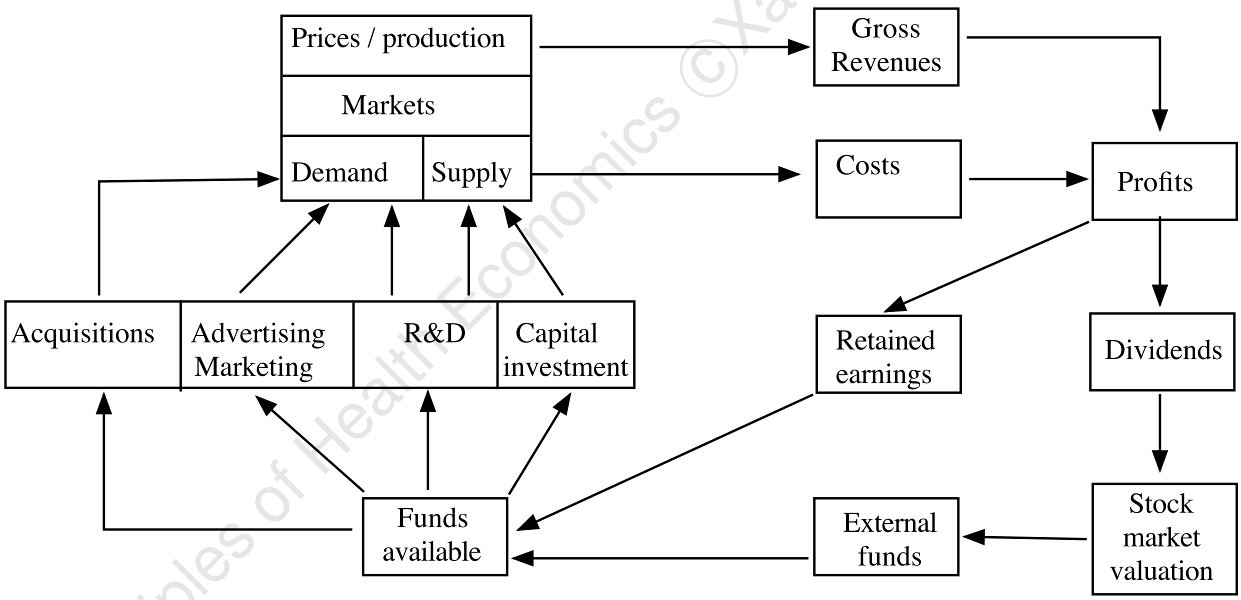
- Market of insurers (3PP): Private vs Public

- Market of hospital services: Entry barriers, concentration, Ecs. of scale, Regulation

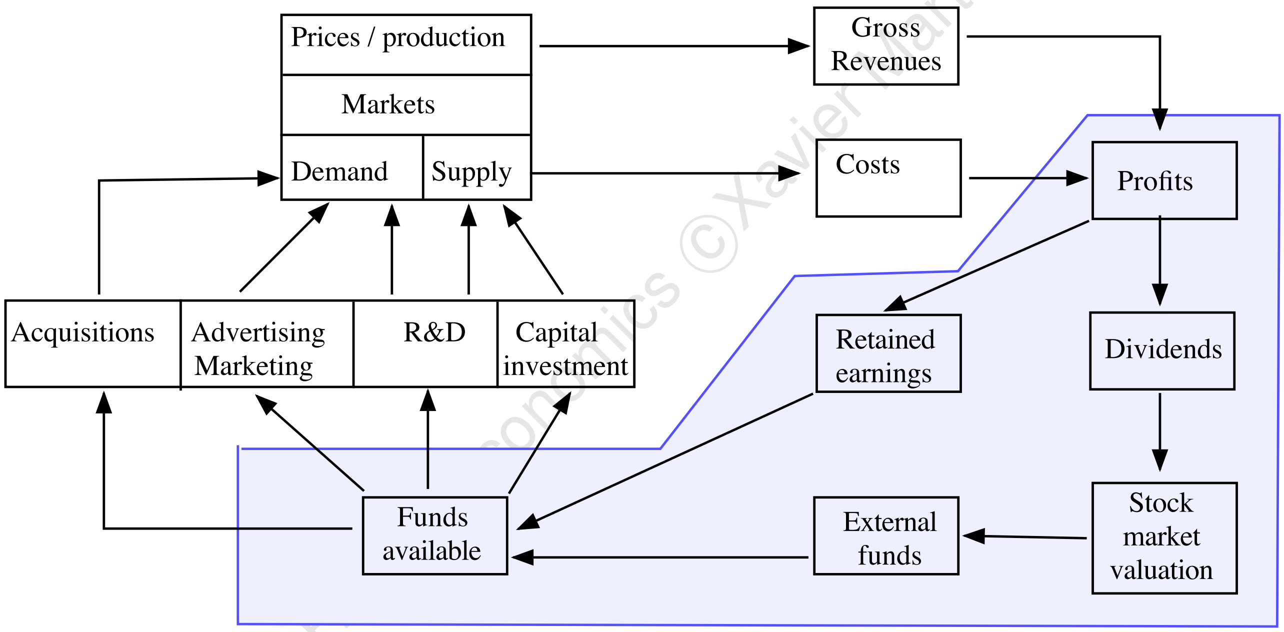
- Market of physician services: Supplier-induced demand, Competitiveness, Costs and quality

- Also Regulation: reimbursement systems to providers

Flows of resources in industrial economics



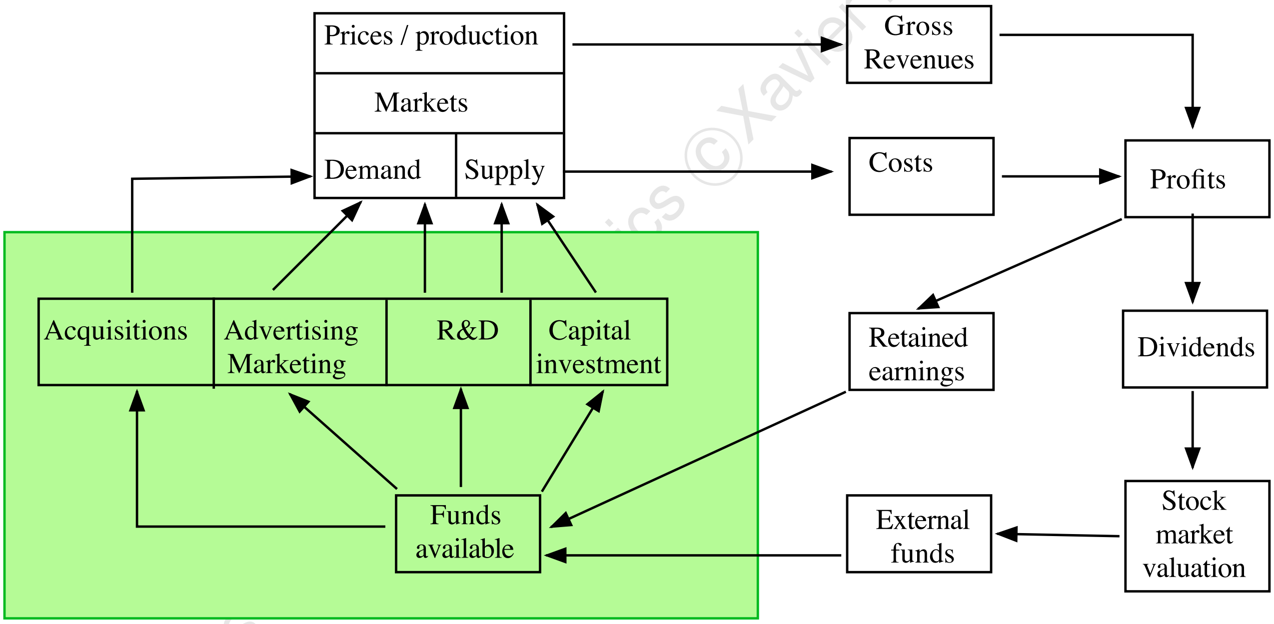
Financial flows in industrial economics



- Generation of resources

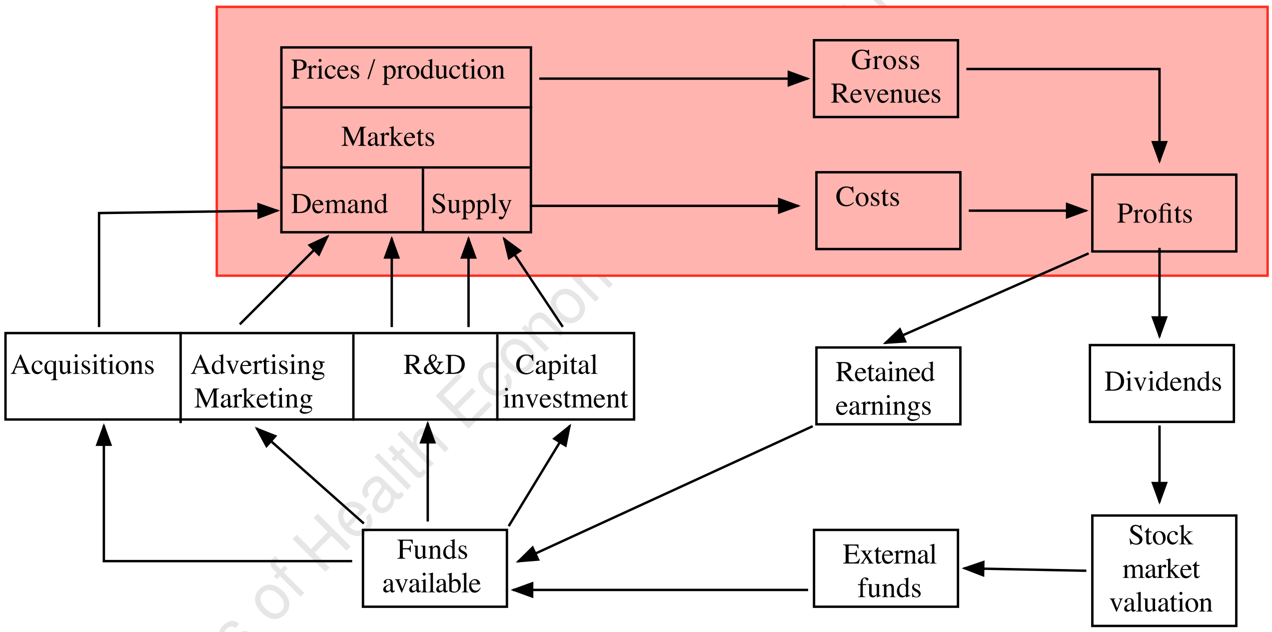
- Distribution of profits

Expenditure flows in industrial economics



- Use of available flows

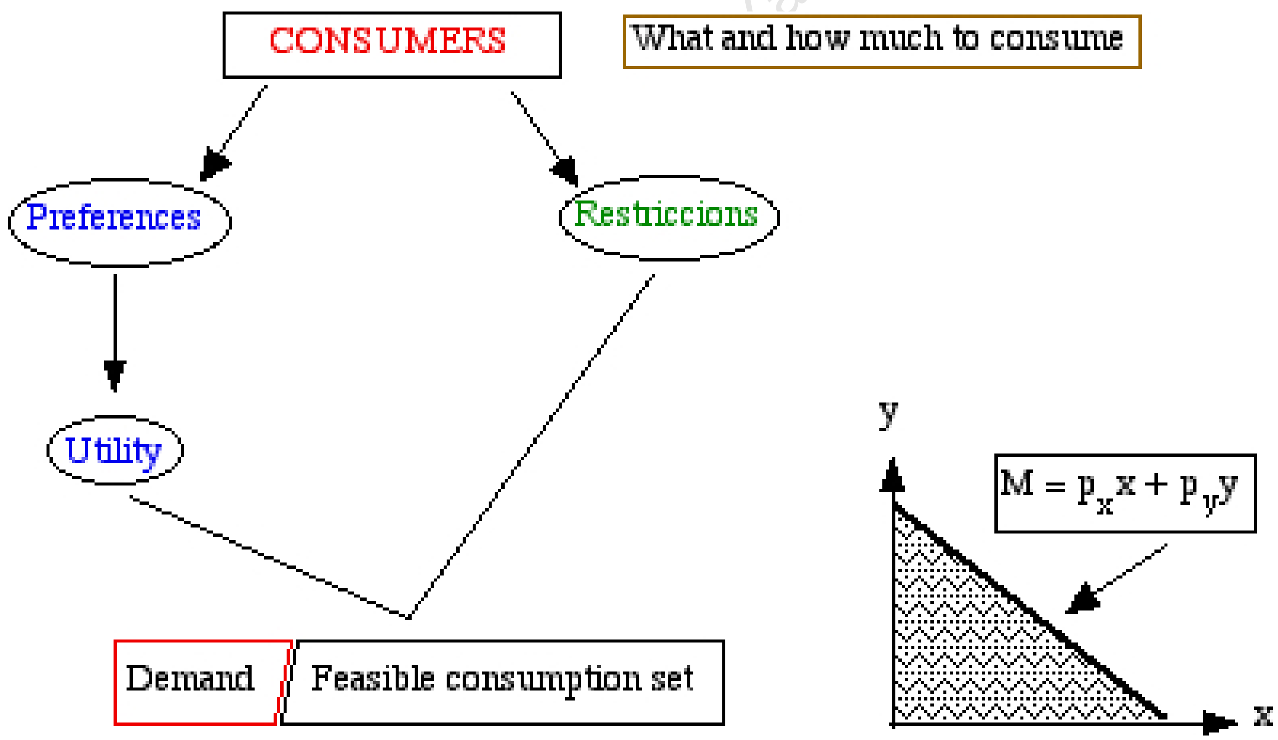
Market flows in industrial economics



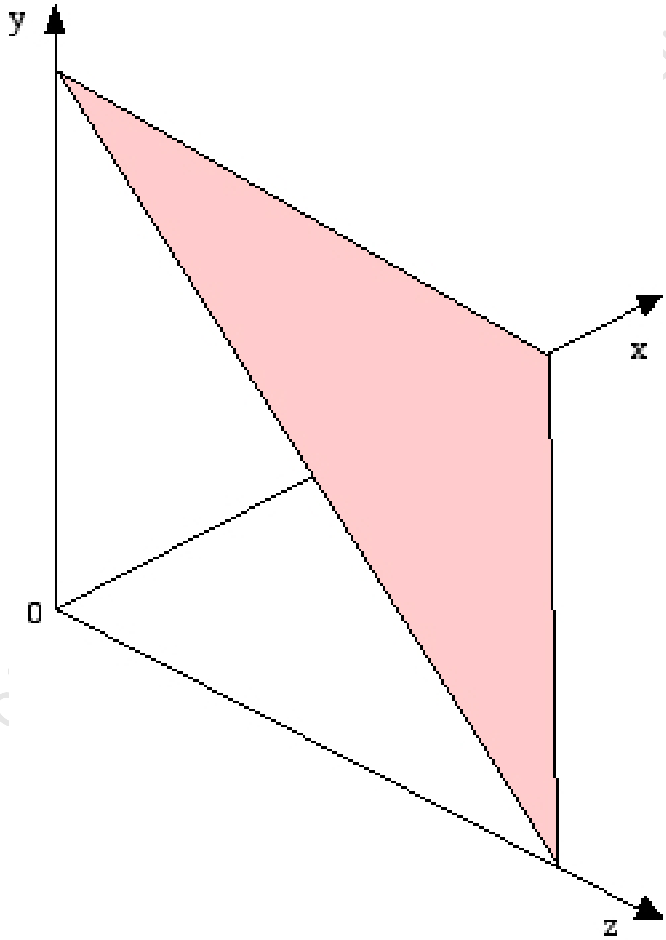
- Generation of profits

2. The agents of the economy

Population/ Patients (Demand)



3D consumption set

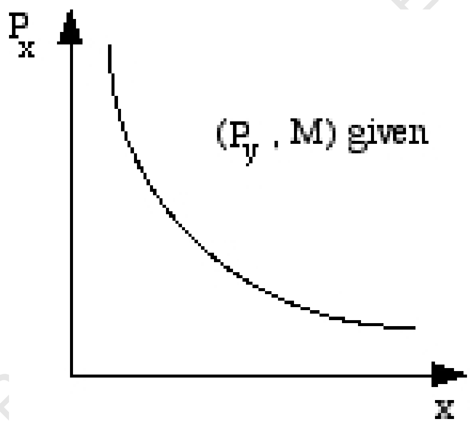


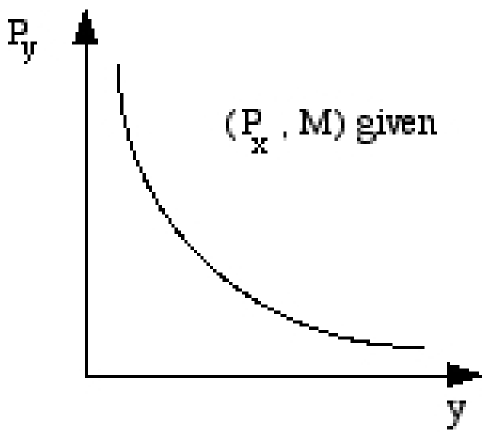
Individual vs. aggregate demand

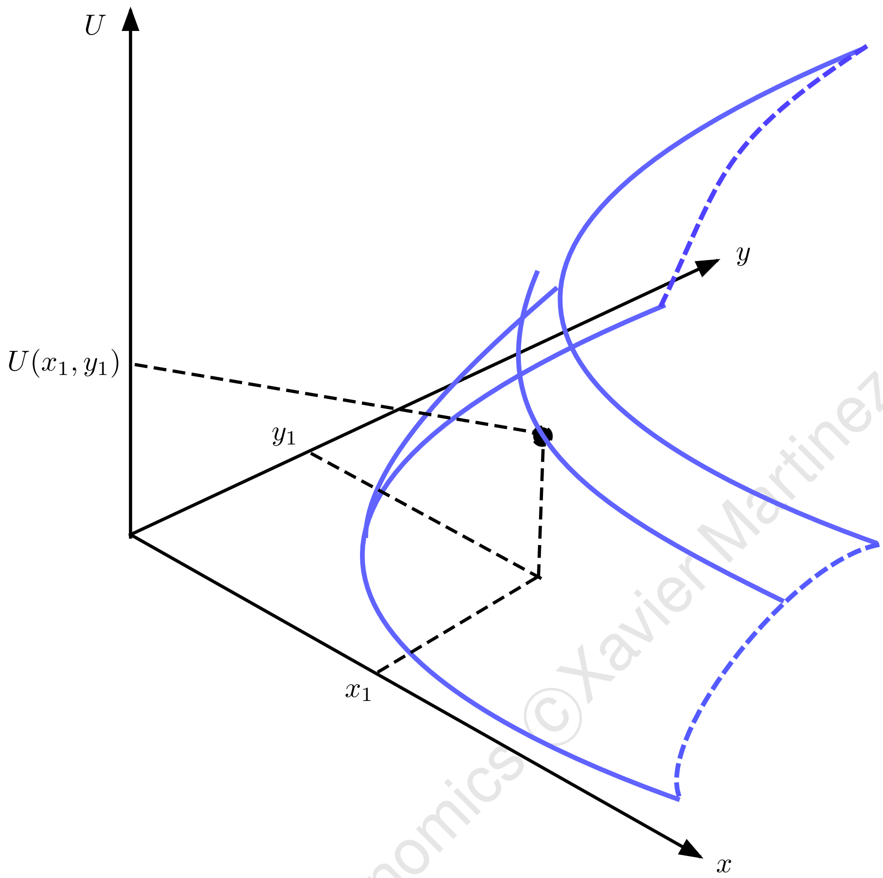
Individual demand $\rightarrow$ solution of

$$\max_{x,y} U(x,y) \text{ s.t. } M = P_x x + P_y y$$

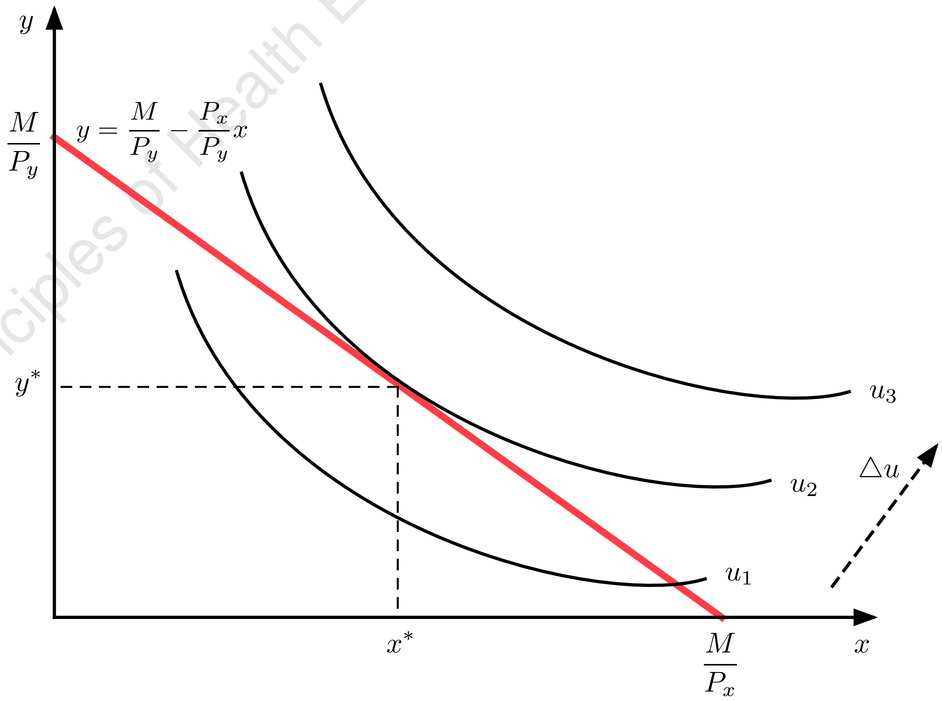
$$x^*(P_x, P_y, M)$$
$$y^*(P_x, P_y, M)$$







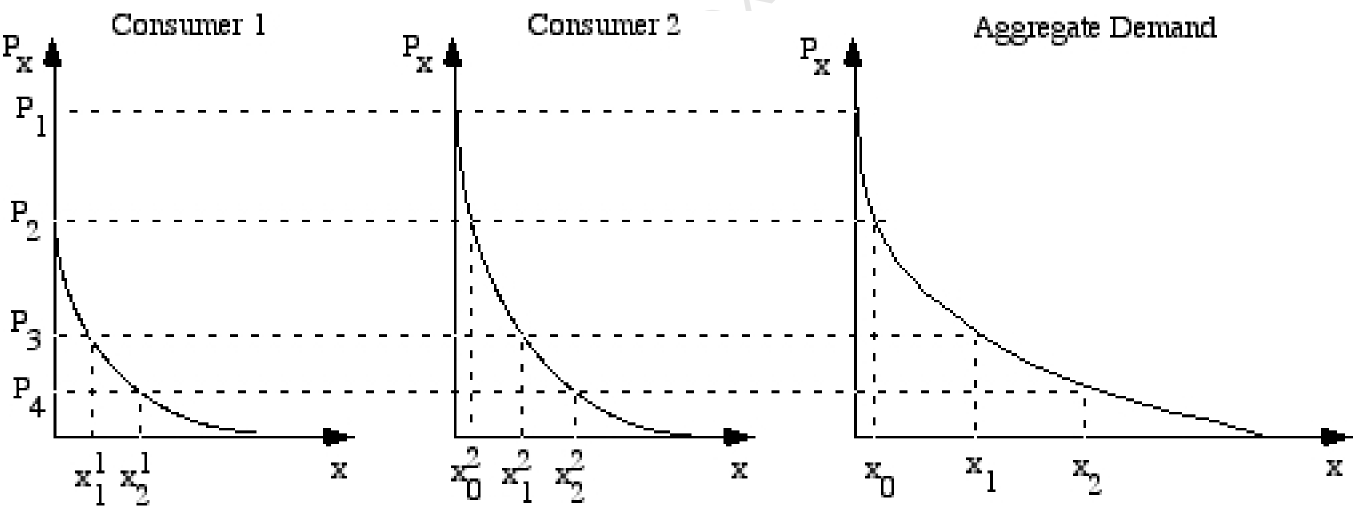
U
$U(x_1, y_1)$
y_1
y
x_1
x



y
$\frac{M}{P_y}$
$y = \frac{M}{P_y} - \frac{P_x}{P_y}x$
y^*
u_3
$\triangle u$
u_2
u_1
x^*
$\frac{M}{P_x}$
x

Consider 2 individuals $x_1(P_x, P_y, M_1)$ and $x_2(P_x, P_y, M_2)$.

The aggregate (market) demand for good x is the horizontal sum of individual demands.



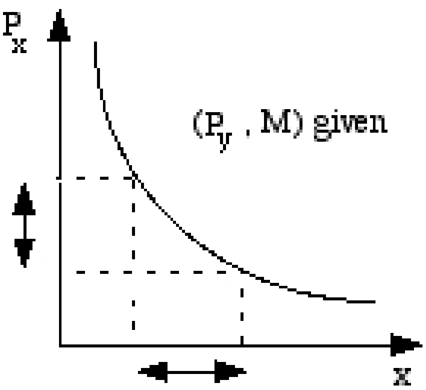
$$x_0 = x_0^2$$
$$x_1 = x_1^1 + x_1^2$$
$$x_2 = x_2^1 + x_2^2$$

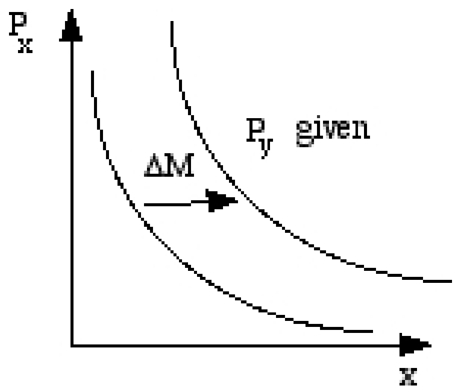
Effects on (aggregate) demand

Changes along the demand curve [(P_y, M) given]

- $\uparrow P_x, \;\; x \downarrow$: some consumers buy less and some others leave the market.

- $\downarrow P_x, \;\; x \uparrow$: some consumers buy more and some others enter the market.





Shifting the demand curve [(P_x, P_y) given]

- $\uparrow M \longrightarrow$ increase demand x and y: demand curve moves outwards.

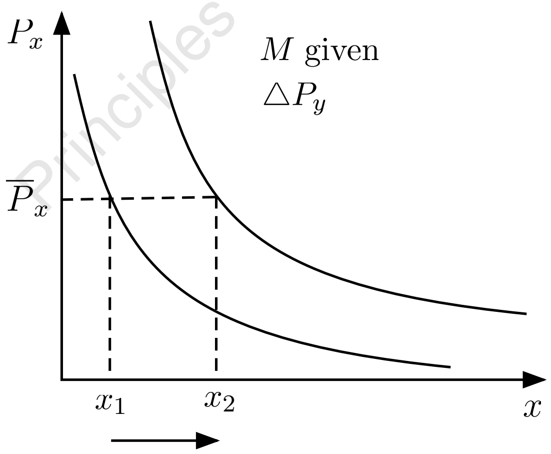
Crossed effects [(P_x, M) given]

Impact of $\uparrow P_y$ (M constant) on x, three possibilities:

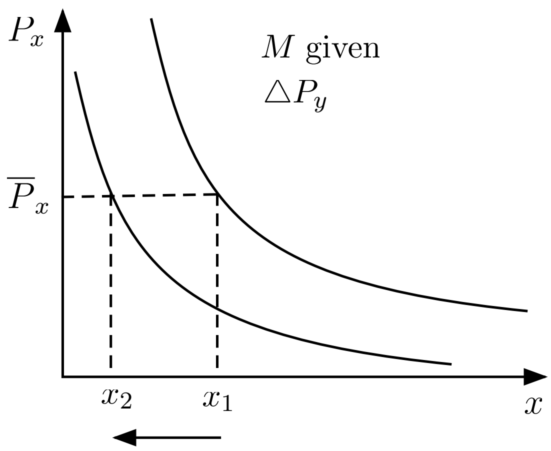
(i) x and y independent, e.g. (x,y)= (coffee, gasoline):
$\uparrow P_y \rightarrow \downarrow y \rightarrow$ demand of x unaffected

(ii) x and y substitutes: satisfy similar needs, e.g. (x,y) = (butter, margarine):
$\uparrow P_y \rightarrow \downarrow$ demand of $y \rightarrow \uparrow$ demand of x.

(iii) x and y complements: joint consumption, e.g. (x,y) = (coffe, sugar):
$\uparrow P_y \rightarrow \downarrow$ demand of $y \rightarrow \downarrow$ demand of x.



(x, y) substitutes



(x, y) complements

Elasticity

How to measure the impact of $\triangle P_x$ on x?

Method 1: Direct and simple

$$\frac{\triangle x}{\triangle P_x}$$

Problem: dependent on units

EURO		US $	
P_x	x	P_x	x
6	10	8	10
12	5	16	5

$$\left.\frac{\triangle x}{\triangle P_x}\right|_{EUR} = \frac{-5}{6} = -0.83$$

$$\left.\frac{\triangle x}{\triangle P_x}\right|_{\$} = \frac{-5}{8} = -0.625$$

Method 2: Index invariant to units $\longrightarrow$

Elasticity

Own-price elasticity

$$|\varepsilon_x| = \left|\frac{\%\Delta x}{\%\Delta P_x}\right| = \left|\frac{\frac{\Delta x}{x}}{\frac{\Delta P_x}{P_x}}\right| = \left|\frac{\Delta x P_x}{\Delta P_x x}\right|$$

$|\varepsilon_x| > 1$ elastic (overreaction)

$|\varepsilon_x| < 1$ inelastic (underreaction)

Example: $|\varepsilon_x| = \frac{1}{2}$

Cross-price elasticity

$$\varepsilon_{xy} = \frac{\%\Delta x}{\%\Delta P_y} = \frac{\frac{\Delta x}{x}}{\frac{\Delta P_y}{P_y}} = \frac{\Delta x P_y}{\Delta P_y x} \lesseqgtr 0 \text{ compl v. subs}$$

Income elasticity

$$\eta_x = \frac{\%\Delta x}{\%\Delta M} = \frac{\frac{\Delta x}{x}}{\frac{\Delta M}{M}} = \frac{\Delta x M}{\Delta M x} > 0$$

Ilustration

Derivation of the demand function

- Consider a two-good economy: a composite consumption good (y) ["food"] and health care (x).
- (Representative) individual's utility function:

$$U(x,y) = x^{\alpha} y^{\beta}, \ \alpha, \beta > 0$$

- Individual's income m.
- Individual's budget constraint:

$$m \geq xP_x + yP_y$$

where P_x y P_y denote prices of x and y respectively.

- Individual's problem:
Select a bundle (x, y) to maximize utility given $(P_x, P_y; m)$:

$$\max_{x,y} x^{\alpha} y^{\beta} \text{ s.t. } m \geq xP_x + yP_y$$

Solution:

$$\max_{x,y} L(x,y) = x^{\alpha}y^{\beta} + \lambda(m - xP_x - yP_y)$$

First order conditions,

$$\frac{\partial L}{\partial x} = \alpha x^{\alpha-1}y^{\beta} - \lambda P_x = 0 \tag{1}$$

$$\frac{\partial L}{\partial y} = \beta y^{\beta-1}x^{\alpha} - \lambda P_y = 0 \tag{2}$$

$$\frac{\partial L}{\partial \lambda} = m - xP_x + yP_y = 0 \tag{3}$$

From (1) and (2),

$$\frac{\alpha y}{\beta x} = \frac{P_x}{P_y}$$

That is,

$$y = \frac{\beta x}{\alpha}\frac{P_x}{P_y} \tag{4}$$

Substituting (4) in (3) yields

$$x(P_x, m) = \frac{\alpha m}{P_x(\alpha + \beta)} \tag{5}$$

Substituting (5) in (4) yields

$$y(P_y, m) = \frac{\beta m}{P_y(\alpha + \beta)} \tag{6}$$

Note: indep goods! $\partial x/\partial P_y = 0 = \partial y/\partial P_x$

Example Society with two consumers a and b and two goods x and y.

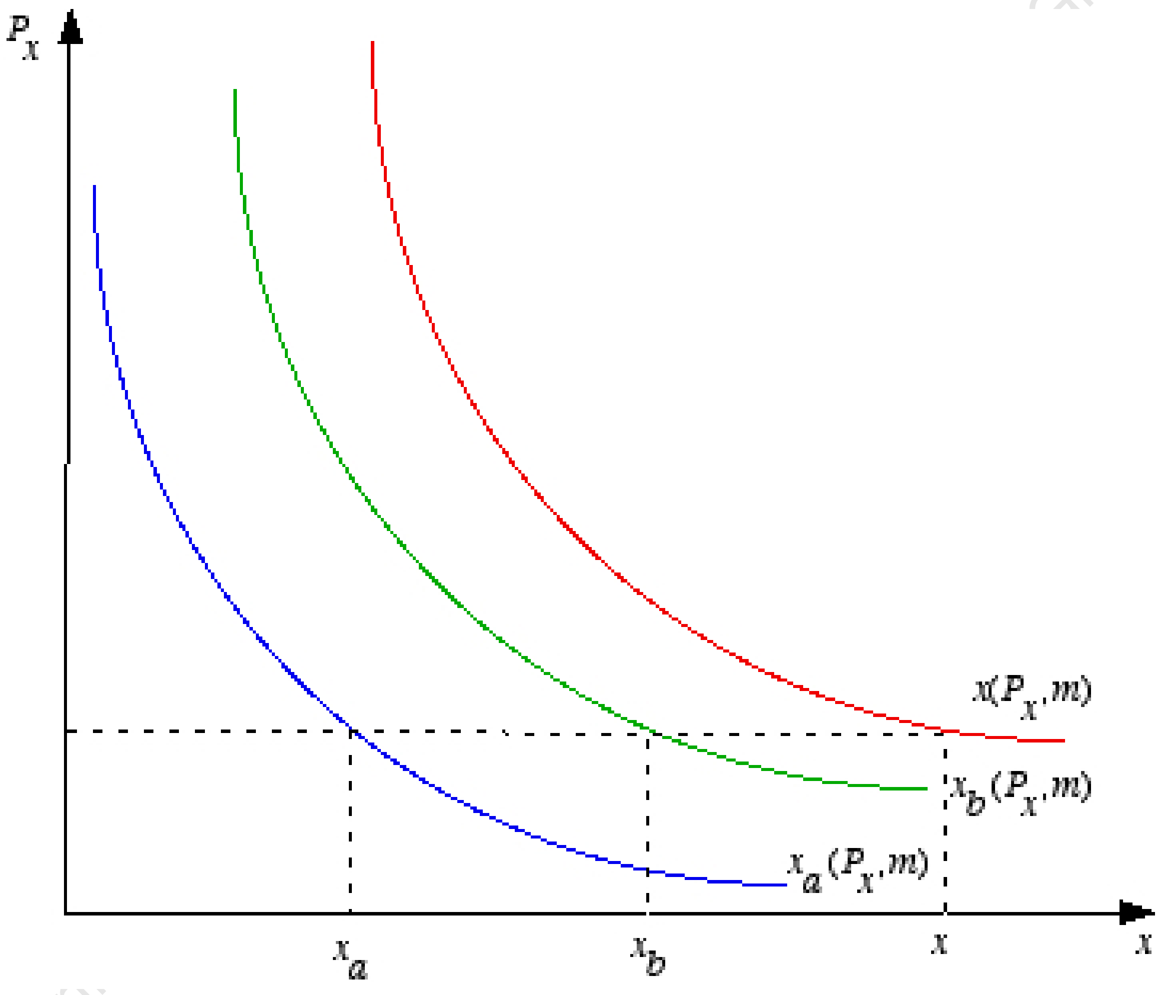
$$U_a(x_a, y_a) = x_a^{\frac{1}{3}} y_a^{\frac{2}{3}}$$
$$U_b(x_b, y_b) = x_b^{\frac{2}{3}} y_b^{\frac{1}{3}}$$

Individual demands:

$$x_a(P_x, m) = \frac{m}{3P_x}$$
$$y_a(P_y, m) = \frac{2m}{3P_y}$$
$$x_b(P_x, m) = \frac{2m}{3P_x}$$
$$y_b(P_y, m) = \frac{m}{3P_y}$$

Market demands:

$$x(P_x, m) = \frac{m}{P_x}$$
$$y(P_y, m) = \frac{m}{P_y}$$



P_x
$x(P_x,m)$
$x_b(P_x,m)$
$x_a(P_x,m)$
x_a
x_b
x
x

Elasticity

◇ own-price elasticity

$$\varepsilon_{x_a} = \frac{\partial x_a}{\partial P_x}\frac{P_x}{x_a} = -\frac{1}{3}$$
$$\varepsilon_{x_b} = \frac{\partial x_b}{\partial P_x}\frac{P_x}{x_a} = -\frac{2}{3}$$
$$\varepsilon_{x} = \frac{\partial x}{\partial P_x}\frac{P_x}{x_a} = -1$$

◇ income elasticity

$$\eta_{x_a} = \frac{\partial x_a}{\partial m}\frac{m}{x_a} = 1$$
$$\eta_{x_b} = \frac{\partial x_b}{\partial m}\frac{m}{x_a} = 1$$
$$\eta_{x} = \frac{\partial x}{\partial m}\frac{m}{x_a} = 1$$

Example: Manning, W. and C. Phelps, 1979, The demand for dental care, *Bell Journal of Economics*, **10**: 503-525.

	Cleanings	Fillings	Extractions	Examinations	Aggregate
Price elasticity (abs. value)					
Adult males	0.79	0.58	0.21	0.56	0.70
Adult females	0.14	0.73	1.51	0.03	1.05
Children	1.34	0.95	0.97	0.59	1.81
Income elasticity					
Adult males	0.76	0.54	-0.13	0.64	0.82
Adult females	0.80	0.88	-0.08	0.73	0.81
Children	0.74	0.28	0.47	0.51	1.05

Price and Income elasticities of demand for primary dental services.

Comments:

1. Price elasticity of demand for children much greater than adults.

2. Children demand for cleanings, fillings and extractions quite sensitive to price .

3. Some income elasticities are substantial in cleanings and examinations.

4. Negative income elasticity for extractions in adults: “poor people’s dentistry”.

Readings:

Manning, W. and C. Phelps, 1979, The demand for dental care, *Bell Journal of Economics*, **10**: 503-525.

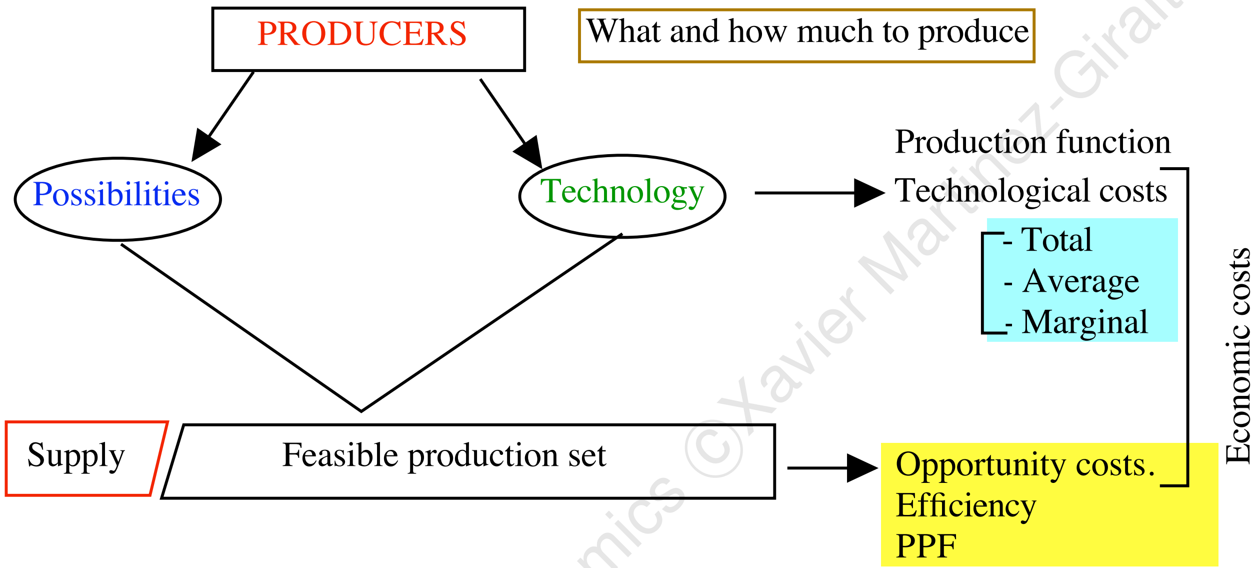
[http://ideas.repec.org/a/rje/bellje/v10y1979iautumnp503-525.html]

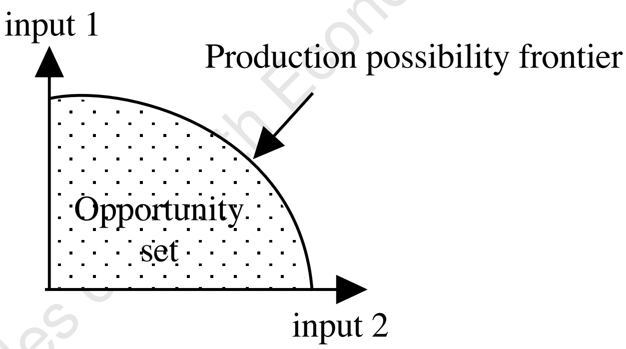
AIHW, 2003, Demand for dental care, AIHW Dental Statistics and Research Unit Research Report No. 8.

[http://arcpoh.adelaide.edu.au/publications/report/research/]

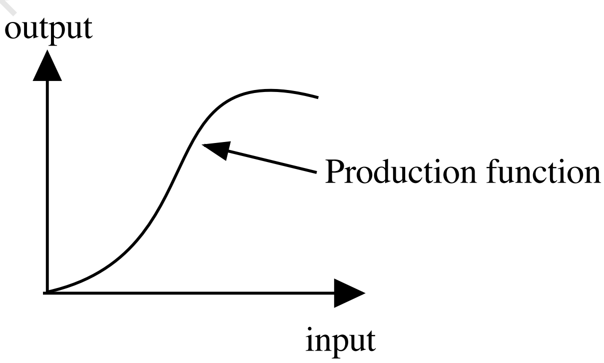
Note: Usually dental care is not covered by health insurance. Demand for dental care is thus sensitive to price variations.

Producers (Suppliers).





$$C(x) = F + V(x)$$
$$AC(x) = \frac{C(x)}{x}$$
$$MC(x) = \frac{\partial C(x)}{\partial x}$$



Production function

♠ relation between output and inputs: output = f(inputs).
$\rightarrow$ engineering approach to production activity.
bread=f(flower, water, salt, labor, ...)
surgery=f(surgery room, blood, anesthesia, nurse, surgeon, ...)
e.g. $q = f(K, L)$

♠ Def.: represents the maximum amount of output that can be obtained from a given combination of inputs. (conveys efficiency)

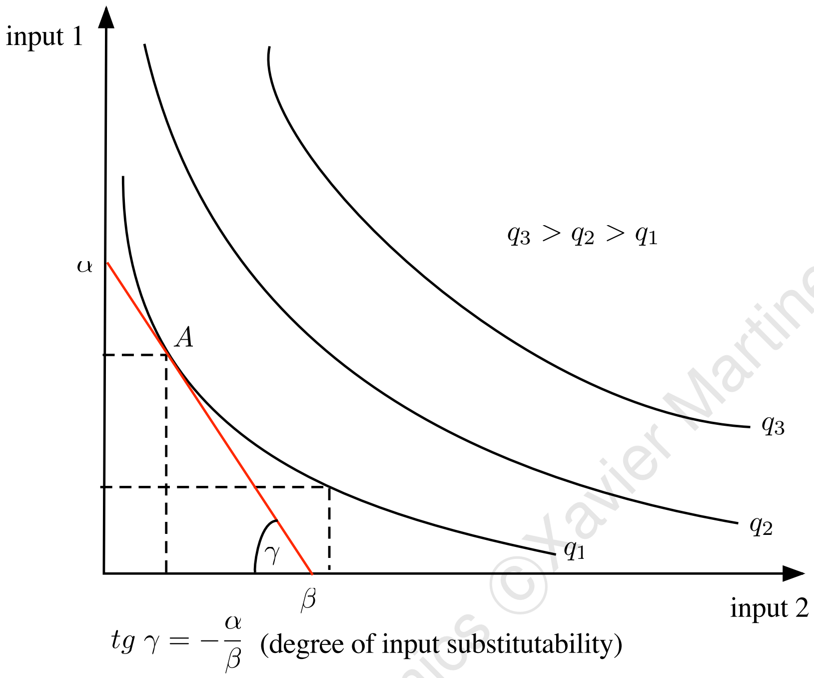
♠ Graphical representation (1 output, 2 inputs):

(a) isoquant map $\rightarrow$ degree of substitutability of inputs.

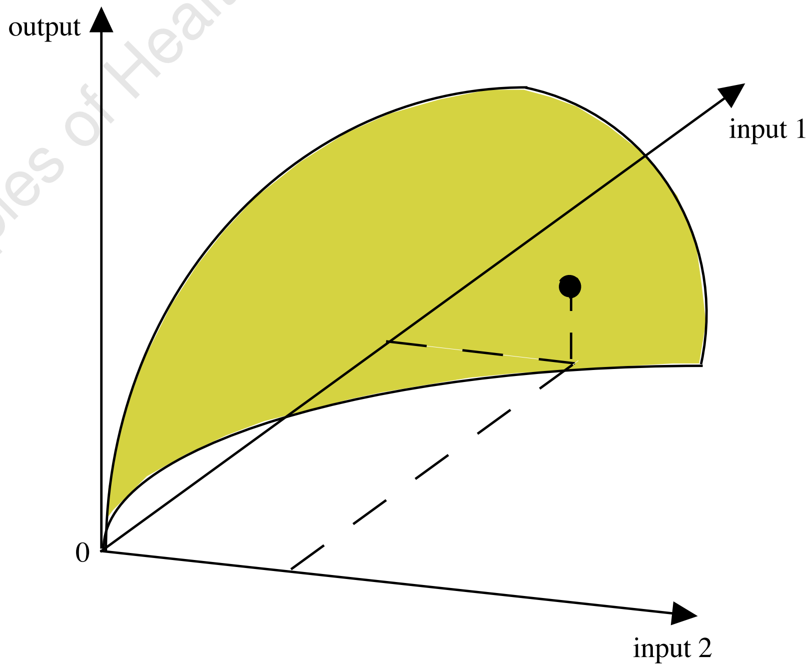
(b) 3D

(c) Production possibility frontier (multiproduct)

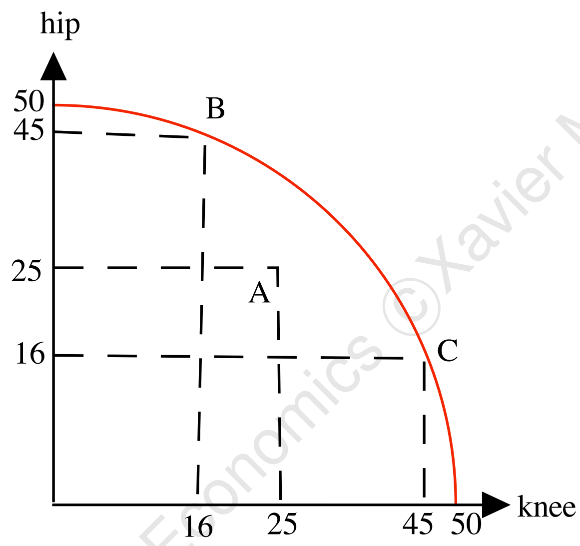
(a) isoquant map



(b) 3D representation



Consider a hospital with 10 surgeons and 2 activities.
If all perform knee surgery $\rightarrow$ 50 interventions/week;
If all perform hip replacements $\rightarrow$ 50 interventions/week.



Points $A, B, C \in$ feasible production set.
Represent production of hospital (supply).
Points $B, C \in$ FPP.

Production possibility frontier:
Set of all the maximum combinations of operations the hospital can achieve given the quantity and productivity of resources available.

Efficiency.

An allocation of resources is efficient if it is impossible to change that allocation to make a consumer better off (perform one additional intervention) without making anybody else worse off (reducing number of operations).

Efficiency refers to allocations of resources yielding the maximum possible output, i.e. allocations on PPF.

Hence, allocation A is not efficient, while allocations B, C are efficient.

From a social point of view, there is interest in moving from A to B (or C). The hospital is able to increase its output with the same inputs.

Efficacy.

Potential benefit of a technology. Probability that an individual benefits from the application of a (health) technology to solve a particular (health) problem, under ideal conditions of application.

Effectiveness.

Probability that an individual benefits from the application of a (health) technology to solve a particular (health) problem, under real conditions of application.

Examples:

Highly effective treatments: vaccinations, heart surgery, diabetes, influenza, renal insufficiency, ...

Clinical interventions of known efficacy explain 5 of the years won in life expectancy at birth.

Efficacy vs Effectiveness

In general, efficacy or ideal use or perfect use is the ability to produce a specifically desired effect. For example, an efficacious vaccine has the ability to prevent or cure a specific illness. In medicine a distinction is often drawn between efficacy and effectiveness or typical use. Whereas efficacy may be shown in clinical trials, effectiveness is demonstrated in practice.

The distinction between efficacy and effectiveness is important because doctors and patients often do not follow best practice in using a treatment. For instance, a patient using oral contraceptive pills to prevent pregnancy may sometimes forget to take a pill at the prescribed time; thus, while the perfect-use failure rate for this form of conception in the first year of use is just 0.3%, the typical-use failure rate is 8%.

Illustration

★ Clinical essay: efficacy of drug 1=75%.
★ ∃ drug 2, same price and efficacy = 70%

more effective to select drug 1 and reject drug 2?

YES, with this information.

Additional INFO

♦ both drugs are correctly prescribed to 75% of patients
♦ drug 1: 50% of patients follow treatment correctly (shots)
♦ drug 2: 70% of patients follow treatment correctly (pills)

Effectiveness of drugs:

$$E_1 = 0.75 \times 0.75 \times 0.5 = 0.28125$$
$$E_2 = 0.7 \times 0.75 \times 0.7 = 0.3675$$

Conclusion: select drug 2.

Cost function

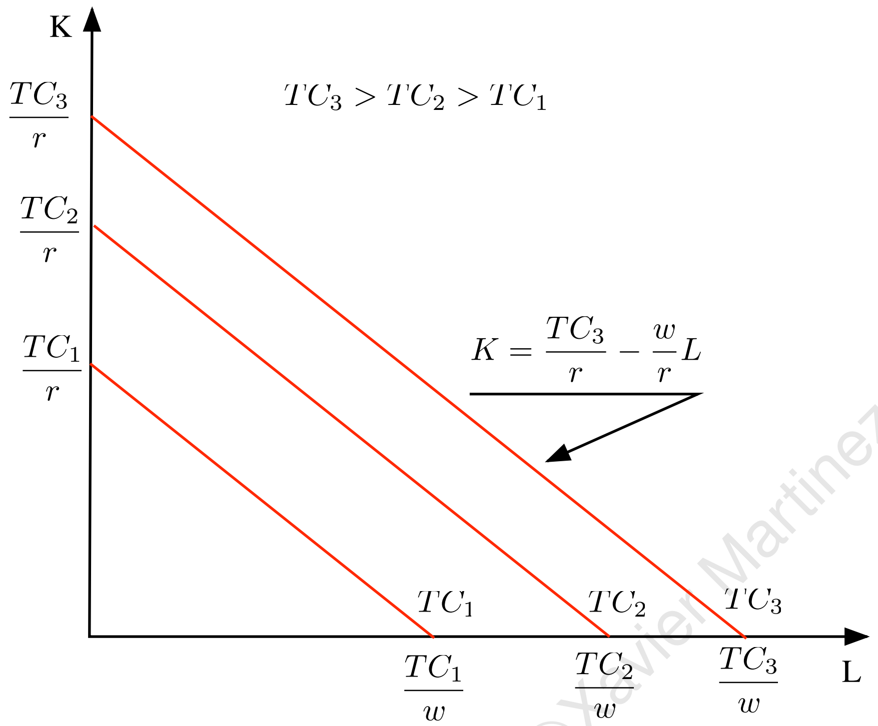
Cost function shows relationship between output and cost. $\rightarrow$ economic approach to production activity.

Def.: minimum possible cost of production of a given volume of output ($\bar{q}$). (conveys efficiency)
$CT(\bar{q}) = \min_{K,L} rK + wL$ s.t. $q = f(K,L)$
$\rightarrow K(\bar{q}), L(\bar{q})$

Example: Let,
q represent physician office visits,
L represent labor input (with price $w = 1$ €),
K represent capital input (with price $r = 1.2$ €).

We are assuming competitive markets!

Short run vs. long run: fixed costs.
Total cost: $TC(\bar{q}) = rK(\bar{q}) + wL(\bar{q}) = 1.2K(\bar{q}) + L(\bar{q})$
Average cost: $AC(\bar{q}) = \frac{TC(\bar{q})}{\bar{q}}$
Marginal cost: $MC(\bar{q}) = \frac{\partial TC(\bar{q})}{\partial q}$
Representation: Isocost map $\rightarrow K = \frac{\overline{TC}}{r} - \frac{w}{r}L$

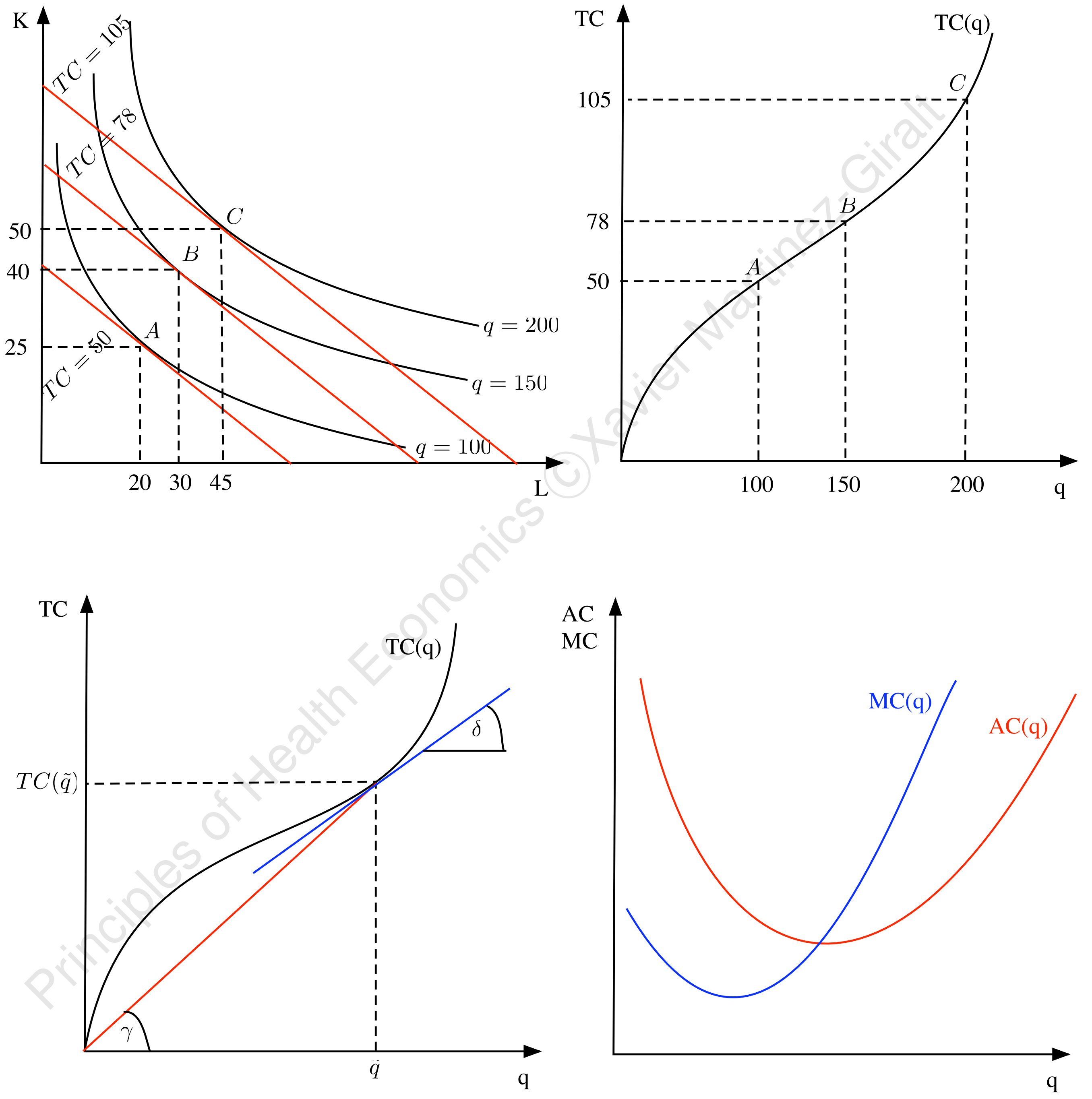


To derive the total cost function, combine isocost map and isoquant map:

- To produce $q = 100$ (i.e. 100 visits of patients) given the prices w and r, the physician minimizes cost by contracting 20 units of labor and 25 of capital. This yields a total cost of $TC(100) = (1.2)25 + 20 = 50$ €.

- To producte $q = 150, \rightarrow TC(150) = (1.2)40 + 30 = 78$ €

- To producte $q = 200, \rightarrow TC(200) = (1.2)50 + 45 = 105$ €



$$AC(\tilde{q}) = tg\,\gamma = \frac{TC(\tilde{q})}{\tilde{q}} \quad ; \quad MC(\tilde{q}) = tg\,\delta$$

Remark 1: decreasing (long run) AC implies a range of values of q such that $MC(q) < AC(q)$.

$$\frac{\partial AC(q)}{\partial q} = \frac{\partial \frac{TC(q)}{q}}{\partial q} = \frac{MC(q)q - TC(q)}{q^2} =$$
$$\frac{MC(q)}{q} - \frac{AC(q)}{q} < 0 \Leftrightarrow MC(q) < AC(q)$$

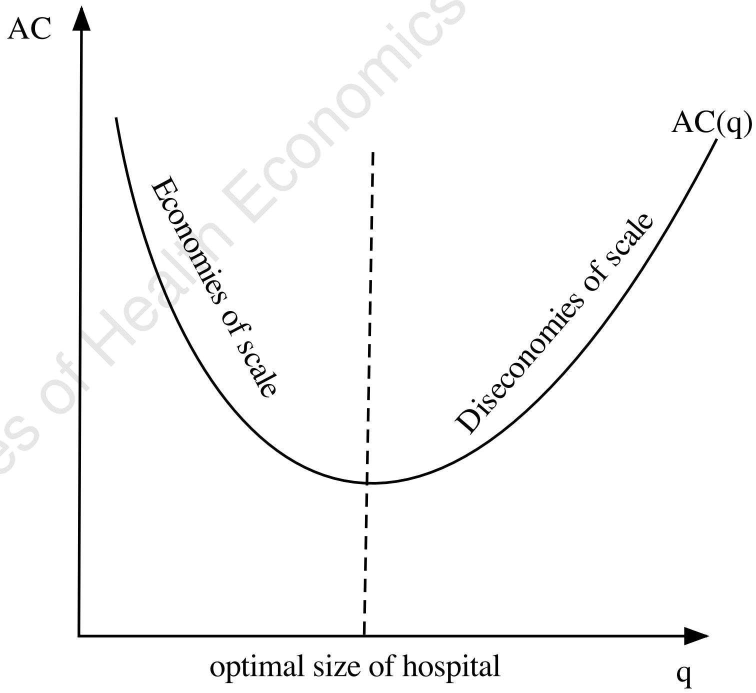
Remark 2: let $\hat{q}$ be such that $AC(\hat{q})$ is minimum. Then, $AC(\hat{q}) = MC(\hat{q})$.

If $AC(\hat{q})$ is minimum means derivative = 0. Thus,

$$\left.\frac{\partial AC(q)}{\partial q}\right|_{\hat{q}} = \left.\frac{\partial \frac{TC(q)}{q}}{\partial q}\right|_{\hat{q}} = \left.\frac{MC(q)q - TC(q)}{q^2}\right|_{\hat{q}} =$$
$$\left.\frac{MC(q)}{q}\right|_{\hat{q}} - \left.\frac{AC(q)}{q}\right|_{\hat{q}} = 0 \Leftrightarrow MC(\hat{q}) = AC(\hat{q})$$

Economies of scale

Economies (diseconomies) of scale characterizes a production process in which an increase in the level of production causes a decrease (increase) in the long run average cost of each unit.



Economies of scope

Economies of scope may appear in multiproduct firms. Scope economies refer to changes in average costs induced by changes in the mix of output between two or more products. In other words, they refer to the potential cost savings from joint production.

Consider a community with two hospitals. One specialized in pediatric care (q_1), the other specialized in cancer care (q_2). May it be worth to merge both activities in a single hospital?

Scope economies arise if

$$TC(q_1, q_2) < TC(q_1) + TC(q_2)$$

That is, the joint production of pediatric and cancer care allows for savings in the hospital's management structure, administration systems, management of hospital capacity, nurses, and non-sanitary personnel, etc.

Opportunity cost.

The concept of opportunity cost is defined as the benefit given up by not choosing an alternative allocation.

Assume a shift from B to C (page 6b). Consequences?

- 29 additional heart surgery interventions
- 29 less hip replacements.

The opportunity cost of moving from B to C is the reduction in hip replacements due to the increase in heart operations.

The opportunity cost is an economic concept (not in accountancy).

How does society chooses among feasible allocations? VOTING mechanism.

Criteria to be used:

- Efficiency: Select only efficient allocations (rule out allocation A)

- Equity. [Normative criterion] Select allocations meeting society's requirement for justice.
$\rightarrow$ people's values
e.g. social justice is behind the set-up of a NHS.

★Horizontal and Vertical equity.

■ Horizontal equity: equal treatment of equal need.
□ 2 individuals with same illness and severity should receive same treatment.

■ Vertical equity: unequal treatment of unequal need.
□ more treatment for patients with serious conditions than for those with minor affections.
□ passing the financing of health care to ability to pay (progressive income tax).

Technical progress and its diffusion

Technical progress: Defs.:

(a) produce "old" goods less costly, or produce "new" goods.

(b) Ability to produce at a lower cost given a quality level.

Diffusion: who adopts a new tech, and why.

2 principles:
- profit principle: physicians more likely to adopt a new surgical technique if it is expected to increase their revenue stream by enhancing their prestige and/or by improves well-being of patients. [if present value of future profits due to innovation > 0.]
- information principle: role of friends, colleagues, journals, and conferences at informing and encouraging the adoption decision.

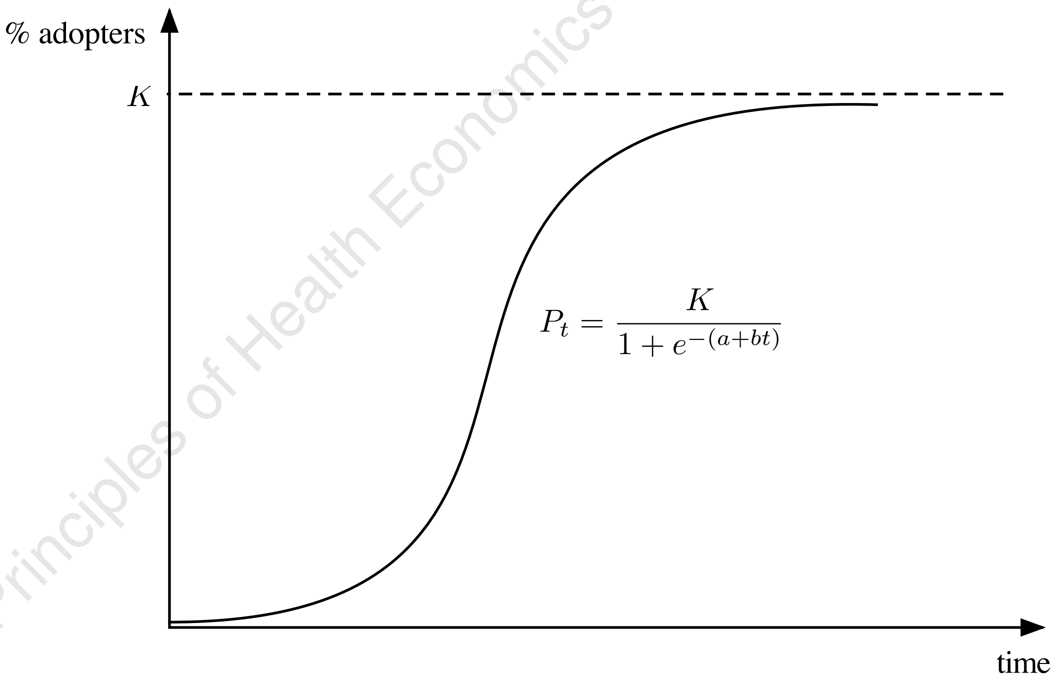
Trade-off:
- waiting may give rivals a competitive advantage;
- waiting allows for learning from others' experience.

(Classic) Pattern of diffusion

- Slow at the beginning;

- Then at an increasing rate;

- Then at a decreasing rate asymptotically reaching its limit K.



(a, b) parameters to be estimated.

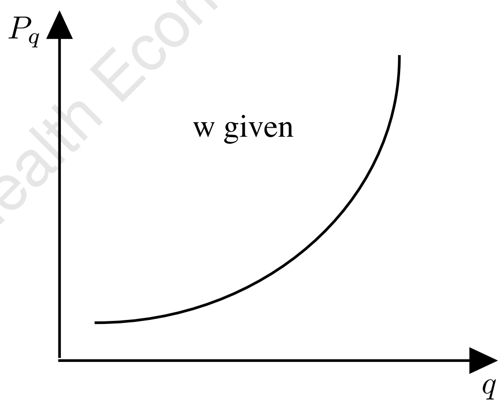
Individual vs. aggregate supply

Individual supply $\rightarrow$ solution of

$$\max_q \Pi(q) = qP_q - C(q)$$

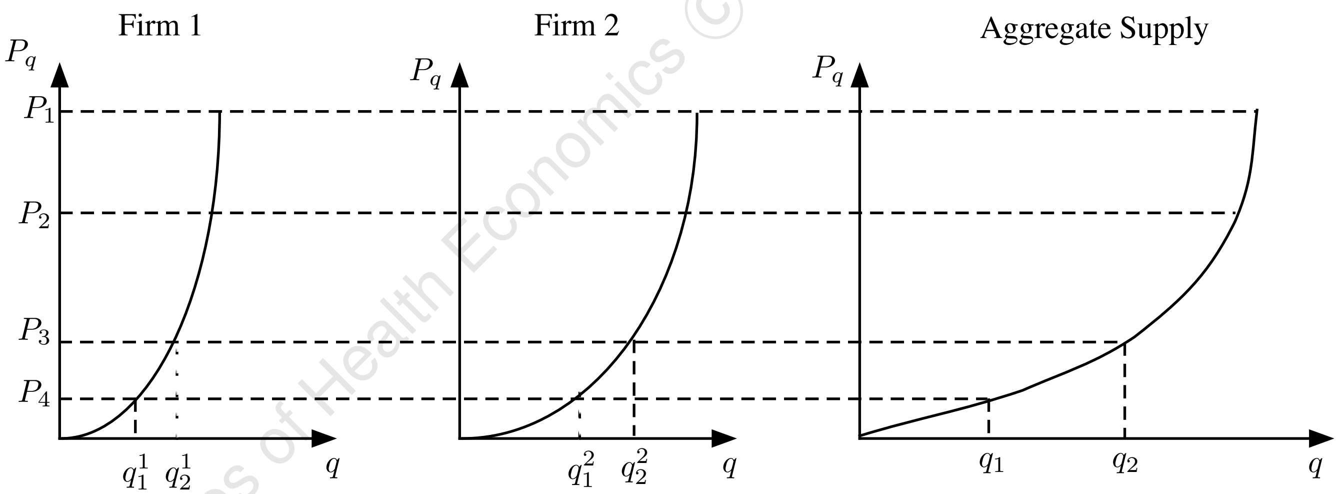
That is, (w input price vector)

$$q^*(P_q, w) \rightarrow \text{market structure?}$$



NOTE: P_q vs. $P(q)$.

Consider 2 firms $q_1(P_q, w)$ and $q_2(P_q, w)$.
The aggregate (market) supply for good q is the horizontal sum of individual supplies.



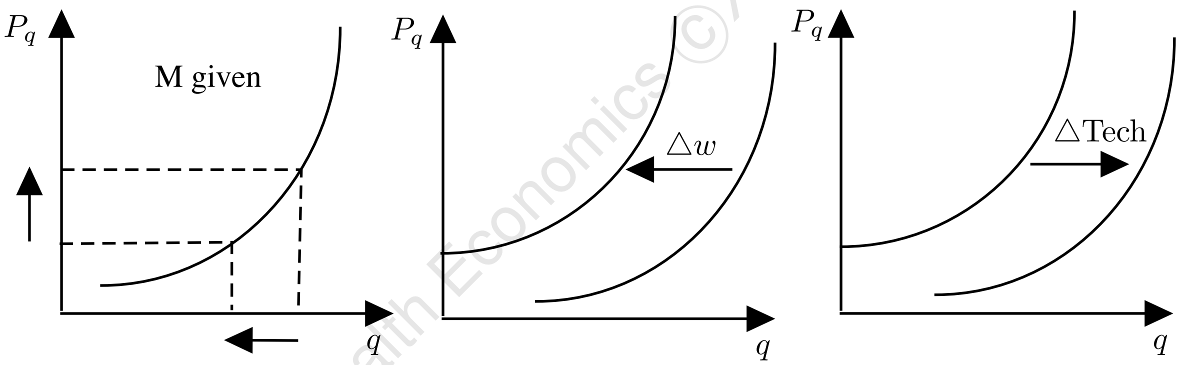
$q_1 = q_1^1 + q_1^2$
$q_2 = q_2^1 + q_2^2$

Effects on supply

Changes along the supply curve

- $\uparrow P_q, \ q \uparrow$: some firms produce more and some others enter the market.

- $\downarrow P_q, \ q \downarrow$: some firms produce less and some others leave the market.



Shifting the supply curve

- $\uparrow w$, (P_q constant), same production level is more expensive $\longrightarrow \downarrow$ production: supply moves inwards.

- R&D $\longrightarrow$ more efficient technology $\longrightarrow$ same production level is cheaper $\longrightarrow$
$\uparrow$ production: supply moves outwards

Illustration

Consider a firm (hospital) with a production function of health services $q(l) = l^\delta$, where l denote working hours and q health services.

The associated cost function $C(w, q) = wl(q)$ where $l(q) = q^{1/\delta}$, that is,

$$C(q, w) = wq^{\frac{1}{\delta}}$$

The (competitive) profit function is

$$\Pi(q) = qP_q - C(q)$$

The problem of the hospital is to determine the level of q to maximize profits. Formally,

$$\max_q qP_q - wq^{\frac{1}{\delta}} \tag{7}$$

First order condition:

$$\frac{\partial \Pi}{\partial q} = P_q - \frac{1}{\delta} wq^{\frac{1-\delta}{\delta}} = 0.$$

Thus, the supply function of the hospital is

$$q(P_q, w) = \left(\frac{\delta P_q}{w}\right)^{\frac{\delta}{1-\delta}}$$

Example Society with 2 (competitive) firms 1 and 2 and a good q.

$$q_1(l) = l^{1/3}$$
$$q_2(l) = l^{1/2}$$

Individual supply functions:

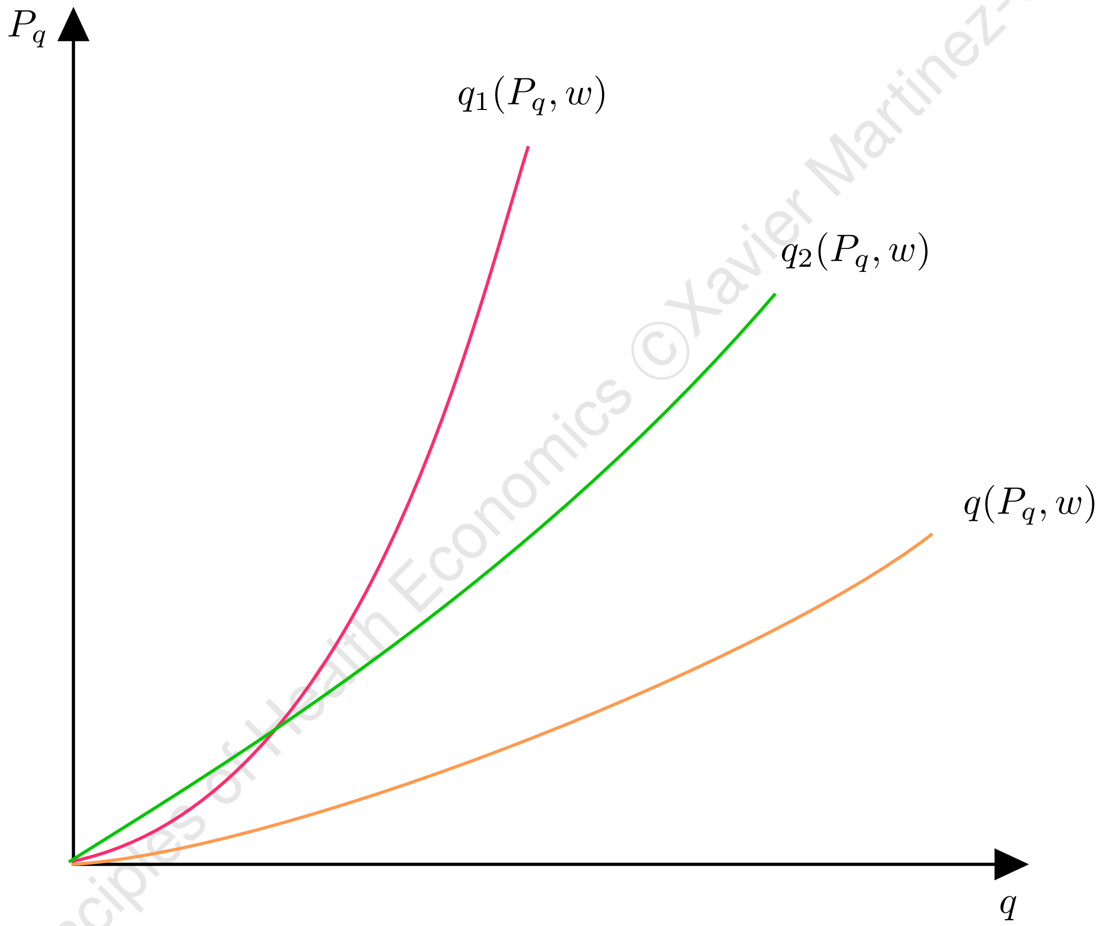
$$q_1(P_q, w) = \left(\frac{P_q}{3w}\right)^{\frac{1}{2}}$$
$$q_2(P_q, w) = \frac{P_q}{2w}$$

Aggregate supply:

$$q(P_q, w) = \left(\frac{P_q}{3w}\right)^{\frac{1}{2}} + \frac{P_q}{2w} = \frac{2wP_q^{1/2} + 3wP_q}{2w(3w)^{1/2}}$$

Elasticities

$$\varepsilon_{q_1} = \frac{\partial q_1}{\partial P_q}\frac{P_q}{q_1} = \frac{1}{2}$$
$$\varepsilon_{q_2} = \frac{\partial q_2}{\partial P_q}\frac{P_q}{q_2} = 1$$


P_q
$q_1(P_q, w)$
$q_2(P_q, w)$
$q(P_q, w)$
q

Insurers

Private vs Public health care systems

Private market for health insurance

- adjustment of premia to the individual risk: only weak solidarity

- Efficiency

  * consumers can choose among a menu of policies

  *insurers have incentives to control expenses

- Equity

  * some individuals may not be insured (adverse selection problem)

  * different treatment of good and bad risks

Readings:

- Setting priorities:
Hitchen, L., 2006, Bid to cut waiting lists has pushed safety down NHS agenda, *BMJ* **332**(7537), February 11: 324.

- Equity:
Deemong, C., and J. Keen, 2004, Choice and equity: lessons from long term care, *BMJ* **328**(7453), June 12: 1389-1390.

Public centralized system for health insurance

- compulsory insurance financed through taxes and/or employer/employee contributions

- government regulation of the health care sector

- Efficiency

  * limited choice for population

  * spending control through government policies

- Equity

  * universal coverage

  * solidarity between good and bad risks

  * other aspects of equity:

- equity of finance (cost-sharing by income; indiv. election insurance public/private) vs. equity of access (= treatment for = need; universal access) $\rightarrow$ Deeming and Keen (2004).

- health care insurance $\rightarrow$ see ch. 7

3. The market and the health care market

“Place” where consumers and producers interact (i.e. exchange goods).

What goods compose a market? $\rightarrow$ demand oriented vs supply oriented

Demand oriented: set of products with high crossed elasticities among them and low wrt other goods.

Examples

(a) crossed elasticity between 95 octane and 98 octane gasoline is high. They are close substitutes. They belong to the same market.

(b) crossed elasticity between consumption of gasoline and mineral water is low. They are independent goods. They belong to different markets.

PROBLEM: ambiguity of high/low enough crossed elasticity.

Supply oriented:

- Europe NACE (General Industrial Classification of Economic Activities [Nomenclature statistique des Activités économiques dans la Communauté Européenne]),

- Spain CNAE (Clasificación Nacional de Actividades Económicas)

- US NAICS (North American Industry Classification System)

PROBLEM: codes assigned according to technologically oriented criteria. May be misleading, e.g. elaboration of wine and champagne have different codes, but often grouped in the same market (high crossed demand elasticity).

Imperative assumption in the study of a market: Rational behavior of agents:

- consumers: maximize utility $\longrightarrow$ individual demand $\longrightarrow$ Market demand

- firms: maximize profits $\longrightarrow$ individual supply $\longrightarrow$ Market supply

Market structures:

Sellers \ Buyers	Many	Few	One
Many	Perfect Competition	Oligopsony	Monopsony
Few	Oligopoly	Bilateral Oligopoly	
One	Monopoly		Bilateral Monopoly

PERFECTLY COMPETITIVE MARKET

Justification:

1. Simplicity.

2. Generates the best allocation of resources (no mismanagement): efficient distribution (Pareto-optimality) [$\neq$ equity].

3. No need of the State to achieve efficiency.

4. Benchmark to build models allowing better understanding of real phenomena.

Assumptions:

1. Many sellers (producers): price-takers; given prices choose production volume to max profit.

$$Q^* = \sum_{j=1} \infty q_j *, \ \lim_{j \to \infty} \frac{q_j *}{Q^*} = 0;$$
$$q_j^*(p, w) = argmax_q \Pi(q)$$

2. Many buyers (consumers): price takers; given prices choose consumption bundle to max satisfaction.

$$x^* = \sum_{j=1} \infty x_i *, \ \lim_{i \to \infty} \frac{x_i *}{x^*} = 0;$$
$$x_i^*(p, m) = argmax_x U(x) \text{s.t. budget constraint}$$

3. Homogeneous product.

4. Perfect information.

5. Free entry (and exit) of firms.

6. Partial equilibrium. Static set-up.

Additional assumption:

7. Real markets (no financial markets)

    - markets of goods and services: firms sell; consumers buy.

    - labor markets: firms buy; consumers sell.

Implicit assumption: property rights

8. Firms (shareholders) hold the property right over profits $\longrightarrow$ **incentives** to reinvest to improve profitability $\longrightarrow \Delta\Pi$.

9. Consumers hold the property rights over their incomes:

   - **incentives** to work (increase income)

   - **incentivos** to save (increase returns of capital)

   $\Longrightarrow \Delta$ consumption.

A State setting incomes and profits eliminates incentives.

Incentives

Are necessary but ... generate inequality.

Induce proper behavior if linked to profitability: higher profitability $\longrightarrow$ higher income.

Consequence: trade-off between incentives and inequality.

If society offers + incentives (e.g. ∇ Tx, ∇ social benefits) i.e. indiv. welfare. $\sim$ income

$$\longrightarrow \begin{cases} \Delta \text{ production} \\ \Delta \text{ inequality} \end{cases}$$

If society offers - incentives (e.g. Δ Tx, Δ social benefits) i.e. indiv. welfare depends of income and social benefits

$$\longrightarrow \begin{cases} \nabla \text{ production} \\ \nabla \text{ inequality} \end{cases}$$

Societies solve the trade-off between the two forces through *voting* in government elections.

Prices

allocate goods and services through the market to those with highest willingness to pay.

BUT is not the only allocation mechanism, e.g.

(i) Rationing (the consumption bundles consumers get are smaller that what they wish)

- por queuing (cinemas, primary care services, ...) $\longrightarrow$ inefficient

- por lotteries (licences, ...) $\longrightarrow$ inefficient

- por sharing rules (prorate shares in privatization of public firms, food stamp programs, wartime, ...)

  - without market for coupons $\longrightarrow$ inefficient

  - with market for coupons $\longrightarrow$ efficient

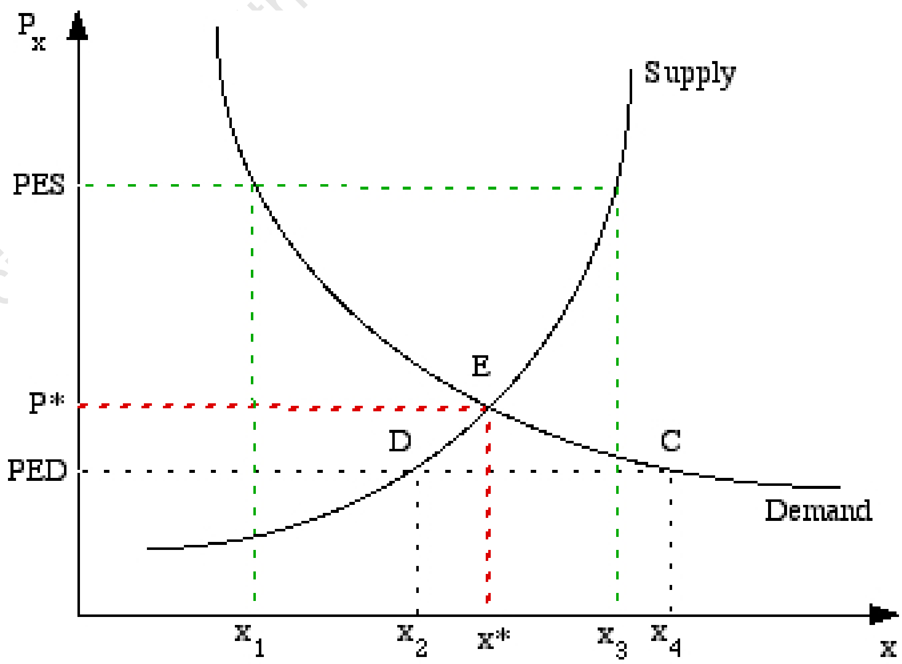
(ii) Fixing prices (electricity, house-rental, ...)

Market equilibrium: Law of demand and supply.

Aggregate demand and supply of a commodity x jointly determine its (partial) equilibrium price (and quantity) in a perfectly competitive market.

An equilibrium is a situation where no agent has incentives to modify his(her) actions.

The equilibrium pair (P^*, x^*) denotes a situation where firms are maximizing profits and consumers are maximizing satisfaction from consumption.



Ilustration

Recall the market demand in pp. 5j-5l and market supply in pp. 6u-6w.

$$\text{Demand}: x^D(P_x, m) = \frac{m}{P_x}$$

$$\text{Supply}: x^S(P_x, w) = \left(\frac{P_x}{3w}\right)^{\frac{1}{2}} + \frac{P_x}{2w}$$

Assume $m = 10$ and $w = 1/3$, so that

$$\text{Demand}: x^D(P_x) = \frac{10}{P_x}$$

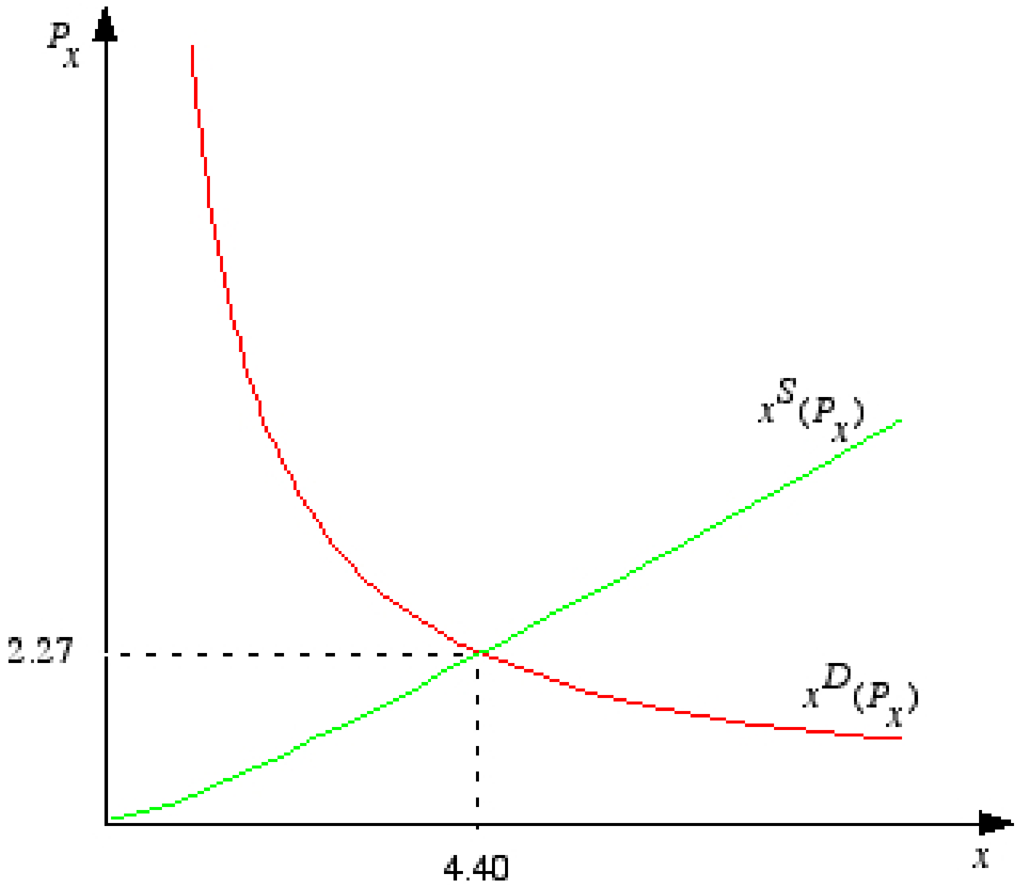
$$\text{Supply}: x^S(P_x) = P_x^{1/2} + \frac{3P_x}{2}$$

Equilibrium is characterized by $x^D(P_x) = x^S(P_x)$. Formally,

$$P_x^{1/2} + \frac{3P_x}{2} = \frac{10}{P_x} \Longleftrightarrow$$

$$\frac{3}{2}P_x^2 + P_x - 10 = 0$$

That is, $P_x \approx 2.27$ and $x \approx 4.40$.

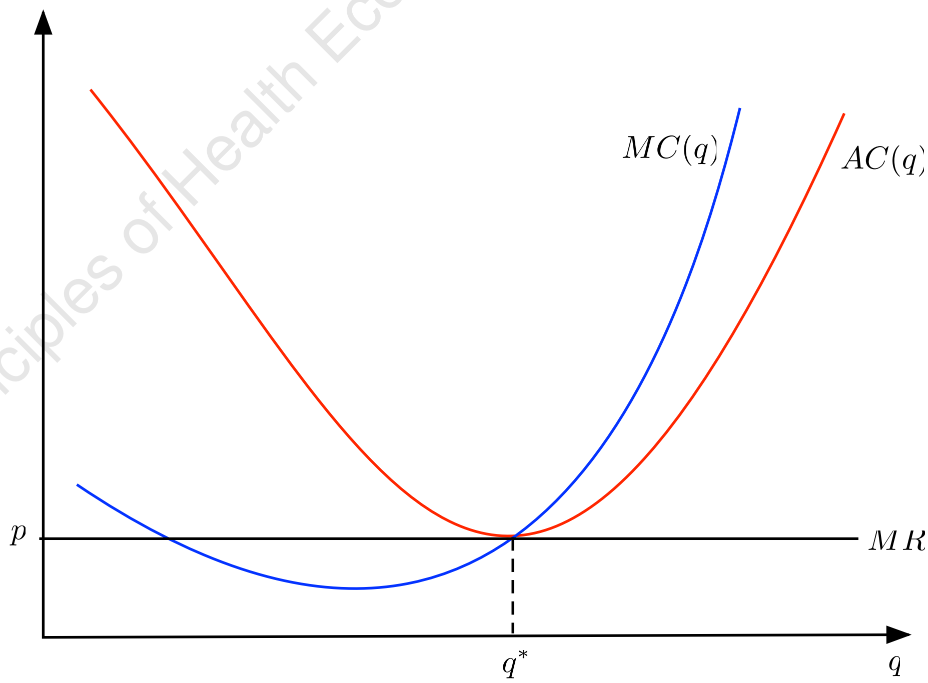

P_x
$x^S(P_x)$
2.27
$x^D(P_x)$
4.40
x

Characterization of competitive equilibrium

- Firms (given prices) choose q to maximize profits,
$\Pi(q) = pq - TC(q)$
$\frac{\partial \Pi(q)}{\partial q} = 0 \rightarrow q^*$ s.t. $p = MC(q^*)$

- free entry guarantees zero profits, $\Pi(q^*) = 0$
$\rightarrow pq^* = TC(q^*) \rightarrow p = TC(q^*)/q^* = AC(q^*)$.

Hence, at $q^*,\ p = MC(q^*) = AC(q^*)$.



Equivalence Max profits and Min costs

- Profit maximization:

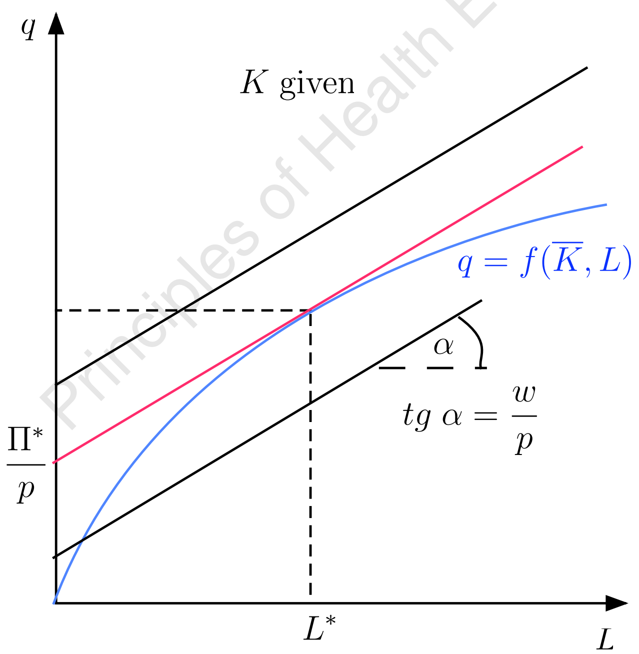
$\max_q \Pi(q) = pq - wL - rK$ s.t. $q = f(K, L)$

Isoprofit map: $q = \frac{\overline{\Pi}}{p} + \frac{w}{p}L + \frac{r}{p}K$

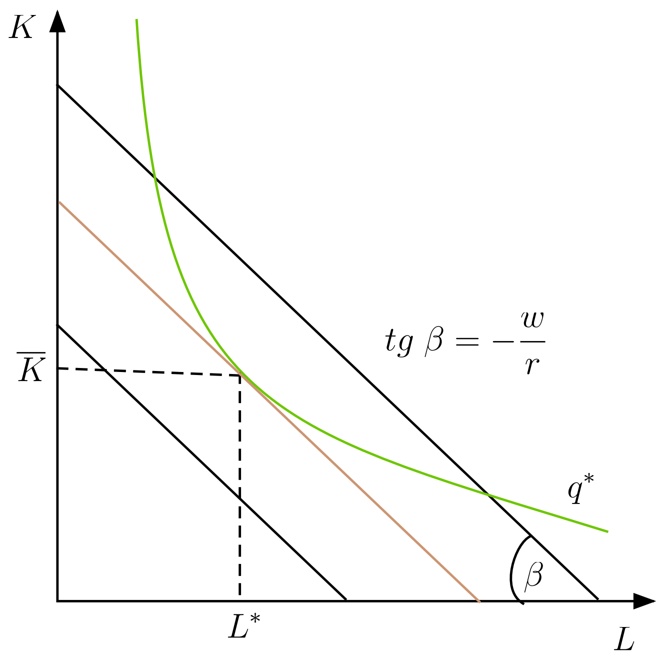
$\rightarrow$ optimum satisfies

$$\frac{w}{p} = \frac{\partial f}{\partial L}, \text{ and } \frac{r}{p} = \frac{\partial f}{\partial K}.$$

Thus, profits are maximized at $\frac{w}{r} = \frac{\frac{\partial f}{\partial L}}{\frac{\partial f}{\partial K}}$.



Profit maximization



Cost minimization

- Cost minimization:

$$\min_{K,L} wL + rK \text{ s.t. } q = f(K, L)$$

Isocost map: $K = \frac{\overline{TC}}{r} - \frac{w}{r}L$
$\rightarrow$ optimum satisfies

$$-\frac{w}{r} = -\frac{\frac{\partial f}{\partial L}}{\frac{\partial f}{\partial K}}.$$

Conclusion:

With given prices (p, r, w), max profits $\Leftrightarrow$ min total cost. If a firm max profits producing q^*, it must be minimizing cost. Otherwise, it would mean there is a cheaper way to produce q^* contradicting profit maximization.

4. Regulation

Why does it exist a public sector?

The State plays a double rol in the economy:

- regulates the market (taxes, transfers, minimum wages, compulsory schooling, vaccination campaigns, ...)

- agent in the market $\longrightarrow$ PUBLIC SECTOR ($\longrightarrow$ Mixed Economy).

Components of the Public Sector:

(a) Welfare State: Health care services (SS), Education, Pensions, Defense (?).

(b) Services (Liberalization, Privatization): Railways, Mail, Telecommunications, Airlines.

(c) Industry (Privatization): Mining, Energy, Iron and Steel.

Characteristics of the Public Sector:

(i) its objective need not be profit maximization ;

(ii) managers of public firms are “reliable officials”;

(iii) State has the right to impose duties (e.g. taxes) to citizens and self-imposes control mechanisms.

The rol of the State in the Economy: Market failures and Intervention (Regulation).

If competitive markets are efficient, why is there any need of State regulation?

Free competition raises problems, e.g. negative externalities (pollution, insufficient education, ...) Also there appear market failures $\longrightarrow$ inefficiencies (exclusion high risks individuals, ...), free-riding, social complaints, entry barriers (licence for activities: banks, restaurants, physicians,...)

Mechanisms of regulation:

- direct (substituting the private sector);

public transport, health care provision, public education

- providing incentives to the private sector (price manipulation via transfers/taxes);

subsidies to private schools

- imposing rules to the private sector (legislation);

min wage, age in labor market, safety workplace, antitrust laws

- combinations.

Types of regulation:

- universally accepted (access of kids to the labor market)

- controversial (positive action for gender/race)

- on producers/consumers (price discrimination; antitrust laws; controls on advertising; access of consumers to info on products, ...)

- on production conditions (safety at workplace; patents; waste disposal; environmental pollution, ...)

Reasons for regulation:

- protection of working conditions (health, safety, ...)

- protection of vulnerable social groups (kids, immigrants, ...)

- protection of competitive conditions

- prevention of market abuse

Instruments for regulation:

- laws (antitrust agencies)

- administrative actions

- professional associations (entry conditions

Objetive of the regulation: correct market failures.

Why does the State regulates the health care market?

Typology of answers:

(a) the market is too complex for patients. Providers would take advantage on them;
(b) health is too a fundamental good for governments let the market operate freely;
(c) health care market generates externalities ([-] epidemies, [+] vaccinations);
(d) poor people must have access to the health care market;
(e) asymmetric information between physician and patient (moral hazard, adverse selection).

BUT ... there are other markets for which these arguments also apply and there is no intervention (food, housing) neither in production nor in distribution.

ALSO,

- Health care market is not competitive $\rightarrow$ monopoly power, public goods, externalities, ... (see below)

- Hospitals

entry barriers (permissions, subsidies, ...)
size (scale and scope economies)
asymmetric info hospital/patient (quality,...)
ownership (public, private, for profit, nonprofit)

-Physicians

entry barriers
professional associations
private sector: price discrimination to patients and insurers

Reading:

Philipson T., and E. Sun, 2008, Regulating the safety and efficacy of prescription drugs, VoxEU.orp,

[http://www.voxeu.org/index.php?q=node/804]

SOURCES OF MARKET FAILURE

I. Supply side

(i) natural monopolies (scale economies) $\rightarrow$ large initial investment: supply of water, gas, electricity, transport, telecommunications, ...

Regulation (limit monopoly power) widely accepted (prices)

(ii) oligopolies (monopoly power) [see below]

Regulation (limit monopoly power): antitrust laws

(iii) Externalities $\rightarrow$ difficult to measure, diversity of effects, diversity of types. [see below]

Regulation (limit monopoly power): OK but how?

(iv) public goods: no exclusion, no rivalry (public gardens, roads, army) [see Ch. 5]

Regulation (protect "monopoly rents")

(v) Merit goods and incomplete markets [see below]

II. Demand side

(i) imperfect and incomplete information on products (AIDS, drugs) and markets.

Regulation: control on sales of dangerous products; info on label of products (expiry date, ingredients, ...); control on advertisement campaigns.

(ii) information as a public good $\rightarrow$ private market does not provide enough information (see below).

Regulation: increase volume of information.

OLIGOPOLY

Consider a market with two firms (duopoly) 1 and 2. Firm 1's decision will be affected by firm 2's behavior $\rightarrow$ Strategic interaction

Now, $Q = \sum_{j=1}^{n} q_j$ and $q_j/Q > 0$!!

Firm 1's decision-making process

- Market price will depend on firms production levels: $P(q_1, q_2)$. Therefore, demand downward sloping.

1's profit maximization: find production level solving

$$max_{q_1} \Pi(q_1, q_2) = q_1 P(q_1, q_2) - C(q_1)$$

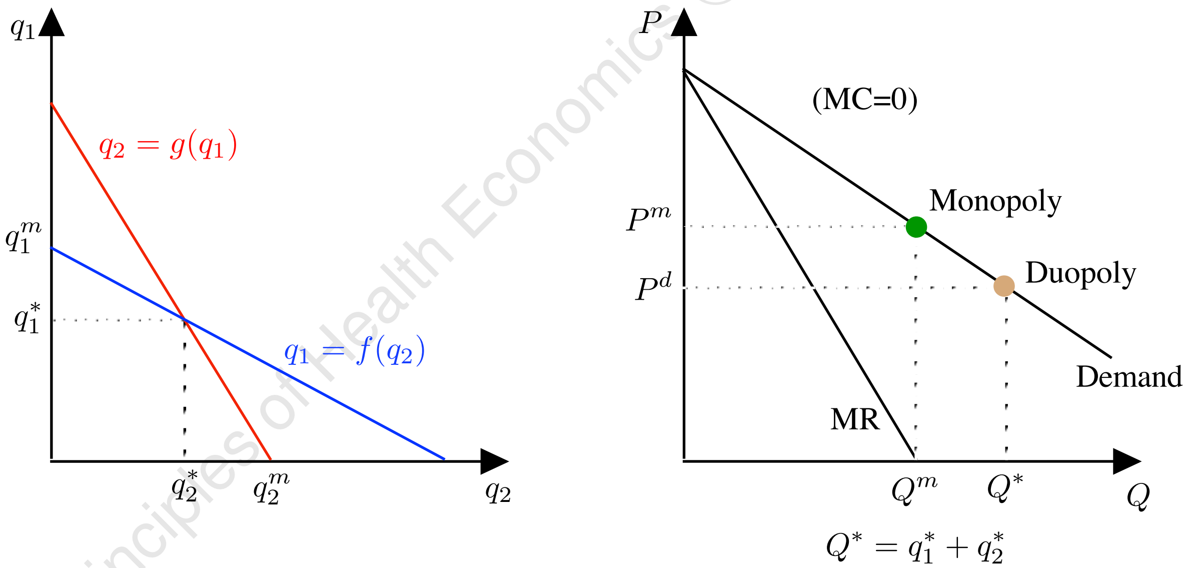
Solución: $q_1 = f(q_2)$

Similarly, firm 2 maximizes profits producing

$q_2 = g(q_1)$

Market equilibrium

(q_1^*, q_2^*) such that $f(q_2)$ is compatible with $g(q_1)$



MONOPOLY

Profit maximization

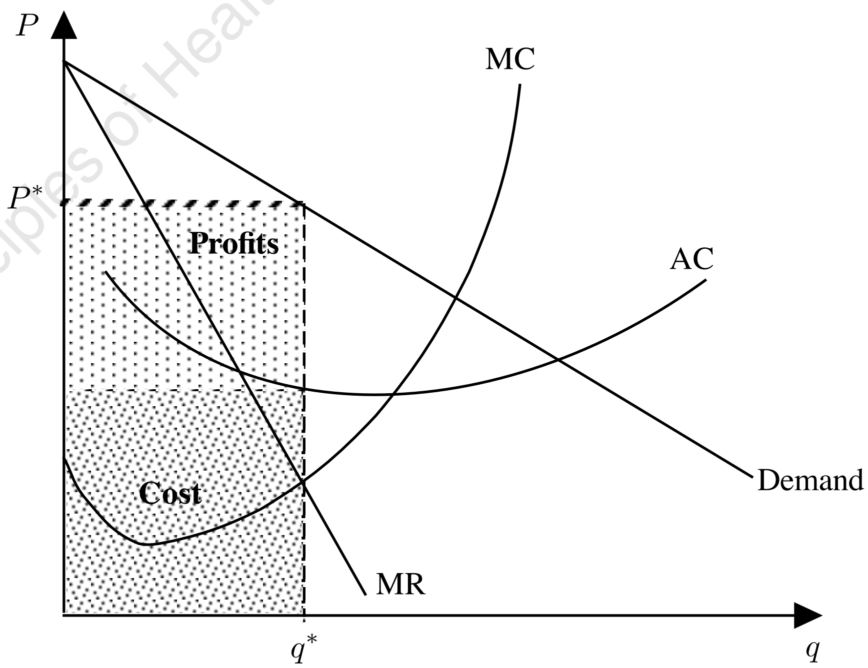
$\max_q \Pi(q) = qP(q) - C(q) = I(q) - C(q)$

Marginal Revenue: Δ revenue when selling one additional unit

Marginal Cost: Δ cost when producing one additional unit

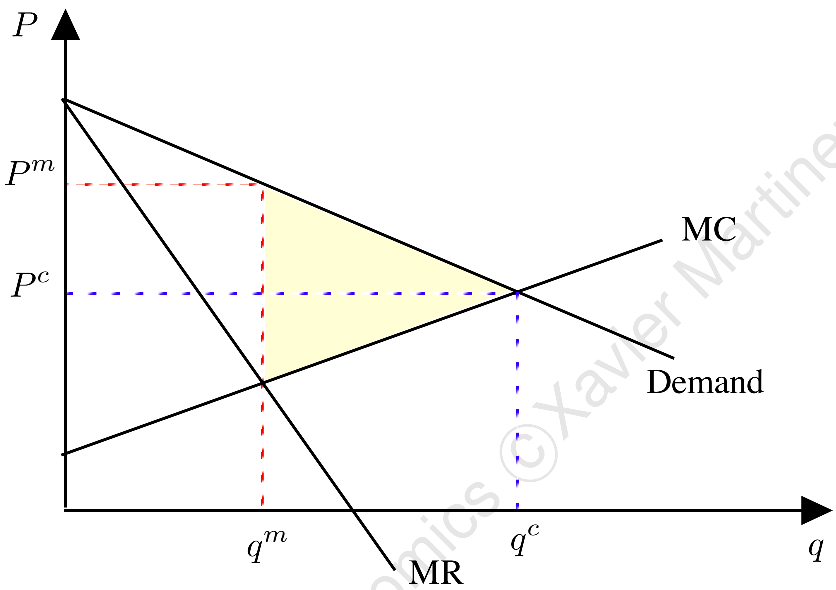
Average Cost: Total Cost/production (unit cost)

Firm's problem: $\max_q \Pi(q), \Longrightarrow MR = MC$



Monopoly power

Monopolist: $p^m > MC = p^c \Rightarrow$ deadweightloss



Deadweightloss: Monopolist expels consumers unable to pay $P^m \rightarrow$ aggregate consumption $\downarrow (q^c - q^m)$ Remaining consumers pay higher price. Consumer surplus $\downarrow$ upper yellow triangle.

Monopolist sells q^m at higher price, but does not produce $(q^c - q^m)$ that could sell at a price $> MC \rightarrow$ Producer surplus $\downarrow$ lower yellow triangle.

Note: no price discrimination

Overall loss of efficiency: yellow triangle.

Health care market contains elements potentially allowing for market power:

- Hospitals with few competitors
[rural vs. urban areas; specialities]

- Private hospitals w/ mkt. power
[ad campaigns, contracts w/ insurers]

- Patented pharmaceutical products

- Social Security (State monoposonist pharma mkt.)

- Licences (exams) to enter the market

- Professional associations fixing minimum fees

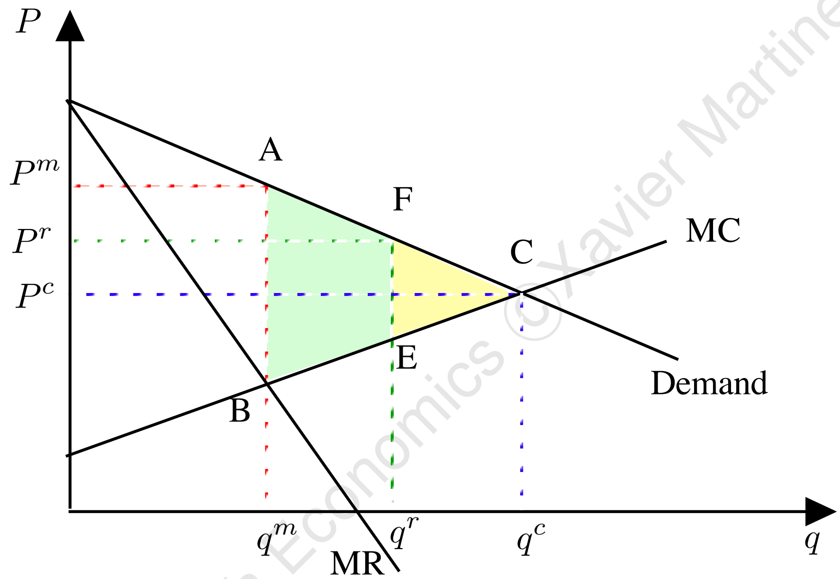
i.e.

* Entry barriers induced or introduced by the governments to guarantee minimum quality standards, promote R&D, ...

* Government may decide to regulate non-profitable situations: transfers donations to build a hospital in a small community; offer nonprofitable services (trauma, burnt, neonatal, intensive care units).

CRITICISM: regulation may worsen situation if not adequate. BUT may improve situation if regulation is efficient.

Example: control on monopoly prices



Monopolist hospital: $(P^m, q^m) \to$ welfare (deadweight) loss $= ABC$.

Government regulation: price cap $P^r \to q^r \to$ welfare (deadweight) loss $= FEC < ABC$.

Problem: hospital is multiproduct service provider $+$ demand and technology evolve $\to$ difficult to regulate properly.

Measuring monopoly power

♠ Firm level

Lerner index: $L_i = \frac{P_i - MC_i}{P_i} \in [0, 1)$
[i's capacity to quote P_i above MC_i]

♠ Aggregate level: 3 measures
[rank firms from largest to smallest market share]

$$\mathcal{L}_k = \frac{\sum_{i=1}^{k} L_i}{k}$$

[arithmetic mean of k largest firms]

$$\mathcal{L}_a = \sum_{i=1}^{n} m_i L_i, \; m_i = \frac{q_i}{\sum_{i=1}^{n} q_i}$$

[arithmetic mean weighted by firms' market shares]

$$\mathcal{L}_g = \prod_{i=1}^{n} (L - I)^{m_i}, \; L_i \neq 0$$

[geometric mean weighted by firms' market shares]

Example:

Rewrite Lerner index as (see below)

$$L_i = \frac{P_i - MC_i}{P_i} = -\frac{m_i}{\varepsilon}$$

(i) Let $\varepsilon_i = -100$ (very elastic) $\Rightarrow \begin{cases} P_i = 1.01 MC_i \\ L_i = 0.01 \end{cases}$

Note 1: $P_i \approx MC_i \rightarrow \sim$ compet behavior

(ii) Let $\varepsilon_i = -10/9$ (very low elast) $\Rightarrow \begin{cases} P_i = 10 MC_i \\ L_i = 9/10 = 0.9 \end{cases}$

Note 2: $P_i \ggg MC_i \rightarrow \sim$ monop behavior

Note 3: Recall P^m always on elastic part of demand function

Example (cont): Let $\varepsilon = -2;\ n = 5$

m_1	m_2	m_3	m_4	m_5
0.4	0.25	0.2	0.1	0.05
L_1	L_2	L_3	L_4	L_5
$-\frac{0.4}{-2} = 0.2$	$-\frac{0.25}{-2} = 0.125$	$-\frac{0.2}{-2} = 0.1$	$-\frac{0.1}{-2} = 0.05$	$-\frac{0.05}{-2} = 0.025$

$$\mathcal{L}_{k=3} = \frac{1}{3}\sum_{i=1}^{3} L_i = 0.142$$

$$\mathcal{L}_a = \sum_{i=1}^{5} m_i L_i = 0.1375$$

$$\mathcal{L}_g = \prod_{i=1}^{5} (L_i)^{m_i} = 3.323$$

Let $q = (q_1, q_2, \ldots, q_n)$ and $Q = \sum_{j=1}^{n} q_j$.
Then, $\Pi_j(q) = P(Q)q_j - C_j(q_j)$
FOC:

$$\frac{\partial \Pi_j}{\partial q_j} = \frac{\partial P(Q)}{\partial q_j} q_j + P(Q) - \frac{\partial C_j(q_j)}{\partial q_j} = 0 \tag{1}$$

Let us write the marginal revenue function as

$$MR_j(q) = \frac{\partial P(Q)}{\partial q_j} q_j + P(Q) = P(Q)\left(1 + \frac{\partial P(Q)}{\partial q_j} q_j \frac{Q}{P(Q)} \frac{1}{Q}\right) =$$
$$P(Q)\left(1 + \frac{q_j}{Q}\frac{1}{\varepsilon}\right) = P(Q)\left(1 + \frac{m_j}{\varepsilon}\right). \tag{2}$$

Substitute (2) into (1) to obtain

$$P(Q)\left(1 + \frac{m_j}{\varepsilon}\right) = MC_j, \text{ or}$$
$$P(Q) - MC_j + P(Q)\frac{m_j}{\varepsilon} = 0, \text{ or}$$
$$\frac{P(Q) - MC_j}{P(Q)} = -\frac{m_j}{\varepsilon} = L_i$$

An illustration of market power:

Welfare effects of a switch from R_x to OTC

Reading:

Tina Shih,Y-C., M. Prasad, and B.R. Luce, 2002, The effect on social welfare of a switch of second-generation antihistamines from prescription to over-the-counter status: A microeconomic analysis, *Clinical Therapeutics*, **24**: 701-716.

Welfare effects of a switch from R_x to OTC

1.- description of the set-up

2a.- Drugs close to patent expiration

2b.- Drugs under patent protection

3.- Welfare effects of a switch from R_x to OTC. Results:

- case a)

$$\begin{cases} MC_{R_x} & = MC_{OTC} \\ \left|\varepsilon_{R_x}\right| & < \left|\varepsilon_{OTC}\right| \end{cases} \Rightarrow \begin{cases} \triangle W & \text{ambiguous} \\ P_{OTC} & < P_{R_x} \end{cases}$$

- case b)

$$\begin{cases} MC_{R_x} & < MC_{OTC} \\ \left|\varepsilon_{R_x}\right| & < \left|\varepsilon_{OTC}\right| \end{cases} \Rightarrow \begin{cases} \triangle W & \text{ambiguous} \\ \triangle P & \text{ambiguous} \end{cases}$$

Welfare effects of a switch from R_x to OTC

July '88 Blue Cross California request to NDAC for switching from R_x to OTC status 3 SGAs:
- fexofenadine hydrochloride [*Allegra* - Aventis]
- loratadine [*Claritin* - Schering]
- cetirizine hydrochloride [*Zyrtec* - Pfizer]

Regulation: An OTC product must show safe and effective when used without supervision of a health care practitioner.

Basic economic argument of request:
- cost savings due to expected price reduction in SGAs after switch
- based on observed pricing for H_2-receptor antagonists before and after switch to OTC status

BUT

H_2-receptor antagonists switch was proposed by manufacturers near patent expiration

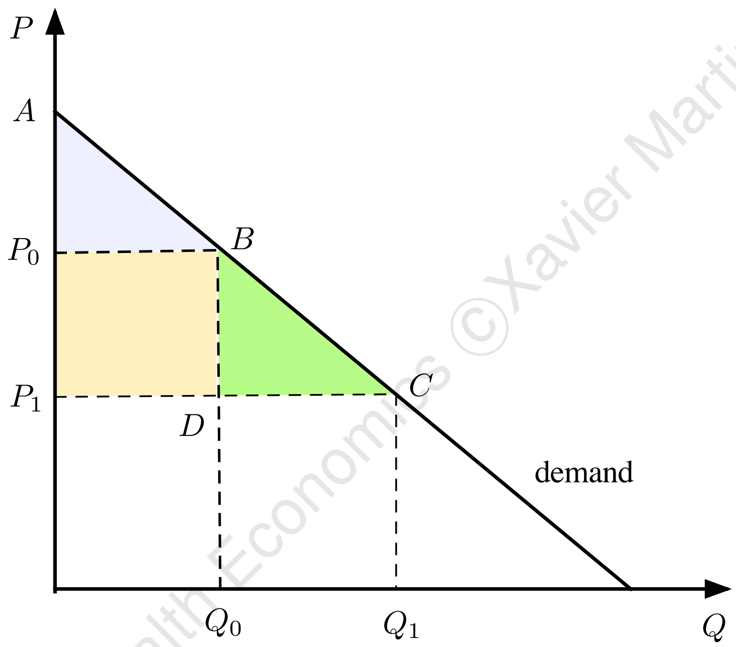
WHILE

in SGAs case, all 3 drugs were atill under patent protection.

THUS
- extrapolating conclusions $\rightarrow$ erroneous
- social welfare implications $\rightarrow$ uncertain.

[2a] Drugs close to patent expiration

Argument: after switch to OTC status, competition will lower prices $\rightarrow$ higher consumer surplus (proxy for social welfare)



$$CS(P_0) = AP_0B$$
$$CS(P_1) = AP_1C = AP_0B + P_0P_1DB + DBC$$

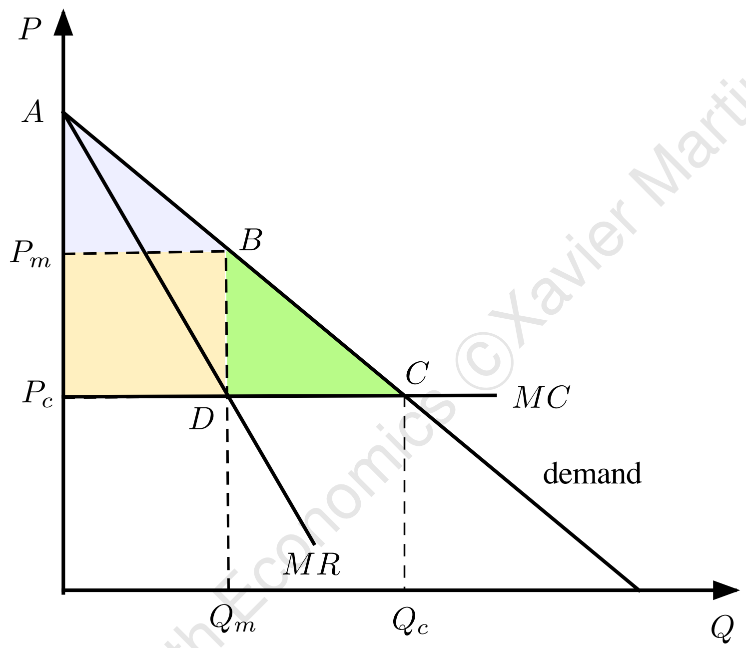
$\triangle\, CS = P_0P_1DB + DBC$, that is,

$\triangle\, CS$ from $\downarrow$ price $+ \triangle CS$ from $\uparrow$ consumption

Strategic switch to OTC status to preempt generic competition.

[2b] Drugs under patent protection

Patent protection grants monopoly power to manufacturer $\rightarrow$ pricing rule: $MR = MC \Rightarrow$ deadweight loss wrt perfect competitive pricing.



$$CS(P_m) = AP_mB$$

$$CS(P_c) = AP_cC = AP_mB + P_mP_cDB + DBC$$

$$\triangle CS = P_mP_cDB + DBC, \text{ that is,}$$

$\triangle CS$ transfer to firms $+ \triangle CS$ deadweight loss

In addition to consider CS, discussions of welfare effects of switch from R_x to OTC must consider change in deadweight loss before and after the switch.

[3.] Welfare effects of a R_x to OTC switch

2 questions

- will the price of SGAs $\downarrow$ after the switch?
- social welfare consequences of the switch?

Effects on demand

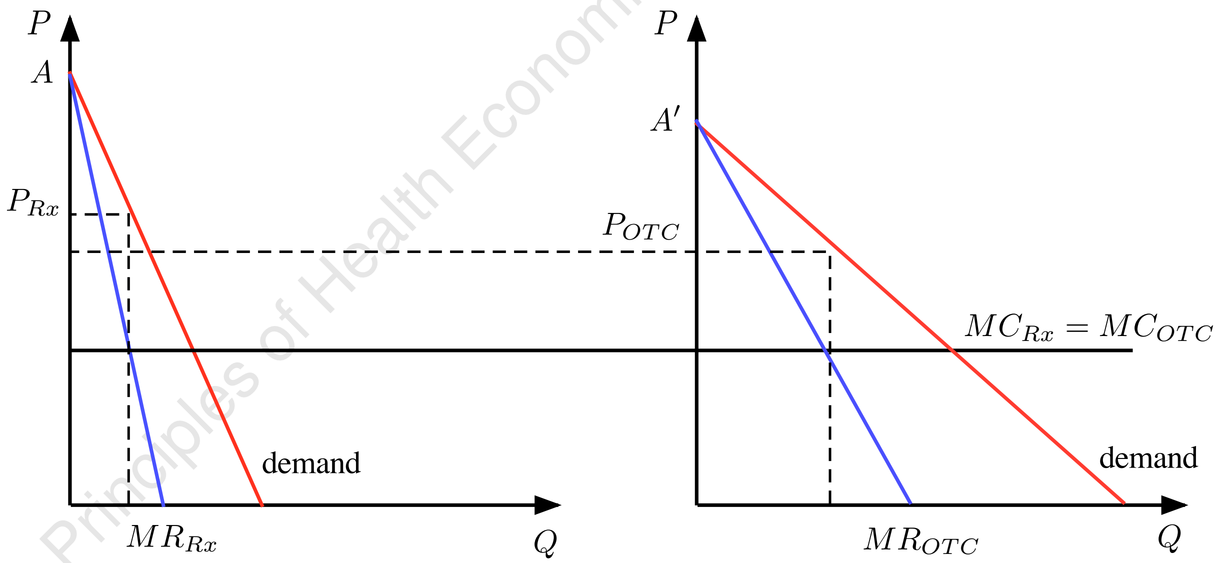
- Health insurance $\to$ $\triangle$ demand (moral hazard)

$\to$ consumers less price sensitive

BUT no coverage for OTC drugs:

• $R_x \to$ OTC $\Rightarrow$ $sP \to P$ (s: copayment rate)

• demand R_x less elastic than demand OTC



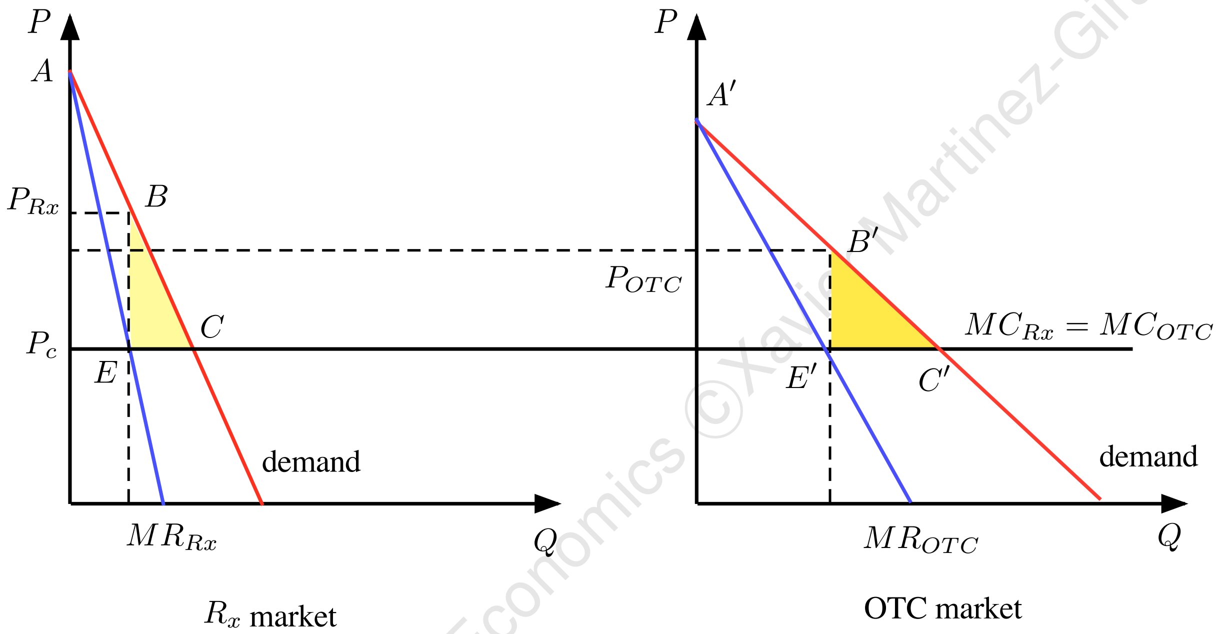
R_x market (before switch)

OTC market (after the switch)

Pricing strategy of a (profit max) patent holder?

assumption: $MC_{Rx} = MC_{OTC}$

- micro theory: $\varepsilon_{Rx} < \varepsilon_{OTC} \ \rightarrow P_{OTC} < P_{Rx}$
- BUT $\downarrow P_{OTC}$ no guarantee $\triangle$ welfare.
- Consider a drug under patent



R_x market

$CS(P_{Rx}) = AP_{Rx}B$

$CS(P_c) = AP_cC$

$\triangle CS = P_cP_{Rx}BE + BEC$

$$W_{Rx} = \underbrace{AP_{Rx}B + P_cP_{Rx}BE}_{M} - \underbrace{BEC}_{N}$$

OTC market

$CS(P_{OTC}) = A'P_{OTC}B'$

$CS(P_c) = A'P_cC'$

$\triangle CS = P_cP_{OTC}B'E' + B'E'C'$

$$W_{OTC} = \underbrace{A'P_{OTC}B' + P_cP_{OTC}B'E'}_{M'} - \underbrace{B'E'C'}_{N'}$$

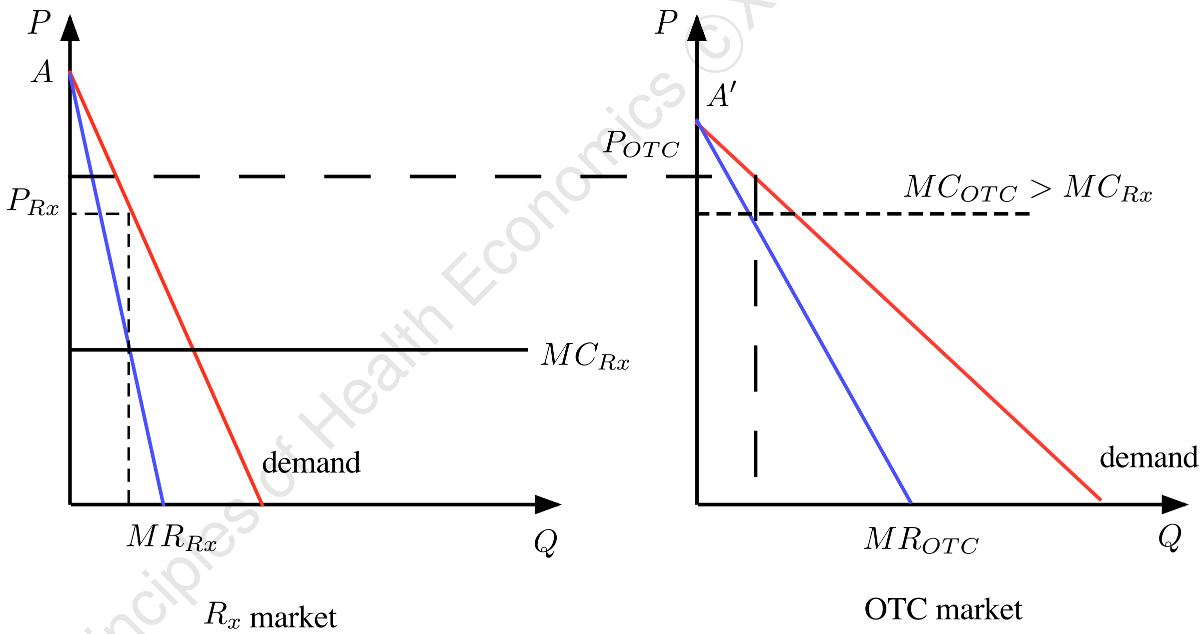
$$\triangle W = (M - M') - (N - N') \gtrless 0$$

sign$\triangle W$ depends on shape of demand curves $\rightarrow$ empirical issue

Assumption $MC_{OTC} > MC_{Rx}$
- advertising
- new distribution channels
- new packaging, ...

THEN

P_{OTC} may be increased after switching to OTC status



THUS

not only welfare consequences are uncertain, but the assumption of a post switch price reduction as well.

Externalities

A good shows externalities when it generates third-party effects *outside the price system*

- positive: vaccination of my neighbors on my chances to get infected, etc.

- negative: pollution, neighbor's loud music, etc.

Competitive market only considers private costs and benefits, not social ones $\rightarrow$ inefficiency:
negative externalities $\rightarrow$ overproduction;
positive externalities $\rightarrow$ underproduction.

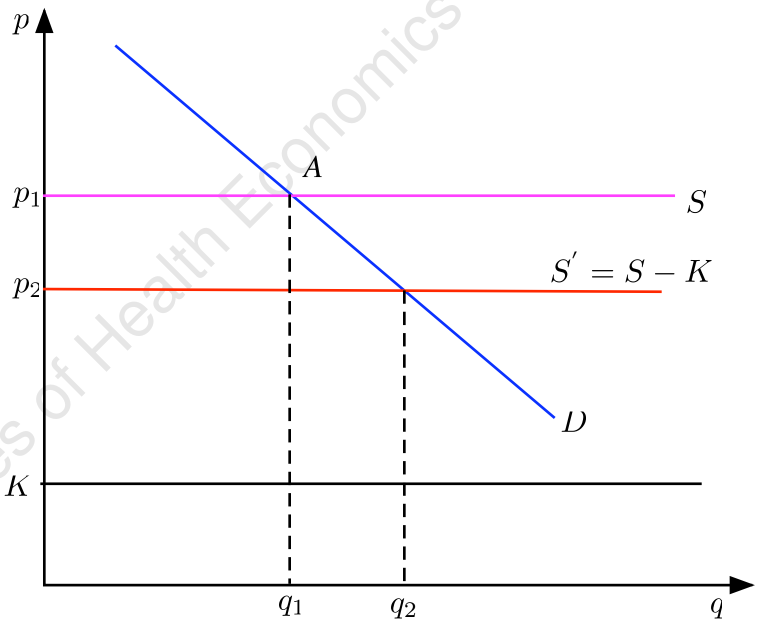
Example: market of vaccination.

D: demand (marginal private benefit)
S: supply (marginal private cost)
K: marginal external benefit

Initial situation: Competitive allocation $A \rightarrow$ inefficient under positive externality K:
marg. social benefit $= D + K > S =$ marg. social cost (= marg. private cost)

Government intervention: direct subsidy to producers of K €$\rightarrow$ supply shifts to $S^{'} = S - K$.

New equilibrium allocation: q_2 at price p_2 $\rightarrow$ efficient.



Merit goods

Commodities that are “good” regardless of each individual’s preferences: arts, compulsory education, compulsory social insurance, ...

Individuals because of info problems are not fully aware of the benefits obtained from their consumption.

Govt. regulation: promotion of their consumption.

Incomplete markets

Private insurers may not provide coverage for some illnesses: AIDS, cancer, ...

Govt. regulation: public provision of insurance, compulsory contracts on private insurers.

Regulating the health care market

Definition: Regulation consists in the implementation of NON-Market mechanisms to affect the quantity, price, quality of a good exchanged in the market.

Implementation: Governmental agency (Ministry of health, ...)

Objective: guarantee a minimum level of quality, quantity, ... eliminating inefficiencies due to scale or scope economies.

Instruments:

-Monetary:

*salaries to personnel in public outlets

* reimbursement conditions to hospital (per diem, per admission, prospective, retrospective) by third-party payers (public and private).

2 basic mechanisms:

(i) retrospective: $\rightarrow$ ex-post

(ii) prospective: payment rates fixed *prior* to the period health care is provided $\rightarrow$ incentives for efficiency by limiting spurious spending. Problem: How to calculate prices?[DRGs]

-Quantity: indirect instruments. Need for approval if budget deviations $\rightarrow$ limit excess supply of facilities, promote higher use rates of existing facilities.

-Quality: Entry barriers $\rightarrow$ providers with minimum standards (physicians, nurses, pharmaceuticals); control of admission protocols, minimum/maximum in-hospital stay, adequacy of treatments, ...

-Other instruments:

* licensure laws, mandates, national drug agency, universal and compulsory health insurance (public or private)

* Regulating insurance companies ($\sim$ banks) $\rightarrow$ guarantee financial capacity

* Fiscal waives on insurance contracts

* Public health:

+ info campaigns on alcohol, tobacco, drugs, working accidents, traffic, ...

+prevention and control campaigns at schools, vaccination campaigns, ...

* Financing research in particular diseases (AIDS, cancer, ...) in public (Universities) and private (laboratories) research centers.

PPS and DRGs

DRGs instrument to determine rates of the PPS.

Def.: DRG attemps to represent a case type that identifies patients with similar conditions and processes of care.

Each DRG is given a flat payment rate calculated in part, on the basis of costs incurred for that DRG nationally.

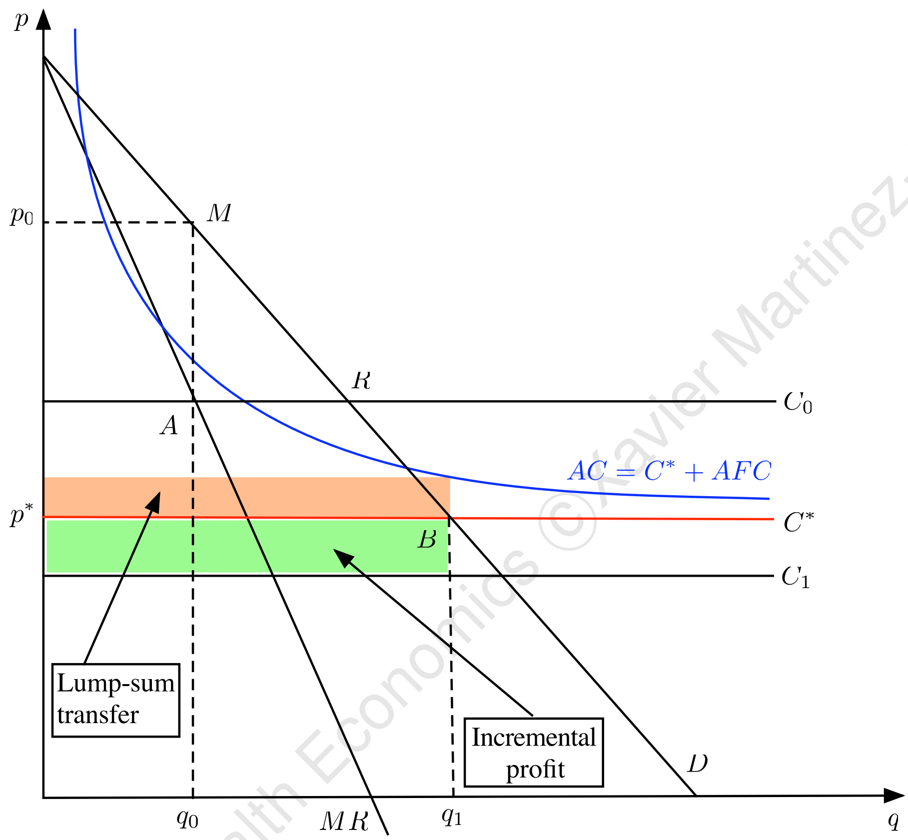
<u>Example</u>

Consider a community with n hospitals and let us focus in hospital 1. It faces a demand D and $MC(q) = AC(q) = C_0$.

(a) Monopoly: provide q_0 units of care at a price p_0 (point M).

(b) If hospital $\in$ NHS subject to retrospective reimbursement: produce at point R, i.e. $AC = p \rightarrow \Pi = 0$.

(c) If hospital $\in$ NHS subject to prospective reimbursement based on DRGs.



- Assume 1 sickness
- Assume hospital's effort to reduce cost is a fixed cost.
- Rates are fixed at the average marginal cost of competitors $(2, \ldots, n) = C^*$
- Also fixed cost is reimbursed as lump-sum transfer.
- Thus, "new" average cost $AC = C^* + AFC$(average fixed cost)

Equilibrium: point B where $C^* = D$, i.e. (q_1, p^*) so that $\Pi = 0$ because $p = AC$ and $fixedcost 0 transfer$.

$\odot$ Assume cost reduction yields "new" marginal cost $= C^* \rightarrow$ hospital zero (incremental) profits.

$\odot$ Assume cost reduction yields "new" marginal cost $= C_1 < C^* \rightarrow$ hospital (incremental) profits $= q_1(C^* - C_1)$.

$\odot$ Assume cost reduction yields "new" marginal cost $= C \in (C^*, C_0) \rightarrow$ hospital loses.

Conclusion: As hospital's costs do not enter into the price it receives, hospital big incentive to lower cost.

5. Public goods

* Public goods vs Public provision of (private) goods.

Public goods	Public provision of (private) goods
↓	↓
no rivalry	because of natural monopoly
no exclusivity	subsidize particular users

Examples:

PG: free highways, gardens, bridges, roads, national army, ...

PPG: private highways (tolls), mail, garbage collection, public transport, ... [exclusion if no pay]

* Why does market fail?

Private market underprovides public goods $\rightarrow$ "free riders" [$\rightarrow$ no exclusion $\rightarrow$ no incentives to finance (individual impact negligible)]

Examples:

- lack of prevention at work because of accident insurance

- "free ride" in the bus

- inhabitants of BCN using public gardens in Sant Cugat

- avoid vaccination when everybody gets vaccinated (The Economist 11-4-98)

Conclusion: underprovision by private markets $\rightarrow$ government regulation.

Are health care services public goods? NO!

- there is rivalry (services to a patient cannot be simultaneously provided to another)

- there may be exclusion (if patient cannot pay, may be excluded)

$\Rightarrow$ Health care services: private good publicly provided

BUT

INFORMATION is an economic good with a high component of public good:

- getting info by one individual does not limit possibilities to ohers.

- although information has a price, the cost of providing information to an additional individual is negligible (advertising campaigns, mailings, ...)

$\Rightarrow$ private market underprovides information $\rightarrow$ public provision. How to do it?

- help disseminating info (public provision or transfers to private provision)

- increase information participating in scientific research (public provision or transfers to private provision)

ALSO

Donations (charity) have characteristic of a public good: help people with low income levels to improve consumption (also health care)

Individual donations are small in the aggregate $\rightarrow$ free riding [donation to help victims of natural disasters ...]

How to implement these donations? (i) additional income free to use; (ii) transfer with a predefined use $\rightarrow$ problems of equity, efficiency, need, ...

Reading

Clinical trials as a public good:

Lewis, T.R., J.H. Reichman, and A.D. So, 2007, The case for public funding and public oversight of clinical trials, *Economists' Voice*, **4**: article 3.

http://www.bepress.com/ev/vol4/iss1/art3/

6. Nonprofit Enterprises/Organizations (NPE)

NPEs are important in the health care market (hospitals and nursing homes):

Definition: A NPE is an organization where nobody holds property rights on profits $\Longrightarrow$

- allows for objectives $\neq$ max. profits,

- exempt from corporate taxes (profits, VAT, ...)

- donations to NPEs receive special fiscal treatment

Why do NPE exist?

2 reasons: (i) market inefficiencies, (ii) asymmetric information

(i) Market inefficiencies (not solved by governmental regulation)

3 types of firms in a market:

- for profit private firms,

- public firms,

- Nonprofit firms (public and private).

Public firms appear to correct *market failures* (externalities, public goods) but no guarantee of efficiency.

* Externalities $\rightarrow$ private market yields underprovision $\rightarrow$ inefficiency. Why?

Example 1: vaccination for influenza.

- Individual $\downarrow$ fall sick (private benefit)

- Individual $\downarrow$ infect others (social benefit): Externality.

Free markets: individual only computes private benefits $\rightarrow$ ignore social benefits $\rightarrow$ market delivers quantity lower than max social benefit $\rightarrow$ inefficiency.

Government reaction: public firm to provide a public good $\rightarrow$ avoid free rider problem.

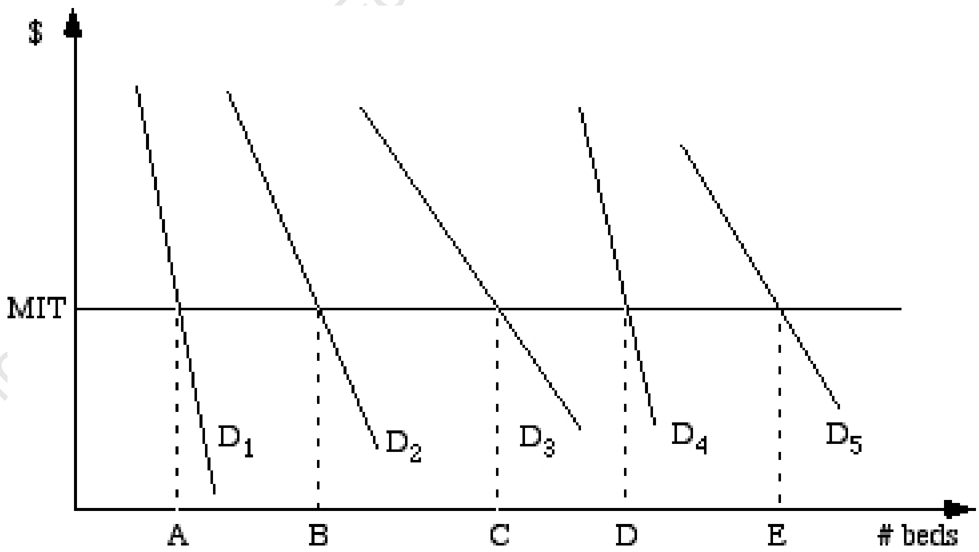
BUT does not guarantee efficiency (potential inefficiencies of governmental activities may offset potential gains)

Example 2: campaigning for provision of a public good.

Society with 5 individuals: common marginal income tax (MIT).

Government proposes building a hospital for children. Question: how big (how many beds)? VOTING (majority rule)

Individual demands D_i, $(i = 1, 2, 3, 4, 5)$



Voting outcome for the different alternatives:

Proposal	Votes against	Who	Why
A	4	2,3,4,5	too low
B	3	3,4,5 1	too low too high
D	3	1,2,3 5	too high too low
E	4	1,2,3,4	too high
C	2	1,2	too high

Government provides C beds, every individual will pay $c \times MIT$ and fiscal revenues $=$ cost of the project. (Individuals 4,5 vote for C as a "second best" alternative).

Conclusion: Voting only satisfies individual 3 for whom $MIT =$ marginal benefit.

Consequence: government inefficient in providing the public good $\rightarrow$ individuals 4,5 form a NPE and provide the rest of the public good.

Application to the health care sector.

Health care is a private good (exclusion, rivalry) with externalities.

Hospitals and nursing homes $\rightarrow$ room for NPE when there is enough dissatisfaction with public provision

$\downarrow$

- non-governmental organizations (greenpeace, medicus mundi, xxx sans frontières, ...)

- origin of hospitals as charitable institutions relying on donations.

(ii) Asymmetric information

Different argument: difficulty in writing a complete contract because quantity or quality are not (perfectly) observable by the purchaser.

Example: assistance 3rd world.

Too costly to verify that a for-profit firm delivers goods to targeted population $\rightarrow$ delegate in a NPE.

Example: nursing home

Similar to hotel management (rooms, housekeeping, meals, recreation facilities)

Differences

hotel max profit s.t. satisfaction of clients

nursing home clients (patients) are not able to evaluate quality of the service given their health state. Relatives only partial info.

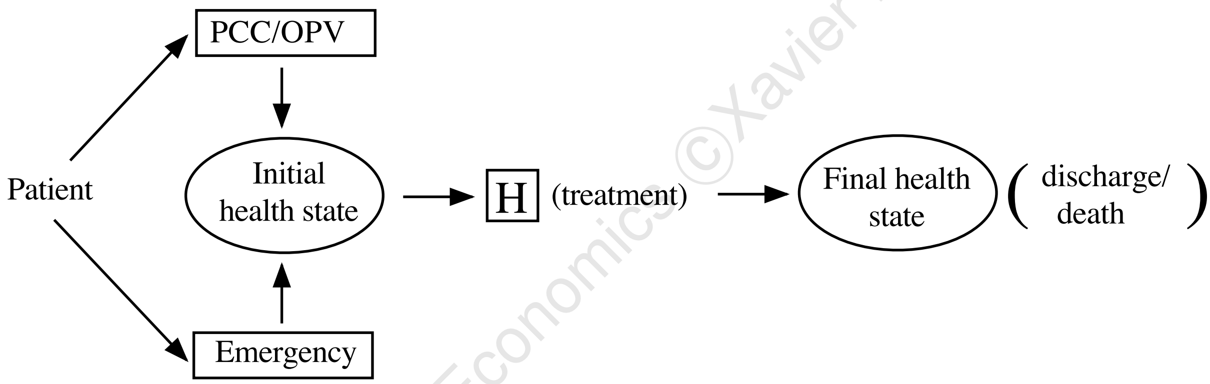
* If nursing home is for-profit, may arise conflict of interest with some clients.

* Empirical evidence: quality of services non-profit nursing homes not inferior to for-profit nursing homes.

Comment Not easy to reach consensus on quality criteria → proxies: observable signals (variation in health state of inmates, ...)

What is a hospital

1.- What does a hospital do?



2.- Hospital's idiosyncrasy

- personalized treatment to every patient
- *detailing* $\rightarrow$ distort treatment selection
- *moonlighting* $\rightarrow$ distort allocation effort/quality
- *resource hoarding*

3.- Measures of activity

♠ # patients treated:

- aggregate

- per DRGs

- per discharges/out-patient visits/emergency room episodes

♠ mortality rate

- Summary

Hospital unit of multiproduct services $\rightarrow$

◇ Scale economies

◇ Scope economies

Modeling a hospital as a NPE

Three initial lines of research:

(a) Quantity vs. quality: Newhouse (1970)

$$\max_{Q,q} U(Q,q) \text{ s.t. } \Pi = 0$$

(Q,q): (Quantity, quality) of health care services.

(b) As a cooperative Pauly-Redisch (1973)

$$\max_{M} \frac{net\ hosp.\ revenues}{\#physicians\ in\ coop.}$$

$HR \sim \Pi$. Closed/open cooperative.

(a), (b) comparable

(c) NPE vs. FPE Harris (1976)

Efficiency NPE vs. efficiency FPE, via property rights

basic argument:

manager reimbursement: trade-off between pecuniary & non-pecuniary components

NPE: $\downarrow$ salary, $\uparrow$ NPI than FPE

Modeling a Nonprofit hospital (I): Newhouse (1970)

Organization of a hospital as a NPE: 3 decision-making parties:

- Board of trustees $\rightarrow$ patrons $\neq$ profiles,

- Hospital administrator (CEO) $\rightarrow$ agent of trustees,

- Physician staff.

Assumption 1: complex decision-making $\rightarrow$ single utility function.

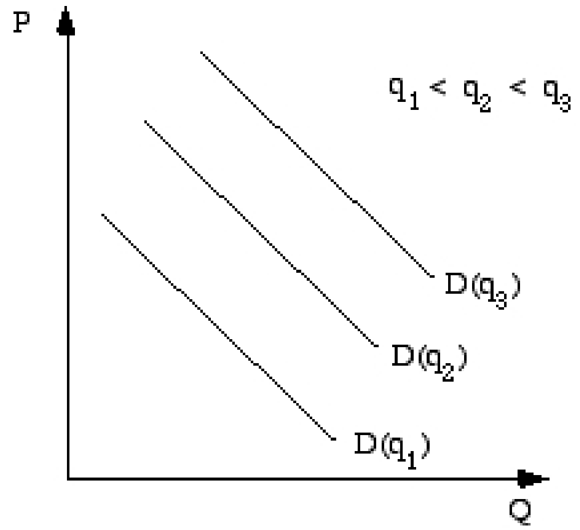
Assumption 2: Utility function $U(Q, q)$ defined over single sickness.

Q quantity of output (cases treated/time period);

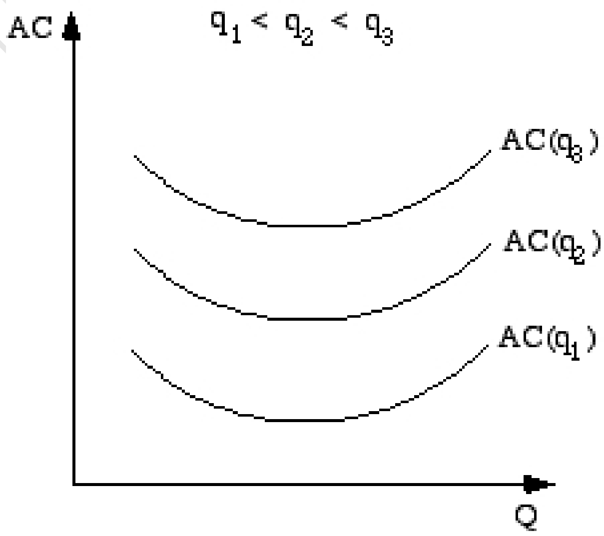
q quality of output: index aggregating physician staff expertise, hospital facilities, nursing care to patients, ...

Objective of the hospital: select (Q, q) to max $U(Q, q)$ given budget constraint (revenue form donations and patients = cost).

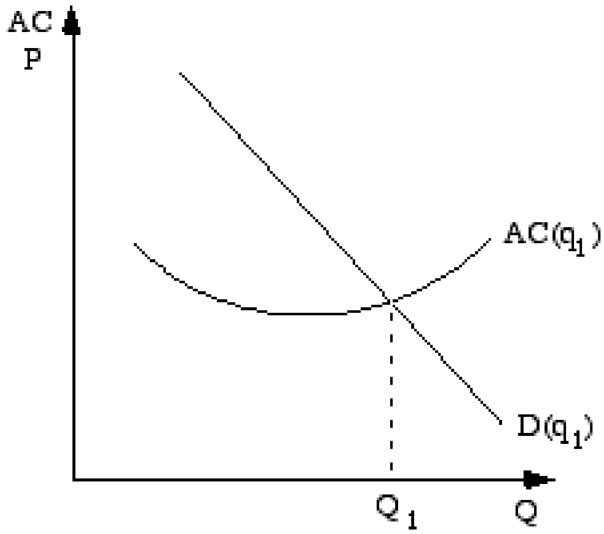
Demand of health services depend on quality $D(q_i)$.



Costs of hospital depend on quality. Average cost $AC(q_i)$



Approach 1 (Equilibrium): given a quality level q_1, budget constraint (i.e. zero-profit condition) requires $demand = average\ cost \ \Rightarrow Q_1$



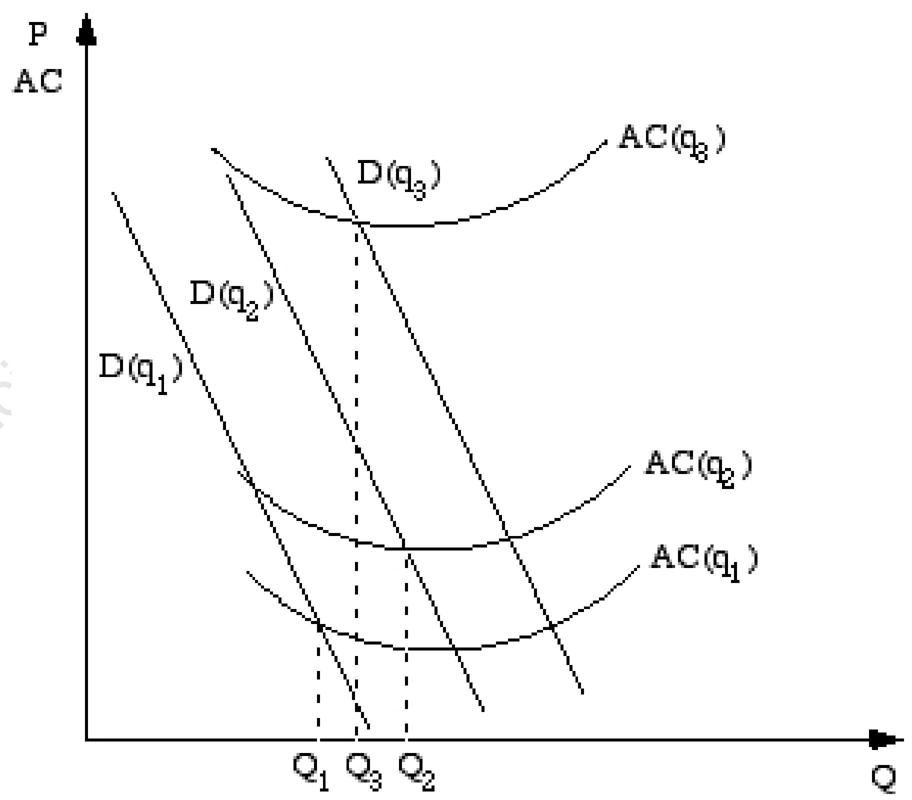
Note: $D = AC \Rightarrow \Pi = 0$

$$P(Q) = \frac{C(Q)}{Q} \Leftrightarrow P(Q)Q = C(Q) \Leftrightarrow Q(Q)Q - C(Q) = 0 = \Pi$$

ALERT: Quality and quantity non-monotonic relations:

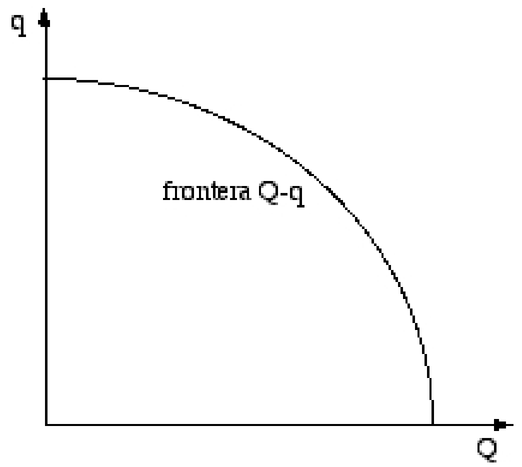
If patients evaluate an $\triangle$ in quality $q_1 \rightarrow q_2$ more than an $\triangle$ increase in cost, we obtain $Q_1 < Q_2$, i.e. $\triangle q \rightarrow \triangle Q$.

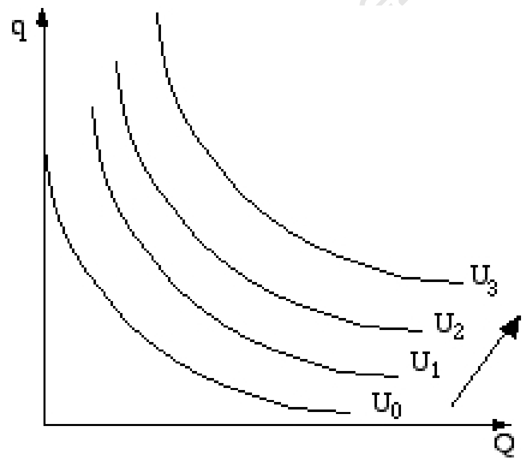
If average cost of providing a high level of quality q_3 is higher than consumers willingness to pay $D(q_3)$, we obtain $Q_3 < Q_2$, i.e. $\triangle q \rightarrow \triangledown Q$.



Approach 2 (Equilibrium): find (Q, q) that $\max U(Q, q)$ given budget constraint, i.e. $\Pi = 0$.

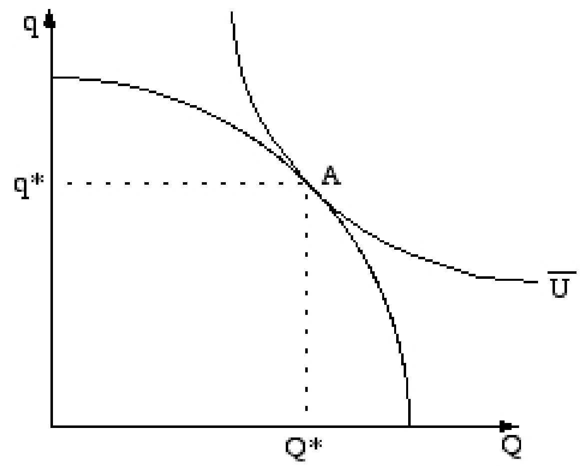
Equivalently, find $Q - q$ frontier (feasible set) and combine with utility levels (indifference map).





Hospital problem:

$$\max U(Q, q) \text{ t.q. } (Q, q) \in \text{frontier } Q - q$$



Modeling a Nonprofit hospital (II): Pauly-Redisch (1973)

Hospital as a physicians' cooperative to maximize their net income.

Assume revenues only from bills to patients (no donations) $\rightarrow$ price of care determined by demand.

Supply of health care services depends on quantity of inputs: capital K, (non-technical) labor L, and physicians M.

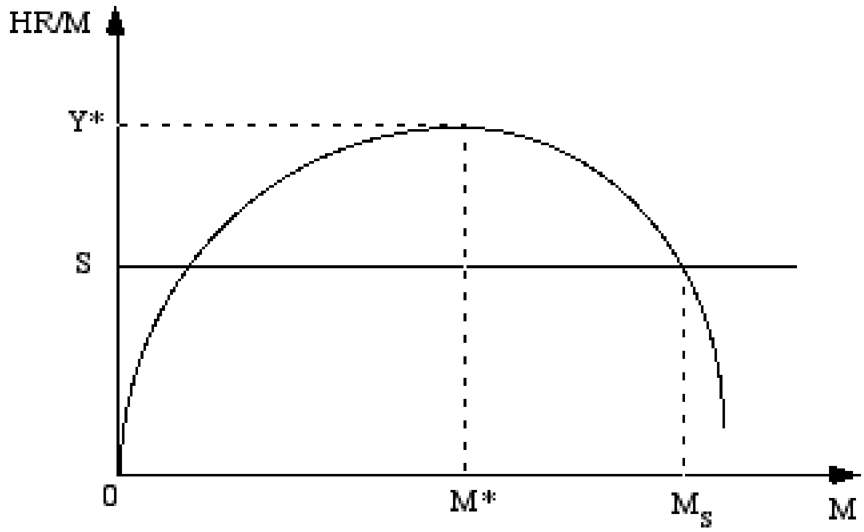
Objective of the hospital: max net revenue per physician max $\frac{HR}{M}$, where

$HR =$ revenues $-$ payments to (K, L, M).

Let M^* denote the optima number of physicians closed staff cooperative.

Given (K, L)

$\frac{HR}{M} \uparrow$ if $M < M^*$, and $\frac{HR}{M} \downarrow$ if $M > M^*$.



If open staff cooperative and competitive physicians market $\rightarrow$

physicians supply perfectly elastic S $\rightarrow$ optimal number of physicians M_s.

In any case, contracting of (K, L) according to M^* or M_s.

Newhouse vs Pauly-Redisch

Simplifying assumptions

* Combine hospital and physicians revenues in a single function $R(Q, q)$

* (Q, q) depend of (K, L, M)

* Other hospital revenues: donations D + transfers (subsidies) G

* Perfectly competitive physicians market: price s

* Perfectly competitive capital market: price r

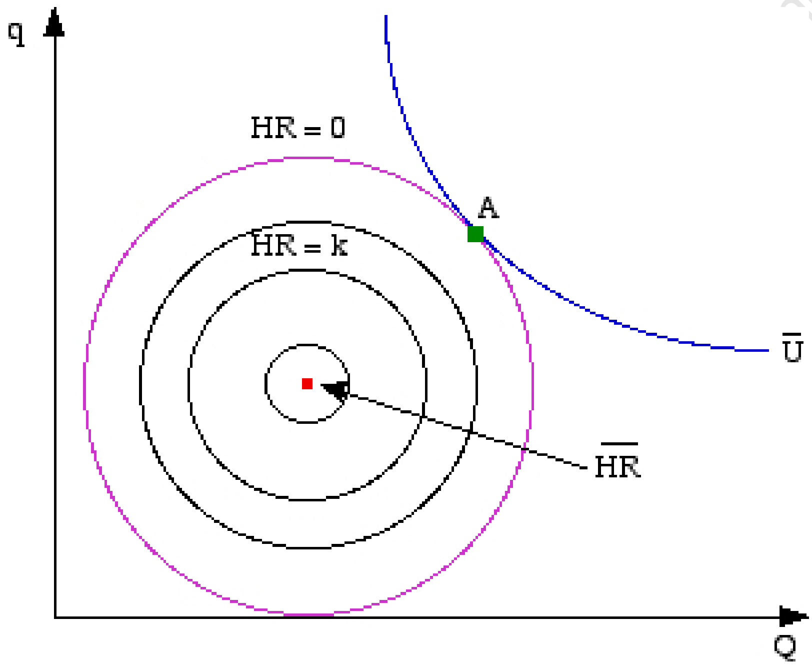
* Perfectly competitive labor market: price w

Hence,

$$HR = R(Q, q) + D + G - (wL + rK + sM)$$

Pauly-Redisch: max $HR \rightarrow \overline{HR}$ appropriated by cooperative.

Newhouse: max $U(Q,q)$ $s.t.$ $HR = 0$ Solution: A



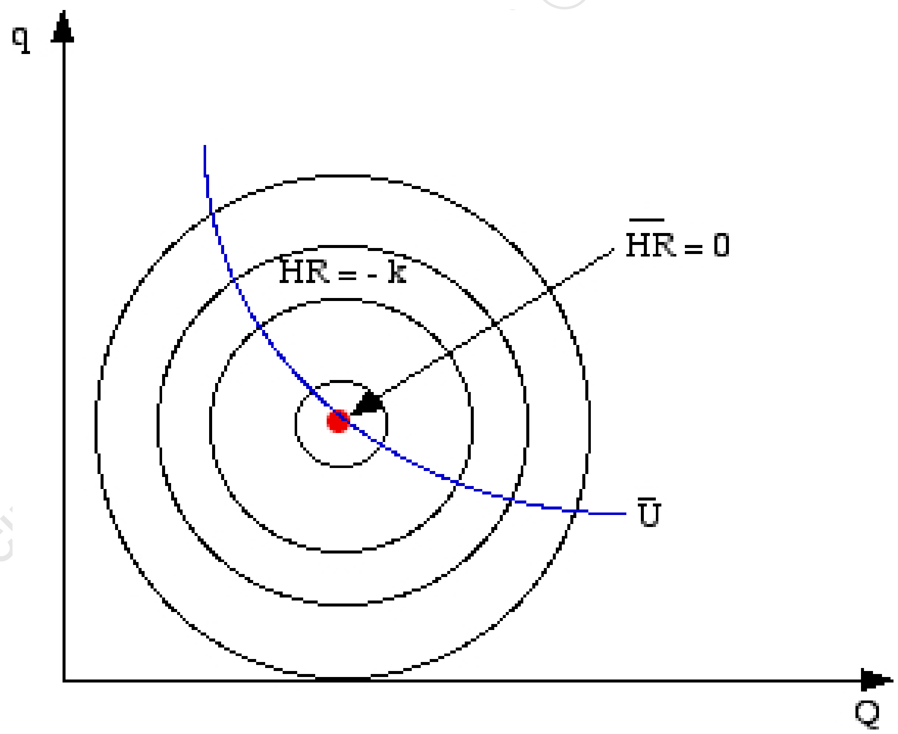
Different outcome because cooperative when appropriating HR includes D and G. It is “as if” hospital would be a cover for a for-profit organization $\rightarrow$

Policy conclusion: eliminate G and corporate tax exemptions.

Comment: Is it possible Pauly-Redisch $\rightarrow$ Newhouse?

YES, under some conditions, e.g.

$\triangle$ competition among hospitals (free entry). If demand $\sim$ constant, $HR \downarrow$. Limit case $HR \rightarrow 0$.



Modeling a Nonprofit hospital (III): Harris (1976)

Aim: compare efficiency NPE vs FPE $\rightarrow$ theory of property rights

The theory of property rights

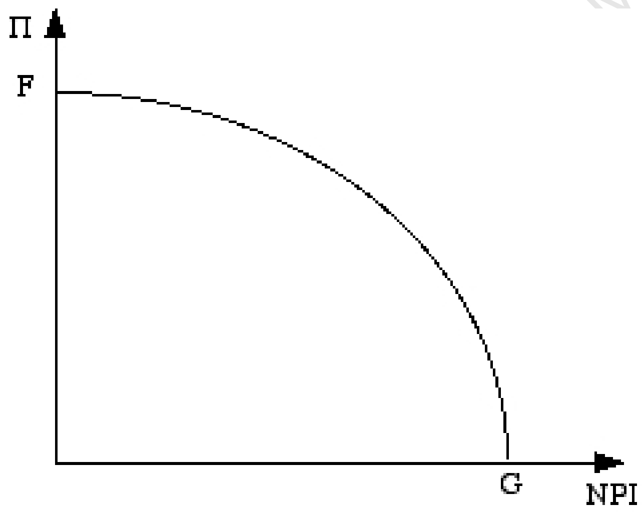
Private firm: owner holds property rights on net profits $\rightarrow$ may sell those rights (shares, ...)

Large private firms: property $\neq$ management. Managers are agents of owners BUT imperfect agents because,

* Cost of monitoring the manager $\rightarrow$ owner accepts deviations from $\max \Pi$.

* in particular, manager also obtains "non pecuniary income" (NPI) $\rightarrow$ manager's utility depends of Π and NPI .../...

.../... in turn, NPI will affect wealth generated by firm (profits). Hence, trade-off (Π, NPI)

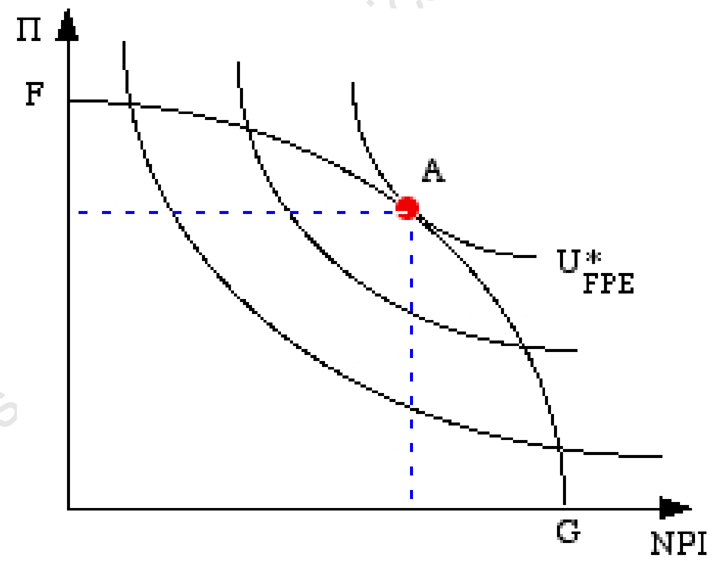


Example Hospital management opens a heart surgery outlet, not profitable but prestige $\rightarrow$ economic result (profits) will be affected.

Property rights and for-profit enterprises

FPE: selects feasible (Π, NPI) to max $U(\Pi, NPI)$.

Solution: A



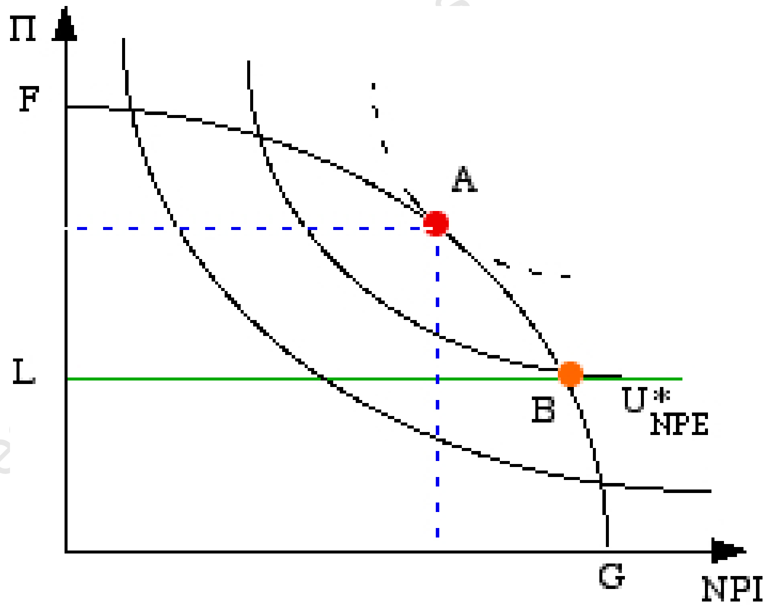
Property rights and nonprofit enterprises

NPE's problem: set manager's wage to avoid appropriation of profits $\rightarrow$ 2 restrictions:

- feasible (Π, NPI) [1]

- max salary: L [2]

NPE: selects (Π, NPI) to max $U(\Pi, NPI)$ s.t. [1] and [2]



Solution: lower salary and higher NPI.

If NPI involve excessive non productive activities, NPEs less efficient than FPEs.

Conclusion

- (III) is a different model because hospital does not max profits as managers are imperfect agents.

- NPE no access to incentives on profits but in models (I) and (II)hospitals take efficient decisions.

- more adequate model? $\rightarrow$ empirical evidence:

* no significant differences between nonprofit and for-profit hospitals $\Rightarrow$ models (I) and (II) better than (III).

* significant differences between nonprofit and for-profit nursing homes $\Rightarrow$ model (III) better than (I) or (II).

Lines of development of literature

♣ 1 illness → several illnesses

♣ random demands (epidemic events, accidents, ...)

♣ emergency vs. regular health care services

♣ primary health care integrated/segregated hospital care

♣ estimation of hospitals' PPF: technical efficiency, ...

♣ etc.

Reading

Eggleston, K., Y-C. Shen, J. Lau, C.H.Schmid, and J. Chan, 2008, Hospital ownership and quality of care: what explains the different results in the literature, *Health Economics*, **17**: 1345-1362.

http://www3.interscience.wiley.com/journal/121519547/issue

7. Preventive vs. Curative Medicine. A health policy exercise

The general set-up. Identify tools to incentivate:

- *Patients* to develop healthy habits
- *Insurance companies*, to provide preventive medicine coverage.

Initial scenario:

- Insurer covers hospital and treatment expenses.
- Patient losses salary and bears pain.

$\Rightarrow$ split responsibility between insurer and insuree.

$\Downarrow$

Insurance contracts do not cover both demand sources $\rightarrow$ underinvestment in preventive medicine.

$\Downarrow$

Socially, investment in preventive medicine is profitable. BUT insufficient individual incentives.

Example [Helwege, 1996]

Thesis: Policy misdesign because ignores some interactions among agents (patients, insurer)

Compute costs of preventive vs. curative measures in men with high risk of heart attack.

Preventive measures:
- Weight control
- Yearly check-ups and cholesterol control.

Curative measure:
- Hospitalization and treatment of heart attack.

Data:

1. *Population*: Men, 50 years old (today).
$\star$15% will suffer a heart attack before age 65;
$\star$ average age of heart attack: 60.

2. *Cost of treatment*: 30,000 €/individual

3. *Cost of weight control*: 50 €/individual/year

4. *Cost of check-up*: 200 €/individual/year

5. Incidence of weight control on risk: 5%

6. Incidence of weight control on cost:
(0.05)(30,000)=1,500 €/year (for 10 years).

7. Incidence of check-up on risk: 20%

8. Incidence of check-up on cost:
(0.2)(30,000)= 6,000 €/year (for 10 years).

9. Interest rate: 5%

10. Individual's loss due to heart attack: 100.000 €

Discounted present value (time value of money)

[money today is more valuable than money in the future by the amount of interest that money can earn.]

Compute the investment today at a return rate of 5%, so that in three years we will receive 100 EUR:

$$x(1.05)^3 = 100$$

$$x = \frac{100}{1.05^3} = 86.383759$$

In general, the present value of a capital K to be available in n years at the interest rate r is given by,

$$x = \frac{K}{(1+r)^n}$$

Example:

- 1EUR at $r = 5\%$ in 10 years: $1.05^{10} = 1.629$

- present value in 10 years of weight control:

$$\frac{50}{1.629} = 30.69$$

- present value in 10 years of check-up:

$$\frac{200}{1.629} = 122.77$$

Discounted present value: two approaches

(i) Value of 100 € today in 3 years discounted at 5%

$$t = 0: \ 100$$
$$t = 1: \ 100 + 5\%(100) = 100 + 5 = 105$$
$$t = 2: \ 105 + 5\%(105) = 105 + 5.25 = 110.25$$
$$t = 3: \ 110.25 + 5\%(110.25) = 110.25 + 5.5125 = 115.7625$$

Summarizing: $y = 100(1.05)^3 = 115.7625$ €

(ii) Capital to invest to day at 5% interest rate so that in three years it is 100 €

$$x(1.05)^3 = 100$$
$$x = \frac{100}{(1.05)^3} = 86.38$$

That is investing today 86.38 €at 5%, yields 100 €in three years.

Costs of performing weight controls and check-ups along 15 years

Year	Discount	Weight control	Check-up	
0	0	50	200	
1	1.050	47.62	190.48	$\frac{200}{1.05}$
2	1.103	45.63	181.32	$\frac{200}{(1.05)^2}$
3	1.158	43.18	172.71	$\frac{200}{(1.05)^3}$
4	1.216	41.12	164.47	$\frac{200}{(1.05)^4}$
5	1.276	39.18	156.74	$\frac{200}{(1.05)^5}$
6	1.340	37.31	149.25	$\frac{200}{(1.05)^6}$
7	1.407	35.54	142.15	$\frac{200}{(1.05)^7}$
8	1.477	33.85	135.41	$\frac{200}{(1.05)^8}$
9	1.551	32.24	128.95	$\frac{200}{(1.05)^9}$
10	1.629	30.69	122.77	$\frac{200}{(1.05)^{10}}$
11	1.710	29.24	116.96	$\frac{200}{(1.05)^{11}}$
12	1.796	27.84	111.36	$\frac{200}{(1.05)^{12}}$
13	1.886	26.51	106.04	$\frac{200}{(1.05)^{13}}$
14	1.980	25.25	101.01	$\frac{200}{(1.05)^{14}}$
	Total	544.90	2179.62	

Insurer's incentives to invest in prevention in one individual

⋆ Expected cost of a heart attack (to happen in 10 years):

$$(0.15)(30000) = 4500 \text{ €}$$

Discounted present value of this expected cost:

$$\frac{4500}{1.05^{10}} = \frac{4500}{1.629} = 2762.43 \text{ €}$$

⋆ Expected cost savings from weight control (5%):

$$(0.05)(2762.43) = 138.12 \text{ €}$$

⋆ Expected cost savings from check-ups (20%):

$$(0.2)(2762.43) = 552.48 \text{ €}$$

⋆ Discounted present value of cost weight control along 15 years: 544.90 €

⋆ Discounted present value of cost check-ups along 15 years: 2179.62 €

Conclusion

$$138.12 < 544.90$$
$$552.48 < 2179.62$$

Insurer does not provide contracts with coverage for preventive services. [neither separately nor together]

Patient's incentives to invest in prevention

Patient's loss: 100000 €(wage, pain, ...)

$\star$ Expected loss from a heart attack (to happen in 10 years time):

$$(0.15)(100000) = 15000 \text{ €}$$

Discounted present value of this expected loss:

$$\frac{(15000)}{1.05^{10}} = \frac{15000}{1.629} = 9208.10 \text{ €}$$

$\star$ Expected cost savings from weight control (5%):

$$(0.05)(9208.10) = 460.40 \text{ €}$$

$\star$ Expected cost saving from check-ups (20%):

$$(0.2)(9208.10) = 1841.62 \text{ €}$$

$\star$ Discounted present value of cost weight control along 15 years: 544.90 €

$\star$ Discounted present value of cost check-ups along 15 years: 2179.62 €

Conclusion

$$460.40 < 544.90$$
$$1841.62 < 2179.62$$

Patient does not invest in preventive medicine (healthy habits). [neither separately nor together]

Joint patient-insurer incentives to invest in prevention

⋆ Expected cost savings from weight control:

$$138.12 + 460.40 = 598.52 \text{ €}$$

⋆ Expected cost savings from check-ups:

$$552.48 + 1841.62 = 2394.10 \text{ €}$$

⋆ Discounted present value of cost weight control along 15 years: 544.90 €

⋆ Discounted present value of cost check-ups along 15 years: 2179.62 €

Conclusion

$$598.52 > 544.90$$

$$2394.10 > 2179.62$$

The alignment of incentives of insurer AND patient makes investment in prevention profitable.

Comments

(i) Technological change increases uncertainty in computation of costs. Compare

$$\frac{\triangledown \text{ treatment costs}}{\triangledown \text{ preventive costs}} > 1 \Rightarrow \text{ prevention less attractive}$$

(ii) Valuation of risk and benefits of prevention.
★ Common objection: psychological costs$>$ hospital costs$+$ loss of income. Maybe, but not for everybody.

★ Willingness to pay vs. willingness to accept compensation. Common problem in cost-benefit analysis.

Example 1. Money parents willing to pay to prevent death of an offspring $\neq$ money they would accept as compensation after death of that offspring.

Example 2. Patients that cannot afford paying for drugs to prevent cholesterol, need not be willing to accept compensation of 30000 € to have a heart attack.

(iii) Patients' information

Imperfect info on:

★ expected loss from a health crisis;

★ risk of suffering a health crisis;

★ benefits of prevention.

$\Rightarrow$ info campaigns to induce healthy habits.

(iv) Patients' risk aversion.

(v) Preventive free services:

★ physical exercise;

★ use of seat belts in cars.

▶ Why not? Difficult answer: psychology.

How to solve inefficiency?

(i) Agreements insurer/insured: $\triangledown$ premiums if insured also contracts preventive services.

■ insurer must invest in monitoring
■ compare (monitoring cost + $\triangledown$ revenues) with hospital cost savings.

BUT

★ variety of illnesses and risk attitudes $\rightarrow$ large menu of discounts (hard to manage)

★ high risk groups may not be able to control all elements of risk.

★ preventive treatments (with medicines) may have side effects (trigger other illnesses).

★ low income patients may not have access to discounts in premiums.

(ii) Government subsidies to insurer and insuree to incentivate prevention.

BUT

★ best use of tax revenues?

★ may be justified for public goods. Health Care services are not.

★ tool to redistribute income. consequences:

✓ who benefits from it?

✓ who finance it (via taxes))?

(iii) General information campaigns.

Readings

- on incentives in healthy habits:

Helwege, A., 1996, Preventative versus Curative Medicine: A Policy Exercise for the Classroom, *J. of Economic Education*, **27**: 59-71.

- on preventive care:

Hennesy, D.A., 2008, Prevention and cure efforts both substitute and complement, *Health Economics*, **17**: 503-511.

http://www3.interscience.wiley.com/journal/117932700/issue

- on prenatal care:

Conway, K.S., and A. Kutinova, 2006, Maternal health: does prenatal care make a difference?, *Health Economics*, **15**: 461-488.

http://www3.interscience.wiley.com/journal/112589788/issue

8. Uncertainty, Risk and Insurance

Individual: income Y, Utility $U(Y)$.

Two states: healthy, sick (prob. p) $\rightarrow\ Y_h, Y_s$

• *Expected income*: ex-ante average income weighted by p: $E(Y) = pY_s + (1-p)Y_h$
• *Utility of expected income*: $U(E(Y))$
• *Expected utility*: ex-ante average utility weighted by p: $E(U) = pU(Y_s) + (1-p)U(Y_h)$

Ilustración

$$\begin{cases} p = 1/3 \\ Y_s = 0 \\ Y_h = 150 \end{cases} \Rightarrow E(Y) = \tfrac{1}{3}(0) + \tfrac{2}{3}(150) = 100$$

$$U(Y) = Y^{\frac{1}{2}} \Rightarrow U(E(Y)) = 100^{\frac{1}{2}} = 10$$

$$\begin{cases} U(Y_s) = U(0) = 0 \\ U(Y_h) = U(150) = 12.25 \end{cases}$$

$$E(U) = \frac{1}{3}(0) + \frac{2}{3}(12.25) = 8.16$$

Crucial elements of the analysis:

(a) $E(U)$ vs. $U(E(Y))$

(b) Uncertainty vs. risk

Individual behavior facing probability of illness?

Distinguish Uncertainty and Risk

Def.: Risk

Individual can assign probabilities to the different states he may face.

Def.: Uncertainty

Probabilities of the different situations are exogenous.

Example 1 *(Risk)*: 2 situations

1. Careless driver:

Prob 1/10,000 $\rightarrow$ accident

Prob 9999/10,000 $\rightarrow$ no accident

2. Careful driver:

Prob 1/100,000 $\rightarrow$ accident

Prob 99,999/100,000 $\rightarrow$ no accident

Remarks

1. Driving style is a choice variable.

2. Occurrence of accident no proof of careless driving.

3. Occurrence of acccident is observable.

Example 2 *(Uncertainty)*: 2 situations

1. Able physician:

Prob 1/100 $\rightarrow$ wrong diagnose

Prob 99/100 $\rightarrow$ correct diagnose

2. Lesss-able physician:

Prob 2/100 $\rightarrow$ wrong diagnose

Prob 98/100 $\rightarrow$ correct diagnose

Remarks

1. "Ability" is not choice variable.

2. Occurrence of wrong diagnose no proof of lack of ability.

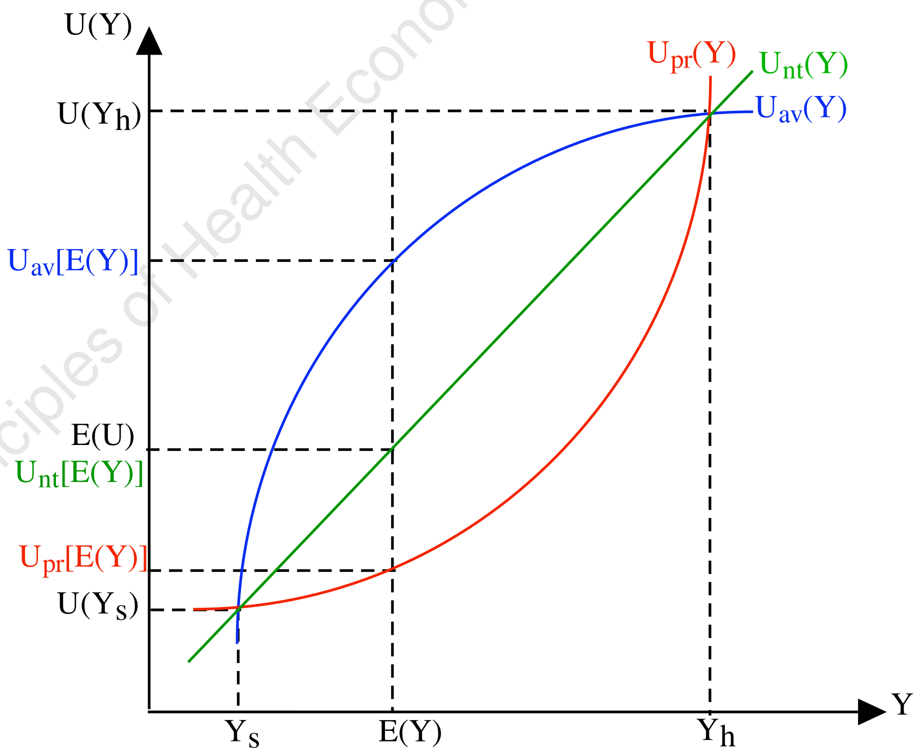
3. Wrong diagnose is observable.

Three attitudes towards risk. Two alternatives: participate in a risky situation $\rightarrow E(U)$; do not participate $\rightarrow U(E(Y))$.

Def.: Risk aversion: $E(U) < U(E(Y))$.

Def.: Risk neutrality: $E(U) = U(E(Y))$.

Def.: Risk preference: $E(U) > U(E(Y))$.



Example 1: tossing a coin

Individual: $Y = 49$ €, $U(Y) = \sqrt{Y}$.

Alternative 1. Participate in a lottery: toss a coin.

If win $\rightarrow$ 98 €. If loss $\rightarrow$ 0 €.

Cost of participation: 49 €.

Expected utility:

$$E(U) = \frac{1}{2}U(49 + 98 - 49) + \frac{1}{2}U(49 - 49) = \frac{1}{2}U(98) + \frac{1}{2}U(0) \approx 4.9497$$

Alternative 2. Do not participate $\rightarrow U(49) = 7$ (In this case, $Y = E(Y)$)

Conclusion: $E(U) < U(E(Y))$. Risk averse individual decides not to participate.

Remark: $U(Y)$ is strictly concave.

How can the individual be induced to participate?

- $\triangle$ payment if winning: e.g. 256 €

$$
\begin{aligned}
E(U) =& \frac{1}{2}U(49+256-49)+\frac{1}{2}U(49-49) = \\
& \frac{1}{2}U(256)+\frac{1}{2}U(0) = \\
& \frac{1}{2}16 = 8 > 7
\end{aligned}
$$

-$\triangledown$ participation cost: e.g. 24 €

$$
\begin{aligned}
E(U) =& \frac{1}{2}U(49+98-24)+\frac{1}{2}U(49-24) = \\
& \frac{1}{2}U(147)+\frac{1}{2}U(25) \approx \\
& \frac{1}{2}12.1243+\frac{1}{2}5 \approx \\
& 6.0622+2.5 \approx 8.56232 > 7
\end{aligned}
$$

Remark: either way implies rising the expected value of the lottery. The seller of the lottery tickets would make a loss for sure if selling many tickets!

Example 2: contracting insurance

Individual with assets valued 21000 €.

Probability of losing 6000 €= 1%

Probability distribution:

$$\begin{cases} 1\% \longrightarrow 15000 \text{ €} \\ 99\% \longrightarrow 21000 \text{ €} \end{cases}$$

Insurance: alter probability distribution

Insurance contract:
- indemnity = 6000 €
- premium = 60 €

New probability distribution:

$$\begin{cases} 1\% \rightarrow 20940 \text{ €}(= 21000 - 6000 + 6000 - 60) \\ 99\% \rightarrow 20940 \text{ €}(= 21000 - 60) \end{cases}$$

Equal wealth in both states of nature: Individual fully insured against loss.

Healthcare insurance

Risk aversion $\rightarrow$ contract healthcare insurance.

★Demand of insurance

Recall:

- Individual: income Y, Utility $U(Y)$ concave.
- Two states: healthy, sick (prob. p) $\rightarrow$ Y_h, Y_s
- L loss of income if sick.
- Protection against loss L $\rightarrow$ insurance indemnity: Z € when sick. Premium: αZ €.

How much insurance to buy? (i.e. choose the value of Z to max $E(U)$)

$$Y_s(Z) = Y - L - \alpha Z + Z = Y - L + (1-\alpha)Z$$
$$Y_h(Z) = Y - \alpha Z$$

Formally,

$$\max_Z E(U) = pU(Y_s) + (1-p)U(Y_h)$$

Solution:

$$\frac{\partial E(U)}{\partial Z} = p\frac{\partial U}{\partial Y}\bigg|_{Y_s}\frac{\partial Y_s}{\partial Z} + (1-p)\frac{\partial U}{\partial Y}\bigg|_{Y_h}\frac{\partial Y_h}{\partial Z}$$
$$= (1-\alpha)p\frac{\partial U}{\partial Y}\bigg|_{Y_s} - \alpha(1-p)\frac{\partial U}{\partial Y}\bigg|_{Y_h} = 0$$

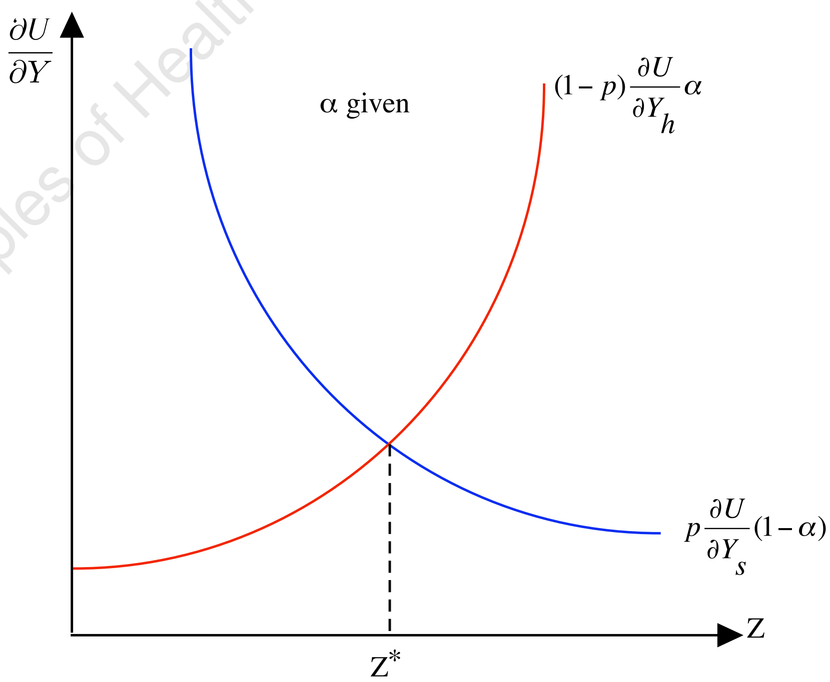
Interpretation

Concave utility $\rightarrow$ decreasing marginal utility.

♠ Each extra euro of coverage implies higher income when sick. But expected marginal utility of each extra euro of coverage diminishes. Formally, $(1-\alpha)p\frac{\partial U}{\partial Y_s}$ diminishes as Z increases (marginal benefit).

♠ Each extra euro of coverage implies higher cost (less income) when healthy. Thus, marginal income increases. Formally, $\alpha(1-p)\frac{\partial U}{\partial Y_h}$ increases as Z increases (marginal cost).

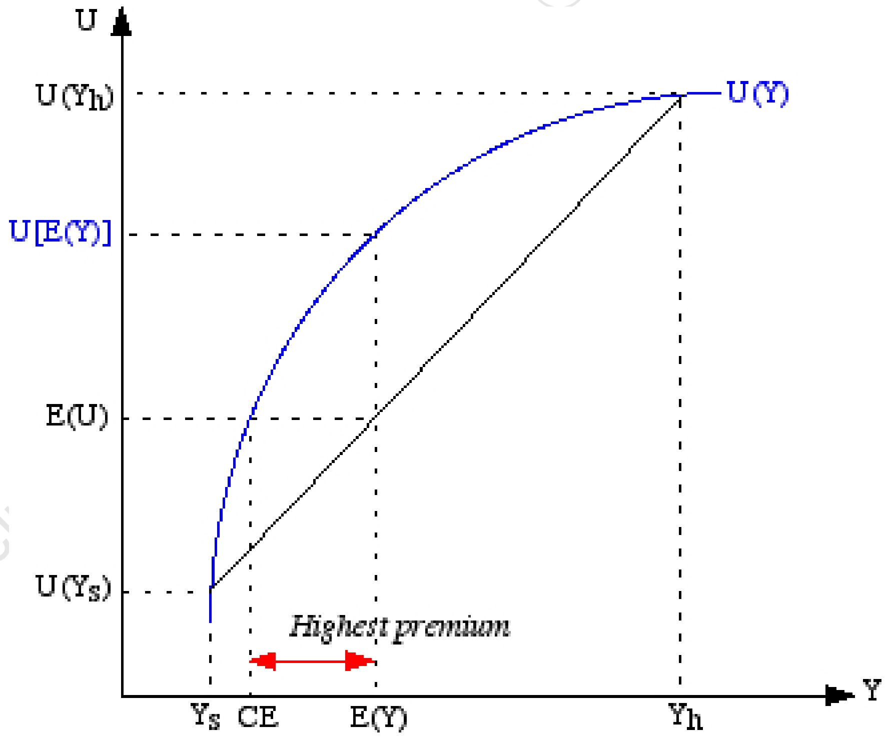
♠ Combination of these two opposite effects determines optimal demand of insurance.



Highest premium willing to pay?

Def.: Certainty equivalent (CE). Level of income whose utility is equal to expected utility, $U(CE) = E(U)$.

Highest premium $= E(Y) - CE$



★Supply of insurance

Z^* depends on α. In turn, α is a decision of insurance company. Such decision depends on the structure of insurance market.

Assumption: perfectly competitive market.

Expected profit = premia - indemnity payments

$$E(B) = (1-p)\alpha Z - p(1-\alpha)Z = Z(\alpha - p)$$

2 set-ups:

Set-up 1: determine α ("fair premium") solution of $E(B) = 0$. Thus,

$$\hat{\alpha} = p$$

Interpretation

The *fair premium* is equal to the probability of falling sick. If insurer sets lower premium will incur (expected) losses. If insurer sets too a high premium will obtain (expected) extra profits $\rightarrow$ new entrants offering lower premia.

Set-up 2: determine α solving $\max_\alpha E(B)$. Solution depends on the market structure.

★Equilibrium of the insurance market

- Demand: [marginal benefit = marginal cost]

$$p(1-\alpha)\frac{\partial U}{\partial Y}\bigg|_{Y_s} = \alpha(1-p)\frac{\partial U}{\partial Y}\bigg|_{Y_h}$$

- Supply

$$\alpha = p$$

Therefore, $p(1-\alpha) = \alpha(1-p)$, and market equilibrium is characterized by

$$\frac{\partial U}{\partial Y}\bigg|_{Y_s} = \frac{\partial U}{\partial Y}\bigg|_{Y_h}.$$

Equality only satisfied when $Y_s = Y_h$, i.e.

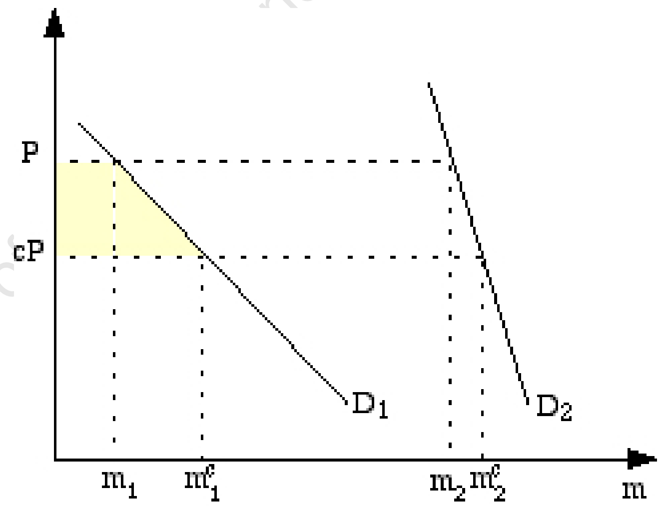
$$Y - L + (1-\alpha)Z = Y - \alpha Z, \quad \text{or}$$
$$Z^* = L.$$

The individual optimally fully insured against expected loss.

Demand of insurance and healthcare demand elasticity

■ D_1 and D_2 demands for healthcare of 2 illnesses.
■ Illness 2 more severe $\rightarrow$ more demand, more inelastic.
■ Price of healthcare: P

▲ 2 scenarios: no insurance; insurance with copayment c



Higher elasticity $\rightarrow$ insurance generates higher *relative* welfare gain.

9. Contract theory

Introduction

So far, market failure → mkt power, △ returns, public goods, externalities.

New element of analysis: private information (asymmetric, imperfect).

What is a contract? Bilateral agreement: contracting party (*principal*) delegates in contracted party (*agent*) decision making.

Elements of a contract:
♢ Principal: offers contract; verifiable variables
♢ Agent: if accepts, performs effort for Principal.

Perfect agent: physician as perfect agent for the patient takes decisions (diagnostic, treatment) "as if" it would be the very patient taking decisions should (s)he have the same information as the physician. → deontologic code, hypocratic oath.

- If there is no conflict, the agent behaves as if (s)he would be the principal rather than himself.
- If conflict of interest, problem for the principal: make sure that the agent (physician) respects the interest of the principal (patient).
- Usual scenario: conflict of interest between principal and agent.

Conflict of objectives:
♠ salary: income for agent, cost for principal
♠ effort: benefits principal, costly for agent

INFORMATION?
Complete (perfect), incomplete (imperfect), symmetric (public), asymmetric (private)

Definitions

Perfect information: at each move, party knows history of decisions so far.

Imperfect information: not perfect.

Complete information: every party knows all relevant information about other party (parties know decision tree).

Incomplete information: $\exists$ party uncertain about other party's behavior, i.e. there are random elements in the relationship.

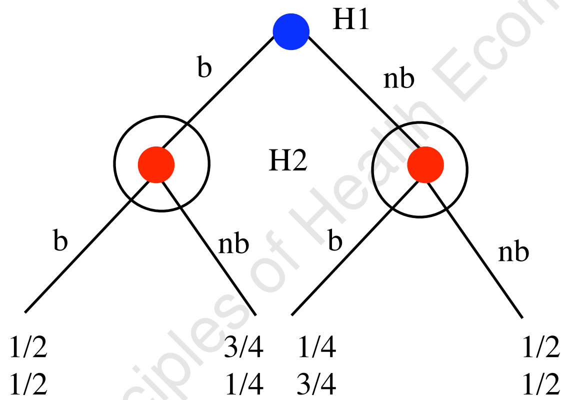
Symmetric information: all parties have exactly the same information;

Asymmetric information: One party has more information than the other party.

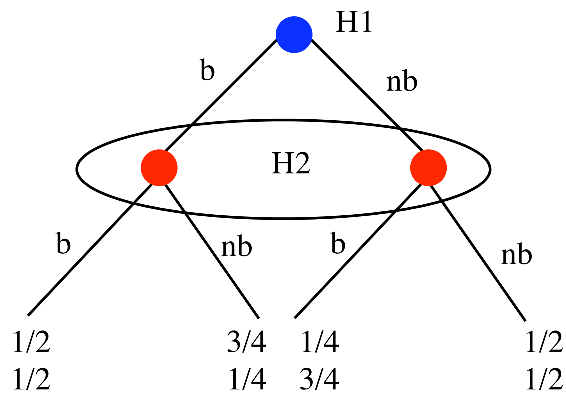
Illustration 1: complete information

2 Hospitals deciding whether buying or not, new MRI device.

Payoff: patient share.



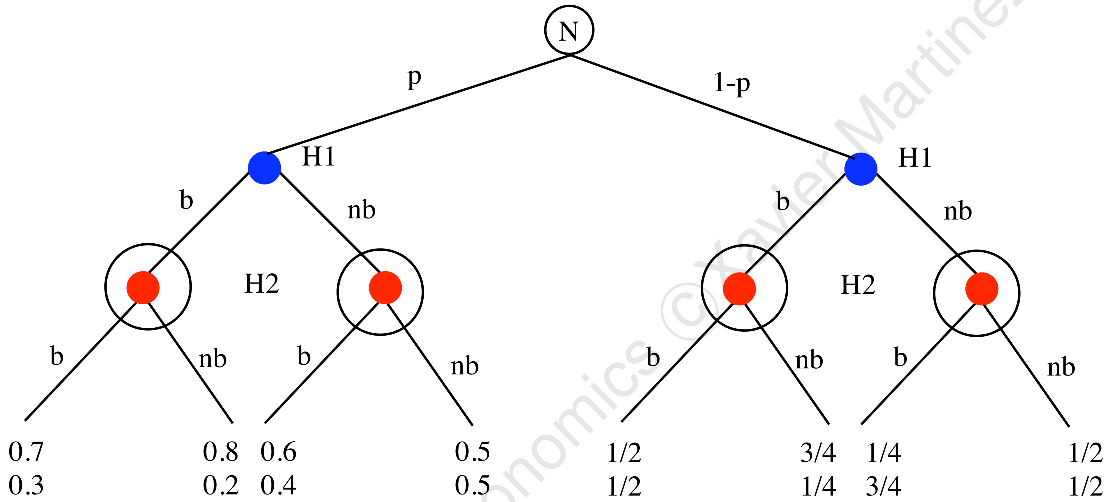
Complete and perfect information



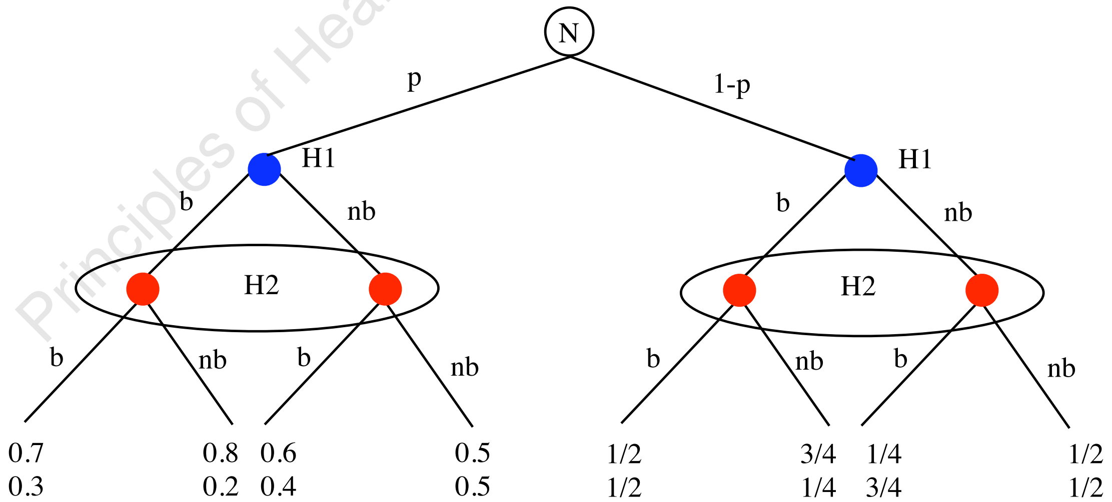
Complete and imperfect information

Illustration 2: incomplete information

H1 may be aggressive (pr. p) or soft (pr. $(1-p)$). Nature determines. H2 does not know attitude H1.



Incomplete and perfect information



Incomplete and imperfect information

Provision of incentives and objectives in the healthcare sector

Objetive: Maximum quality with minimum cost.

PATIENTS

Problem 1:

Healthcare insurance → limited cost sensibility, excessive visits, only issue is quality.

Incentives: cost-sharing (copayments). [Avoid equity issues!]

Problem 2:

Degree of precision in following treatment → hard to correct.

US (1995) losses due to deviations in use of pharmaceuticals: 80,000 - 100,000 mil $

[recall efficacy vs. effectiveness (p. 6f)]

PHYSICIANS

Problem 1:

Market of experts $\rightarrow$ ”trust goods”: diagnostic and treatment.
Treatment: difficult to assess its quality (subject to random elements, every patient is different, ...).
Valuation can only be made by provider.

Incentives: Separation between diagnostic and treatment.
Example: Japan (Macho-Stadler, I., 1999, “Reflexiones sobre la provisión de incentivos en los servicios sanitarios”, p.5)
Incentives: Patient access to second opinions $\rightarrow$ discipline via reputation BUT search of info is costly.

Problem 2:

“Supplier induced demand” (capacity of the physician to manipulate his income or the importance of a service)

Incentives: Patient: access to second opinions; Insurer: ∇ prices/services does not work. Ej.: Osakidetza (Macho-Stadler, I., 1999, p.6)

Definitions of types of goods under asymmetric information

- search goods: their quality is apparent before purchase.

- experience goods: their quality is apparent after consumption.

- trust goods: their quality is not always apparent even after consumption.

Problem 3:

2 payment systems: fee-for-service, or capitation.

fee-for-service [fixed payment + cost reimbursement]: provider does not participate in costs; does not have control on costs; does not avoid difficult (costly) patients.

capitation [fixed payment per patient]: cost contention; avoids costly patients.

Incentives: combination: fixed payment + partial cost reimbursement → allows for cost control maintaining quality.

HOSPITALS

2 payment systems: prospectives or retrospective budgets.

retrospective budgets [ex-post reimbursement of costs]: no cost control.

prospective budgets [ex-ante]: cost control; quality tends to ↓, unforeseen events (epidemic episodes , catastrophic situations,...)?

Incentives: Prospective budget + payment according to comparative performance.
Define "normal" price to each hospital service based on average. Exclude special treatments.

Conclusion:

No incentive mechanism adequate for all situations: Often, incentive mechanisms raise (unwanted) second order effects, BUT better than doing nothing.

Asymmetric info and conflict of objectives. Example

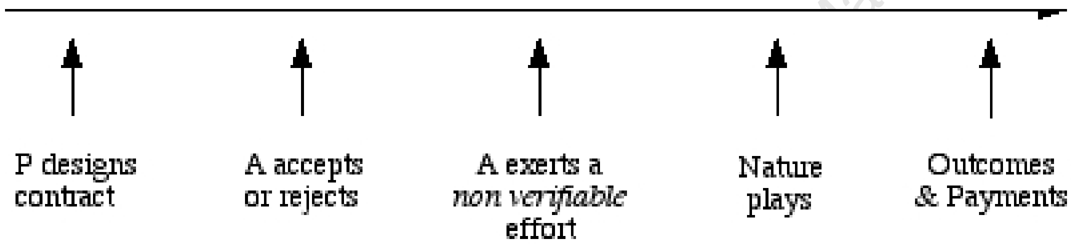
Hospital (principal) contracts manager (agent) to defend interests of hospital.
Hospital cannot perfectly control manager's decisions.
Contract cannot be based on manager's behavior (not verifialble).
Hospital does not have info on manager's characteristics.
Manager can exploit his informative advantage to his own benefit, instead of hospital's.

Aim: study relation between two individuals, where one of them has an informative advantage over the other and their objectives are not aligned. $\Longrightarrow$
Provision of incentives to reach objective.
If interests would coincide, info would be communicated eliminating asymmetry.

3 topics:
moral hazard
adverse selection
signalling

Moral hazard

In a moral hazard situation both parties have the same info at the moment of signing the contract, BUT afterwards the agent receives private info. The principal cannot observe (verify) the effort (action) exerted by the agent.



Source: Macho-Stadler et al. (1994, p. 21)

Examples

★ labor contracts: publisher representative to sell books. Only verifiable element: # books sold. Effort (# hours visiting clients) not verifiable by publisher → payment cannot be dependent on effort.

★ hospital: manager contracted to control costs. If fixed payment → insufficient effort.

★ researchers: research center contracts researcher in a project. → difficult to distinguish a thinker from a dreamer. Fixed payment → little incentives to think.

Example 1. Hospital with retrospective budget $\rightarrow$ little incentives for cost containment
Naïve solution: prospective budgets.

Example 2. Fully insured driver $\rightarrow$ little incentive for careful driving.
Naïve solution: "bonus-malus" system

Example 3. Fully insured physician $\rightarrow$ little incentive to exert the (costly) efficient level of effort to obtain best diagnostic.
Naïve solution: make physician responsible for diagnostic errors. Reputation (cf. TV series "House")

Naïve solutions because too much risk on the agent:
(i) hospital may have high costs because unexpected $\triangle$ unfortunate case mix, epidemic episodes ... (and for lack of effort)
(ii) driver may be unlucky on one occasion along the year.
(iii) physician may obtain a wrong diagnostic by accident.

Too much risk on the agent. What to do?

♠ Hospital with prospective budget. Too a high risk (earthquakes, epidemic episodes, ...)

Solution 1: Observe average performance along time and implement compensations according to deviations from the average value.

Solution 2: Induce competition among hospitals. Indirect method to achieve the same objective.

♠ Hospitals with $\neq$ case mix (because of the environment where they perform activity)

Solution:
Step 1: define types of illnesses with similar cost/patient (Diagnostic related groups)
Step 2: Use unit average cost for each DRG and compensate the hospital per patient within each DRG.

Moral hazard and demand for health care

Health Insurance: price patient $\neq$ price treatment

Health insurance $\rightarrow$ Δ price of health services
So far: L exogenous, BUT
demand sensible to price, Z^*?

Assume (1):
Prob p sick, demand for treatment
Prob $(1-p)$ healthy. No demand for health services.

We already know:
contract full healthcare insurance (cost of treatment P_1Q_1); premium: pP_1Q_1

Assume (2):
Demand decreasing in price
full healthcare insurance $\rightarrow$ free treatment $\Rightarrow$
Δ demand for healthcare until the level $P=0$, say $Q_2 > Q_1$.

Consequence:
Real cost of treatment: $P_1Q_2 > P_1Q_1 \;\Rightarrow$

Problem:

♠ If insurer maintains premium, expected revenue pP_1Q_1, expected payment $pP_1Q_2 \rightarrow$ losses.

♠ If insurer increases premium to pP_1Q_2 individual cannot contract insurance. (May buy premium $> pP_1Q_1$ as protection against risk)

Premium: 2 components
- protection against risk,
- supplementary resources to compensate moral hazard.

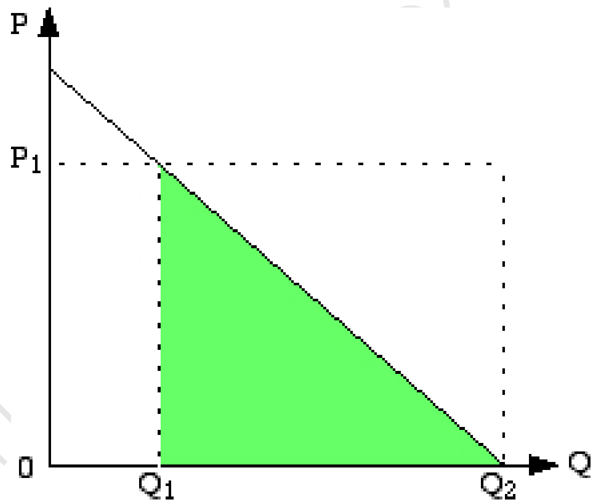
As before, $Z^* \rightarrow$ MR=MC
now, individual costs = premium + moral hazard.

♠ Insurer's mechanisms to provide incentives to insurees: deductibles and copayments.

Effect of a deductible

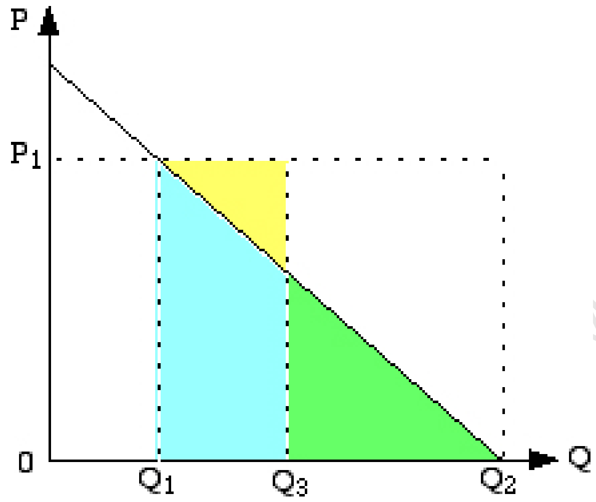
Assume insurance contains a deductible of D € (Cost borne by insuree before insurer starts covering expenses). Individual compares the level of services obtained after paying the deductible (Q_2) and without insurance (Q_1).

Example



★ no insurance: (P_1, Q_1)
★ p: prob "accident"
★ $D = P_1 Q_1$
★ individual obtains Q_2 paying $D (= P_1 Q_1)$
★ benefit: area under demand curve between Q_2 and Q_1 (green area)

Insurer ΔD to $D' = P_1 Q_3$. Will the individual buy the insurance?



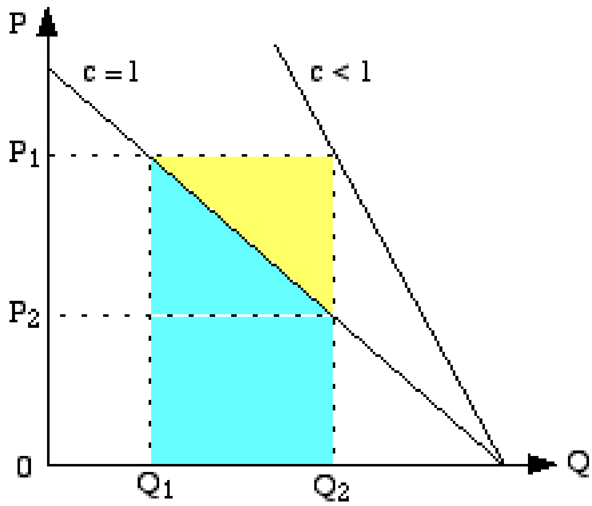
♣ Δ payment if sick = $P_1(Q_3 - Q_1)$ (blue+yellow)
♣ benefit: area under demand curve between Q_2 and Q_1 (blue+green)
♣ Summary:
- expense increase: yellow
- benefit increase: green

Conclusion:
If green $>$ yellow $\rightarrow$ contract insurance with deductible D'. Otherwise,
Too high a deductible $\rightarrow$ eliminates incentives to contract insurance

Effects of a copayment

Initial situation: no insurance (P_1, Q_1)

Contract insurance with copayment $c \in (0,1)$ i.e. $P_2 = cP_1 \Rightarrow$ Demand increases $Q_1 \to Q_2$

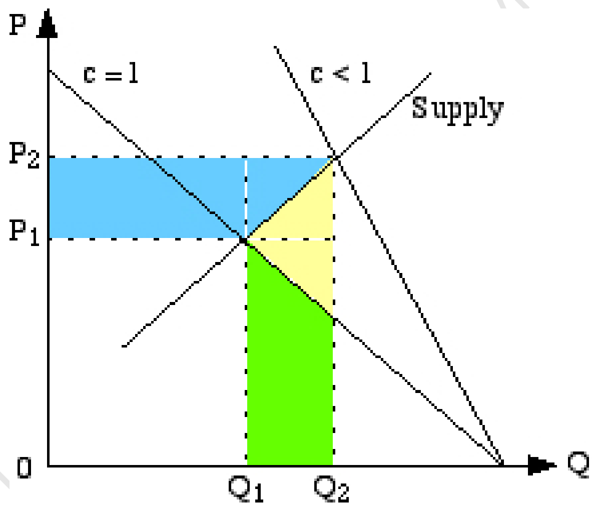


Value of services = P_1Q_2
Δ expenditure = $P_1(Q_2 - Q_1)$ (blue+yellow)
Δ benefit = area under demand curve between Q_2 and Q_1 (blue)
Triangle yellow: welfare loss $\to$ Individual demands more insurance services than optimum.

Interpretation
Insurance $\to$ consumer "as if" ignorant real cost of health services $\to$ distortion in resource allocation between demand for insurance and other goods.

Copayment and market equilibrium

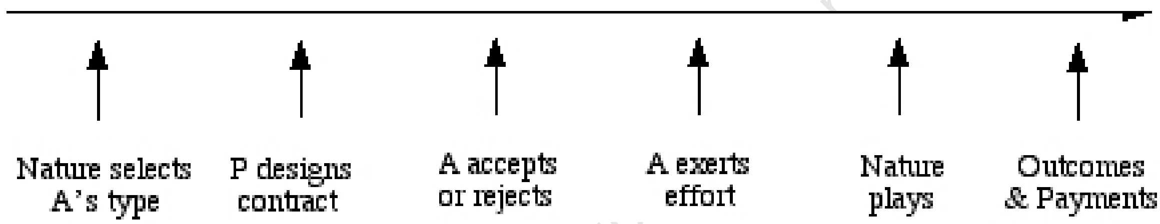
Initial situation: no insurance (P_1, Q_1) with demand = supply
Contract insurance with copayment $c \in (0,1) \Rightarrow$
Demand increases $Q_1 \to Q_2$
New equilibrium: (P_2, Q_2).



$\triangle$ expenditure = $P_2Q_2 - P_1Q_1$ (blue+green+yellow)
Resource allocation distortion:
$\triangle$ benefit induced by copayment = green
$\triangle$ costs additional demand = blue
Deadweight loss from overproduction of insurance services = yellow

Adverse selection

Adverse selection appears in situations where the agent has private information before signing the contract. In this case the principal can verify the agent's behavior. Principal knows there are several types of agents but cannot identify it at the moment of the contract.



Source: Macho-Stadler et al. (1994, p. 23)

Examples

★ Insurance company may face a potential client with high or low risk. Insurer can design a contract for each type of insuree, but does not know *ex-ante* which is the optimal one.

★ Regulation of a public monopoly. Theory: price to marginal cost and cover fixed cost with a transfer. → monopoly knows better its cost function than regulator. Regulator includes monopolist informational advantge in the design of the contract (transfer, price).

★ Patient has better info on his real health status than insurer → excessive costs, higher probability of falling ill.

★ Hospital has better info on the case mix of patients than insurer and Health authority → inflation of costs and budgets.

★ Physician, after the visit, has better info on the patient's real health status than
- patient → induced demand, prescription of branded drugs (instead of generics)
- hospital → excessive referral to specialized care.

Asymmetric info may cause the market to perform poorly, and even disappear.

Asymmetric info, key element in insurance and health care markets.

Illustration: Akerlof's (1970) lemons market.

Used-cars on sale with $\neq$ qualities.
Sellers know about qualities better than buyers.
Lemons principle: Good cars are driven out of the market by the lemons

Simplified Akerlof's example (FGS, 2004, ch. 9):

- 9 used-cars qualities
$q = \{0, \frac{1}{4}, \frac{1}{2}, \frac{3}{4}, 1, 1\frac{1}{4}, 1\frac{1}{2}, 1\frac{3}{4}, 2\}$

- Uniform prob. of picking a car ($= \frac{1}{9}$)

- Sellers know quality

- Buyers only know distr. qualities

- (min) Reservation value to sellers= 1000q €

- (max) Reservation value to buyers= 1500q €

- Auctioneer calls out market prices

- Sale at a price s.t. $D = S$

Let $p = 2000$€ per car

• Supply:
Sellers willing to sell each car if for each car,
$\widehat{p} \geq 1000 \times q$.

car (q=2)$\rightarrow$ $2000 = 1000 \times 2$ $\rightarrow$ S=9.

• Demand:
Average quality=1;
Buyers willing to buy if $p \leq 1500 \times 1 = 1500$;

(price)$2000 > 1500$(res.value) $\rightarrow D = 0$.

Let $p = 1500€$ per car

• Supply:
Sellers willing to sell each car if for each car, $\widehat{p} \geq 1000 \times q$.

$\widehat{p}_{q=2} = (1000)2 = 2000 > 1500 \rightarrow$ not offered
$\widehat{p}_{q=1.75} = (1000)1.75 = 1750 > 1500 \rightarrow$ not offered
$\widehat{p}_{q=1.5} = (1000)1.5 = 1500 = 1500 \rightarrow$ offered
$\widehat{p}_{q=1.25} = (1000)1.25 = 1250 < 1500 \rightarrow$ offered
Thus, $\rightarrow$ S=7 cars; average quality = 3/4.

• Demand:
Average quality $\overline{q} = 3/4$;
Buyers willing to buy if $p_{\overline{q}} \leq 1500 \times \frac{3}{4} = 1125$.
Thus, (price)$1500 > 1125$(res.value) $\rightarrow D = 0$.

etc, etc.

<u>Conclusion:</u>
Under asymmetric info, $\nexists p$ at which $D = S$.

Why? Lemons principle.

Assume symmetric info:

Buyers and sellers only know average quality ($\bar{q} = 1$).

Let $p = 1500$€ per car

• Supply:
Sellers willing to sell if $\widehat{p}_{\bar{q}} \geq 1000\bar{q} = 1000$;
(price)$2000 > 1000$(res.value) $\rightarrow S = 9$.

• Demand:
Average quality $\bar{q} = 1$;
Buyers willing to buy if $p_{\bar{q}} \leq 1500\bar{q} = 1500$;

(price)$1500 = 1500$(res.value) $\rightarrow D = 9$.

Equilibrium price of 1500 € and 9 cars are sold.

Akerlof and health insurance market.

Individual has more info on his real health status than insurer.

If insurer ignores this fact, and set premium according to general population statistics $\rightarrow$ losses. Why?
- high risk individuals more interested in contracting insurance $\rightarrow$
- insurer's customers will be a biased population sample.

Insurers anticipates it $\rightarrow$ contracts with higher premia. Low risk individuals do not contract insurance: Exclusion

Conclusion: asymmetric info $\rightarrow$ inefficient resource allocation.

★ ind. do not know their p $\rightarrow$ insurance against risk.

★ If insurer offers same contract to everybody $\rightarrow$
- low risk indiv, too high premium $\rightarrow$ underinsurance
- high risk indiv, too low premium $\rightarrow$ overinsurance.

Solutions

Solution 1: Screening

Insurer offers menu of contracts:
- i) contract with high coverage and high premium;
- ii) contract with low coverage and low premium

Consequence: self-selection:
- low risk indiv, $\rightarrow$ contract ii)
- high risk indiv, $\rightarrow$ contract i).

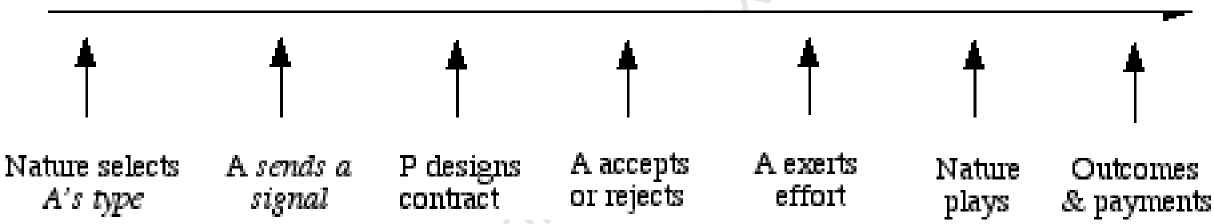
Problems

1. Argument OK if insurer is monopolist. $\nexists$ eq. if competition.
2. Even when $\exists$ eq, it is inefficient: low risk indiv. overinsured.

Solution 2: Signaling

Signaling

Similar situation to adverse selection. After knowing his type and before signing the contract, the agent may send a signal observable by the principal.

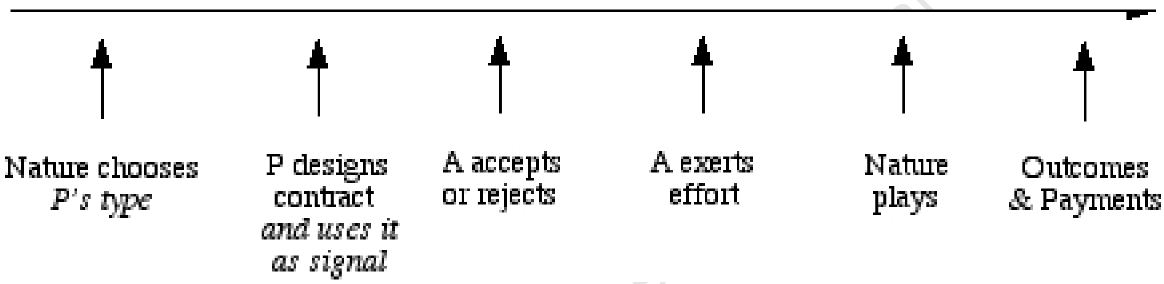


Source: Macho-Stadler et al. (1994, p. 24)

Example

★ Physician shows credentials (Ph.D., etc) as signal of ability when being contracted by hospital/patient. Also hangs from the walls of his office credentials so that patients can see them.

Alternatively, the principal may posses private info that transmits to the agent through the contract design.



Source: Macho-Stadler et al. (1994, p. 25)

Example

★ University Dpts in job market include "goodies" in offers as signals of quality.

What is a signal? investment to disclose some info (the "type") yielding some advantage over keeping it secret.

Solution 2: Signaling

Low risk indiv. willing to show to insurer they are low risk:
e.g. volunteer medical reports.
$\Rightarrow$ Signaling theory

Problem
high risk indiv. want to look like low risk imitating their signals.

Consequence
- Insurers very cautions in interpreting signals
- As signaling is costly, low risk indiv. may prefer not to signal.

Equilibria: 2 types
(i) Separating equilibrium
(ii) Pooling equilibrium

(i) Separating equilibrium

Appears when signaling is very costly for high risk indiv. $\rightarrow$
- high risk indiv. do not imitate
- Insurer takes signals serously
- low risk indiv. obtain better contracts
- signaling attractive for low risk indiv.

(ii) Pooling equilibrium

Appears when imitation is not very costly $\rightarrow$
- Insurer ignores signals
- Signals are useless
- Nobody signals

Problem (technical, but important)

Even with high signaling costs, often also exist pooling equilibria.

Examples:
- Corporation places ad looking for "young graduate" $\rightarrow$ education as a signal of ability.
- Hospital real "case mix" difficult to know by Health authority.
- Physicians' ability hard to know by patient.

Summary

Asymmetric Info gives rise to the possibility of asking the following questions:

♦ A situation with relatively ignorant consumers prevents high levels of competition?
♦ Should be observe high price dispersion in the health care market?
♦ Will the health care market provide unnecessary or non optimal treatments to patients?

Objetive: find mechanisms to correct for the bad consequences of asymmetric info.
Incentive contracts, competition, ...

BUT

Contracts require verifiable info $\rightarrow$ costly (monitoring, auditing)

Competition may lead to exclusion of some groups of individuals $\rightarrow$ equity, social justice

Reading

The Henry J, Kaiser Family Foundation, 2006, Illustrating the Potential Impacts of Adverse Selection on Health Insurance Costs in Consumer Choice Models, Snapshots: Health Care Costs,

http://www.kff.org/insurance/snapshot/chcm111006oth2.cfm

Supplier induced demand

WHAT IS IT?

Agency problem. Patient's dependency on physician gives physician an advantage (due to better info) to manipulate demand to his benefit.

Old topic (1958 $\rightarrow$) Roemer's effect: "a bed built is a bed filled" (Roemer 1961) Very high correlation between availability of beds/1000 inhabitants and occupation rate (days in hospital/1000 inhabitants).

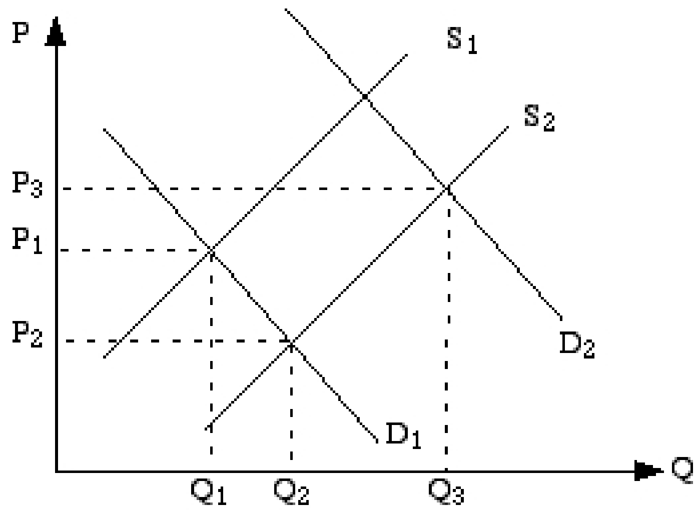
Generalization to physician services $\rightarrow$ SID

Well documented phenomenon, although controversial

- introduction of wages controls on physicians, often $\triangle$ SID
- clinical decisions often influenced by financial incentives (e.g. physicians with salaries, lower hospitalization rates then physicians payed on fee-for-services basis).

Basic model of SID

Initial situation (P_1, Q_1).
Supply increase $S_1 \rightarrow \ S_2$



Standard micro analysis: eq: (P_2, Q_2). Total expenditure $\triangle$ o $\bigtriangledown$ according to ε.
Healthcare services: $\varepsilon < 1 \ \rightarrow$ Total expenditure $\downarrow$
Moreover, $\triangle\sharp$ physicians $\rightarrow$ lower demand/physician.

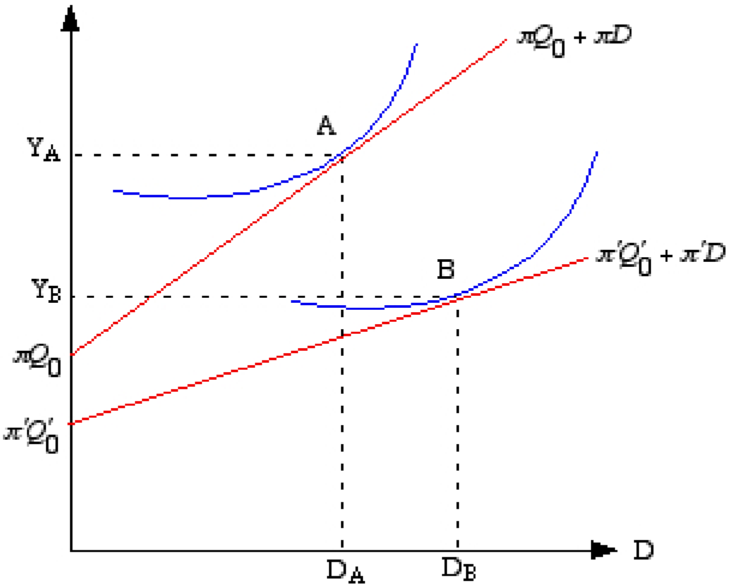
SID: physicians use their capacity to induce extra demand (D_2). New eq. (P_3, Q_3).
If $P_3 \ > \ P_1$ SID with certainty (Reinhardt inducement test).
If $P_3 < P_1$ ambiguity.

Modeling problem: analysis assumes competitive market.

Other models of SID

1. Evans (1974) model (simplified)

Physician's utility: $U(Y, D)$
Y = income; D = inducement ($\sharp$ h. induced demand)

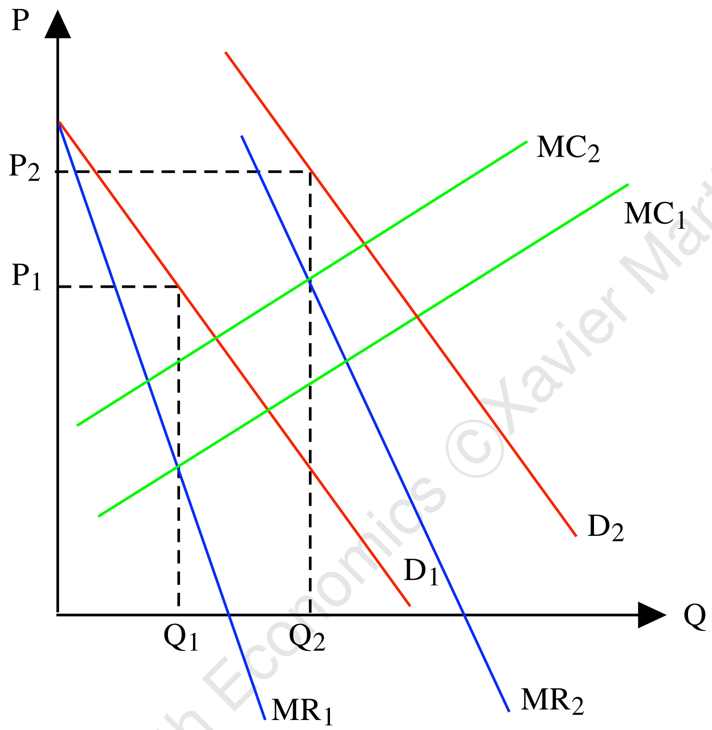


Assume: π average profit rate
- max profit without inducement: πQ_0
- profit from inducement: πD

Therefore: $Y = \pi Q_0 + \pi D \;\rightarrow$ combinations (Y, D) feasible for physician.
Given U, eq. in $A = (Y_A, D_A)$
$\star$ If $\triangle$ competition: $\pi \;\rightarrow\; \pi'$, $\pi' < \pi \rightarrow$
New eq. with $\triangle$ inducement: $D_A \rightarrow D_B$
aiming at $\pi' Q_0' + \pi' D' \geq \pi Q_0 + \pi D$.

2. SID vs. advertising

Begin: max. profit $\rightarrow MR_1 = MC_1 \rightarrow (P_1, Q_1)$



Margin $(P - CM)$ incentive to stimulate demand as each additional unit yields profits: $D_1 \rightarrow D_2 \sim$ argument to introduce advertising.

BUT

inducing demand has cost (reputation, time): $MC_1 \rightarrow MC_2$
New equilibrium: (P_2, Q_2)

Remarks

1. Incentives to induce demand depends on the difference between P and MC (market power)
- if competitive market, small gap, low incentives;
- if high market power, big gap, high incentives
- empirical evidence: physician, high monopoly power.

Enhance competition to limit incentive to induce demand.

2. Professional and ethical considerations limit physicians activities (contracts between principal (patient) and agent (physician)) $\rightarrow$ limits informational advantage:
- monitor insurer activity
- ease possibility of second opinions
- improve patient's info on treatments (internet)

3. Distinction between informative advertising (positive) and persuasive advertising (negative) corresponds to a physician transmitting info to the patient (positive) or implementing non optimal/unnecessary treatments (negative).

10. Economic Evaluation

Optimal policy design requires evaluation to select best alternative:

- What is included in the estimation of costs: the costs at the hospital, the social costs, cost to the individual?

- We assign value to commodities through our choices on the (free) “market-place”. But most markets are neither free, nor ideal. To consent in a market is not identical to consent to a market. Can these considerations be included in the analysis? How?

- Can we put a price on everything? is everything a commodity that is for sale if only the price is right? life, honor, rights, embryos, human tissues...if not, there are certain things that will be difficult or impossible to include in the economic analysis.

General difficulty: assign value to human life

Quality-Adjusted Life Years (QALYs)

Most often used measure of health services.

- Consider an individual with health status Q_t in year t and life horizon T.
- Ideal health state is Q^* (reference value)
- Let $H(Q)$ be utility of individual with Q
- $(Q_1, t_1; Q_2, t_2; \ldots; Q_n, t_n)$ health profile. Q_τ prevails t_τ years, $\sum_{\tau=1}^{n} t_\tau = T$
- r discount rate (interest rate)

Definition: QALY

QALY index is a measure of the utility of health status, $U(Q, T)$, defined as the present value of the utility of each health status weighted by the time period along which that health status prevails:

$$U(Q_1, t_1; Q_2, t_2; \ldots; Q_n, t_n) = \sum_{\tau=1}^{n} \frac{Q_\tau t_\tau}{(1+r)^\tau}$$

Weight =1 if perfect health status. Weight = 0 if death (negative as well)

Example 1

Indiv. 70 years old, life expectancy 20 more years.
First 10 years, perfect health (weight = 1),
Second 10 years, half quality of life.
$QALY = (10 \times 1) + (10 \times 0.5) = 15.$

Example 2: *Esclerosis múltiple*
Niveles de incapacidad:

1. Ausencia de incapacidad.
2. Ligera incapacidad social.
3. Incapacidad social grave y/o ligero deterioro del rendimiento laboral. Capaz de realizar todas las tareas domésticas excepto las muy pesadas.
4. Limitación muy grave en las posibilidades de elección de trabajo y en el rendimiento laboral. Las amas de casa y los ancianos son tan solo capaces de realizar tareas domésticas ligeras, pero son capaces de ir de compras.
5. Incapacidad para conseguir un empleo remunerado. Incapacidad para proseguir cualquier tipo de educación. Ancianos confinados en su hogar, excepto raras salidas acompañadas y breves paseos, e incapaces de ir de compras. Amas de casa capaces sólo de realizar unas pocas tareas sencillas.
6. Confinado en una silla de ruedas, o bien incapaz de desplazarse por la vivienda sin la ayuda de otra persona.
7. Confinado en cama.
8. Inconsciente.

Incapacidad	Niveles de sufrimiento			
	Ausente	Leve	Moderado	Grave
Nivel 1.	1.000	0.995	0.990	0.967
Nivel 2.	0.990	0.986	0.973	0.932
Nivel 3.	0.980	0.972	0.956	0.912
Nivel 4.	0.964	0.956	0.942	0.870
Nivel 5.	0.946	0.935	0.900	0.700
Nivel 6.	0.875	0.845	0.680	0.000
Nivel 7.	0.677	0.564	0.000	-1.486
Nivel 8.	-1.028	na	na	na

Véase Hidalgo, A. (2000): Evaluación económica de tecnologías sanitarias, en Hidalgo *et al.* (2000, cap. 12).

Historia de un paciente:

- Sano durante 28 años
- Primeros síntomas: 29 años
- Empeoramiento progresivo
- Muerte: 49 años.

Edad	Incapacidad	Sufrimiento	Indice	Valor
0-28	Sano	Ausente	1.000	28.000
29	nivel 2	Leve	0.986	0.986
30-33	nivel 2	Moderado	0.973	3.892
34-36	nivel 3	Moderado	0.956	2.868
37-40	nivel 4	Moderado	0.942	3.768
41-43	nivel 5	Grave	0.700	2.100
44-46	nivel 6	Grave	0.000	0.000
47-49	nivel 7	Grave	-1.486	-4.458
			QALY	37.156

$$
\begin{aligned}
QALY &= (28 * 1) + (1 * 0.986) + (4 * 0.973) + \\
&+ (3 * 0.956) + (4 * 0.942) + (3 * 0.7) + \\
&+ (3 * 0) + (3 * -1.486) = 37.156.
\end{aligned}
$$

QALYs $<$ 49 años: calidad de vida desde la aparición de los síntomas va en continuo retroceso.

Example 3. *Eval. alternative health programs*
Patient with health status 60% optimal.
If medication $\rightarrow$ 3 more years alive.
If surgery $\rightarrow$ 5 more years and better quality of life.
Success rate of surgery: 40%.
Prob. dying in surgery room: 3%
Cost of surgery $= 30,000$ €
Discount rate $= 5\%$

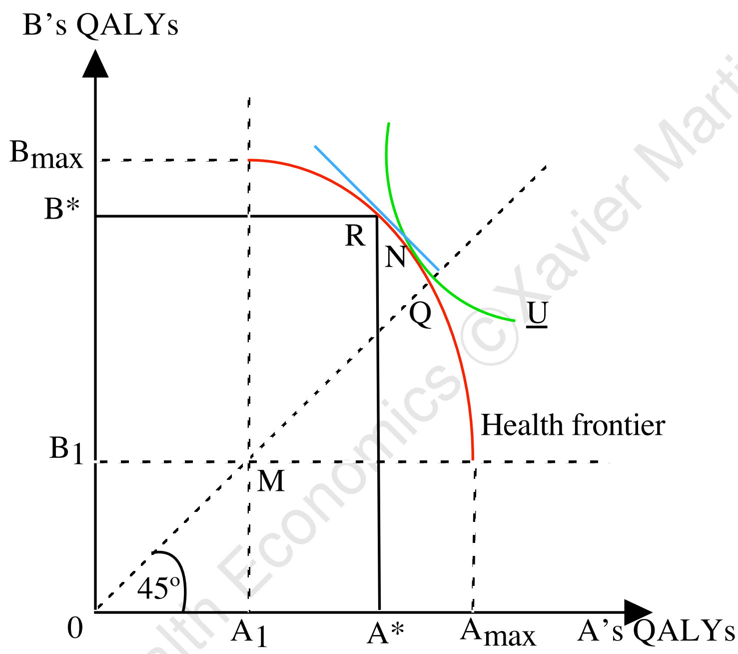
Year	1	2	3	4	5	total
Discount	1.00	0.95	0.91	0.86	0.82	
Medication						
Life quality	.60	.50	.40	.00	.00	
Disc. value	.60	.48	.36	.00	.00	*1.44*
Surgery						
Life quality	.90	.80	.70	.60	.50	
Disc. value	.90	.76	.63	.52	.41	*3.23*

QALYs: Medic.= 1.44 QALYs; surgery = 3.23 QALYs
Risk of death w/ surgery = $3.23 \times 0.03 = 0.09$
Expected net Δ QALY = $[(3.23 - 1.44) \times 0.4] - 0.09 = 0.72 - 0.09 = 0.63$ QALY
i.e. surgery $\rightarrow$ expected net Δ QALY = 0.63

Cost per extra QALY = $30,000/0.63 = 47,620$ €

Conclusión: Patient if surgery, expected Δ QALY of 0.63 years, at a cost of 47,620 € per QALY.

Ejemplo 3. *Resource allocation*
Society: 2 individuals, A, B
Initial situation: $A_1 = B_1, (M)$
Society gets extra resources $\rightarrow$ Δ health $\rightarrow$ $R = \max(A^* + B^*)$ s.t. $(A^*, B^*) \in$ health frontier



From R and along the frontier, $\triangle$ A's QALY $\rightarrow$ $\bigtriangledown$ B's QALY s.t. $A + B \downarrow$
Is R socially efficient and/or egalitarian?
As $B_{max} > A_{max}$, the same resources will yield more QALYs to B than to A.
Given that $R = \max(A^* + B^*)$, R is socially efficient but, not egalitarian ($B^* > A^*$).
Egalitarian allocation: Q
Allocation max social welfare: N (not egalitarian)

Economic Evaluation

Questions for a planner:

♠ *Who* should do *what* to *whom*?

♠ With what *health care* resources?

♠ With what *relation* to other health services?

Replies (Definition: Economic evaluation)
Comparative analysis of the use of resources (costs) and improvements from alternat. health programs (consequences).

Issues to analyze,
Efficacy: Can the program work?

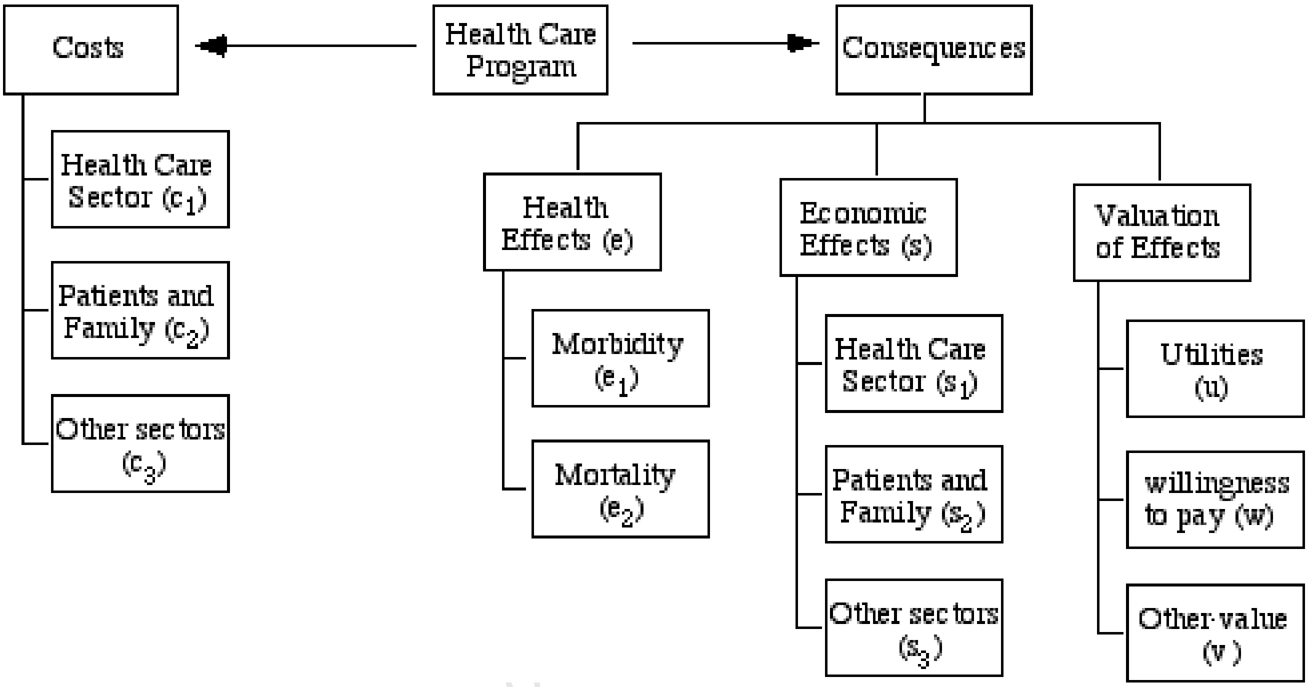
Effectiveness: Does it work?
Data: medical literature; but consider
- should adjustments be made?
- quality? Question checklist (McMaster Univ, '81)
- relevance?

Availability: Does it reach the target population ?

Opportunity cost: is it worth compared with alternative uses of the same resources?

Optimality: Best possible use of resources?

Components in Economic Evaluation



Consequences: 3 categories

- *Identification*: Health effects (e) (△ QALYs)
- *Valuation*: utility (u), monetary (w), “info” (v)
- *Measurement* (s): resources saved (s_1, s_2, s_3)

Costs

- health care sector (c_1): hosp, physicians, pharma
- patient/family (c_2): income, time
- other sectors (c_3): opportunity costs

Economic Evaluation Techniques

Combination of costs and consequences

COMPARISON OF COSTS AND CONSEQUENCES

		NO		YES
		ONLY COSTS	ONLY CONSEQUENCES	
ALTERNATIVES	NO	COST DESCRIPTION	OUTCOME DESCRIPTION	COST-OUTCOME DESCRIPTION
ALTERNATIVES	YES	COST ANALYSIS	EFFICACY OR EFFECTIVENESS EVALUATION	COST-MINIMIZATION COST-EFECTIVENESS COST-UTILITY COST-BENEFIT

Cost minimization analysis

$$(c_1 + c_2 + c_3) - (s_1 + s_2 + s_3)$$

Cost-effectiveness analysis (CEA)

$$[(c_1 + c_2 + c_3) - (s_1 + s_2 + s_3)]/e$$

Cost-utility analysis (CUA)

$$[(c_1 + c_2 + c_3) - (s_1 + s_2 + s_3)]/u$$

Cost-benefit analysis (CBA)

$$(w + v + s_1 + s_2 + s_3) - (c_1 + c_2 + c_3)$$

Measurement of costs consequences

MEASUREMENT OF COSTS AND CONSEQUENCES

TYPE OF STUDY	MEASUREMENT / VAL. OF COSTS	IDENTIFICATION OF CONSEQUENCES	MEASUREMENT / VAL. OF CONSEQUENCES
Min Cost	$	IDENTICAL	NONE
CEA	$	SINGLE EFFECT OF INTEREST COMMON TO ALL THE ALTERNATIVES	NATURAL UNITS / NONE
CUA	$	SINGLE OR MULTIPLE EFFECTS NOT NECESSARILY COMMON TO ALL THE ALTERNATIVES	QALYs / COST per QUALY
CBA	$		$

Cost minimization analysis

Illustration 1

2 programs: minor surgery for adults

Both accomplish successful surgery

Differ in effectiveness:
A: one night stay in hospital
B: day-surgery program

Evaluation: select the least cost alternative.

Cost minimization analysis (2)

Analysis: Four basic questions:

1. What costs should be considered?

♠ Health care sector
♢ Hospital resources (treatment, bed days, out-patient attendance, overheads)
♢ Community care resources (GP visits, nurse visits, ambulance)

♠ Patient and family
♢ Patients time: treatment and off-work
♢ Time of relatives looking after the patient
♢ Out-of pocket expenses

♠ Other sectors
♢ social workers visits, nursing home help, voluntary sector

2. What costs should be included?

♠ Viewpoint of analysis.
health sector?, hospital's?, patient's?, social?
e.g. monetary compensation while off-work:
◇ socially: no cost, no benefit (transfer)
◇ Government: cost
◇ Patient: revenue.

♠ Short/long run evaluation.
◇ Intertemporal prefs (life is short, future uncertain)
◇ Illustration

Year	Cost A	Cost B
1	5	15
2	10	10
3	15	4
Total	30	29

♠ Justify exclusion of “irrelevant costs”.

♠ Order of magnitude.

♠ Opportunity costs.

♠ No-market goods and services. (volunteer time, donations)

3. How costs should be estimated?

♠ Is there a market?

YES: Opportunity costs (if there is info); Quantities and prices

NO: negotiations; market values as proxy; shadow prices. (Ethical values!)

♠ Time span of project

♢ costs ↓ in hospital but out-patient treatment needed

♢ costs ↑ in hospital but final (see previous example)

♠ Assets

Equipment, buildings, land...

♠ Average vs Marginal costs

Compute present values

Discounting future costs to present values
(recall example page 35b)

$$P = \sum_{n=1}^{N} F_n (1+r)^{-n}$$

where,
P: present value
F_n: future cost at year n
r : annual interest (discount) rate
Take $r = 5\%. PA = 26.79 < PB = 26.81$!!
Note: expenses computed at the end of period.

Choice of r: praxis {0, 3%, 5%}
social opportunity cost
social rate of time preference
convention: 5%
shadow-price of capital:3%

4. How accurate does costing should be?

♠ Availability of data

♠ Time and effort vs. outcome

"Do not make the perfect the enemy of the merely good"

Shadow prices

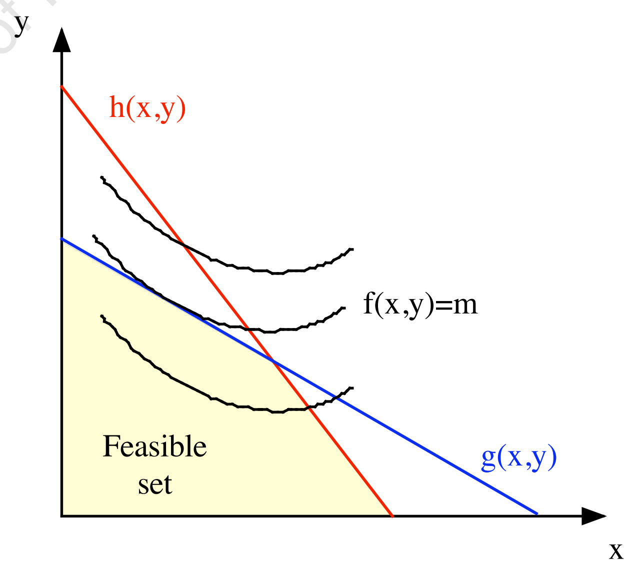
Concept linked to optimization problem:

$$\max_{x,y} f(x,y) \text{ s.a } \begin{cases} g(x,y) < k \\ h(x,y) < q \end{cases}$$

$$\max_{x,y} L(x,y) = f(x,y) + \lambda(k - g(x,y)) + \mu(q - h(x - y))$$

Illustration

$f(x,y)$: number of patients treated
x: available equipment
y: labor
k: budget constraint
q: available time



λ and μ represent rate of change of $f(x, y)$ wrt change in k and q;
λ and μ represent additional resources needed so that objective function achieves value beyond m;
λ and μ evaluate that cost;
λ and μ called shadow prices

$\lambda > 0$; constraint $g(x, y) < k$ binding.
$\mu > 0$: constraint $h(x, y) < q$ binding.

$\lambda = 0$; constraint $g(x, y) \leq k$ not binding.
$\mu = 0$: constraint $h(x, y) \leq q$ not binding $\rightarrow$ resource requirement $\leq$ availability

Example

Recall example in pp. 5i-5j.

First order conditions,

$$\frac{\partial L}{\partial x} = \alpha x^{\alpha-1} y^{\beta} - \lambda P_x = 0 \qquad (8)$$
$$\frac{\partial L}{\partial y} = \beta y^{\beta-1} x^{\alpha} - \lambda P_y = 0$$
$$\frac{\partial L}{\partial \lambda} = m - xP_x + yP_y = 0$$

Substituting values of

$$x(P_x, m) = \frac{\alpha m}{P_x(\alpha+\beta)}$$
$$y(P_y, m) = \frac{\beta m}{P_y(\alpha+\beta)}$$

in, say, (8) we obtain

$$\lambda = \frac{\alpha x^{\alpha-1} y^{\beta}}{P_x} = \frac{\alpha\left(\frac{\alpha m}{P_x(\alpha+\beta)}\right)^{\alpha-1}\left(\frac{\beta m}{P_y(\alpha+\beta)}\right)^{\beta}}{P_x}$$

If $\alpha = 1/3, \beta = 2/3, m = 30, P_x = 2, P_y = 1,$

$$\lambda = \frac{\left(\frac{20}{3}\right)^{2/3}}{6(5)^{2/3}} \approx 0.202$$

Cost-Effectiveness Analysis

Illustration

♣ 2 programs:
- A: hospital dialysis
- B: kidney transplantation

♣ Outcome of interest (common):
life-years gained after renal failure.

♣ Programs Differ in success and in cost.

♣ Comparison:
- Cost per life-year gained
- Life-years gained per dollar spent

Cost-Effectiveness Analysis (2)

Basic elements

♠ Choosing a measure of effectiveness
♢ define, first, objectives of the program
♢ performance of program in actual use
♢ relate to
⊙ final health output (life-years gained)
⊙ intermediate output (cases found, patients appropriately treated) if value by itself

♠ Linking intermediate and final outcomes
♢ important in prevention studies
♢ confident in proper link (previous research)

♠ Discounting of effects (as well as costs)
♢ if only costs, may yield nonsense conclusions
♢ if only costs, present value of the cost next year is always lower than today
♢ if only costs, differential treatment with respect to other sectors in the economy may yield inconsistencies in the overall allocation of resources
♢ individuals can trade reductions in health status and other goods/services today in return for a healthier time in the future (and vice versa)

♠ Uncertainties and Sensibility Analysis

♢ no data may be available → "informed guess"

♢ estimates may not be precise

♢ methodological controversies

♢ Sensibility: 3 steps

⊙ identify uncertain parameters for which sensitivity analysis is required

⊙ specify plausible range of these parameters

⊙ compute results based on best, optimistic and pessimistic guesses

Use of Quality-Life Scales

♠ Additional measure of effectiveness

♠Relative costs of treatments compared with their relative consequences in natural units (success of therapy, life-years gained)

♠ 2 types of quality-life scales

♢ specific (disease specific, age specific)

♢ general health profiles: Short Form 36, Nottingham Health Profile, Sickness Impact Profile

General health profiles

⊙ physical functioning
⊙ ability for self-care
⊙ psychological status
⊙ level of pain and distress
⊙ social integration

Advantages:
reliable and valid, supplementary information only.

Disadvantages:
- multidimensional
- not based on individuals preferences
- not possible to combine quality and quantity of life

Cost-Utility Analysis

Illustration

♠ Measure of value: utility of effects.

♠ Twins identical except in occupation (sign painter, soccer player).

♠ Valuation in [0,1] of broken arm will differ

♠ Utility of treatment will differ

♠ CUA allows for quality of life adjustments via QALYs: generic outcome measure for comparison of costs and outcomes in different programs.

Cost-Utility Analysis (2)

Basic elements

♠ Form of evaluation that places particular attention on the quality of the health outcome produced.

♠ CUA vs. CEA

♢ CEA: evaluation measured in natural units (blood pressure improvement, patients improved, lives saved, life-years gained, etc.)

♢ CUA: measured in QALYs gained.

♢ Identical on the cost side. Different on the outcome side (see p.33)

♢ CEA: its specificity makes comparisons across studies difficult.s

♢ CUA: generic measure of outcome allows for comparisons. Highlights crucial role of preferences (utilities) in valuing the outcomes.

♠ CUA is useful if:

♢ health-related quality of life is important,

♢ program affects both mortality and morbidity,

♢ program to be compared are multidimensional.

Utility function (von Neumann-Morgenstern)

♠ Utilities $\equiv$ Preferences:

♢ Ordinal: ranking
♢ Cardinal: numbers representing strength of preferences for the outcome relative to the others.

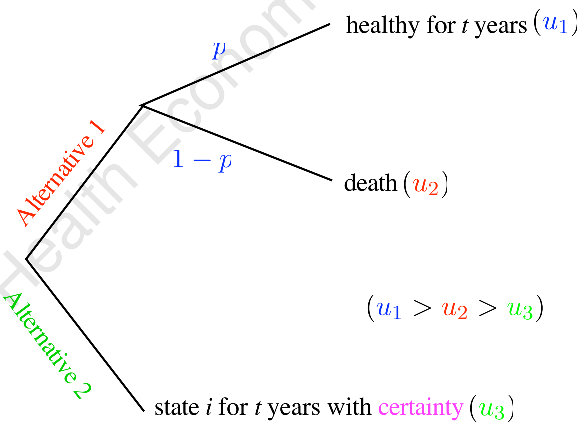
♠ Environment:

♢ Certainty
♢ Uncertainty: risk aversion, risk neutrality, risk love

Measuring preferences:
ask subjects to rank health outcomes, i.e. construct a rating scale.

♠ Interpretation: ‘The difference in desirability between outcomes A and B is twice as great as the difference between C and D. Hence, I will make the interval between A and B twice as large”.

♠ Example:
Standard gamble (classical method to measure cardinal preferences)



Problem: find p such that the individual is indifferent between both alternatives.

Probability $p = \frac{u2-u3}{u1-u3}$: cardinal utility index.

♠ QALYs (see pp. 30a-30d)

Cost-Benefit Analysis

Example 1 (multiple common effects)

♣ 3 programs:
- A: hospital dialysis
- B: kidney transplantation
- C: home dialysis

♣ Outcomes of interest (common):
- Life-years gained
- Quality of Life
- Incidence of Medical Complications

♠ Compute cost effectiveness ratios

♠ NO alternative superior on 3 dimensions?
♢ Determine a primary effect and CEA, or
♢ Attach a money measure of value to all effects resulting from each program

♠ Pro: directly comparable w/ costs

♠ Con: difficult to translate effects into €

Example 2 (multiple not common effects)

♣ 2 programs:

- A: hypertension screening

- B: influenza inmunization

♣ Outcomes of interest:

- A: prevention of premature death

- B: prevention disability days

Cost-Benefit Analysis (2): Measuring benefits

2 alternatives

♠ Human capital approach

◇ Use monetary value of lost productivity

◇ Problem: how to measure benefits at retirement age? It is not acceptable that there are no benefits! (cynical view: pensions saved)

♠ Willingness to pay

◇ Closer to the notion of opportunity cost

◇ More difficult to measure (but this an implementation argument)

Basic open issues

⊙ Are ethical, cultural values pre-determined? Or do they interact?

⊙ What is the meaning of “fair” and “just”?
No definite answer is available; it influences the way we want to measure benefits

⊙ include distribution concerns?
Requires detailed information, presumably difficult to obtain
On conceptual grounds, offers no problem
Example:

$$SW = w(y)B(y)dF(y)$$

where
- $F(y)$: cumulative distribution of income
- $B(y)$: benefits
- $w(y)$: weight to each income level

Distribution concerns

♣ Usually economic evaluation does not treat *explicitly* the distribution of consequences and costs

♣ Options made have implicit treatment:

- Willingness to pay (richer more willing to pay), gives more weight to rich people

- QALYs: same weight to everyone

Additional remarks

♣ Economic evaluation assumes that freed resources are redeployed efficiently.

♣ Incentives: patients with kidney problems following their treatment correctly (incorrectly)

$\rightarrow$ are the ones with least (most) transplantations.

$\Rightarrow$ Bad behavior yields more severe health status and go first in the waiting list.

♣ BUT if we aim at maximize the aggregate life years, may be OK!

11. Macroeconomics

What is Macroeconomics about?

Global behavior of the economy. Aggregation.

Macro variables: GDP, Aggregate expenditure, Unemployment, Inflation, Consumption, Saving, Investment, Exports, Imports, Public expenditure, etc.

Questions:

Long term growth,

Economic cycles,

Unemployment,

Inflation,

International Trade and Development,

Economic Policy (monetary, fiscal, labor, etc).

Definition of GDP: market value of all final goods and services produced within a country in a given period of time. ["Gross" means depreciation of capital stock included]

Measures of GDP: *Two approaches*: expenditure and income (equivalent)

GDP - expenditure: adding up expenditure on all final goods and services produced during the year.

$$\begin{aligned} GDP &= \text{private consumption + investment} \\ &\qquad \text{+ government spending + (exports - imports)} \\ &\equiv C + G + I + (X - M) \end{aligned}$$

GDP - income: adding up all payments to owners of resources used to produce output during the year (aggregate income)

$$GDP = W + P + (T - S)$$

Equivalence in the National Income Accounts,

$$W+P+(T-S) = GDP = C+G+I+(X-M)$$

Private consumption (C): commodities and services acquired by households.

Investment (I): goods and services increasing the capital stock. *Investment = Savings*.

Public consumption (G): goods and services acquired by the public administrations (army, roads). No transfers (pensions, social programs) because these are transfers.

Net exports (X-M): net spending from rest of the world in goods and services yielding income to national producers.

Wages and salaries (W): Compensation of employees measures the total remuneration to employees for work done. It includes wages and salaries, as well as employer contributions to social security and other such programs.

Profits (P): Surplus due to owners of incorporated businesses. Often called profits.

Net taxes (T-S): Difference between the resources transferred from the families to the State and the transfers from the State to the families.

Illustration:

real GDP components in Spain in 2006 (constant prices 2000)

Demand components

	10^6 €	%
Private consumption (C)	553.867	56.7
Public consumption (G)	184.233	18.9
Investment (I)	298.362	30.6
Exports	254.985	26.1
Imports	315.258	-32.3
Net exports (X-M)	-60.273	
TOTAL	976.189	100

Source: Contabilidad Nacional de España, INE.

Illustration (2):

real GDP components in Spain in 2006 (constant prices 2000)

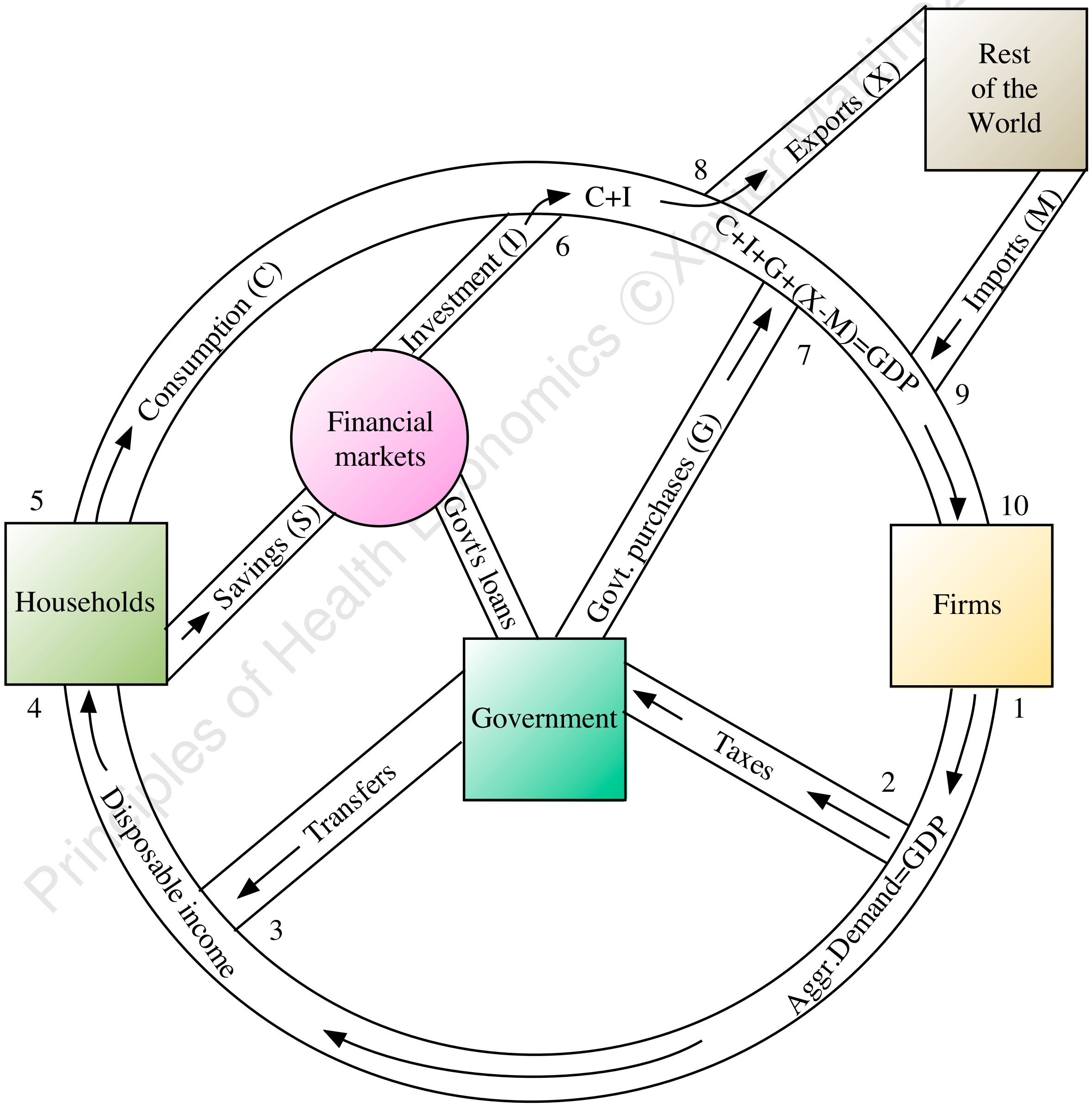
Supply components

	10^6 €	%
Agriculture	27.199	2.8
Industry	151.709	15.5
Construction	106.437	10.9
Services	583.773	59.8
Net taxes	107071	11.0
TOTAL	976.189	100

Source: Contabilidad Nacional de España, INE.

Circular flow model:

Flow of resources, products, income, and revenue among economic decision makers.



Legend:

Flows of income:

(1): GDP = Aggregate income.
(2): Taxes are transfers from families to the State.
(3): Transfers from the State to the families.
(4): Disposable income of families = Aggregate income-taxes+transfers.

Flows of expenses:

(5): Disposable income splits in consumption and savings (= investment).
(6): Investment adds to flow of expenditure.
(7): Public expenditure adds to flow of expenditure.
(8): Exports add to flow of expenditure from the rest of the world.
(9): Imports are transfers to the rest of the world.
(10): National account identity.

Example

Orange Inc.		Juice Inc.	
Wages and salaries	15000	Wages and salaries	10000
Taxes	5000	Taxes	2000
		Purchase of oranges	25000
Revenues from oranges	35000	Revenues from juice	40000
Consumers	10000		
Juice Inc.	25000		
Profits before taxes	20000	Profits before taxes	5000
Profits after taxes	15000	Profits after taxes	3000

VA Orange Inc. = 35000 (revenues from oranges)

VA Juice Inc. = 40000 - 25000 = 15000 (revenues from juice - cost of oranges)

VA total= 35000 + 15000 = 50000 = GDP (production)

GDP (income): 10000 + 40000 = 50000 (consumers expenditure)

GDP (income): (15000 + 10000) + (20000 + 5000)= 50000 (wages + profits before taxes)

Total production = Total income = Total expenditure real GDP and nominal GDP.

nominal GDP: market value of production at today's prices.

Example: Economy with two goods (apples and oranges)

$$GDPn^{2006} = (P^{2006}_{ora} * Q^{2006}_{ora}) + (P^{2006}_{app} * Q^{2006}_{app})$$

Problem: If prices double, GDP also doubles $\Longrightarrow$ poor welfare indicator.

real GDP: market value of production at prices of a reference year (1996).

$$GDPr^{2006} = (P^{1996}_{ora} * Q^{2006}_{ora}) + (P^{1996}_{app} * Q^{2006}_{app})$$

Illustration:

Evolution $GDPn$ and $GDPr$ Spain 1995-2003 (10^6 €).

Year	GDPn	price index	GDPr
1995	437.783	100	437.783
1996	464.251	103.5	448.457
1997	494.140	105.9	466.513
1998	527.975	108.5	486.785
1999	565.419	111.4	507.346
2000	610.541	115.3	529.691
2001	653.927	120.1	544.496
2002	698.589	125.5	556.651
2003	744.754	130.5	570.556

Source: INE.

The working of the Economy

Model of aggregate demand and supply:

(1) understand incidence of the different forces on macro variables, and

(2) measure potential effectiveness of economic policies.

Aggregate demand is (the value of) the total quantity the different sectors of the economy are willing to spend in a particular period.

Graphically, market demand curve: relation between general price level of the economy and aggregate spending in goods and services in the economy.

Aggregate supply: (value of the) total quantity of goods and services firms in the country are willing to produce in a given period.

The market supply curve shows the production level firms are willing to supply at any given price level.

Macroeconomic equilibrium: characterization of the production level and of the price level.

Graphically: intersection point of aggregate demand and supply curves. Compatibility between consumers and producers behavior.

Equilibrium: two (potential) problems
1. negative results: equilibrium price-production pair may not satisfy macro objectives (inflation, unemployment, investment level, ...)
2. unstable results: even if the economy reaches optimal equilibrium may be perturbed by external shocks. *oil crisis, bird flu, ...*

$\Longrightarrow$ MACROECONOMIC POLICY

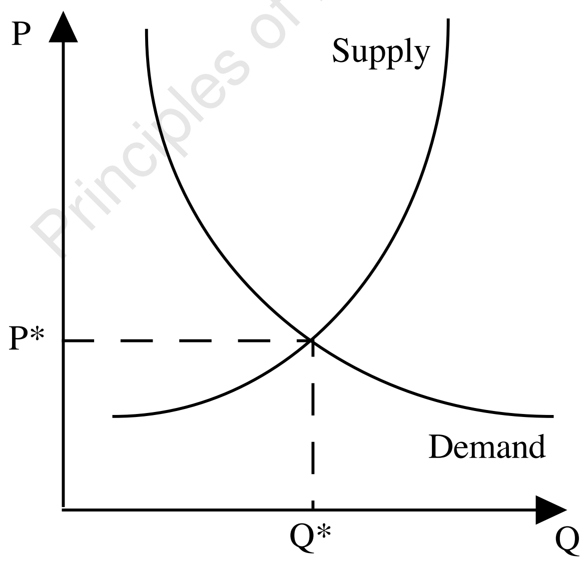
Aggregate supply and demand curves are shifted by changes in consumers and/or producers behavior (endogenous and/or exogenous shocks).

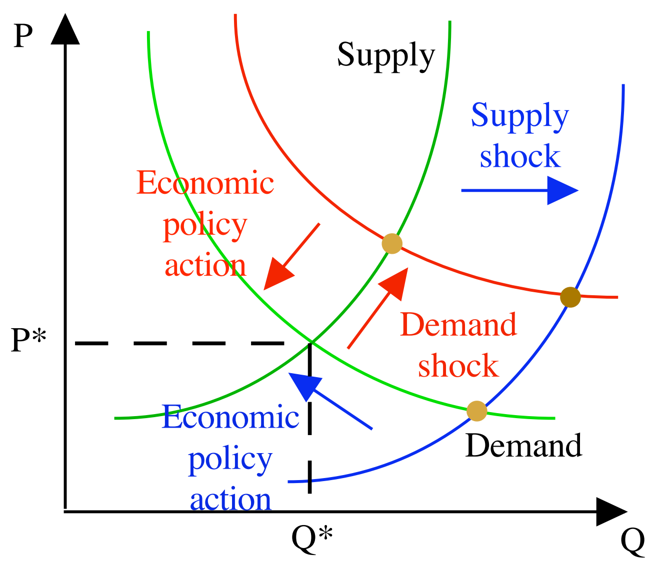
Options of the macroeconomic policy:

1. shift demand curve through fiscal and monetary policy;

2. shift supply curve through R&D policies;

3. do nothing if the causes of the perturbation are not identified.





Unemployment.

Objective: maximize employment level.

Active population: set of people legally able to work = employed + unemployed.

Activity rate: (employed/active pop.)*100

Unemployment rate: (unemployed/employed)*100.

Labor market equilibrium: wage level inducing compatibility between labor supply and demand.

Full employment $\neq$ absence of unemployment $\longrightarrow$ *frictional unemployment* $(3\% - 5\%)$.

Structural unemployment: lack of adjustment between labor demand and supply. (labor market rigidities, professional qualifications, ...)

Frictional + structural unemployment = involuntary unemployment = unemployment rate.

Measuring Unemployment.

"Encuesta de Población Activa" (Active population enquiry): estimated unemployment [harmonized across OECD countries].

Sampling on population $\longrightarrow$ number of employed, unemployed, discouraged, by age, sex, education level, length of unemployment, etc.

Def.: unemployed individual not working the previous week, but ready to take a job along the following two weeks.

Def.: employed individual with a job ($\geq$ 1 hour) in the previous week.

Active population = population employed + population unemployed.

RESUMEN DE INDICADORES DEL MERCADO DE TRABAJO

	Último dato (1)		Tasa de variación anual en %					
	Miles	? anual	2004-I	2004-II	2004-III	2004-IV	2005-I	2005-II
EPA								
Activos	20.839,6	746,6	3,5	3,4	3,2	3,2	3,5	3,7
- Varones	12.207,9	353,2	2,5	2,4	2,4	2,3	2,9	3,0
- Mujeres	8.631,7	393,5	4,9	4,9	4,4	4,6	4,5	4,8
Tasa de actividad (2)	57,4	-	1,0	0,9	0,8	0,8	1,0	1,1
- Varones	68,7	-	0,5	0,4	0,3	0,3	0,7	0,8
- Mujeres	46,5	-	1,4	1,4	1,2	1,3	1,3	1,4
Ocupados	18.693,8	1.029,1	4,0	3,6	3,8	4,1	5,1	5,8
- Sector no agrario	17.908,4	1.021,9	4,1	3,9	4,0	4,6	5,5	6,1
- Industria	3.262,8	62,4	-1,1	-0,1	-0,1	2,6	2,6	2,0
- Construcción	2.339,3	101,6	5,8	5,5	7,7	9,8	5,1	4,5
- Servicios	12.306,3	857,8	5,3	4,7	4,6	4,2	6,4	7,5
- Varones	11.317,8	435,4	2,6	2,3	2,6	3,1	3,8	4,0
- Mujeres	7.577,1	593,7	6,3	5,7	5,8	5,9	7,0	8,5
- Extranjeros	2.043,8	436,1	34,0	28,6	25,1	25,8	25,7	27,1
- A tiempo completo	16.476,8	196,2	3,5	3,0	2,8	3,7	-0,1	1,2
- A tiempo parcial	2.418,1	832,9	9,7	10,4	16,2	8,9	59,5	52,5
- Tasa de parcialidad (3)	12,8	-	0,4	0,5	0,9	0,4	4,5	3,9
Asalariados	15.440,1	830,7	4,4	3,8	4,1	4,5	4,2	5,7
- Sector Privado	12.596,7	747,7	4,8	4,1	4,2	4,5	4,4	6,3
- Sector Público	2.843,5	83,0	3,1	2,2	3,7	4,7	3,2	3,0
- Con contrato indefinido	10.305,3	381,7	3,8	3,3	2,4	3,2	3,8	3,8
- Con contrato temporal	5.134,8	449,4	5,8	4,7	7,6	7,4	5,0	9,6
- Tasa de temporalidad (4)	33,3	-	0,4	0,3	1,1	0,9	0,3	1,2
No asalariados	3.454,8	198,4	2,1	3,0	2,7	2,5	9,0	6,1
Parados	1.944,7	-282,5	-0,5	1,6	-2,0	-4,1	-8,2	-12,7
- Varones	890,1	-82,3	1,6	2,8	-0,2	-6,2	-6,7	-8,5
- Mujeres	1.054,6	-200,2	-2,1	0,8	-3,4	-2,5	-9,4	-16,0
- Menores de 25 años	508,1	-27,9	-3,2	-0,1	-3,7	-8,1	-1,6	-5,2
- Sin empleo anterior	258,1	-79,1	-6,7	-9,4	-9,1	-15,5	-26,4	-23,5
Tasa de paro (5)	9,3	-	-0,5	-0,2	-0,6	-0,8	-1,3	-1,8
- Varones	7,3	-	-0,1	0,0	-0,2	-0,7	-0,8	-0,9
- Mujeres	12,2	-	-1,1	-0,6	-1,2	-1,0	-2,1	-3,0
- Jóvenes (16-24 años)	20,4	-	-0,6	0,1	-0,7	-1,6	-1,0	-2,0
AFILIACIÓN A LA S.S								
Total afiliados	17.968,5	895,4	2,9	2,6	2,7	3,1	2,8	3,9
- Asalariados	14.733,4	816,9	2,9	2,4	2,6	3,1	2,8	4,2
- No asalariados	3.235,1	78,5	3,2	3,2	3,2	3,2	2,9	2,7
- Extranjeros	1.633,9	576,3	12,5	12,8	12,9	15,1	15,1	29,1
OFICINAS DE EMPLEO								
Paro registrado	2.019,1	-30,5	1,6	2,4	1,0	-1,7	-2,2	-3,6
Contratos registrados	1.298,4	173,3	13,9	13,9	15,0	4,0	-8,8	10,0
- Indefinidos (6)	7,1	-	-0,3	0,2	0,2	0,0	1,0	-0,1
- A tiempo parcial (6)	21,8	-	1,1	2,1	1,5	1,5	1,0	0,7

(1) Segundo trimestre para la EPA y mes de agosto para las Afiliaciones y datos del SPEE.
(2) Porcentaje de activos sobre la población de 16 años y más. En las columnas finales aparece la variación anual en puntos porcentuales.
(3) Porcentaje de ocupados a tiempo parcial sobre el total de ocupados. En las columnas finales aparece la variación anual en puntos porcentuales.
(4) Porcentaje de asalariados con contrato temporal. En las columnas finales aparece la variación anual en puntos porcentuales.
(5) Porcentaje de parados sobre la población activa. En las columnas finales aparece la variación anual en puntos porcentuales.
(6) Porcentaje sobre el total de contratos. En las columnas finales aparece la variación anual en puntos porcentuales.
Fuente: INE (EPA) Y MTAS

EVOLUCIÓN DE LAS PRINCIPALES VARIABLES DE LA EPA. Datos corregidos *

	Variaciones interanuales			
	En miles		En porcentaje	
	1º Trim. 2005	2º Trim. 2005	1º Trim. 2005	2º Trim. 2005
Ambos sexos				
Población de 16 años y más	604,2	599,5	1,7	1,7
Activos	650,5	693,0	3,3	3,4
- Ocupados	760,3	897,1	4,3	5,0
- Parados	-109,8	-204,0	-4,8	-9,2
Inactivos	-46,3	-93,4	-0,3	-0,6
Varones				
Población de 16 años y más	323,9	319,8	1,9	1,8
Activos	324,0	335,1	2,8	2,8
- Ocupados	370,8	396,3	3,4	3,6
- Parados	-46,8	-61,3	-4,6	-6,3
Inactivos	-0,1	-15,3	0,0	-0,3
Mujeres				
Población de 16 años y más	280,3	279,7	1,5	1,5
Activas	326,5	358,0	4,0	4,3
- Ocupadas	389,5	500,7	5,7	7,2
- Paradas	-63,0	-142,8	-4,9	-11,4
Inactivas	-46,2	-78,1	-0,5	-0,8
Ocupados por ramas				
- Agricultura	-16,7	5,1	-1,6	0,5
- Industria	30,1	8,6	0,9	0,3
- Construcción	175,9	168,0	8,1	7,5
- Servicios	571,0	715,4	5,1	6,2
Ocupados por situación profesional y tipo de contrato				
Trabajadores por cuenta propia	31,1	-60,8	1,0	-1,9
Asalariados	678,3	907,5	4,7	6,2
- Con contrato indefinido	294,4	300,9	3,0	3,0
- Con contrato temporal	384,0	606,6	8,4	12,9
Otros	50,8	50,4	285,0	336,7
Ocupados según jornada				
A tiempo completo	236,0	444,3	1,5	2,7
- Varones	242,6	291,2	2,3	2,7
- Mujeres	-6,7	152,9	-0,1	2,7
A tiempo parcial	524,3	452,9	34,5	28,6
- Varones	128,2	105,2	44,4	34,6
- Mujeres	396,1	347,6	32,1	27,1
Tasa de actividad (1)	0,9	1,0	-	-
- Varones	0,6	0,7	-	-
- Mujeres	1,1	1,2	-	-
Tasa de paro (1)	-0,9	-1,3	-	-
- Varones	-0,6	-0,7	-	-
- Mujeres	-1,4	-2,3	-	-

* Variaciones corregidas del impacto de los cambios en el cuestionario y método de entrevista calculado a partir de datos definitivos del primer trimestre

(1) Variaciones interanuales en puntos porcentuales.

Fuente: Elaboración propia a partir de INE (EPA).

Inflation.

Sustained and generalized increase of the general level of prices of goods and services in an economy.

How to define that price level? $\rightarrow$ Two alternative price indices (weighted average of prices):

1. GDP deflator,

2. CPI (Consumer price index).

$\star$ GDP deflator

GDP deflator = (nominal GDP)/(real GDP).

In our economy with oranges and apples,

$$GDP\text{deflator} = \frac{(P_{app}^{2006} * Q_{app}^{2006}) + (P_{ora}^{2006} * Q_{ora}^{2006})}{(P_{app}^{1996} * Q_{app}^{2006}) + (P_{ora}^{1996} * Q_{ora}^{2006})}.$$

Comparison of a consumption bundle evaluated at today's prices and at the base year prices.

⋆ Consumer Price Index.

CPI = nominal value of consumption bundle/real value of that consumption bundle.

consumption bundle: "Encuesta de Presupuestos Familiares del INE" → representative sample of consumption goods of families weighted by their importance.

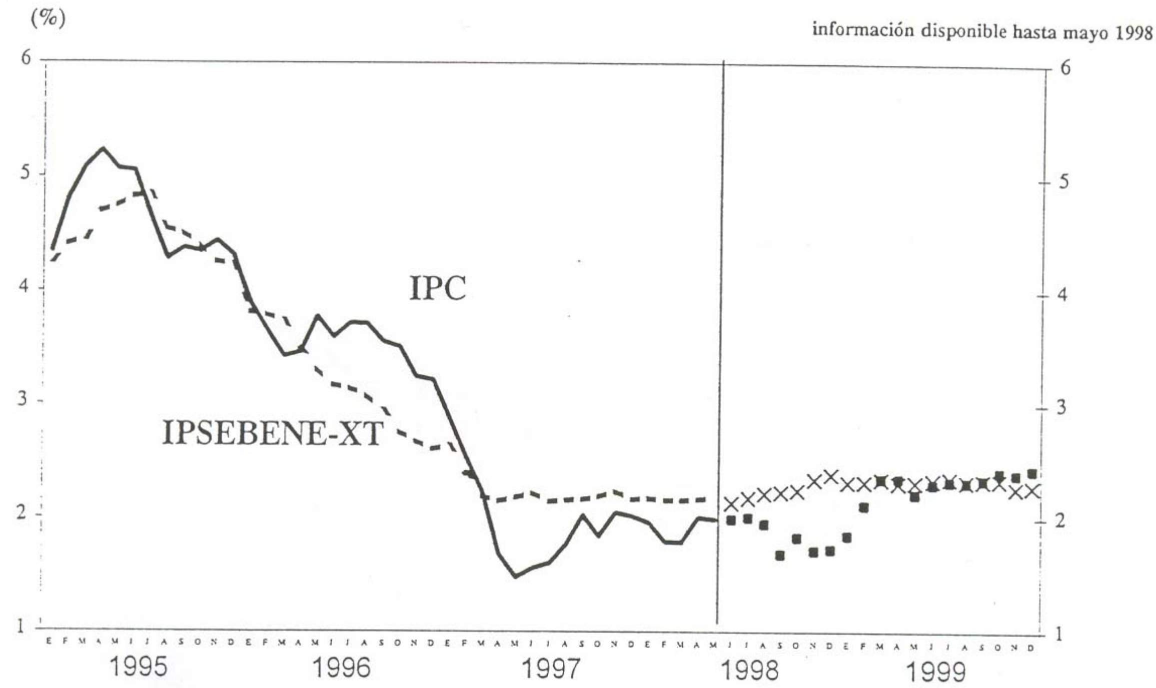
CPI evolution: monthly, yearly, aggregated within the year, last 12 months.

Disaggregate CPI in sectorial price indices: non-energy goods and services, energy goods and services, non-manipulated food, ... → analyze their evolution. (See sample figures)

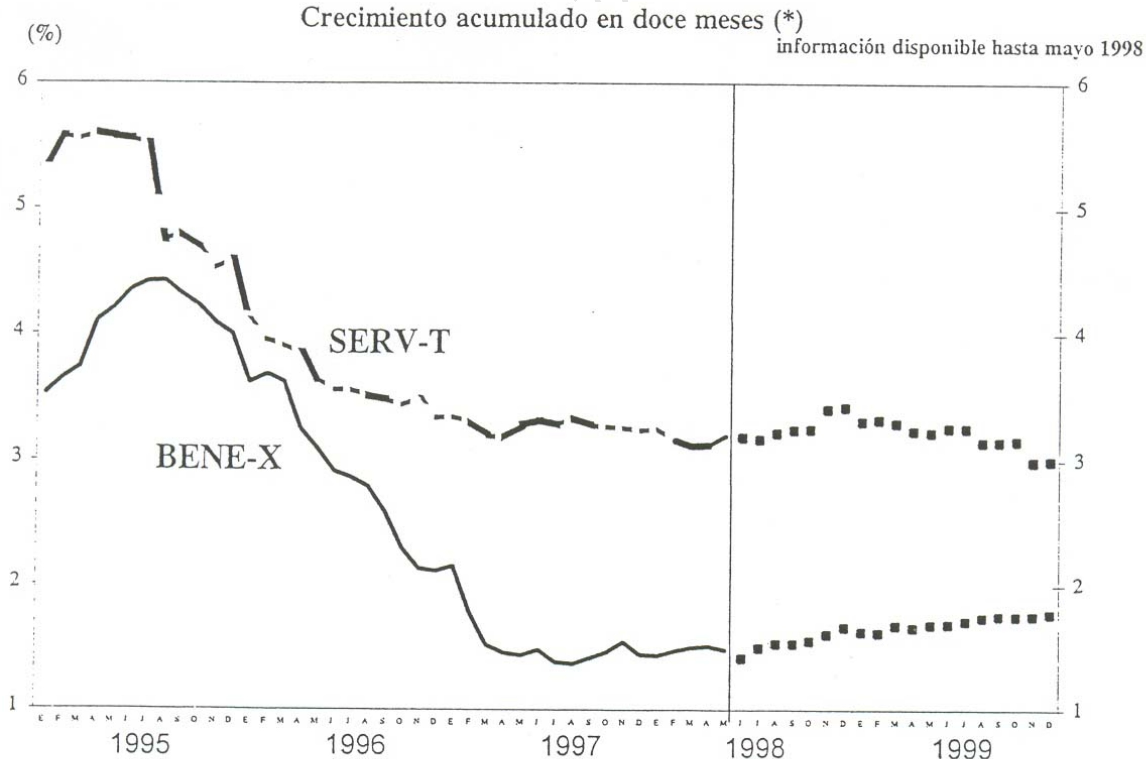
PRINCIPALES INDICADORES DE PRECIOS
Tasas de variación anual en %

	Media anual			Dic. 03	Dic. 04	Ene. 05	Mar. 05	Jun. 05	Ago. 05(2)
	03	04	05(1)						
IPC: Total	3,0	3,0	3,3	2,6	3,2	3,1	3,4	3,1	3,3
IPSEBENE (3)	2,9	2,7	2,7	2,5	2,9	2,8	2,9	2,5	2,4
IPC sin alimentos ni energía	2,9	2,4	2,4	2,5	2,6	2,5	2,6	2,4	2,4
IPC no energético	3,2	2,9	2,7	2,9	2,8	2,8	2,9	2,6	2,4
IPC alimentación	4,0	3,9	3,4	3,9	3,3	3,5	3,6	3,3	2,7
- No elaborada	6,0	4,6	3,0	6,4	1,8	2,3	2,9	3,4	2,7
- Elaborada	3,0	3,6	3,6	2,7	4,1	4,2	4,0	3,2	2,8
IPC no alimentación	2,7	2,7	3,2	2,2	3,2	2,9	3,3	3,1	3,5
- Bienes industriales	1,9	1,9	2,7	0,9	2,6	2,2	2,7	2,5	3,3
- Energía	1,4	4,8	8,7	-0,1	7,6	6,0	8,2	8,2	11,5
- Bienes industrial. sin energía	2,0	0,9	0,9	1,2	1,2	1,0	1,0	0,8	0,7
- Servicios totales	3,7	3,7	3,8	3,6	3,8	3,8	4,0	3,7	3,7
IPC manufacturas (4)	2,4	1,9	1,9	1,7	2,2	2,2	2,1	1,7	1,5
IPRI: Total	1,4	3,4	4,7	1,1	5,0	4,8	5,1	4,4	4,6
Bienes de consumo	2,3	2,5	2,7	2,4	2,8	3,2	2,8	2,2	2,0
- Alimentación	2,1	3,8	1,8	3,1	2,9	3,2	2,0	0,8	0,7
- No alimentación	2,4	0,9	3,8	1,5	2,6	3,1	3,9	4,0	3,8
Bienes de equipo	1,2	1,5	2,0	1,3	1,6	1,8	2,0	2,1	1,9
Bienes intermedios	0,8	4,5	4,2	1,0	6,2	6,2	4,9	3,1	3,0
Energía	1,3	5,3	12,5	-1,2	10,7	8,8	13,1	13,5	15,7
IVU: Importación	-1,4	2,5	4,9	-2,9	5,8	5,0	5,3	5,3	8,2
- Bienes de consumo	0,0	0,4	1,2	-1,8	4,2	3,4	2,6	3,6	0,6
Exportación	-1,5	1,0	4,3	0,1	2,2	5,1	4,8	3,2	5,7
Precios percibidos por agricultores	5,5	0,9	3,9	9,8	2,5	8,4	13,2	-11,7	-
Deflactor del PIB	4,0	4,1	4,2	-	-	-	-	-	-

(1) Media del período del que se dispone de datos sobre igual período del año anterior. El dato del deflactor del PIB incluye el segundo trimestre.
(2) Los datos del IPRI y de los IVUS corresponden a julio.
(3) IPC general sin alimentación no elaborada y sin energía.
(4) Alimentos elaborados y bienes industriales no energéticos.
Fuentes: INE, MAPYA y SGAM.



CPI and price index of non elaborated produced goods and services excluding fats, tobacco and touristic packs.



Price index of non elaborated produced goods and services excluding fats and tobacco (BENE-X), and price index of services excluding touristic packs (SERV-T).

CPI vs. GDP deflator

1. GDP deflator measures the prices of all goods and services produced.
CPI measures prices of goods and services in the representative consumption bundle.

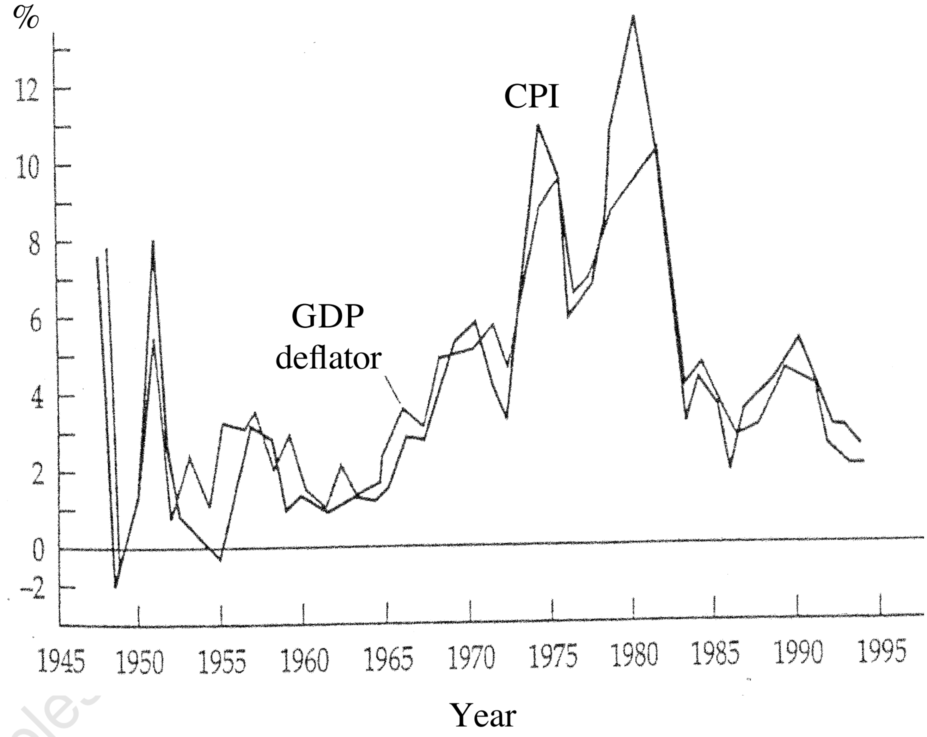
2. GDP deflator considers only goods and services produced inside the country.

3. CPI is computed for a fixed consumption bundle; GDP deflator allows for variations of the bundle along time in accordance with the variation in the composition of the GDP.

4. CPI does not measure possibility of consumers to alter the composition of the bundle (neither substitution nor income effects.

Although CPI may differ from GDP, both convey the same info on the *rhythm* of price increase. See next figure.

Illustration:



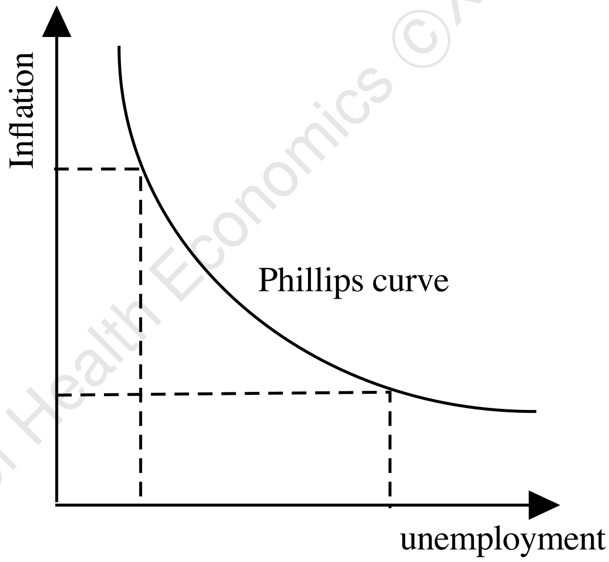
Source: US Department of Commerce, Department of Labor.

The Phillips curve.

Inverse relationship between inflation rate and unemployment rate. Controversial!!!

Reductions of unemployment rate against increases in inflation rate;

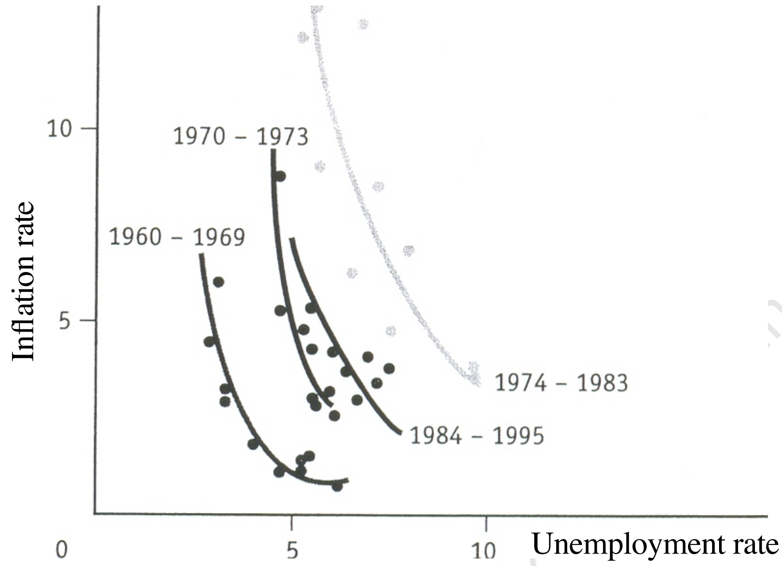
If prices moderate their increment, will yield an increase in unemployment.



The Natural Unemployment Rate

In the long term the economy tends towards an unemployment rate independent of the implementation of fiscal and/or monetary policies (with only short run effects).

Illustration: US 1960-1995.



∗ 1960-1969: good fit (increasing inflation). Average inflation 2.5%, unemployment 4.8%

⋆ 1970-1973: change in expectations (curve shifts). Average inflation and unemployment 5.2%

∘ 1974-1983: oil shock. Worse fit. Average inflation 8.2%, unemployment 7.5%

• 1984-1995: improve expectations. Average inflation 3.7%, unemployment 6.2%

Controversy: curve shifts vs. existence of the curve.

Macroeconomics of the health care market

Variables: 4 groups

⋆ population health status
- Life expectation at birth
- Mortality rate
- other: quality of life, morbidity, ...

⋆ Life style and behavior
- consumption of tobacco, alcohol and other drugs
- other: education rate, ...

⋆ Level of health services
- health expenditure per capita
- other: % hospital and pharma expenditure, ...

⋆ Health promotion
- % health care over GDP
- other: number physicians, nurses, ...

Relation between macro and health variables

★ Economic growth

⊙ Positive effects on health:

- Life expectancy at birth: Spain 1960-97. $\triangle$ in 8 years (70 to 78, both sexes)

- Child mortality rate: Spain 1975-1997.

♢ neonatal + postneonatal: $\triangledown$ 21/1000 to 6/1000

♢ perinatal: $\triangledown$ 19/1000 to 5/1000

⊙ Negative effects on health:

- Suicide and selfinjuries rate: Spain 1960-97. $\triangle$ smooth since 1975

- tobacco consumption: Spain 1960-97. $\triangle$ 1000 ciggarettes/inhab/year. $\rightarrow$

- Lung cancer mortality rate: $\triangle$ $21/10^5$ to $69/10^5$ (males)

Source: Corugedo et al. (1999, p. 273-276)

★ Economic development and health expenditure

Positive relation and more than proportional:

$$\frac{\triangle \text{Health expenditure}}{\triangle GDP} > 1$$

★ Health expenditure and effects on health

Ambiguous effect. Decreasing returns of Health function $\rightarrow$

Initial stages of a health system, big impact; Mature health systems modest impact.