ECONOMICS FOR HEALTH POLICY

SPECIAL FEATURES OF HEALTH CARE

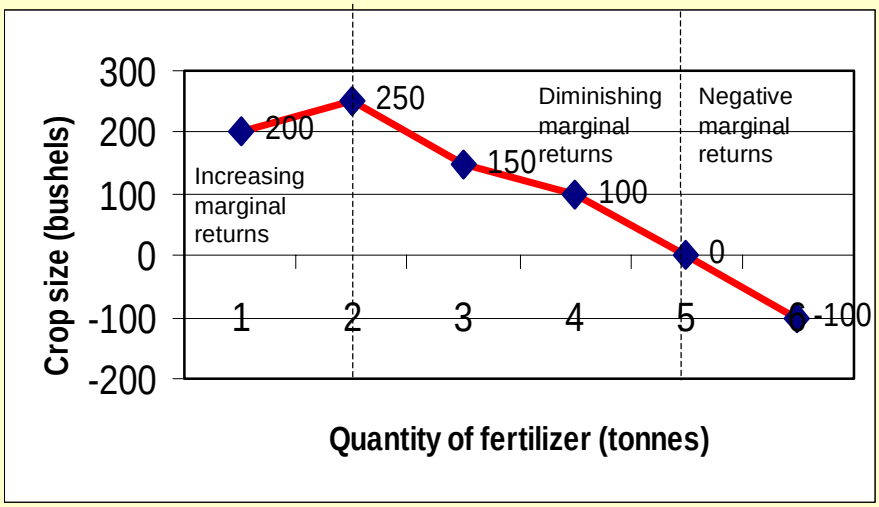
FROM COSTS OF PRODUCTION TO MARKET SUPPLY CURVES

THE SIMPLEST CASE: ONLY ONE VARIABLE INPUT INTO PRODUCTION

A FARMER'S TOTAL, AVERAGE, AND MARGINAL PHYSICAL PRODUCT SCHEDULES

Fertilizer input (tonnes)	Total physical product (bushels of wheat)	Marginal physical product (bushels)	Average physical product (bushels)
0	1000	--	--
1	1200	200	1200
2	1450	250	725
3	1600	150	533.33
4	1700	100	425
5	1700	0	340
6	1600	-100	266.67

MARGINAL PHYSICAL PRODUCT



THE "LAW" OF DIMINISHING MARGINAL RETURNS

The "law" of diminishing marginal returns states that, as we increase the amount of one input, *holding the quantities of all the others fixed,* the marginal returns of the expanding input begin to diminish.

This is only an empirical regularity (something that is virtually always observed in practice), not an axiom or a logically derived proposition.

RELATING OUTPUT TO COSTS

In this simplified world where there is only one input (fertilizer), the total cost of producing a given amount of wheat is simply equal to the cost of the fertilizer needed to produce that quantity.

We can then derive the total cost, average cost, and marginal cost.

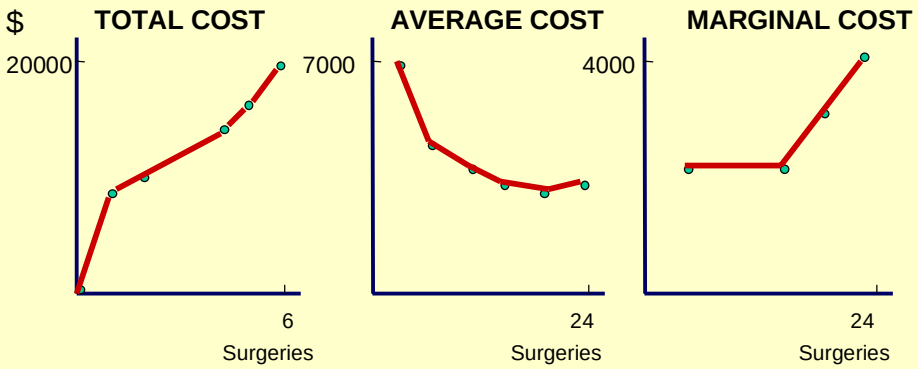
These cost curves, however, can be equally well defined whether there is one input or several.

TOTAL, AVERAGE, AND MARGINAL COSTS

HYPOTHETICAL TOTAL, AVERAGE, AND MARGINAL COSTS OF AN ORTHOPAEDIC SURGEON SPECIALIZED IN HIP REPLACEMENTS

Surgeries per week	Total cost (dollars)	Marginal cost (dollars)	Average cost (dollars)
0	0	--	--
1	7000	7000	7000
2	9000	2000	4500
3	11000	2000	3666.67
4	13000	2000	3250
5	16000	3000	3200
6	20000	4000	3333.33

TOTAL, AVERAGE AND MARGINAL COSTS - GRAPHICALLY



FIXED AND VARIABLE COSTS

- Another important way of classifying costs is between fixed and variable. Fixed costs are those that are incurred in a fixed way (do not change) whatever the level of production. All other costs, which vary with the level of production, are called variable costs.

Thus we have the relation:

TC = TFC + TVC

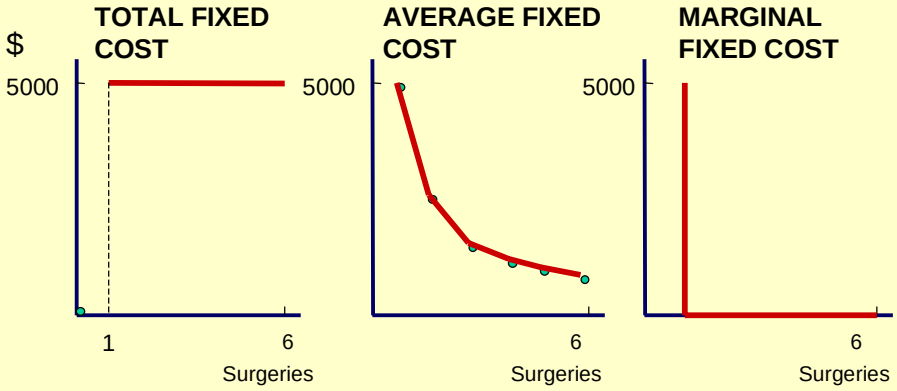
(total costs = total fixed costs + total variable costs)

- The shapes of the variable cost curves (total, average and marginal variable costs) are similar to the shapes of the total cost curves. But the fixed cost curves are quite different.

HYPOTHETICAL FIXED COSTS OF AN ORTHOPAEDIC SURGEON SPECIALIZED IN HIP REPLACEMENTS

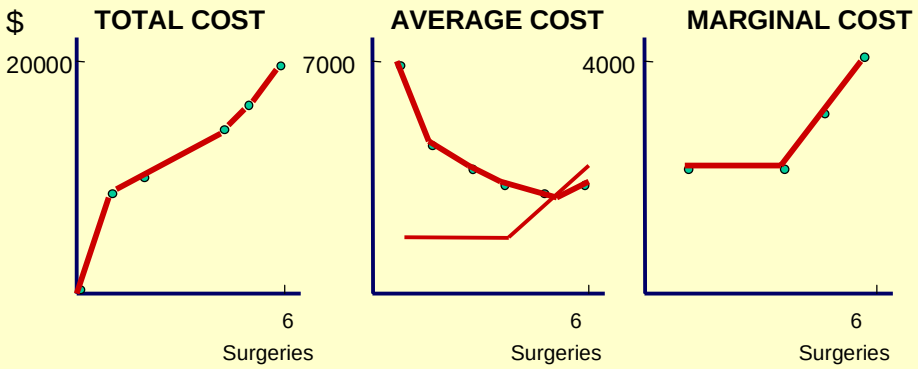
Surgeries per week	Total fixed cost (dollars)	Marginal fixed cost (dollars)	Average fixed cost (dollars)
0	0	--	--
1	5000	5000	5000
2	5000	0	2500
3	5000	0	1666.67
4	5000	0	1250
5	5000	0	1000
6	5000	0	833.33

TOTAL, AVERAGE AND MARGINAL FIXED COSTS - GRAPHICALLY



Total fixed costs do not change once production has begun. Average fixed costs will keep declining, but without ever reaching 0. Marginal fixed cost starts at 5000 with the first unit, then goes to 0. All this follows from the definition of fixed costs.

REVISITING TOTAL, AVERAGE AND MARGINAL COSTS



The total cost function can never be decreasing. If the marginal cost curve intersects the one for average cost, at that point average cost reaches a minimum and then begins to rise. Can you see why?

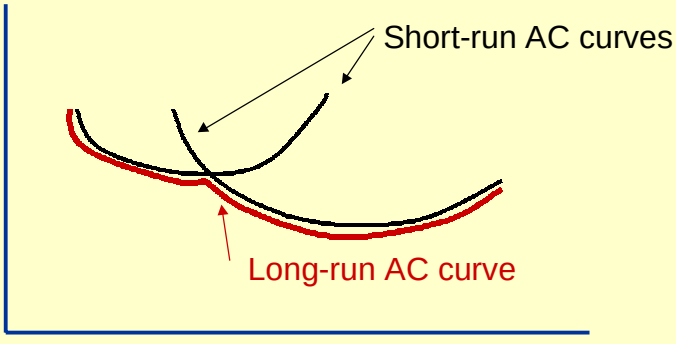
LONG-RUN VERSUS SHORT-RUN COSTS

The cost to a firm of changing its output level is very much dependent on the time horizon for the change. Given enough time, a firm can change many of its inputs so as to be able to more efficiently produce the greater quantity. For example, machinery can be purchased to automate a production process.

The **long run** is a period of time long enough for all the firm's commitments to come to an end.

The **short run** is a shorter period of time than the long run, such that some, but not all, of its commitments will have come to an end.

LONG-RUN VERSUS SHORT-RUN AVERAGE COST CURVES



In the short run, the producer is "stuck" with one production method or another, each associated with one of the short-run AC curves. But in the long-run, depending on the desired level of output, the producer can choose the production method leading to the lowest AC.

THE MARGINAL REVENUE PRODUCT AND THE RULE FOR OPTIMAL USE OF AN INPUT

The marginal revenue product (MRP) is the additional revenue that accrues to a firm when it increases the quantity of an input by one unit:

MRP = MPP x price of output

MARGINAL PHYSICAL PRODUCT (MPP) AND MARGINAL REVENUE PRODUCT(MRP)

Fertilizer input (tonnes)	Total physical product (bushels of wheat)	Marginal physical product (bushels)	Marginal revenue product (dollars)
0	1000	--	--
1	1200	200	400
2	1450	250	500
3	1600	150	300
4	1700	100	200
5	1700	0	0
6	1600	-100	-200

With bushels selling for $2 each, the MRP shows the extra revenue generated by each additional tonne of fertilizer

RULE FOR OPTIMAL USE OF AN INPUT

An input is used optimally if the price of the input is equal to its marginal revenue product:

MRP = price of input

What we mean here by "optimally" is that profit is maximized by following this rule. If MRP is less than the price of an input, then we are paying more for increasing output than we are getting in return from selling increased production; and vice versa.

MULTIPLE INPUTS INTO PRODUCTION

SUBSTITUTING INPUTS TO MINIMIZE COSTS

•Normally, different **combinations** of inputs can be used to produce a given level of output. For example, machinery can be substituted for labour.

•Usually, if we use less of one input, we will need to use more of another (e.g., less labour, more machinery) to produce the same output as before. The inputs are **substitutes**.

•Which combination is cheapest will depend on the relative prices of the different inputs. If the price of labour goes up, the same quantity of output can be produced more cheaply by using more machinery.

SUBSTITUTING INPUTS TO MINIMIZE COSTS - EXAMPLES

•In restaurants such as MacDonald's, where strong social protections increase the cost of labour (e.g., in France), more machinery is used for such tasks as dishwashing, compared to what we observe in North America.

• We also observe that household servants remain common in developing countries, where the cost of labour is low, whereas the much higher relative cost of labour in developed countries has made them much less common there.

•You can probably think of many other examples...

ECONOMIES AND DISECONOMIES OF SCALE

Economies of scale refers to the reduction in average costs that can arise as output is increased.

Look again at the previous graph. As long as average costs are falling, economies of scale are realized by increasing output. If output is pushed beyond that point, **diseconomies of scale** set in.

The volume of output up until which economies of scale are realized is depends on what is being produced. It also depends on technology (new technologies often result in the point of minimum AC being reached at higher output than before).

ECONOMIES OF SCALE AND HOSPITALS

The question of the number of beds a hospital must have before diseconomies of scale set in is an important one for planning purposes, and one that has attracted some attention from health economists.

There are many difficulties associated with such an analysis, such as differences in the services different hospitals provide, and also the fact that differences in hospital costs per unit arise from many factors besides hospital size. But there is evidence to suggest that economies of scale do exist for hospitals, at least until somewhere above 200 beds (Paul Feldstein, *Health Care Economics* 4th edition, 1993.)

HOW TO MAXIMIZE PROFITS

THE ASSUMPTION OF PROFIT MAXIMIZATION

- Economists, like other social scientists, and indeed scientists in general, proceed by formulating models, or simplified representations, of the processes that they study.
- In their study of how firms behave, economists usually represent firms as maximizing their profit.
- In reality, it is pretty clear that firms do not always do that - especially when they don't have to (i.e., when they do not face stiff competition). But it is a reasonable approximation in many instances, and this assumption provides a basis for important economic arguments about the role the government should (or should not) play in the economy - of which health care is an important part.

THE GENERAL RULE FOR MAXIMIZING PROFIT

In order to maximize profits, firms need to maximize the difference between total revenue (selling price x quantity of output) and total cost (average cost x quantity of output).

In many real-world situations, firms face a downward-sloping demand curve. The price they set for their product then determines the quantity they can sell; so it is not simply a matter of choosing an output level such that average cost is as much below the selling price as possible.

It turns out that the general rule for maximizing profit is to set quantity such that: marginal revenue = marginal cost (MR = MC).

THE PERFECTLY COMPETITIVE MARKET

PERFECT COMPETITION

•We have now seen how a firm can choose a combination of inputs so as to minimize its cost of producing a given output. We have also seen that firms are assumed to want to maximize profit, and that to maximize profit they need to choose an output level such that MR = MC.

•Where do we go from here? We now need to look at how **market structure** influences firm behavior.

•Among the different varieties of market structure, the one that serves as point of reference for economists is called perfect competition. As we will see, perfectly competitive markets function remarkably well as a mechanism for allocating resources - they are efficient (output is produced at minimum cost), and they satisfy consumer tastes effectively.

THE ASSUMPTIONS OF PERFECT COMPETITION

•**Numerous participants.** Individual sellers and purchasers have no effect on the price.

•**Homogeneity of products.** The product sold by any seller is identical to that sold by any other seller.

•**Freedom of entry and exit.** If a firm sees a profit to be made in that market, it can enter it freely. It also faces no penalty for leaving the market.

•**Perfect information.** Each firm and customer is well informed about available products and their prices.

•**No "externalities".** Producing, selling and buying the good imposes no incidental costs or benefits on others (e.g., no pollution).

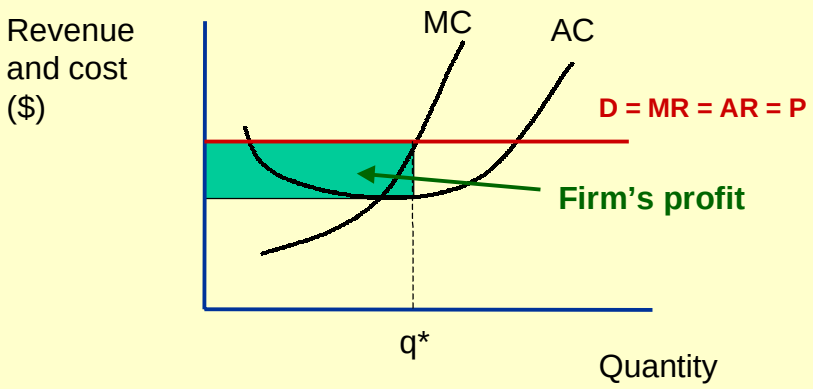
THE FIRM IN A PERFECTLY COMPETITIVE MARKET

A firm in a perfectly competitive market faces a perfectly elastic demand curve - the demand curve for its product is horizontal. The firm is said to be a price-taker.

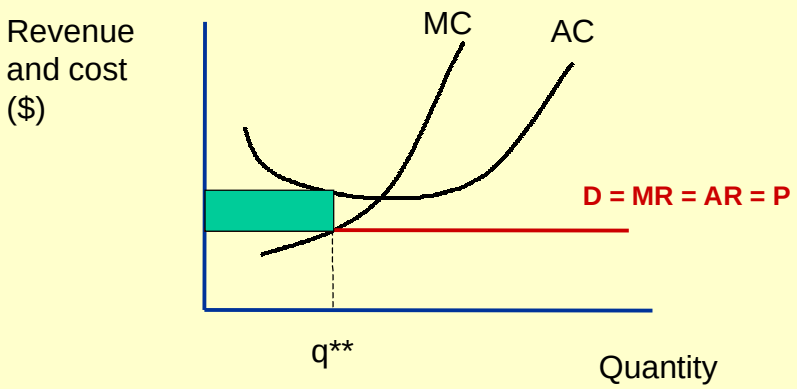
Applying the rule MR=MC then reduces to: MC = P, since marginal revenue (the extra revenue from selling one more unit of the product) is simply equal to price.

In the short run, if price is greater than average cost (P>AC), the firm realizes a profit.

A COMPETITIVE FIRM CAN MAKE PROFITS IN THE SHORT RUN...



… BUT IT CAN ALSO LOSE MONEY



SHOULD A FIRM THAT IS LOSING MONEY STOP PRODUCING?

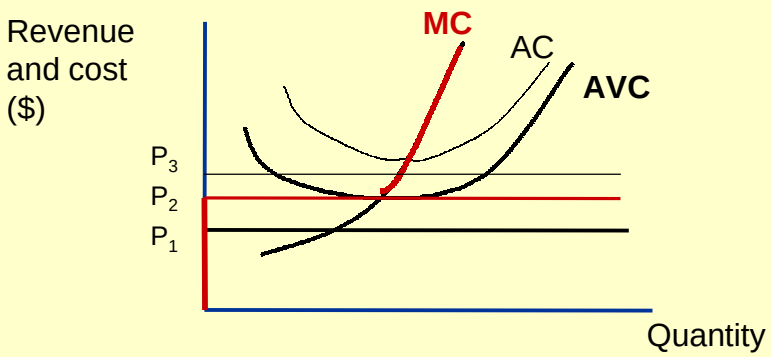
The answer is: not always. There are 2 rules to follow:

Rule 1. The firm will not lose money if total revenue exceeds total cost (obvious!)

Rule 2. The firm should not shut down in the short run if TR exceeds total variable cost (TVC).

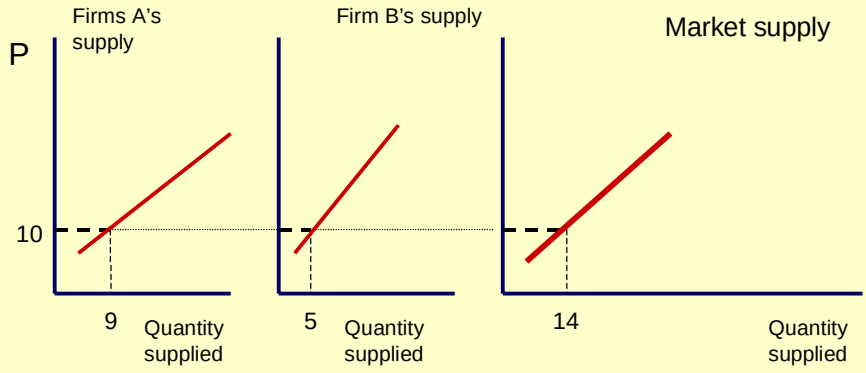
The reason for Rule 2 is simply this: as long as *variable* costs are covered, the firm is contributing to cover fixed costs. But remember the definition of fixed costs: in the long run, they become variable. Time to put the facility up for sale...

SUPPLY CURVE OF THE COMPETITIVE FIRM



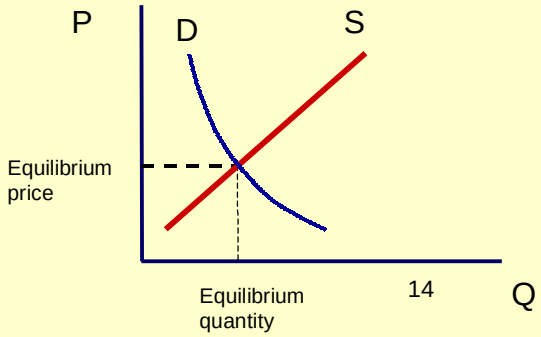
Above P_2, the firm produces according to the MC curve (in red). Below that price, the firm produces 0. Thus we have derived the supply curve of an individual competitive firm.

FROM INDIVIDUAL SUPPLY CURVES TO A MARKET SUPPLY CURVE



The market supply curve is obtained by summing firms' individual quantities supplied at each price

EQUILIBRIUM PRICE AND QUANTITY



The intersection of the demand and supply curves determines the equilibrium price and quantity.

IN THE LONG RUN...

In the long run, because of free entry and exit, as long as there are profits to be made, new firms will enter the market. This will cause price to fall.

The fall in price will drive higher-cost producers out of the market.

Eventually, an equilibrium is reached where every firm remaining in the market just covers its costs. The long-run equilibrium price in a perfectly competitive market is one where each firm is producing at the minimum point on its AC curve, where the MC curve intersects it.

This is an efficient outcome: every firm is producing at the lowest possible cost.

THE EFFICIENCIES OF PERFECT COMPETITION

THREE COORDINATION TASKS OF AN ECONOMY

Any economic system addresses three basic problems of resource allocation:

Output selection. How much of each commodity should be produced?

Production planning. What quantities of each of the available inputs should be used to produce each good?

Distribution. How should the resulting products be distributed among consumers?

We will now see how the market system, under the assumptions of perfect competition, accomplishes these tasks very efficiently - unlike a government-run system.

EFFICIENT OUTPUT SELECTION

We have seen that, in a perfectly competitive market, in the long run all producers choose their production level so that:

MC = P

We have also seen (optimal price rule) that rational consumers will consume of each good to the point where:

MU = P

Thus, in a perfectly competitive market, MC=MU.

But this is in fact an efficient outcome. If MC were not the same as MU, it would be possible to increase consumers' utility by producing more or less of a good.

EFFICIENT ALLOCATION OF INPUTS

Without introducing mathematical notation, it can be shown that in a perfectly competitive economy, inputs will be traded among producers in such a way that the marginal revenue product of each input will be the same across all types of output, and will be equal to the price of that input.

If it were not so, there would be opportunities to swap inputs across production processes and increase total production without any additional inputs.

EFFICIENT DISTRIBUTION OF COMMODITIES

Again without introducing mathematical notation, it can also be shown that in a perfectly competitive economy, goods will be traded among consumers in such a way that the marginal utility of each good will be the same across all consumers, and will be equal to the price of that good.

Thus, for example, John's MU for beef will be equal to Mary's MU for beef. If it were not so, there would be opportunities to swap inputs across production processes and increase total production without any additional inputs.

By allowing for voluntary exchanges, the free market allows consumers to distribute their incomes among the different goods available so as to achieve this.

THE INVISIBLE HAND

Adam Smith noted this more than 200 years ago. Producers and consumers are each only seeking their own personal interest; yet in doing so, they are enabling the economy to efficiently allocate resources. It is as if an "invisible hand" were guiding them to do what was best for society, when they are merely seeking their own self-interest.

This paradigm is very important in economics. Especially in the United States, among economically conservative analysts, there is a strong belief that it is best for the government to leave the markets alone as much as possible. The government is viewed as a source of inefficiency.

PARETO-OPTIMALITY

Aside from making positive statements about the economy and markets (e.g., if you raise the price by 5$ quantity demanded will fall by 1,000 widgets), economists also make normative statements (e.g., this regulation *should* be eliminated.)

Their main criterion for making such statements is efficiency. If an allocation is such that no individual can be made better off without another individual becoming worse off (a consequence of perfect competition), then that allocation is said to be "Pareto-optimal" (named after a 19th century Italian economist).

Of course, this is a limited basis on which to make normative judgments. An allocation such that one individual owns everything is also Pareto-optimal!

OTHER FLIES IN THE OINTMENT

That limitation aside, only a few markets come close to satisfying the conditions for perfect competition. There are a multitude of reasons why that is so, among which:

•**Barriers to entry.** For example, it is difficult for a new company to enter the medical devices or drug industry.

•**Externalities.** Those were defined earlier.

•**Imperfect information.** Consumers cannot always observe all the relevant characteristics of a commodity, or firms of inputs, for that matter.

OTHER TYPES OF MARKET STRUCTURE

The main other types of market structure are:

- **Monopoly.** Only one producer. The producer can then set price so as to make a profit. Barriers to entry can be considerable. In the United States, the government actively tries to prevent companies from exerting monopoly power.
- **Monopolistic competition.** Many producers, but their products are somewhat different (e.g., restaurant meals, clothing). Barriers to entry are usually minor.
- **Oligopoly.** Only a few producers. Products may be identical, or similar. Examples: aircraft, toothpaste.

THE THEORY OF THE SECOND-BEST

As indicated earlier, many conservative economists view all departures from the ideal conditions of a perfectly competitive market as "distortions", which should be removed as much as possible to increase efficiency.

However, in a famous 1956 paper, called "The theory of the second best", Lipsey and Lancaster showed that, if a market departs from the competitive one in several respects, correcting one problem will not necessarily increase efficiency. For reasons that one may suppose are partly ideological, many conservatives ignore this result.

SPECIAL FEATURES OF HEALTH CARE

Do markets for health care services resemble the ideal of perfect competition? Only a moment's thought suffices to conclude that they do not. Four features of health care in particular distinguish it from normal markets, even most non-competitive markets:

GOVERNMENT INTERVENTION

- This is pervasive in health care. It ranges from licensure of professionals, to price-setting, to paying on behalf of providers.
- The pervasiveness of government intervention is itself a consequence of other particularities of health care.

UNCERTAINTY

- People often do not know whether they will need a good.
- The effects of consuming a health care good are also uncertain. This contributes to wide variations in how doctors practice medicine.
- Thus, the marginal utility a consumer will experience from consuming one more unit of a type of health care can be unknown, or ill-defined.

ASYMMETRIC INFORMATION

- Patients know much less about the extent to which they need a health care good than do their doctors.
- Thus, it has often been claimed that doctors are able to influence the position of patients' demand curve - this is called "supplier-induced demand."

EXTERNALITIES

- Many decisions to consume or not consume health care have consequences for others: vaccines, antibiotics (less directly)
- Public health activities in general have large externalities.