

Supply and Demand as Logical Implications of Net Benefit Maximization

I. The Geometry of Net Benefit Maximizing Choice

- A. There are **two widely used models of rational choice**: (1) the net benefit model and (2) the utility maximizing model

Both sets of models can be developed geometrically, and both can be used to create surprisingly well integrated general theories of market activity (and of many other activities).

These models, surprisingly, allow one **to deduce** a broad range of properties about markets--most of which have been verified with statistical tests of one kind or another.

The models do not work perfectly, but it is amazing how much can be explained about a wide range of market, individual, interest group, and political activities from so few assumptions.

We'll develop the net-benefit maximizing model first, because its a bit easier, and is in some ways it is more important for undergraduate applied micro courses.

(The utility maximizing model is developed near the end of the course.)

- B. Nearly all partial equilibrium economic models can be developed from the assumption that individuals maximize their private net benefits.

DEF: Net benefits are total benefits less total cost.

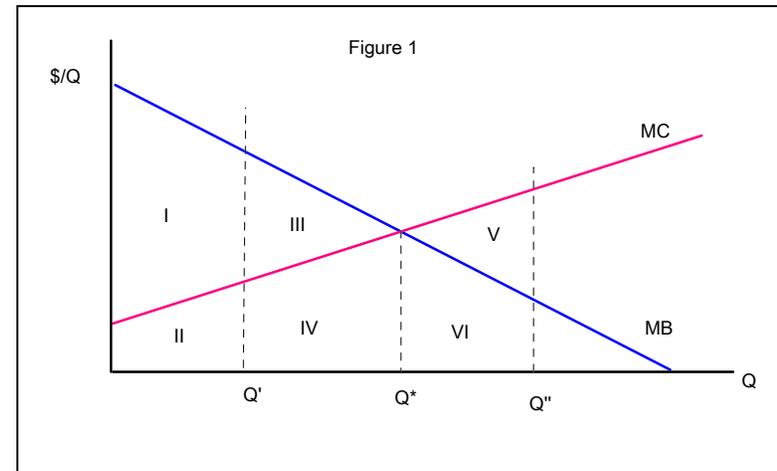
Economists often name various net benefits.

- For example Consumers maximize consumer surplus: the difference between what a thing is worth to them and what they have to pay for it. $CS(Q) = TB(Q) - TC(Q)$
- Firms maximize their profit: the difference in what they receive when they sell their products and what it costs to produce them. $\Pi = TR(Q) - TC(Q)$
- However, the geometry and logic of net benefits is essentially the same whether one deals with consumers, firms, other roles, or other types of activities.

- C. "Marginal" is an adjective and refer to how another unit of a good or service produces additional benefits or costs, etc.

DEF: Marginal "X" is the change in Total "X" caused by a one unit change in quantity. It is the slope of the Total "X" curve. "X" ∈ {cost, benefit, profit, product, utility, revenue, etc.}

- **Important Geometric Property:** Total "X" can be calculated from a Marginal "X" curve by finding the area under the Marginal "X" curve over the range of interest (usually from 0 to some particular quantity, Q).
- The "area property" allows us to determine consumer surplus and/or profit from a diagram of marginal cost and marginal benefit or revenue curves.



D. How to calculate net benefits given MC and MB curves:

Given the marginal cost and marginal benefit curves in Figure 1, it is possible to calculate the total cost of Q' and the total benefit of

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Q' . These correspond to areas under the curves of interest.

$$TC(Q') = II ; TB(Q') = I + II .$$

Similarly, one can calculate the net benefits of any output or activity level Q by finding total benefit and total cost for the quantities of interest, and subtracting them. Thus the net benefit of output Q' is $TB(Q') - TC(Q') = [I + II] - [II] = I$.

Use Figure 1 to determine the areas that correspond to the total benefit, cost and net benefit at output Q^* and Q'' .

Answers:

- $TB(Q^*) = I + II + III + IV$, $TC(Q^*) = II + IV$, $NB(Q^*) = I + III$
- $TB(Q'') = I + II + III + IV + VI$, $TC(Q'') = II + IV + V + VI$, $NB(Q'') = I + III - V$
- (It should be clear that a net benefit maximizing individual will prefer Q^* over Q' and Q'' ! [why?])

E. *If any person or organization attempts to maximize net benefits, it turns out that he, she, or it will normally want to consume or produce at the point where marginal cost equals marginal benefit.*

(This rule of thumb reflects the graph we just worked, and applies in most cases in which Q is very "divisible").

Net-benefit maximizing decision makers tend to choose activity levels where **their own marginal costs equal their own marginal benefits**--not because they care about "margins" but because this is how one maximizes net benefits.

We have already developed a nice geometric proof of this above ("C.iv" above implies this) and also have or will shortly do so in class. (See your class notes.)

This characterization of net benefit maximizing decisions is **quite general**, and can be used to model the behavior of both firms and consumers.

Moreover, it can be used to characterize the policies that maximize net benefits for an organization (firm) or even for a society, insofar as "all" relevant costs and benefits can be computed.

F. Economists have found the idea of "the margin" and the concepts of marginal cost and benefit to be very useful in both explaining behavior and using that behavior to understand markets and other activities.

II. Deriving Consumer's Demand Curve from MB curves using the Net Benefit Maximizing Model

- A. If consumers are rational net benefit maximizers, it turns out that both individual and market demand curves are downward sloping.
- B. To demonstrate this, we will first determine what net benefit maximizing behavior implies about individual demand curves and then what individual demand curves imply about market demand curves.

To derive a demand curve from a consumer's MB curve:

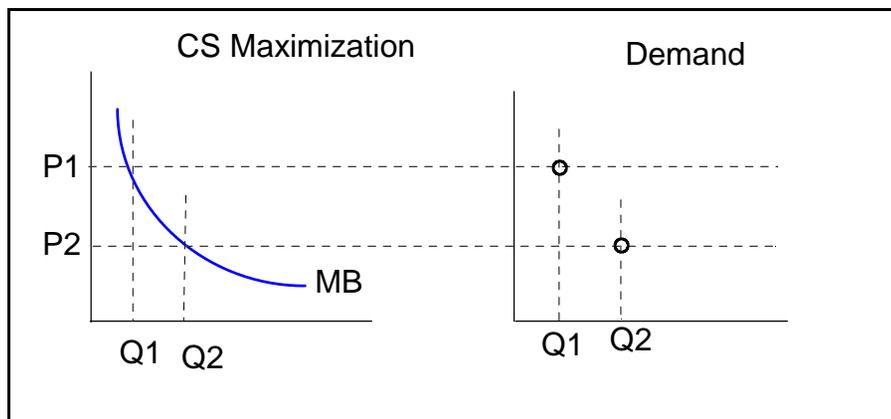
- (i) pick a price, P
- (ii) find the associated MC curve
- (iii) find the NB maximizing quantity, Q (the amount bought by a rational consumer).
- (iv) plot P and Q
- (v) repeat with another price

C. The next figure illustrates the geometry of this process. It begins with a marginal benefit curve (MB) and uses two prices, P_1 and P_2 , to find two points on this person's demand curve.

- Note that the **price(s)** characterizes a consumer's **marginal cost curve(s)**, since he or she can has to pay that amount to get each successive unit of this good. The first MC curve is simply a horizontal line at P_1 .

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- Given that MC curve, this person will choose the quantity that maximizes his or her consumer surplus, which is labeled Q1.
- This price-quantity combination is plotted on the Demand diagram as the point P1, Q1. (At price P1, the consumer will buy quantity Q1.)
- Now we repeat this process with another price, P2. The implied new (second) MC curve is a horizontal line passing at P2.
- Given that MC curve, a net benefit maximizing (rational) consumer chooses the quantity that maximizes his or her consumer surplus, which is found at the quantity where $MC=MB$, and is labeled Q2.
- This price-quantity combination is plotted on the Demand diagram as the point P2, Q2. (At price P2, the consumer will buy quantity Q2.)
- In principle this process is continued forever, choosing prices, finding the associated CS-max quantities, and plotting the price and quantity.
- But in most cases three or four points are enough to get the basic geometry of a consumer's demand curve.



- THE POINT HERE IS NOT TO MEMORIZE DIAGRAMS but to understand how to prices affect purchases by rational consumers.
 - It is the logic that is general, rather than the particular diagrams.
 - Given a consumer's MB curve, we can deduce his or her demand curve!
 - The rational person or organization will do X in circumstance Y, because X maximizes his or her net benefits in those circumstances.
- D. This basic process can be used to derive a consumer's Demand curve from any sort of MB curve, although they are not always as easy as this one.
- [Several less straightforward derivations will be done in class!]
 - Note that whenever the marginal benefit curve is downward sloping over its whole range, the consumer's demand curve goes through exactly the same points as the MB curve and is also downward sloping.
 - In such cases, one can use estimates of individual demand curves as estimates of MB curves.
 - However, although they go through the same points, marginal benefits and demand are not the same function, because they **have different meanings** and the **functions go in opposite directions**.
 - MB functions go from Q into \$/units, whereas demand functions go from P into Q. They are inverse functions of each other.
- E. IN CLASS, A VARIETY OF SIMILAR DERIVATIONS WILL BE DONE ON FOR VARIOUS MB CURVES, ONE OF WHICH WILL BE ASSIGNED AS A HOMEWORK PUZZLE. (So do show up for class!!!)**

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- In some cases, the demand curves include only a subset of the point on an individual's MB curve, but the points in common are always from the downward sloping portions of the MB curve.
- Thus, when a demand curve is derived in this way from MB curves, it turns out that **every** individual demand curve slopes downward.
- [Later in the course, we will see that this is **not necessarily the case when a demand curve is derived from a utility function.**]

F. Notice that we **already have some predictions** about behavior that follows simply from the net-benefit maximizing model of consumer choice:

- Demand curves generally slope downward.
- As price rise, consumers tend to purchase fewer and firms tend to produce more.
- A change in MB will cause demand curves to shift up or down according the shift in MB.
- Consumer net benefits tend to fall as prices rise, other things being equal.
- Firm profits tend to rise as prices rise, other things being equal.

III. Deriving a Firm's Supply Curve from MC Curves

- A. In a similar fashion, one can use the **profit maximizing model** (another measure of net benefit) to derive a competitive firm's short run supply curve from its short run marginal cost (MC) curve.
- B. The method used to derive a firm's supply curve is very similar to that used to derive a consumer's demand curve:
- (i) Choose a price
 - (ii) Find the associated marginal revenue curve (MR)

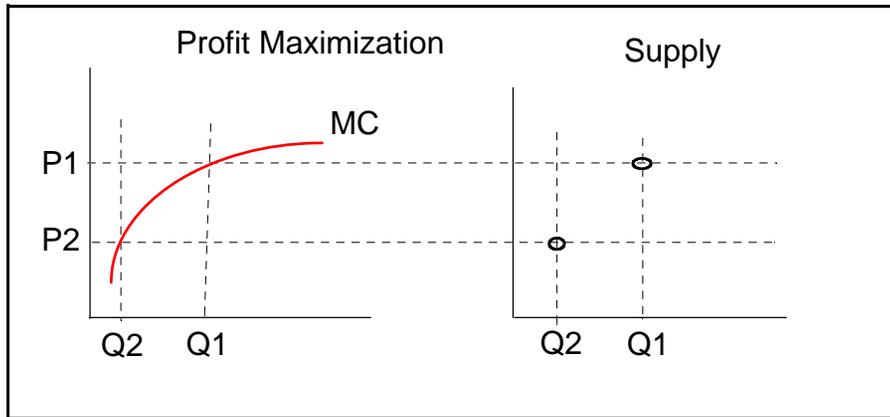
- (iii) Find the profit maximizing quantity of the good or service, given that MC curve
- (iv) Plot the price and the profit-maximizing quantity on another diagram.
- (v) Repeat with several other prices to trace out a supply curve.

C. The next figure illustrates these steps for a given marginal cost curve (MC) and two prices, P1 and P2.

- In a competitive market, the market price is every firm's marginal revenue curve, since the firms gets "P" new dollars of revenue every time it sells an additional unit at that price.
- So the first MR curve is a horizontal line through P1.
- Given that MR curve, the firm will chooses the quantity that maximizes his or her profit (the firm's net benefit), which occurs where $MR=MC$, and is labeled Q1.
- This price and output combination is plotted on the Supply diagram as the point P1, Q1. (At price P1, the firm will produce and sell quantity Q1.)
- Next we try another price, P2. A horizontal line through P2 is the firm's marginal revenue curve, since its revenue now increases by that P2 dollars every time another unit of the good is sold.
- Given that new MR curve, this firm chooses the quantity that maximizes profits, which is again found where $MC=MR$ and is labeled Q2.
- This price output combination is plotted on the Supply diagram as the point P2, Q2. (At price P2, the firm will produce and sell quantity Q2 if the price is P2.)

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- In principle this process is continued forever, choosing prices, finding the associated profit-maximizing quantity, and plotting the price and quantity.
- But in most cases three or four points are enough to get the basic geometry of a firm's supply curve, but more will be needed when MC has a complex shape.



- Note that when the MC is upward sloping (and $MC > 0$) that a firm's supply curve goes through exactly the same points as its MC curve.
- This implies that one can use estimates of a firm's supply curve as estimates of its MC curve.
- (As in the case of demand curves, a firm's supply curve is the inverse of its MC curve. Supply goes from prices (\$/unit) into quantities; whereas MC goes from quantity into \$/unit measures of how costs increase as output increases.)
- However, if MC has a more complex shape, only the points on MC that can represent profit maximizing outputs are on both the MC and firm supply curve.

- Since it turns out that those points in common are all from the upward sloping parts of the firm's MC curve, a firm's supply curve slopes upward.

D. Again deduction generates a series of predictions about a firm's behavior

- Firm supply curves tend to be upward sloping.
- As prices rise, other things being equal, firms produce and sell more units of their products.
- Any change in market conditions that affects a firm's marginal costs will shift the firm's supply curve.
- For example, an increase in input prices tends to cause the marginal cost of production to increase.
- If MC rises, the supply curve shifts back to the left.
- If MC rises, profits will fall, other things being equal.
- If market prices rise, MR shift upward, and profits will increase.

E. Note that our derivation of supply assumes that firms are “**price takers**,” that is that take the market price as given and simply adjust their output in response to it.

- This is a standard assumption in competitive market models.

F. Exactly the same method can be used to derive a firm's Long Run Supply curve given its Long Run Marginal Cost Curve.

- And, the same conclusions will follow.

IV. A Digression on Fixed and Variable Costs in the Short and Long Run

A. The area(s) under the marginal cost curve is technically, total variable cost(s) or producing particular outputs, rather than total cost.

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Total cost is Total Variable Cost plus Total Fixed Cost. $TC(Q) = TVC(Q) + TFC$

Total variable costs vary as output changes. Fixed costs do not, and so they are not “picked up” by the area under the MC curve.

B. For most purposes in this class and other economics classes fixed costs are ignored, because although they may affect profits, they do not affect output decisions.

- The distinction is most important for Marshallian representations of long run equilibrium.
- We’ll mostly be using the Ricardian representation of long run equilibrium, which is both easier to do with our tools and corresponds to more markets in the modern world.
- (More on the distinction between Marshallian and Ricardian long run will developed in the next lecture.)

C. One place where they matter in this course is in the formal definition of short and long run.

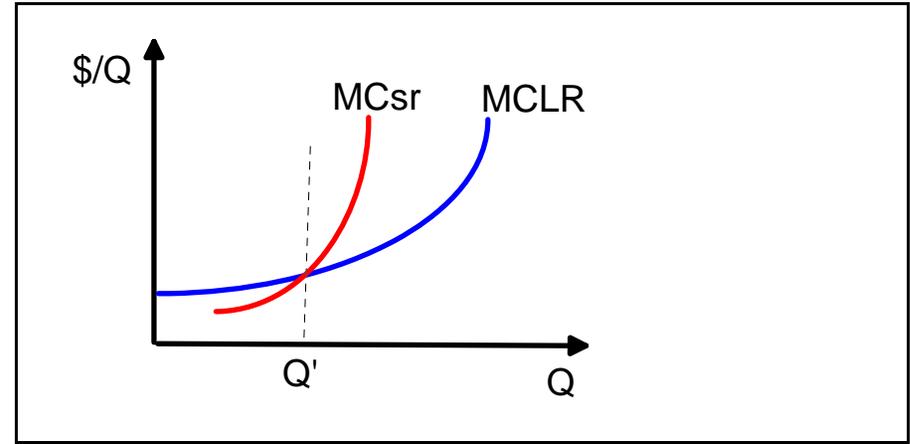
- In the short run there are at least a few fixed costs.
- In the long run all costs are variable, because long run decisions include decisions about whether to enter a market or not, as well as decisions about how much capital to purchase (eg choices about the scale of production).

D. At the level of a firm, the difference between its short run and long run supply is simply a difference in short run and long run marginal cost.

For short run supply, use the firm’s short run MC curve.

For long run supply, use the firm’s long run supply curve.

(In a diagram, it is usually enough just to changes label on the relevant curves from the SR to LR. MC_{SR} to MC_{LR} and S_{SR} to S_{LR} , however if the point is to illustrate differences you’ll need draw both curves.)



E. Because of “fixed factors of production” SR marginal costs tend to rise faster than long run marginal costs.

- SR marginal costs tend to be steeper, because fewer factors can be adjusted to minimize the cost of producing particular units of output.
- Short run and long run marginal costs are only the same when the input mix in the short run is exactly the same as in the long run, as it would be when the fixed factor is actually just the right “amount” to minimize production costs. This happens at Q’ in the above diagram.
- Production costs rise more rapidly in the short run than LR marginal cost for outputs beyond this level.
- They fall more rapidly below that level (because they are not covering fixed costs in this range--e.g. too much capital is being used in production).
- For each level of fixed factors there is a different SR MC curve.

In the diagram above Q’ is the output for which the mix of fixed and variable inputs is ideal (e.g. minimizes total cost.)

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- MC_{SR} and MC_{LR} are equal (for variable factors) when the optimal mix of all factors is used.

V. A Degression on the Relationship between Average and Marginal Costs

A. For the most part, this course will focus on marginal costs, marginal benefits, and marginal revenues, because these most fully characterize a rational consumer or firm's behavior.

B. However, many text books spend quite a bit of time talking about Average Costs and Average Revenues.

- Definition: Average "X" is Total "X" divided by quantity, $TX(Q)/Q$
- where "X" can be total cost, variable cost, fixed cost, revenue, product, etc.
-
- **USEFUL Mathematical Property:** given a value for average X at some specific quantity Q', one can calculate total X by multiplying average X by Q'. that is $AX(Q')*Q' = TX$
- **USEFUL Geometric Implication of this mathematical property:** given an average X curve, one can calculate total X at Q' by finding the area of the rectangle formed with $AX(Q')$ as the righthand upper corner and (0,0) as its lower lefthand corner. This rectangle is Q' wide and $AX(Q')$ high, so its area is just $AX(Q')*Q' = TX(Q')$ (see the above).
- This geometry allows one to use average revenue and cost curves to calculate profit -- although not to directly determine the profit maximizing output.
- [See the illustration in your class notes.]

- However for this class, we will mostly be using the areas under marginal curves as developed above.
-

Illustrative Calculation of Average Marginal costs from a Total Cost Function.

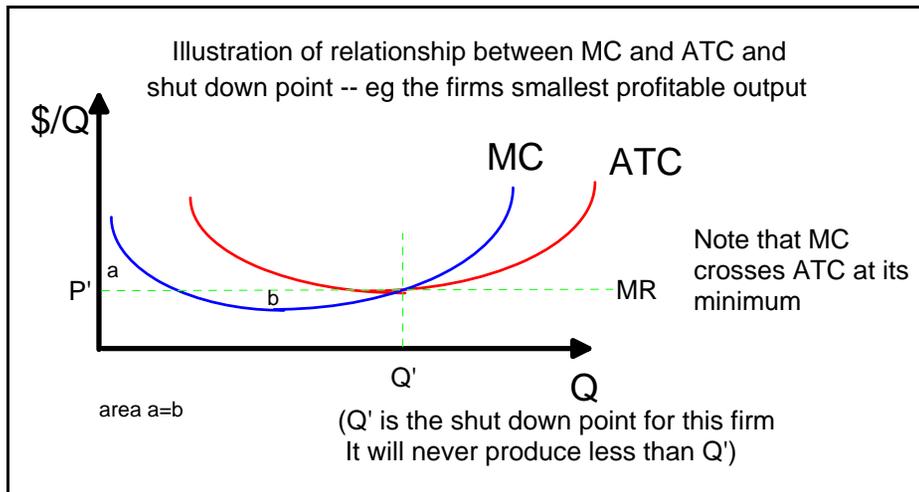
Table Illustrating the Calculation of Average and Marginal Cost from a (Discrete) Total Cost Function			
Quantity of Output	Total Cost	Average Cost = $TC(Q)/Q$	Marginal Cost = DTC
<i>Total Cost Function</i>		<i>Calculations</i>	
1	100	100	100
2	180	90	80
3	250	83.33	70
4	340	85	90
5	440	88	100
6	550	91.67	110

- - Note that whenever MC is below ATC, ATC falls, but when MC is above ATC it rises.
 -
- C. It turns out that marginal X and average X also have a variety of mathematical relationships. Among the most useful in undergraduate economics classes are the following:
- If marginal X is above Average X, then the Average X curve will be rising.
 - If marginal X is below Average X, then the Average X curve will be falling.

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- If marginal X = Average X, then the Average X curve will be neither rising nor falling.
- Of course, all of these relationships apply to your grade point average, if you have a 3.0 average and get an A, then your average will be pulled up, because in this case your marginal grade is higher than your average grade.
- If instead you get a C, then your average will be pulled down (in this case your marginal grade is below your average grade).
- If you get a B, nothing will happen to your average (in this case your marginal grade equals your average grade).

D. Illustration of the relationship between MC and ATC



- You can use either MC or ATC (actually ATVC) to characterize a firm's shut down point.
- Note that at price P', the firm earns zero profits at Q'
- (Profits can be calculated using the average or marginal curves.)

- At prices below P', there is no way for the firm to earn a profit (even ignoring fixed costs) and so it will shut down.

E. On Marginal Product, Prices, and the Demand for Inputs

F. Another application of the net-benefit maximizing framework, allows one to make somewhat sharper predictions about a firm's demand for inputs.

- **Definition:** A production function represents the output that can be produced from various combinations of inputs.
- [Mathematically it can be represented as $Q = q(L,K)$ for an output (Q) produced by two inputs, labor (L) and capital (K).]
- **Definition:** the **marginal product (MP)** of an input is the change in total output produced by a unit increase in the input, holding everything else constant.
- [Mathematically it is the partial derivative of the production function $MP_L = dQ/dL$.]
- **Definition:** the **marginal revenue product (MRP)** of an input is its marginal product times the price of the output; that is, **MRP = MP*P**
- The **marginal benefit of an input to a firm is the input's marginal revenue product** (since marginal revenue is the firm's marginal benefit).

The marginal revenue product (MRP) curve for firms in competitive markets is downward sloping if production exhibits **diminishing marginal returns** over the entire range of interest.

- This, as we saw for ordinary consumer demand curves, implies that the **firm's demand curve** for such inputs also slopes downward, and runs through the same points as the MRP curve.

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- Since its MB curve for inputs is downward sloping, the firms demand curve for inputs will also be downward sloping and go through (most of) the same points.

Both marginal product and input prices ultimately determine the marginal cost of production, although in most cases more than one input is used to produce goods and services

- In a one input model marginal cost is one over the marginal product (1/MP) times the marginal cost of the input. So for a good produced by labor alone, $MC = w/MP$, where w is the prevailing market wage rate.
- (How to model the selection of input combinations is done near the end of the course.)

Illustrating table of a production function, marginal product, and marginal revenue product.

Table Illustrating the calculation of marginal product and marginal revenue product from a one-input production function

Quantity of Inputs Used	Total Output Produced	Marginal Product	Marginal Revenue Product if the price of the output is \$5/unit
<i>Production Function</i>		<i>Calculations</i>	
1	10	10	50
2	18	8	40
3	24	6	30
4	28	4	20
5	31	3	15
6	33	2	10

VI. Deriving Market Demand and Supply Curves

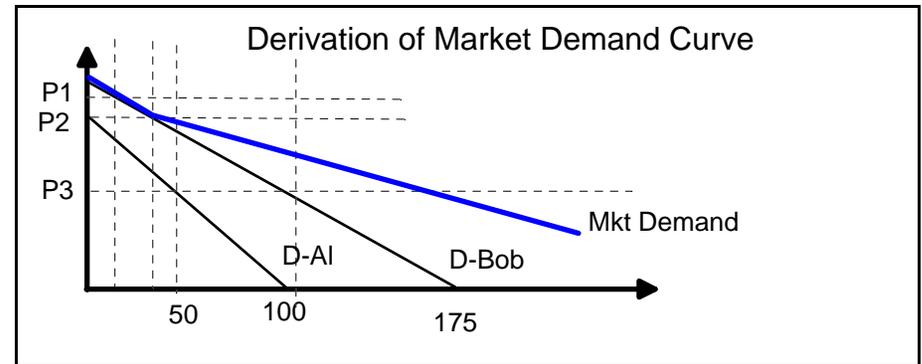
- Market Demand can be calculated by **adding up** all the amounts that consumers are interested in buying at given prices.
- Similarly, Market Supply (in the short and medium run) can be calculated by adding up all the amounts that all the firms in the industry are willing to sell at given prices.

Market Demand curves for ordinary private goods are "horizontal" sums of individual demand curves

Market Supply curves for ordinary private goods are "horizontal" sums of individual firm supply curves.

A market demand curve can thus be derived by choosing a price and plotting the total purchases of all consumers (in the market) at that price, and plotting the price chosen and the total purchase. Repeat with a series of prices to trace out a market demand curve.

[As a practice exercise, draw two demand curves, vary prices and trace out the market demand for these two persons.]



A market supply curve can similarly be derived by choosing a price a price, finding the amounts that will be supplied by every firm in the market, adding up those quantities, and plotting the chosen price and the total output of the industry. Repeat with a series of prices to trace out a market supply curve.

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THE GEOMETRY OF THESE DERIVATIONS WILL BE ILLUSTRATED IN MORE DETAIL IN CLASS, SO DO ATTEND.

C. Having derived the individual market demand and supply curves using the net benefit maximizing model, it should now be clear that:

- A market demand curve is (approximately) the horizontal sum of the **marginal benefit curves of the individual consumers**. So a demand curve can be used to estimate the MB curve for all the consumers in the market of interest.
- A market supply curve (short run) is approximately the horizontal sum of the marginal cost curves of individual firms in the market. So a supply curve can be used to estimate the industry's MC curve.
 - ▶ [An **exception** is the case in which Marshallian assumptions are used, in which case, S_{LR} is the industry's ATC curve. The distinction between Marshallian and Ricardian long run supply is discussed below, and revisited in the next handout.]

D. Normative Analysis Using Supply and Demand

These properties allow us to use some of our area tools on supply and demand curves to analyze gains from trade, the efficiency of markets, and problems that might be associated with trade barriers or externalities.

- **Market demand curve can be used to approximate the marginal benefits received by consumers. So the areas under demand curves can be used to approximate the total benefits received by consumers.**
- **Market supply curve can be used to approximate the marginal cost of suppliers.**

So the areas under a short run supply curve can be used to approximate the short run total variable cost of the industry, and the areas under a long run supply curve can be used to

approximate the total long run total costs of the industry of interest.

- **Consequently, the Demand and supply curves can be used to estimate the net benefits realized by all firms and consumers in an industry (profits and consume surplus).**

We can use these properties of demand and supply curves to show that competitive markets can be “efficient” in the sense that they induce production levels that maximize social net benefits.

- (This is shown below in section VIII.)

VII. Basic Price Theory

A. Supply and demand can also be used to model the origins of market prices and price movements in competitive markets.

B. Market prices tend to move to levels where the total quantity supplied by all firms equals the total amount demanded by consumers. (This defines P^* , and Q^*)

- This “market clearing” model of price determination predicts that output and prices tend to move toward P^* and Q^* as prices adjust to “ration” the quantities produced to consumers.
- In equilibrium, prices adjustments cause all markets to “clear” at which point supply = demand. (Walras Law)
- Note that this adjustment process is, in principal, an entirely decentralized process requiring governments to do nothing more than enforce property rights and contracts.
- If there is a shortage, prices tend to rise, causing consumers to buy less and firms to produce more, until a price emerges that sets demand equal to supply.
- If there is a surplus, prices tend to fall, causing consumers to buy more and firms to produce less until a price emerges that sets demand equal to supply.

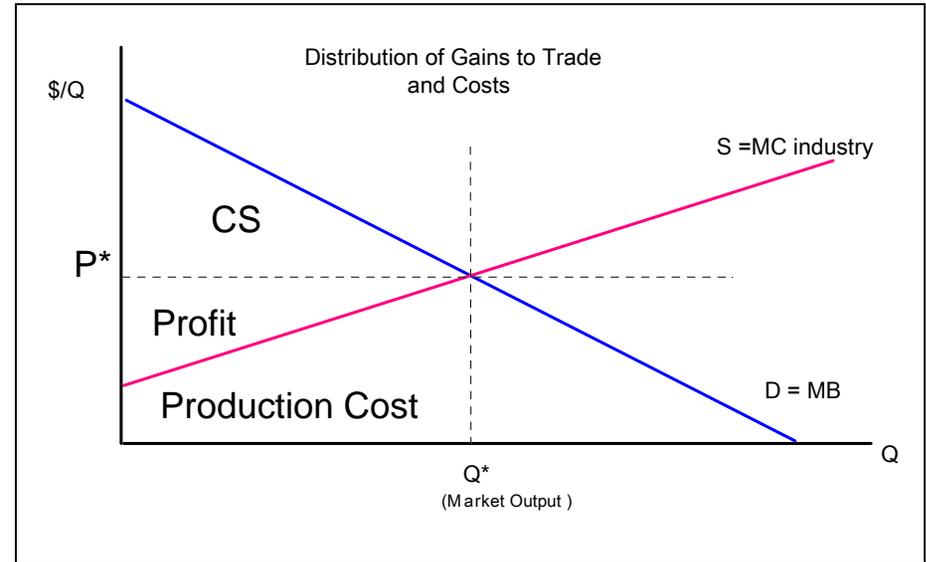
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- Changes affecting marginal benefits of consumers or the marginal costs of firm will imply that existing prices are no longer market clearing prices.
- Price movements thus “coordinate” the activities of firms and consumers, leading markets back to an equilibrium where markets clear, normally at a new market price and market output level.

VIII. Using Net Benefit Maximizing Models of Rationality to Show Market Efficiency [Normative Analysis]

- A. In the absence of externalities or monopoly power (both covered later in the course), **markets tend to produce social net benefit maximizing output levels of goods and services.**
- B. The supply curve represents the industry’s marginal cost of production, which is approximately the marginal opportunity cost of the resources used to produce the good being analyzed.
- Marginal opportunity cost represents the value lost from other uses of the resource (labor, energy, materials etc) when it is shifted from other markets (uses) to producing the good of interest.
- C. The demand curve represents the marginal benefit of producing the goods, which is ultimately the benefits received by consumers.
- So the demand curve can be used to approximate the social marginal benefits of producing the good or service of interest.
 - And, the supply curve can be used to approximate the social marginal cost of using resources to produce that good or service.
 - The areas under the demand and supply curves correspond to society’s total benefits and total costs of production, respectively.
 - (Again, we are assuming that there are no externalities.)

- D. The net benefits of production, sale, and use are normally (but not always) shared between firms and consumers, with the firms share of net benefits called profits and the consumers share of net benefits called consumer surplus.



- E. Note that the geometry of "market clearing" price implies that markets to produce the **output levels that set marginal social benefits (demand) equal to marginal social costs (supply).**
- **Consequently, competitive markets tend to produce the social net benefit maximizing level of output**, the output that maximizes the sum of consumer surplus and profits.
 - This conclusion is one very widely used **normative** argument in support of competitive markets as an "efficient" welfare maximizing form of social organization.
 - It is sometimes called the first theorem of welfare economics: competitive markets produce (Pareto) efficient outcome.

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- They do this in part, because firms have incentives to minimize the resources used to produce their products.
- They also do it because firms have incentives to produce what consumers want, what generates relatively high marginal benefits for them.

- For example, the new health regulations (“Obama Care”) tend to raise the cost of labor, raising MC and shifting S back to the left.
- Input prices may go down because the technology used to produce them improves.

IX. Price Theory and Comparative Statics

A. Supply and demand can be used directly to think about a variety of market outcomes and to analyze both their positive (price theory) and normative (distribution of net benefit) properties.

Perfect competition generates prices that equate marginal industry cost and marginal consumer benefits for all firms and all consumers in the industry.

Prices in competitive markets can be thus be said to coordinate the decisions of individuals and firms in order to clear markets and maximize social net benefits.

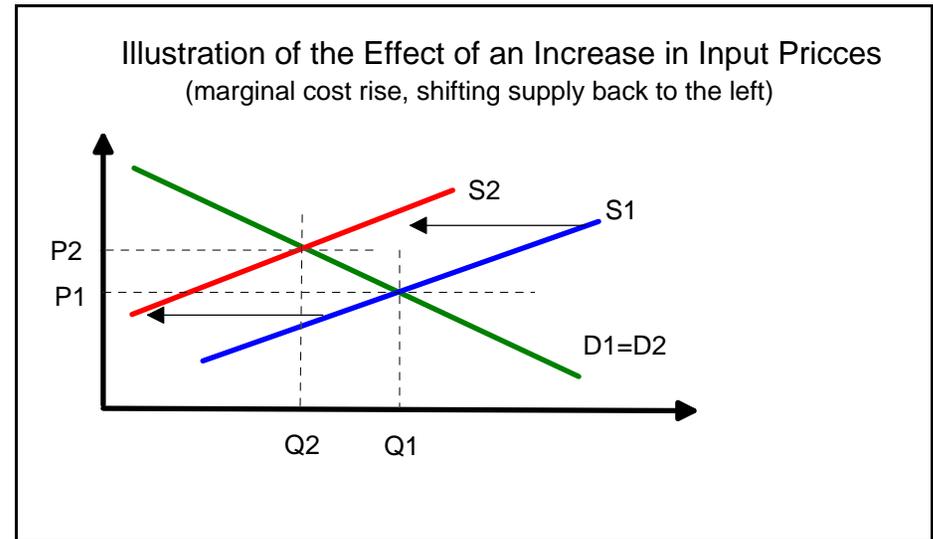
Restrictions on output or prices can also be analyzed for their predicted effects on prices, output, and the distribution of net benefits between consumers and firms.

B. Another use of demand and supply is comparative statics.

C. Whenever a consumer or group of consumer marginal benefit from a good changes, the market demand curve will change. (Explain why.)

- Whenever a firm’s or group of firm marginal cost curves change, the supply curve will change.

- Input prices may go up because world demand for them increases and supplies are limited (at least in the short run) or because of new regulations, restricting the use of available inputs



D. Any change in supply or demand will change market prices, outputs, and their associated distributions of net benefits.

- If just one of the curves is affected there is normally clear (qualitative) predictions about what happens to prices and outputs. [As you all learned in your Principles classes]
- If marginal benefits (willingness to pay) increases, then demand shifts out to the right and both prices and outputs tend to increase.
- If marginal benefits (willingness to pay falls) then demand shifts back to the left, and prices and outputs tend to fall.
- If marginal production costs rise for an industry, the supply curve shifts back to the left, causing higher prices and lower outputs.

Supply and Demand as Logical Implications of Net Benefit Maximization

- If marginal production costs fall, the supply curve shifts out to the right and prices tend to fall and output tends to increase.
- [For practice draw these shifts and their affects on individual consumers and firms.]
- However, if both curves shift, there may be no clear predictions about either price or quantity.

E. Factors that tend to affect a consumers marginal willingness to pay for a good or service (their marginal benefits) include:

- changes in income
- changes in beliefs about the quality or risks of a product
- changes in the prices of substitutes
- changes in the prices of complements
- changes in the cost of acquiring or shipping units of the good

F. Factors that affect a firm's marginal cost of production include:

- changes in input (factor) costs such as wage rates, interest rates, and raw materials
- changes in technology
- changes in the entrepreneur's opportunity cost
- changes in the quality of the good produced

G. All of these implications follow logically from our net-benefit maximizing model of rational consumers and firms.

- That is to say, if consumers and firms behave as rational net benefit maximizers, all of these general conclusions follow.
- If consumers and firms are only approximately rational in this sense, then the conclusions will only be approximately true.

Notice that once you understand where demand and supply come from, its easier to understand why some exogenous changes affect the locations of those curves and therefore market outcomes.

[Some illustrating comparative statics examples will be drawn in class, so see your class notes for illustrations if you are not sure how to shift supply and demand curves yourself.]

X. On the difference between Ricardian and Marshallian long run supply.

A. In the short and medium run, the number of firms in the industry can be taken as fixed.

- As a first approximation, this is also often true in the long run.

B. On this point, however, the Ricardian and Marshallian conceptions of long run supply are quite different and imply different things about the nature of the long run supply curve.

- Long run supply in the Ricardian framework reflects “entry and exit” of firms with different cost functions, with higher cost firms entering last. The low cost producers enter first, other things being equal, and the high cost firms last. (The LR supply curve already includes these effects.)

- **Ricardian long run supply is thus always “upward sloping”** and reflect the **marginal production costs** of firms in the industry. In general, relatively efficient firms (those with better technologies, locations, or natural resources) will continue to earn profits greater than zero in the long run, because they have lower costs than “marginal” firms.

- Long run supply in the "**Marshallian**" long run reflects **entry and exit of identical** efficiently-sized firms into and out of the industry. This process takes place until profits fall to zero. As long as input prices do not change, **Marshallian long run supply**

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curves are always horizontal and reflect the industries average cost (the minimum average cost for each identical firm).

- In the long run, Marshallian firms always produce at efficient scale (at the bottem of their ATC curves) and earn zero profits.
- C. Note the derivation of long run supply in the Ricardian sense, is exactly like that used above for both short and medium run analysis. The number of potential suppliers is essentially fixed (determined by production costs), although the individual firms will alter their production as prices vary.
- It bears noting that the Marshallian model of long run supply works well for some industries (say auto repair shops), and the Ricardian model works well for others (oil, minerals, sports, farming, etc.).
 - We will mostly use the Ricardian model of long run supply in this class, but it should be kept in mind that the Marshallian entry and exit may also be important in some markets.

XI. A Short APPENDIX On Externalities and Market "Failure"

- A. Although markets are an extremely efficient institution for producing goods and services that a broad range of persons want, they are not perfect.
- B. In cases where **external costs** exist, there are costs imposed on others outside the market of interest.
- C. In such cases, competitive market outcomes will (often) fail to maximize social net benefits.
- D. In cases where significant external costs exist at the margin (Q^*), markets will tend to **over produce** the output of interest.
- E. Figure 5 illustrates the "problem of external costs."

In this case, the industry's marginal cost curve does not include all the true costs of production.

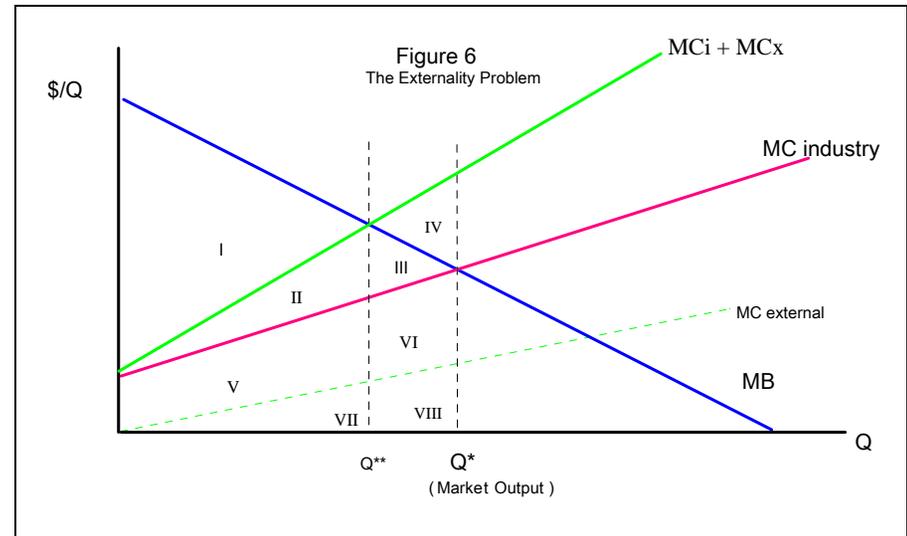
In order to find the social marginal cost, the "external" marginal costs should be added to the industry's marginal costs ($MC = MC_i + MC_x$)

After properly accounting for all of the costs of production, we find that the social net benefit maximizing output, Q^{**} , lies below the market output, Q^* .

At Q^{**} social net benefits equal area I, whereas at Q^* social net benefits equal I - IV (More on this later in the course.)

Markets are sometimes said to "fail" in such cases, because they did not reach Q^{**} .

However, if the externalities are small, market outcomes will be "close" to Q^{**} , and the "failure" will be minor.



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