Consumers, Producers, and the Efficiency of Markets

Willingness to Pay (WTP)

A buyer’s willingness to pay for a good is the maximum amount the buyer will pay for that good. WTP measures how much the buyer values the good.

Example: 4 buyers’ WTP for an iPod

<table>
<thead>
<tr>
<th>name</th>
<th>WTP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anthony</td>
<td>$250</td>
</tr>
<tr>
<td>Chad</td>
<td>175</td>
</tr>
<tr>
<td>Flea</td>
<td>300</td>
</tr>
<tr>
<td>John</td>
<td>125</td>
</tr>
</tbody>
</table>

WTP and the Demand Curve

Q: If price of iPod is $200, who will buy an iPod, and what is quantity demanded?

A: Anthony & Flea will buy an iPod, Chad & John will not. Hence, $Q^d = 2$ when $P = $200.

WTP and the Demand Curve

Derive the demand schedule:

<table>
<thead>
<tr>
<th>P (price of iPod)</th>
<th>who buys</th>
<th>Q^d</th>
</tr>
</thead>
<tbody>
<tr>
<td>$301 &amp; up</td>
<td>nobody</td>
<td>0</td>
</tr>
<tr>
<td>251 – 300</td>
<td>Flea</td>
<td>1</td>
</tr>
<tr>
<td>176 – 250</td>
<td>Anthony, Flea</td>
<td>2</td>
</tr>
<tr>
<td>126 – 175</td>
<td>Chad, Anthony, Flea</td>
<td>3</td>
</tr>
<tr>
<td>0 – 125</td>
<td>John, Chad, Anthony, Flea</td>
<td>4</td>
</tr>
</tbody>
</table>

Welfare Economics

- Recall, the allocation of resources refers to:
  - how much of each good is produced
  - which producers produce it
  - which consumers consume it

- Welfare economics studies how the allocation of resources affects economic well-being.

- First, we look at the well-being of consumers.
### WTP and the Demand Curve

![Graph showing WTP and demand curve with price points and quantities.](image)

<table>
<thead>
<tr>
<th>$P$</th>
<th>Qd</th>
</tr>
</thead>
<tbody>
<tr>
<td>$301$ &amp; up</td>
<td>0</td>
</tr>
<tr>
<td>$251 - 300$</td>
<td>1</td>
</tr>
<tr>
<td>$176 - 250$</td>
<td>2</td>
</tr>
<tr>
<td>$126 - 175$</td>
<td>3</td>
</tr>
<tr>
<td>$0 - 125$</td>
<td>4</td>
</tr>
</tbody>
</table>

### About the Staircase Shape...

This \(D\) curve looks like a staircase with 4 steps – one per buyer.

If there were a huge # of buyers, as in a competitive market, there would be a huge # of very tiny steps, and it would look more like a smooth curve.

### Consumer Surplus (CS)

**Consumer surplus** is the amount a buyer is willing to pay minus the amount the buyer actually pays:

\[
CS = WTP - P
\]

<table>
<thead>
<tr>
<th>name</th>
<th>WTP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anthony</td>
<td>$250$</td>
</tr>
<tr>
<td>Chad</td>
<td>$175$</td>
</tr>
<tr>
<td>Flea</td>
<td>$300$</td>
</tr>
<tr>
<td>John</td>
<td>$125$</td>
</tr>
</tbody>
</table>

Suppose \(P = $260\).

- **Flea’s CS** = $300 - $260 = $40.
- The others get no CS because they do not buy an iPod at this price.
- Total CS = $40.

### CS and the Demand Curve

![Graph showing consumer surplus calculation.](image)

**Flea’s WTP**

\(P = $260\)

- Flea’s CS = $300 - $260 = $40
- Total CS = $40

### WTP and the Demand Curve

At any \(Q\), the height of the \(D\) curve is the WTP of the **marginal buyer**, the buyer who would leave the market if \(P\) were any higher.

### CS and the Demand Curve

Instead, suppose \(P = $220\).

- **Flea’s CS** = $300 - $220 = $80
- **Anthony’s CS** = $250 - $220 = $30
- Total CS = $110
The lesson: Total CS equals the area under the demand curve above the price, from 0 to Q.

CS and the Demand Curve

How a Higher Price Reduces CS

If $P$ rises to $40,

CS = $\frac{1}{2} \times 10 \times 20$

= $100$.

Two reasons for the fall in CS.

1. Fall in CS due to buyers leaving market

2. Fall in CS due to remaining buyers paying higher $P$

CS with Lots of Buyers & a Smooth D Curve

At $Q = 5$(thousands), the marginal buyer is willing to pay $50 for pair of shoes.

Suppose $P = $30.

Then his consumer surplus = $20.

CS with Lots of Buyers & a Smooth D Curve

$P$ is the demand for shoes

The demand for shoes

$D$

$Q$

$100s$ of pairs of shoes

CS is the area b/w $P$ and the $D$ curve, from 0 to $Q$.

Recall: area of a triangle equals $\frac{1}{2} \times$ base x height

Height = $60 - 30 = 30$.

So,

CS = $\frac{1}{2} \times 15 \times 30$

= $225$.

Active Learning 1

Consumer surplus

A. Find marginal buyer’s WTP at $Q = 10$.

B. Find CS for $P = $30.

Suppose $P$ falls to $20$.

How much will CS increase due to…

C. buyers entering the market

D. existing buyers paying lower price

Active Learning 1

Answers

A. At $Q = 10$, marginal buyer’s WTP is $30$.

B. CS = $\frac{1}{2} \times 10 \times 10$

= $50$

$P$ falls to $20$.

C. CS for the additional buyers

= $\frac{1}{2} \times 10 \times 10$

= $50$

D. Increase in CS on initial 10 units

= $10 \times 10$

= $100$
Cost and the Supply Curve

- **Cost** is the value of everything a seller must give up to produce a good (i.e., opportunity cost).
- Includes cost of all resources used to produce good, including value of the seller's time.
- Example: Costs of 3 sellers in the lawn-cutting business.

<table>
<thead>
<tr>
<th>Name</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jack</td>
<td>$10</td>
</tr>
<tr>
<td>Janet</td>
<td>$20</td>
</tr>
<tr>
<td>Chrissy</td>
<td>$35</td>
</tr>
</tbody>
</table>

A seller will produce and sell the good/service only if the price exceeds his or her cost. Hence, cost is a measure of willingness to sell.

Cost and the Supply Curve

Derive the supply schedule from the cost data:

<table>
<thead>
<tr>
<th>P</th>
<th>Q^a</th>
</tr>
</thead>
<tbody>
<tr>
<td>$0 - 9</td>
<td>0</td>
</tr>
<tr>
<td>10 - 19</td>
<td>1</td>
</tr>
<tr>
<td>20 - 34</td>
<td>2</td>
</tr>
<tr>
<td>35 &amp; up</td>
<td>3</td>
</tr>
</tbody>
</table>

Producer Surplus

**Producer surplus (PS):** the amount a seller is paid for a good minus the seller's cost

Suppose $P = $25.

- Jack's PS = $15
- Janet's PS = $5
- Chrissy's PS = $0

Total PS = $20

Total PS equals the area above the supply curve under the price, from 0 to $Q$. At each $Q$, the height of the S curve is the cost of the **marginal seller**, the seller who would leave the market if the price were any lower.
PS with Lots of Sellers & a Smooth S Curve
Suppose $P = $40. At $Q = 15$, the marginal seller’s cost is $30, and her producer surplus is $10.

The supply of shoes

1000s of pairs of shoes

$P$ $Q$

Suppose $P = $40.

At $Q = 15$, the marginal seller’s cost is $30, and her producer surplus is $10.

The height of this triangle is $40 - 15 = $25.

So,

PS = $\frac{1}{2} \times b \times h$

= $\frac{1}{2} \times 25 \times $25

= $312.50

How a Lower Price Reduces PS
If $P$ falls to $30$,

PS = $\frac{1}{2} \times 15 \times $15

= $112.50

Two reasons for the fall in PS.

1. Fall in PS due to sellers leaving market

2. Fall in PS due to remaining sellers getting lower $P$

CS, PS, and Total Surplus
CS = (value to buyers) – (amount paid by buyers)

= buyers’ gains from participating in the market

PS = (amount received by sellers) – (cost to sellers)

= sellers’ gains from participating in the market

Total surplus = CS + PS

= total gains from trade in a market

= (value to buyers) – (cost to sellers)
The Market’s Allocation of Resources

- In a market economy, the allocation of resources is decentralized, determined by the interactions of many self-interested buyers and sellers.
- Is the market’s allocation of resources desirable? Or would a different allocation of resources make society better off?
- To answer this, we use total surplus as a measure of society’s well-being, and we consider whether the market’s allocation is efficient.

(Policymakers also care about equality, though our focus here is on efficiency.)

Efficiency

Total surplus = (value to buyers) – (cost to sellers)

An allocation of resources is efficient if it maximizes total surplus. Efficiency means:

- The goods are consumed by the buyers who value them most highly.
- The goods are produced by the producers with the lowest costs.
- Raising or lowering the quantity of a good would not increase total surplus.

Which Buyers Consume the Good?

Every buyer whose WTP is ≥ $30 will buy.

Every buyer whose WTP is < $30 will not.

So, the buyers who value the good most highly are the ones who consume it.

Which Sellers Produce the Good?

Every seller whose cost is ≤ $30 will produce the good.

Every seller whose cost is > $30 will not.

So, the sellers with the lowest cost produce the good.

Evaluating the Market Equilibrium

Market eq’m:

\[ P = \$30 \]
\[ Q = 15,000 \]

Total surplus = CS + PS

Is the market eq’m efficient?

Does Eq’m Q Maximize Total Surplus?

At \( Q = 20 \),

- cost of producing the marginal unit is $35
- value to consumers of the marginal unit is only $20

Hence, can increase total surplus by reducing \( Q \).

This is true at any \( Q \) greater than 15.
Does Eq’m Q Maximize Total Surplus?

At $Q = 10$, the cost of producing the marginal unit is $25.

Value to consumers of the marginal unit is $40.

Hence, can increase total surplus by increasing $Q$.

This is true at any $Q$ less than 15.

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Adam Smith and the Invisible Hand

Passages from *The Wealth of Nations*, 1776

“Every individual...neither intends to promote the public interest, nor knows how much he is promoting it... He intends only his own gain, and he is in this, as in many other cases, led by an invisible hand to promote an end which was no part of his intention. Nor is it always the worse for the society that it was no part of it. By pursuing his own interest he frequently promotes that of the society more effectually than when he really intends to promote it.”

---

Adam Smith and the Invisible Hand

Passages from *The Wealth of Nations*, 1776

“Man has almost constant occasion for the help of his brethren, and it is vain for him to expect it from their benevolence only. He will be more likely to prevail if he can interest their self-love in his favor, and show them that it is for their own advantage to do for him what he requires of them... It is not from the benevolence of the butcher, the brewer, or the baker that we expect our dinner, but from their regard to their own interest....

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The Free Market vs. Govt Intervention

- The market equilibrium is efficient. No other outcome achieves higher total surplus.
- Govt cannot raise total surplus by changing the market’s allocation of resources.
- *Laissez faire* (French for “allow them to do”): the notion that govt should not interfere with the market.

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The Free Market vs. Central Planning

- Suppose resources were allocated not by the market, but by a central planner who cares about society’s well-being.
- To allocate resources efficiently and maximize total surplus, the planner would need to know every seller’s cost and every buyer’s WTP for every good in the entire economy.
- This is impossible, and why centrally-planned economies are never very efficient.
CONCLUSION

- This chapter used welfare economics to demonstrate one of the Ten Principles: Markets are usually a good way to organize economic activity.
- Important note: We derived these lessons assuming perfectly competitive markets.
- In other conditions we will study in later chapters, the market may fail to allocate resources efficiently...

Summary

- The height of the S curve is sellers’ cost of producing the good. Sellers are willing to sell if the price they get is at least as high as their cost.
- Producer surplus is the difference between what sellers receive for a good and their cost of producing it.
- On the graph, producer surplus is the area between P and the S curve.

CONCLUSION

- Such market failures occur when:
  - a buyer or seller has market power—the ability to affect the market price.
  - transactions have side effects, called externalities, that affect bystanders. (example: pollution)
- We’ll use welfare economics to see how public policy may improve on the market outcome in such cases.
- Despite the possibility of market failure, the analysis in this chapter applies in many markets, and the invisible hand remains extremely important.

Summary

- To measure society’s well-being, we use total surplus, the sum of consumer and producer surplus.
- Efficiency means that total surplus is maximized, that the goods are produced by sellers with lowest cost, and that they are consumed by buyers who most value them.
- Under perfect competition, the market outcome is efficient. Altering it would reduce total surplus.

Summary

- The height of the D curve reflects the value of the good to buyers—their willingness to pay for it.
- Consumer surplus is the difference between what buyers are willing to pay for a good and what they actually pay.
- On the graph, consumer surplus is the area between P and the D curve.