

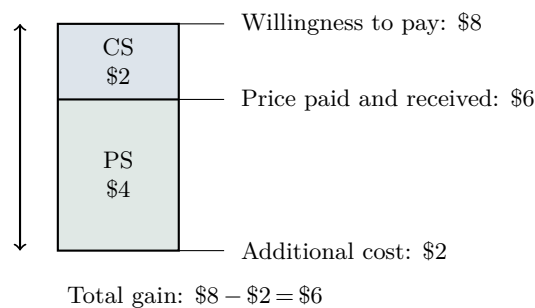
Handout 07 - ECON 101 (Fall 2026)

Measuring Efficiency

1 Surplus Measures the Gains from Trade

Return to Handouts 4 and 6's sandwich market: $Q_d = 18 - 2P$ and $Q_s = P$. Here P is dollars per sandwich and Q is sandwiches per lunch hour. Without intervention, **six sandwiches trade at \$6 each**. The same units apply throughout.

1.1 One sandwich: the price divides the gain



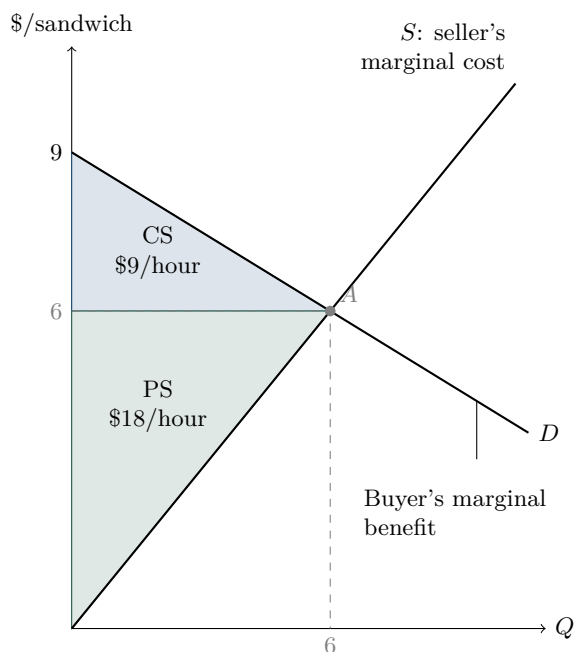
Consumer surplus (CS) is willingness to pay minus the price: here $\$8 - \$6 = \$2$.

Producer surplus (PS) is the seller's receipt minus additional production cost: here $\$6 - \$2 = \$4$.

The buyer's payment becomes the seller's receipt. Their **combined gain** is value minus cost: $\$6$ for this illustrative sandwich. The price divides that gain between them.

If the same sandwich sells for $\$5$ instead, CS is $\$3$ and PS is $\$3$. The total stays $\$6$: a different price reallocates the gain when the trade itself is unchanged.

1.2 All six trades: add the gains as areas



Demand shows the buyer's **marginal benefit**; supply shows the seller's **marginal cost**.

CS: above the price, below demand. Each purchase adds willingness to pay minus $\$6$. Together:

$$CS = \frac{1}{2} \times 6 \times \$3 = \$9.$$

PS: below the price, above supply. Each sale adds $\$6$ minus its production cost. Together:

$$PS = \frac{1}{2} \times 6 \times \$6 = \$18.$$

Total surplus is \$27 per hour: the gains from all six completed trades.

At A , the marginal sandwich adds no surplus: benefit equals cost. **Earlier sandwiches still generate positive gains.** Producer surplus subtracts variable costs; it differs from profit when fixed costs must also be covered, as in Handout 3.

Where to revisit the material. Consumer, producer, and total surplus: textbook Section 7.2, pp. 162–168, slides 16–37, Worksheet 7 Q1, Q3, and Q5. Textbook references use Stevenson and Wolfers, *Principles of Microeconomics*, 3rd ed. Slide numbers count PDF pages.

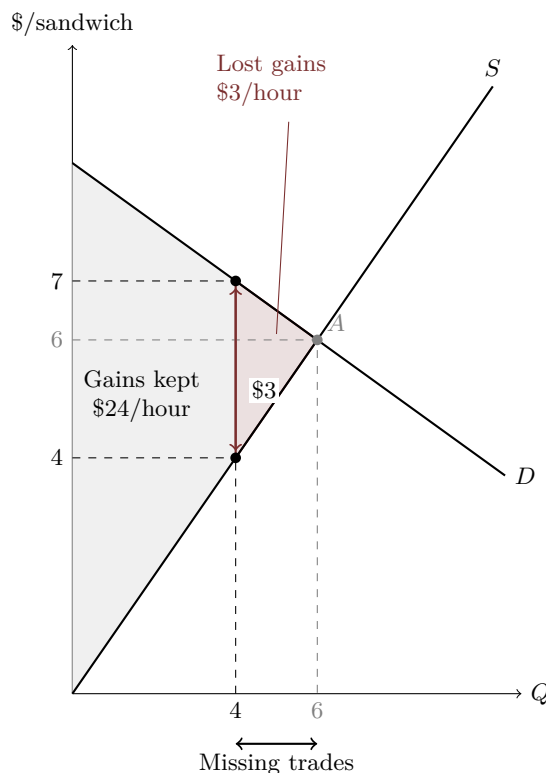
2 Too Few or Too Many Trades Reduce Surplus

Efficiency requires **three things**: goods reach the highest-willingness-to-pay buyers, the lowest-cost sellers produce them, and quantity reaches the point where marginal benefit equals marginal cost. Assume the first two conditions hold below; compare the number of sandwiches produced and traded.

2.1 The gap between benefit and cost tells us what is lost

Both panels use the same market and scales. D measures marginal benefit (MB); S measures marginal cost (MC). The faint point A marks the efficient quantity, six. The heights at four and eight are **benefits and costs**, not a new common transaction price.

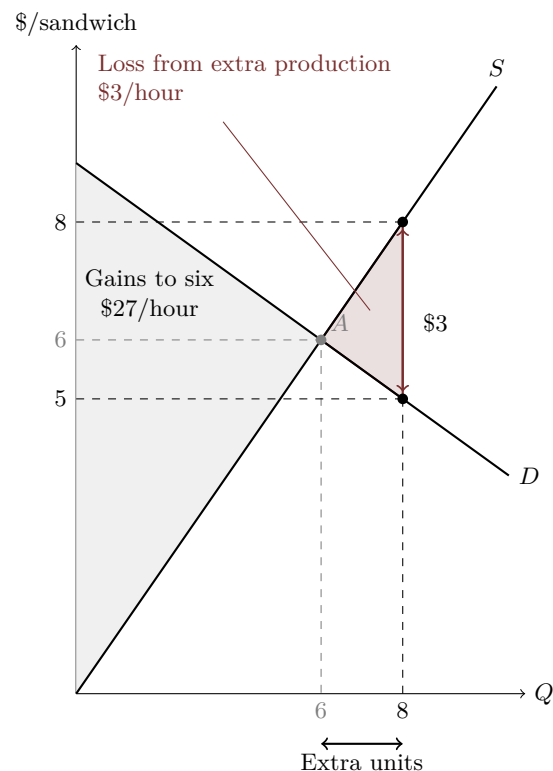
Too few trades: four sandwiches



At four, benefit \$7 exceeds cost \$4.

These missing trades would benefit buyers more than they cost sellers.

Too much production: eight sandwiches



At eight, cost \$8 exceeds benefit \$5.

These extra sandwiches cost more to produce than buyers value them.

2.2 Deadweight loss can come from either direction

Deadweight loss is the reduction in total surplus relative to the efficient outcome. Each outlined triangle has area $\frac{1}{2} \times 2 \times \$3 = \$3$ per hour. At four, \$3 of beneficial trades is missing. At eight, extra production *subtracts* \$3 from the gains to six. **Both leave \$24, compared with \$27 at six.**

The benefit–cost gap shrinks to zero at six. The combined loss across two units is therefore a **triangle**, not a \$3-by-two rectangle.

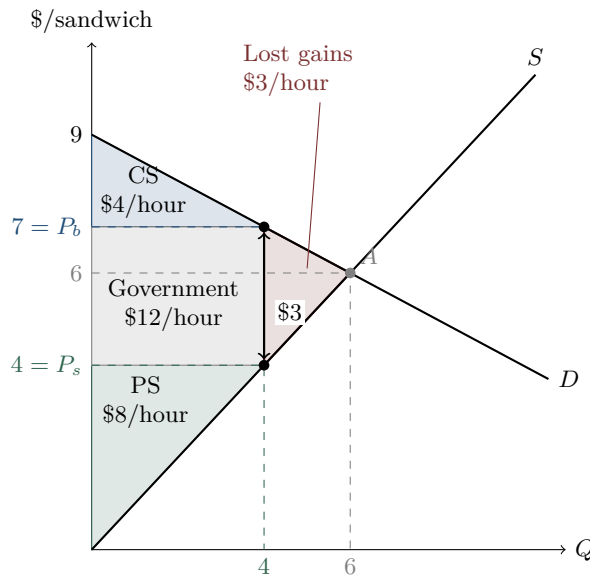
Handout 6's tax reduced trade to four; its subsidy expanded trade to eight. Here we see why each reduces surplus in this market. When an activity affects other people, efficiency instead requires its **social benefits and costs**, including those effects.

Where to revisit the material. Efficient production, allocation, and quantity; deadweight loss: textbook Sections 7.3–7.4, pp. 168–178, slides 39–56, Worksheet 7 Q4. The tax and subsidy quantities: Handout 6, pp. 1–2.

3 Transfers and Losses Are Different

3.1 A tax: include the surplus received by government

Return to Handout 6's **\$3 tax per sandwich**. Four sandwiches trade: buyers pay \$7 and sellers keep \$4. Now label every part of the gains from trade.



P_b is the buyer's payment; P_s is the seller's receipt. The \$3 gap goes to government on each completed trade.

Count the revenue in total surplus:

$$CS + PS + \text{government revenue} \\ = \$4 + \$8 + \$12 = \$24/\text{hour}.$$

Buyers' and sellers' combined surplus falls from \$27 to \$12. Of that **\$15 decrease, \$12 is transferred to government; \$3 is lost gains from trade.**

Revenue counts dollar for dollar here; we omit collection costs. For a **subsidy**, subtract government spending from CS plus PS instead.

3.2 The same total can be divided differently

Surplus received, dollars per hour				
Original market	CS: \$9	PS: \$18		Total \$27
\$3 tax	CS: \$4	PS: \$8	Government: \$12	Lost \$3
\$4 ceiling	CS: \$16	PS: \$8	Lost \$3	Total \$24

The tax and ceiling both yield **four trades**, but divide the gains differently. With the ceiling, buyers pay sellers \$4; government receives no revenue. The dashed gaps show **lost surplus outside the actual totals**. Relative to the original market, buyers gain \$7 of CS while sellers lose \$10 of PS. **Buyers can gain even when the total falls.**

For the ceiling comparison, the four sandwiches reach the highest-willingness-to-pay buyers and are produced by the lowest-cost sellers. Other allocation rules or waiting costs can create additional losses. **Equal quantities alone do not establish equal welfare effects.**

Total surplus measures the size of the gains; the bars show their distribution. A larger total does not establish that everyone benefits or that losers receive compensation. Willingness to pay also reflects ability to pay, so **fairness requires further judgment.**

Where to revisit the material. Policy evaluation, transfers, and fairness: textbook Section 7.1, pp. 160–161, and Sections 7.4–7.5, pp. 173–179, slides 5–14 and 58–68, Worksheet 7 Q4.