X. Zahra uses the low-cost technology;
Y. Zahra uses the high-cost technology and Yakov pays Zahra $250.

Both Zahra and Yakov prefer Y over X. Given such unanimity among the participants, we, as outside observers, should also agree that Y is better than X.

We therefore say that X is inefficient because there is an alternative that benefits at least one party without hurting another party. On the other hand, as long as Zahra uses the noise-reducing technology the outcome is efficient, meaning that it is impossible to make someone better off without hurting someone else.

This efficiency criterion is weak and inconclusive because we rank only those outcomes that the market participants themselves unanimously rank the same way. In our example, there are many efficient outcomes, which differ by the amount (if any) that Yakov pays Zahra. Of course, Yakov prefers to pay less or nothing; Zahra prefers to be paid more. In this book, we do not judge which of these outcomes is better—doing so would require more information about the circumstances as well as contentious criteria about fairness.

### 1.3 Valuation, cost, and surplus

Now let’s turn to the market that we want to study. Recall that each seller has one unit to sell and each buyer is interested in buying only one unit. We use the pronouns “he” for buyers and “she” for sellers.

Suppose that the buyer is faced with the following two options: Either he purchases the good at a price $P$ or he must walk away and not purchase the good at all. Which option does he prefer? For a range of low prices, he prefers to trade (purchase the good); for a range of higher prices he prefers to walk away. There is some cutoff point $V$ that divides the prices at which he trades and the prices at which he does not:

\[
\begin{array}{c@{\quad}c@{\quad}c}
0 & V & \text{Purchase price} \\
\text{Prefer to trade} & \text{Prefer not to trade} \\
\end{array}
\]

This cutoff $V$ is called the buyer’s valuation. (Equivalent terms are willingness to pay and reservation price.)

If he purchases the good, then $V - P$ is called the buyer’s surplus. If he does not, then his surplus is 0. The buyer prefers outcomes that give him the highest surplus.

The seller has a cutoff price above which she prefers to sell the good and below which she prefers not to. This cutoff is called the seller’s cost and is denoted by $C$. It might literally be an amount the seller must pay to produce or obtain the good. Alternatively, it may be how much she values keeping the good for herself: her “opportunity cost” of giving up the good.

If she sells the good at a price $P$, then $P - C$ is called the seller’s surplus. If she does not, then her surplus is 0. The seller prefers outcomes that give her the highest surplus.