**Coase Theorem**

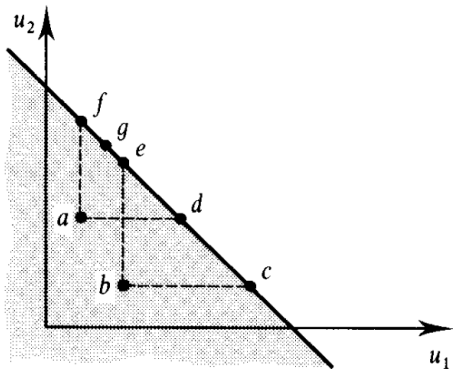
The table below shows the distribution of surplus for each combination of who owns the property rights ($R = i$ means consumer $i$ owns the property rights) and who makes the take-it-or-leave-it offer ($B = i$ means consumer $i$ makes the offer).

The total surplus is the same in each:

$$v_1 + v_2 = \phi_1(h^\circ) + \phi_2(h^\circ)$$

| R | B | Problem | $v_1$ | $v_2$ |
|---|---|---|---|---|
| 1 | 1 | $\max_{h\geq 0,T} \phi_1(h) + T$ s.t. $\phi_2(h) - T \geq \phi_2(h^\star)$ | $\phi_1(h^\circ) + \phi_2(h^\circ) - \phi_2(h^\star)$ | $\phi_2(h^\star)$ |
| 1 | 2 | $\max_{h\geq 0,T} \phi_2(h) - T$ s.t. $\phi_1(h) + T \geq \phi_1(h^\star)$ | $\phi_1(h^\star)$ | $\phi_1(h^\circ) + \phi_2(h^\circ) - \phi_1(h^\star)$ |
| 2 | 1 | $\max_{h\geq 0,T} \phi_1(h) - T$ s.t. $\phi_2(h) + T \geq \phi_2(0)$ | $\phi_1(h^\circ) + \phi_2(h^\circ) - \phi_2(0)$ | $\phi_2(0)$ |
| 2 | 2 | $\max_{h\geq 0,T} \phi_2(h) + T$ s.t. $\phi_1(h) - T \geq \phi_1(0)$ | $\phi_1(0)$ | $\phi_1(h^\circ) + \phi_2(h^\circ) - \phi_1(0)$ |

Graphically, the different outcomes can be represented as follows (as shown in MWG):




- The shaded area is the utility possibilities set and the downward-sloping line is the utility possibilities frontier, the set of Pareto optimal allocations that can be achieved through transfers in the numeraire.
- $a$ is where consumer 2 has the property rights and utilities are $(\phi_1(0), \phi_2(0))$. This the outcome when no bargaining occurs and no externality occurs (because consumer 1 is forbidden to chose $h > 0$).
  - $d$ is where consumer 1 bargains and $f$ is where consumer 2 bargains. Whoever makes the offer extracts the full increase in the surplus.
  - The point $g$ is the outcome from another hypothetical bargaining procedure from when consumer 2 has the property rights and the surplus is shared.
- $b$ is where consumer 1 has the property rights and utilities are $(\phi_1(h^\star), \phi_2(h^\star))$. This the outcome when no bargaining occurs but consumer 1 chooses the competitive amount of the externality.
  - $c$ is where consumer 1 bargains and $e$ is where consumer 2 bargains. Whoever makes the offer extracts the full increase in the surplus.