
Energy Efficiency Policy: Subsidies vs. Mandates

Setup. Consumers are choosing between an efficient air conditioner (E) and an inefficient one (I). The efficient model costs $c_E - c_I = \$100$ more up front. Consumers differ in how much they would save on energy by buying E : lifetime (discounted) savings s are uniformly distributed between \$0 and \$400. Normalize the number of consumers to 1, so $Q \in [0, 1]$ is the share buying E . Ranking consumers from highest to lowest savings gives the *private* marginal benefit curve

$$MB^{\text{private}}(Q) = 400(1 - Q).$$

There are two complications, as in lecture (and Allcott and Greenstone, 2012).

- **Inattention.** When deciding what to buy, consumers only perceive $\gamma = 0.5$ of their energy savings. Purchases are therefore determined by the *decision* marginal benefit

$$MB^{\text{decision}}(Q) = 0.5 \times 400(1 - Q) = 200(1 - Q).$$

Consumers' realized welfare, however, depends on their true savings, MB^{private} .

- **Externality.** Saving energy also reduces pollution. Avoided damages are proportional to energy saved: \$100 for the consumer with the largest savings, and $100(1 - Q)$ in general. The *social* marginal benefit is

$$MB^{\text{social}}(Q) = (400 + 100)(1 - Q) = 500(1 - Q).$$

Welfare is always the area between the relevant MB curve and the incremental cost $c_E - c_I$, up to the quantity actually purchased.

1. The market without policy (baseline).

- (a) Consumers buy E whenever their decision MB exceeds the extra cost. Find the baseline market quantity Q^0 .
- (b) Compute private consumer surplus at Q^0 . (Use the curve that reflects consumers' true savings.)
- (c) Compute social welfare at Q^0 .

2. Policy 1: A subsidy that corrects inattention

The government offers a per-unit subsidy τ for buying E , so consumers pay $100 - \tau$ extra instead of \$100. The subsidy is chosen to offset inattention only: it should lead consumers to buy the quantity they *would* have chosen if they were fully attentive. Ignore the externality when setting τ .

- (a) Find the privately optimal quantity Q^* , where MB^{private} equals the incremental cost.
- (b) What subsidy τ gets inattentive consumers to buy Q^* ? (Hint: at Q^* , decision MB must equal the price consumers face.)
- (c) Compute (i) private consumer surplus with the subsidy, (ii) the government's cost of the subsidy, and (iii) private welfare net of the government's cost. How does (iii) compare to CS^0 from Question 1?

- (d) Compute social welfare with the subsidy and the change from W^0 . (The subsidy is a transfer from taxpayers to consumers, so it does not enter social welfare directly.)

3. Policy 2: Mandating E

Instead of a subsidy, the government bans the inefficient model, so every consumer must buy E ($Q = 1$).

- (a) Compute private consumer surplus under the mandate. Which consumers gain relative to no policy, and which lose?
- (b) Compute social welfare under the mandate. Rank no policy, the subsidy, and the mandate by social welfare. Does the mandate improve welfare?