

Demand Response: Smart Market Designs for Smart Consumers

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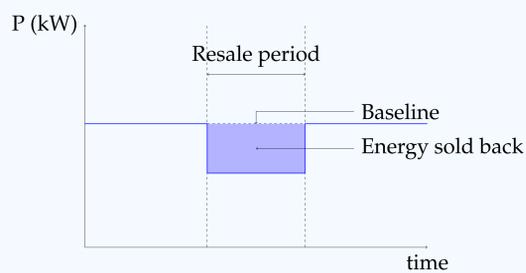
Main Take-Away

PTR programs hide a political choice to give-up incentive-compatibility in favour of political acceptability, implicitly subsidizing consumers in the process. This decision implies both deadweight effects and a need to develop complex monitoring techniques. If - on second thought - such a choice was revised, the relevant political issue would be to increase allocative efficiency as cost-efficiently as possible in terms of public funds. Some complementarities between distinct public policies may then arise:

- local monopolies should make it easier to maintain historical cross-subsidies by allowing a better control of the amount of public funds spent.
- competition should be more efficient at wiping out historical cross-subsidies, given the impossibility to set exogenous constraints on tariffs.

1. Peak-Time Rebates: there is no 'free carrot'

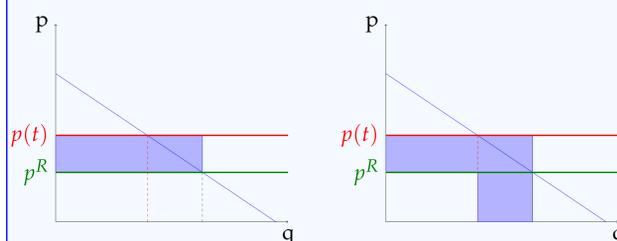
Peak-Time Rebates



- increasing need for flexibility in electricity markets.
- demand-side resources are cheaper than ever.
- PTR have high political acceptability: people (and politicians) prefer carrots to sticks.

Issues with non-strategic consumers

i) Buying first what you resell next

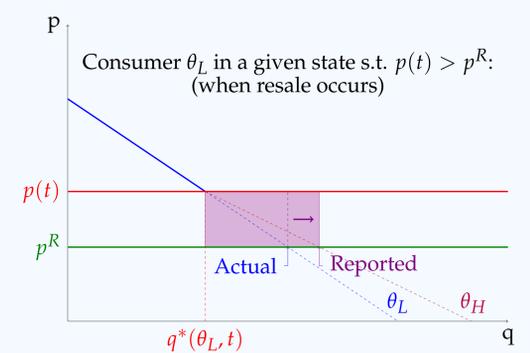


Retailer's on-peak deficit (blue area):
 (1) without PTR (left panel)
 (2) with PTR and free baseline (right panel)

ii) Asymmetric incentives and deadweight effects

- arise because of imperfect baseline setting methods and demand's residual stochasticity.
- decrease the cost-effectiveness of PTR programs (Ito, 2013). Besides random rewards may be perceived as unfair.
- potential trade-off between increasing allocative efficiency and limiting the amount of money spent on subsidies.

Issues with strategic consumers



- PTR provides incentives for baseline inflation: the option value of baseline power is not paid by consumers.
- incentive-compatibility requires that baseline power should be contracted at its forward price.
- such a correction makes PTR equivalent to Critical-Peak Pricing, where full opt-in is no longer guaranteed.

Conclusion: there is no 'free-carrot', the political acceptability of PTR comes at the cost of compromising incentive-compatibility.

2. Consumers' Opt-in to Dynamic Tariffs: a political crossroads

Research question: how to maximize social welfare when dynamic tariffs are introduced as a voluntary alternative to historical tariffs?

We focus on opt-in to Real-Time Pricing (plus a fixed fee). The answer to the above question will be very sensitive to:

- 1) The structure of the retail industry: local monopolies vs. (im)perfect competition.
- 2) The treatment of existing cross-subsidies: 'the fear of large redistributions across customers is possibly the largest impediment to further adoption of dynamic pricing' (Joskow and Wolfram, 2012)

(1) Competition, no CS

- Bertrand competition drives tariffs toward RTP (no fixed fee).
- full-enrollment to RTP is then the equilibrium outcome of perfect competition:
 - $W^{RTP}(\theta) \equiv$ social surplus from trade under RTP for a type θ consumer.
 - $W^0(\theta) \equiv$ historical social surplus from trade for a type θ consumer.
 - $V^{RTP}(\theta) \equiv$ consumer surplus under RTP for a type θ consumer.
 - $V^0(\theta) \equiv$ historical consumer surplus for a type θ consumer.

The historical tariff is not subsidized if and only if:

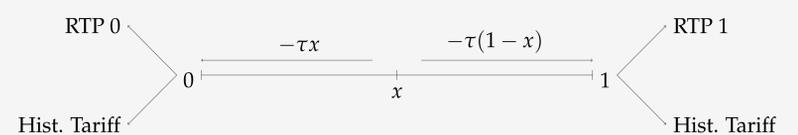
$$\mathbb{E}_\theta \left[\frac{\{W^0(\theta) - V^0(\theta)\}}{\text{Net revenue}} \mathbf{1}_{V^0(\theta) \geq V^{RTP}(\theta)} \right] \geq 0$$

Using $V^{RTP}(\theta) = W^{RTP}(\theta)$, the no cross-subsidies condition can be rewritten:

$$\mathbb{E}_\theta \left[\left\{ \underbrace{W^0(\theta) - W^{RTP}(\theta)}_{\leq 0} + \underbrace{V^{RTP}(\theta) - V^0(\theta)}_{\leq 0} \right\} \mathbf{1}_{V^0(\theta) \geq V^{RTP}(\theta)} \right] \geq 0$$

(2) Competition, maintained CS

- we use Bénabou and Tirole (JPE, 2016) model of imperfect competition:



- entrant retailers do not internalize the social cost of the public funds needed to maintain the historical cross-subsidies.
- perfect competition thus fails to yield the second-best outcome.
- decreasing the intensity of competition may, under some circumstances, increase welfare by alleviating the burden of required public subsidies.

(3) Monopoly, no CS

- a benevolent monopoly can, in theory, replicate the outcome of perfect competition but:
 - i) classic regulatory issues are relevant.
 - ii) exogenous constraints on tariff design can create within switching consumers' cross-subsidies, potentially compromising the unravelling dynamics.

(4) Monopoly, maintained CS

- a benevolent monopoly fully internalizes the social cost of subsidies.
- the second-best outcome is thus reached (formally similar to a Ramsey-Boiteux problem).
- however, classic regulatory issues are of course relevant.

First-Best	Third-Best
First-Best*	Second-Best