REAL-TIME ELECTRICITY PRICING WITH HETEROGENEOUS CONSUMERS: WELFARE AND DISTRIBUTIONAL EFFECTS UNDER VARIABLE RENEWABLE ENERGY SUPPLY

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MOTIVATION
- Time-invariant electricity retail pricing creates short- and long-run market inefficiencies.
- Large-scale diffusion of variable renewable energy sources (vRES) induces growing social benefits from price responsive demand and real-time pricing (RTP) in particular.
- Large-scale smart meter roll-out in EU power systems may be realized in the long run.
- Social acceptance barriers (e.g., from loss aversion, rational inattention) may, however, impede wider adoption of RTP.
- Substantial welfare gains may be left on the table if those consumers oppose to adopt RTP who consume most inefficiently based on their time-invariant retail rates (redistribution of consumption costs among heterogeneous consumers).

MAIN FINDINGS
- Efficiency gains from adopting RTP increase significantly with vRES shares.
- Potential redistribution of consumption costs becomes much less severe with high vRES supply shares.
- Significant portion of potential welfare gains may be lost if mainly largest and “flat consuming” consumers adopt RTP.

NUMERICAL MODEL ANALYSIS
- Long-run equilibrium model of perfectly competitive electricity wholesale and retail market by Borenstein and Holland (2005).
- Equilibrium prices, quantities calculated for 8760 hours/representative year.

RESULTS
- Results driven by isoelastic demand function with own-price elasticity κ = −0.05.
- a% of demand reacts to real-time price p t.
- Comparative statics analysis regarding consumer surplus changes for differing: i. Aggregate RTP share α, sectoral RTP share α n ii. vRES supply share in gross consumption.

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