


Social feedback may impede energy consumption optimization

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Motivation



Social feedback and immediate feedback are two prominent tools that help policy makers nudge individuals towards better energy consumption decisions.

We test the efficacy of social and immediate feedback in a controlled laboratory setting, where individual utility is induced and observable.

Motivation



Programs such as the Home Energy Reports (HER) program informs consumers of their own consumption, of the average consumption of their neighbors, and of the average consumption of the 20% most efficient of their neighbors.

Providing consumers with social feedback via Home Energy Reports (HER) can reduce energy consumption by around 2% (Allcott, 2011; Allcott and Rogers, 2014).

Motivation



The effect of social feedback on energy consumption is, however, not robust, depending on the baseline consumption level (Andor et al., 2017; Schultz et al., 2007).

Nonetheless, social feedback is more cost-efficient compared to more direct interventions such as pricing or investing in direct feedback (Allcott and Mullainathan, 2010).

Motivation



The present study laboratory-tests two interventions that have been proposed in the Israeli electric market: real-time feedback and social feedback.

We constructed a controlled laboratory environment where participants make virtual electric consumption decisions.

Real-time and social feedback are manipulated between subjects.

Experimental design



- Three virtual appliances.
- When turned on, an appliance generates benefits with diminishing returns, and consumes 'electricity' at a fixed rate.
- Twenty-eight rounds, 60 seconds per round.
- A total of 166 participants.



Experimental screen

סיבוב 9 מתוך 28

זמן נותר: 20

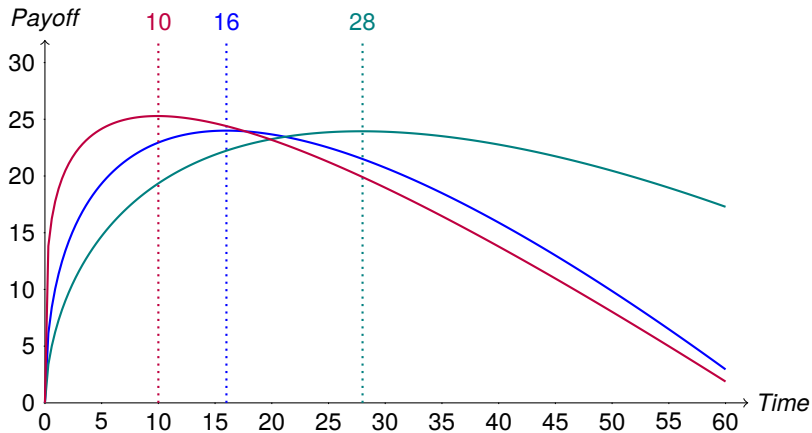
מכשיר 3	מכשיר 2	מכשיר 1
נקודות ממכשיר 3: 36.75	נקודות ממכשיר 2: 77.54	נקודות ממכשיר 1: 62.35
ON	OFF	OFF



The appliances

Appliance	Gains	Energy costs	Optimal consumption	Optimal gains	Optimal costs	Optimal payoff
1	$12 \cdot t^{0.5}$	$1.5 \cdot t$	16	48	24	24
2	$8 \cdot t^{0.62}$	$1.4 \cdot t$	28	63.14	39.2	23.94
3	$19 \cdot t^{0.25}$	$0.85 \cdot t$	10	33.79	8.5	25.29

Optimal consumption



Feedback



We emulate the information available in domestic electric consumption:

- Consumers know whether an appliance is more or less energy consuming;
- Consumers can experience their gain from the appliance (e.g., enjoyment from watching television or comfort from air conditioning);
- Real-time feedback displays the electric usage *rate*;
- Social feedback is presented at fixed intervals, after a given number of consumption periods.



Experimental screen

סיבוב 9 מתוך 28

זמן נותר: 20

מכשיר 3

נקודות ממכשיר 3: 36.75

ON

מכשיר 2

נקודות ממכשיר 2: 77.54

OFF

מכשיר 1

נקודות ממכשיר 1: 62.35

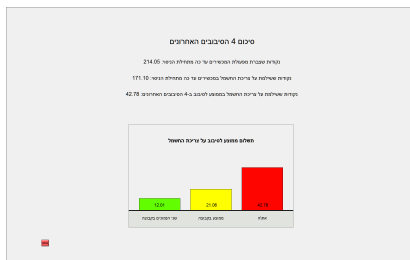
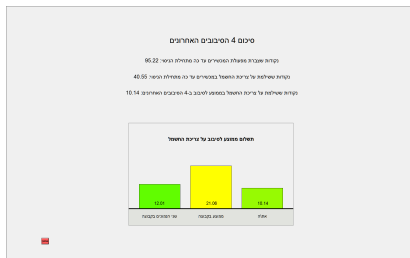
OFF

צג צריכת חשמל לשניה

2.9

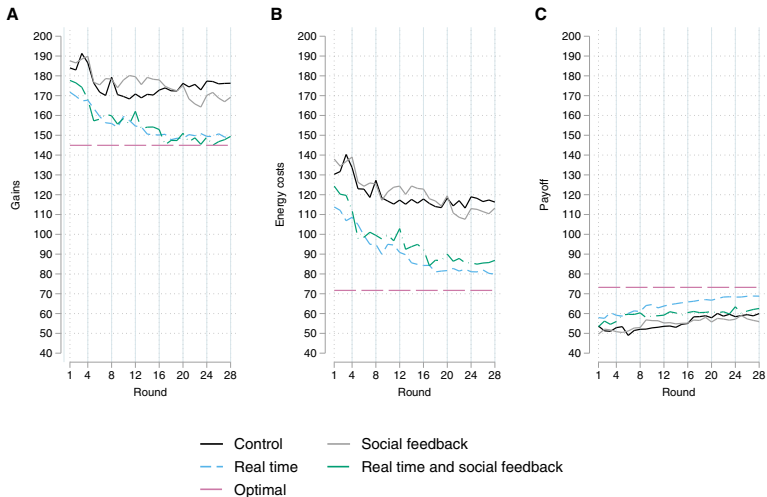


Feedback screens (every 4 rounds)





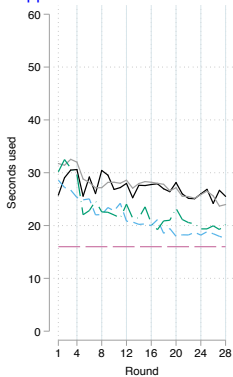
Results



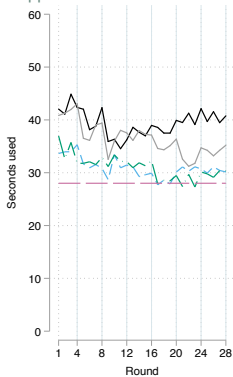


Results

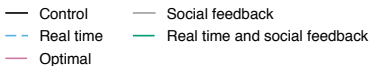
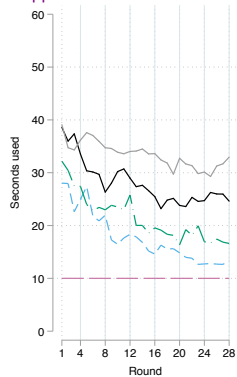
A Appliance 1



B Appliance 2



C Appliance 3





Results

	(1) Gains	(2) Energy costs	(3) Payoff
Real time	-18.068*** (5.938)	-27.215*** (7.083)	9.147*** (2.802)
Social Feedback	4.031 (5.882)	3.642 (6.761)	0.390 (2.350)
Real time × Social Feedback	-2.438 (8.173)	2.013 (9.246)	-4.451 (3.848)
Late rounds	0.772 (3.295)	-4.675 (3.154)	5.447*** (1.081)
Real time × Late rounds	-7.874* (4.347)	-7.893* (4.042)	0.018 (1.720)
Social feedback × Late rounds	-11.636** (4.571)	-9.167* (4.654)	-2.469 (1.592)
Real time × Social Feedback × Late rounds	7.616 (5.994)	8.206 (6.118)	-0.591 (2.402)
Constant	174.974*** (4.754)	121.160*** (5.411)	53.814*** (1.816)
<i>N</i>	4648	4648	4648

Ordinary least square regressions with robust standard errors clustered on subject in parentheses. Late rounds indicate the last two feedback cycles, i.e., the last eight rounds. * $p < 0.10$, ** $p < 0.05$, ***, 0.001 .



Results – payoffs

Marginal effect of real-time feedback.

	Early rounds	Late rounds
Without social feedback	9.15***	9.17***
With social feedback	4.70*	4.12

Marginal effect of social feedback.

	Early rounds	Late rounds
Without real-time feedback	0.39	-2.08
With real-time feedback	-4.06	-7.12 **



Conclusion

The laboratory allows us to 'test run' behavioral interventions before going to the field. Field studies struggle to estimate welfare effects, which are controlled and observable in the laboratory.

Consumption decisions in the experiments only affected the decision maker. The paradigm can be extended to incorporate the (negative) externalities of electrical consumption that exist in the field.



Conclusion

Implementing energy consumption decisions in the laboratory, we find that participants are able to use high-quality immediate feedback to approach optimal decisions.

Social feedback appears to have little effect in our setting, and even impedes learning from real-time feedback.

Previous research established that social feedback may backfire, as it focuses on descriptive norms that may differ from the prescriptive norms (e.g. Schultz et al., 2007).

Our results suggest an additional dark side of social feedback: it draws attention from more objective and informative forms of feedback.

Thank you for your attention!