



Under pressure!

Nudging electricity consumption within firms. Feedback from a field experiment

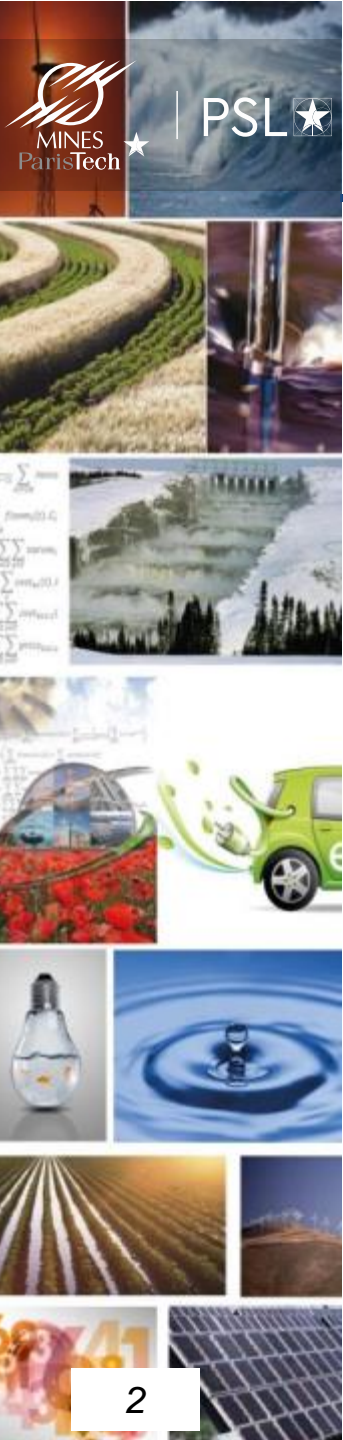
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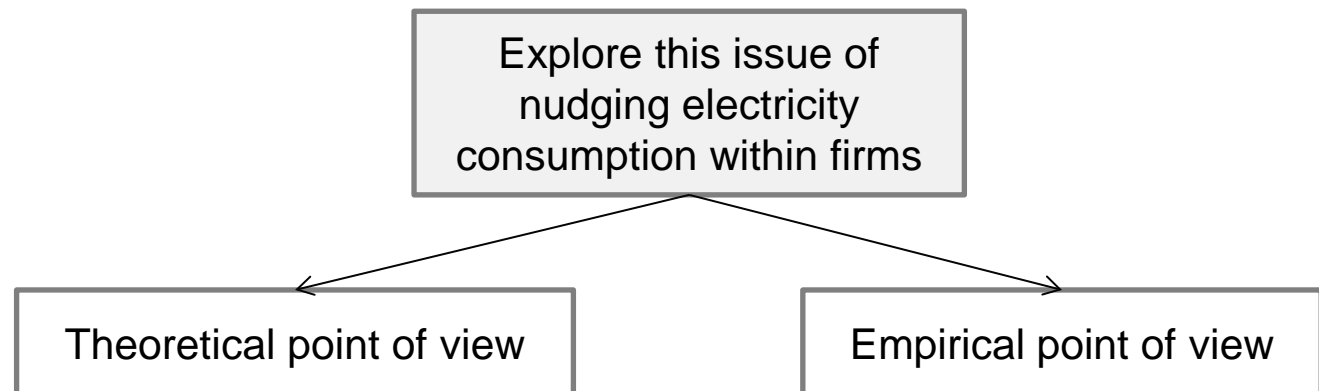
June 20th, 2018

IEW - Chalmers University of Technology - Gothenburg



Objective of the study

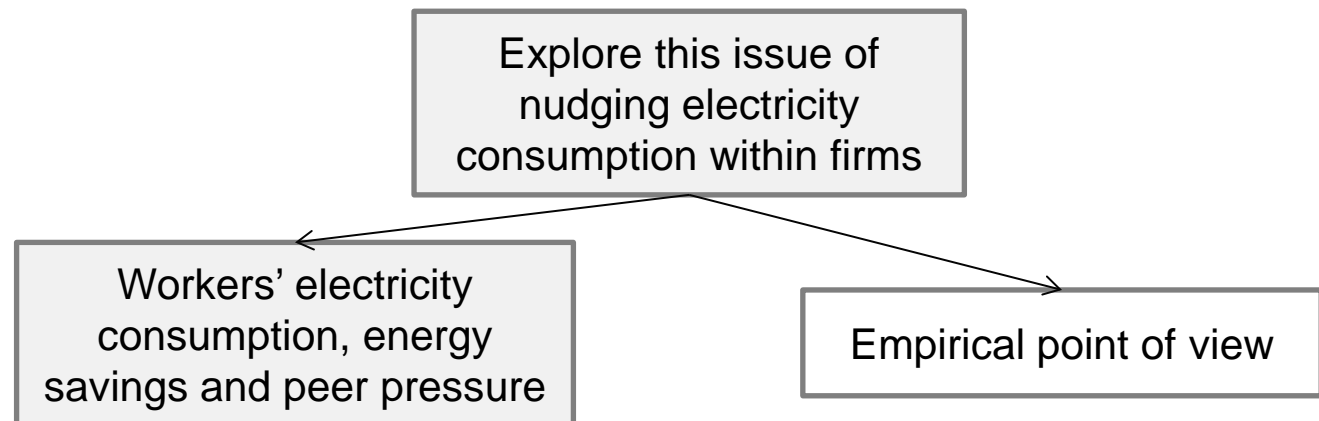
- Energy consumption is an increasing serious environmental issue
- The development of behavioral sciences has raised interest for non-price energy conservation policies
- Nudge: a form of policy aimed at changing individual behaviors without using financial incentives or order
 - ⇒ Induce individuals to choose a wished course of action
- Several experiments testing nudges on energy consumption
 - Households' electricity consumption in residential sites
 - Studies focusing on nudging employees' energy use are rare





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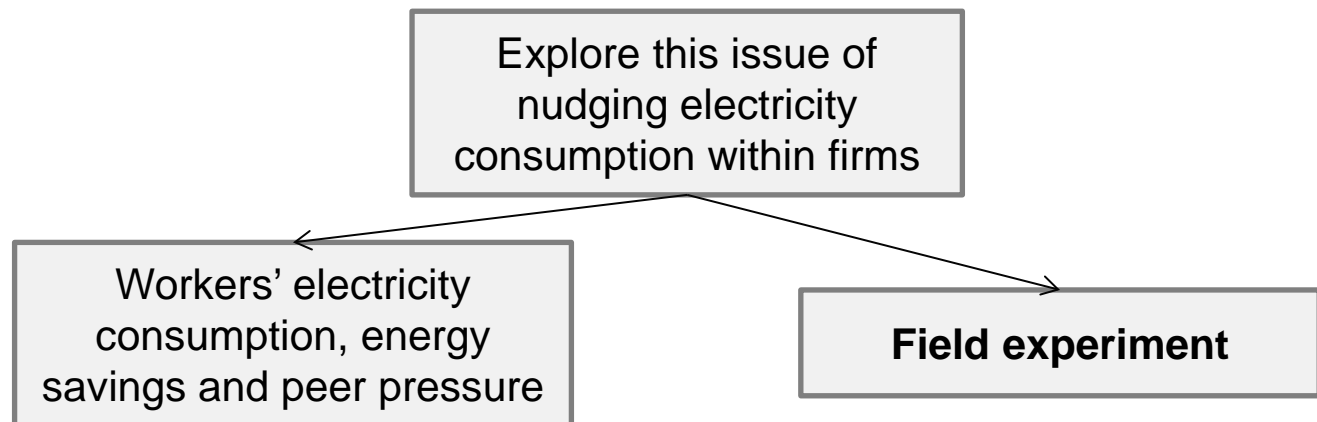
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Field experiment

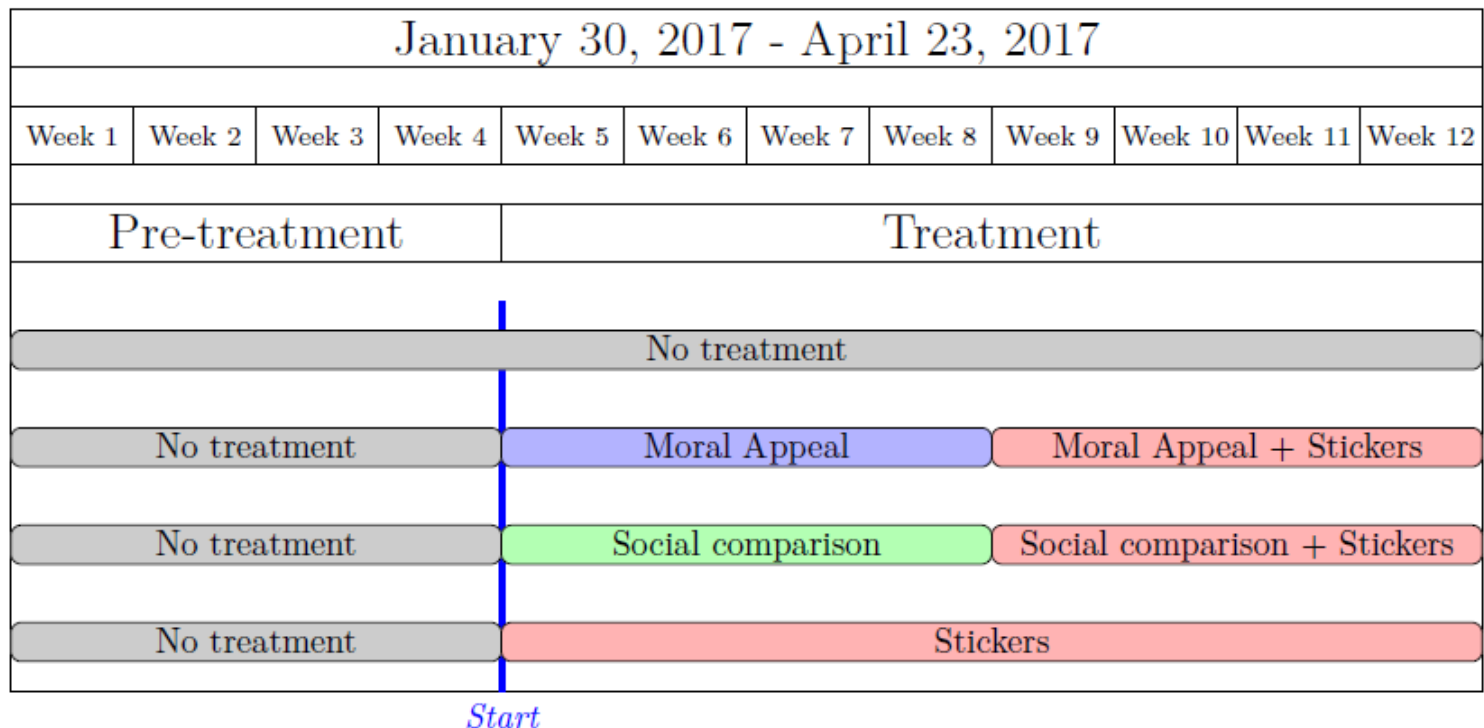
- Particular kinds of information that can be used or not by employees
- Every workers know that others receive the same information
 - The different nudges affect the weight a worker gives to peer pressure
- 3 nudges tested
 - Moral appeal (weekly messages expressing a responsible consideration, human consequences of global warming)
 - Social comparison (weekly reports with peer comparisons of electricity use)
 - Stickers (simply give information on good practices on energy consumption)



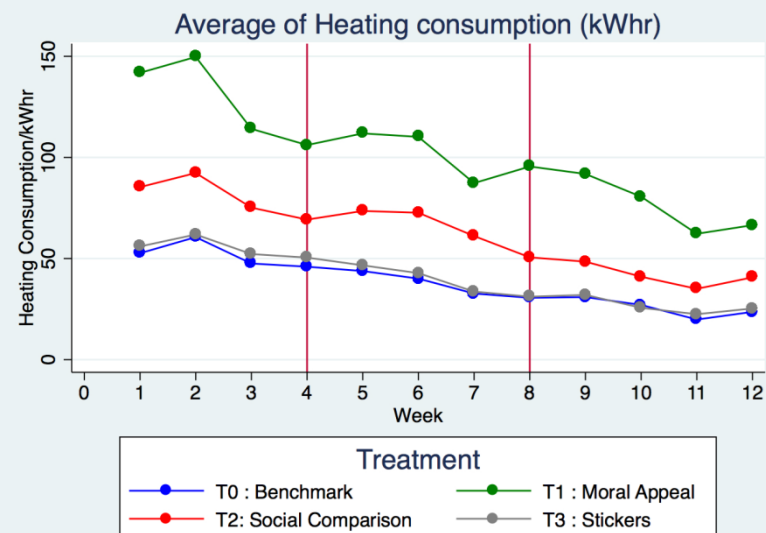
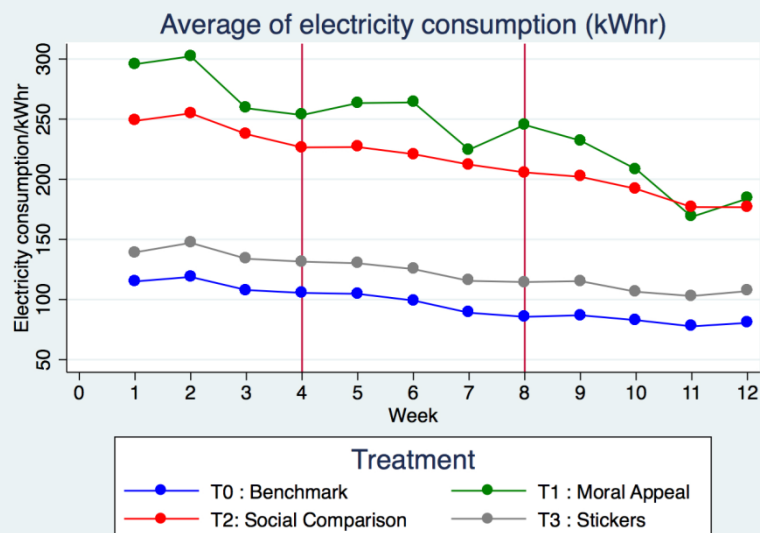


Experimental design

- 47 French commercial companies' sites
 - Randomly assigned to one of the 3 treatment groups or control group
 - BMS
- Baseline period: 12 weeks / Experimental period: 8 weeks
- Surveys (*ex ante* and *ex post*)



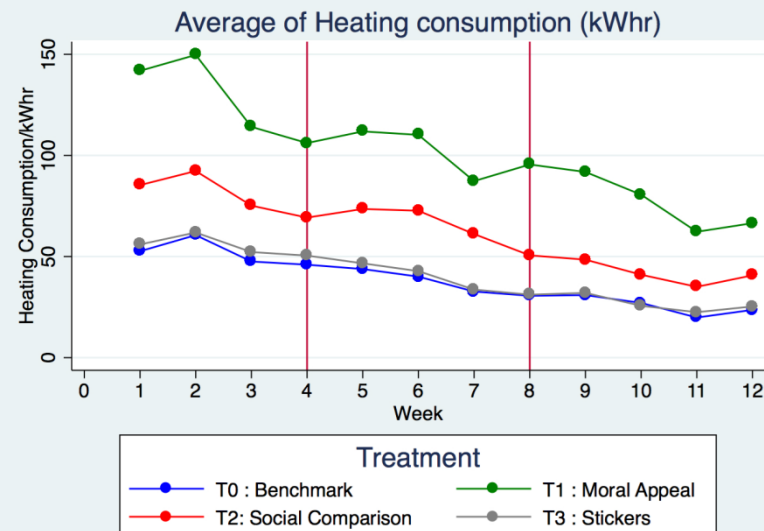
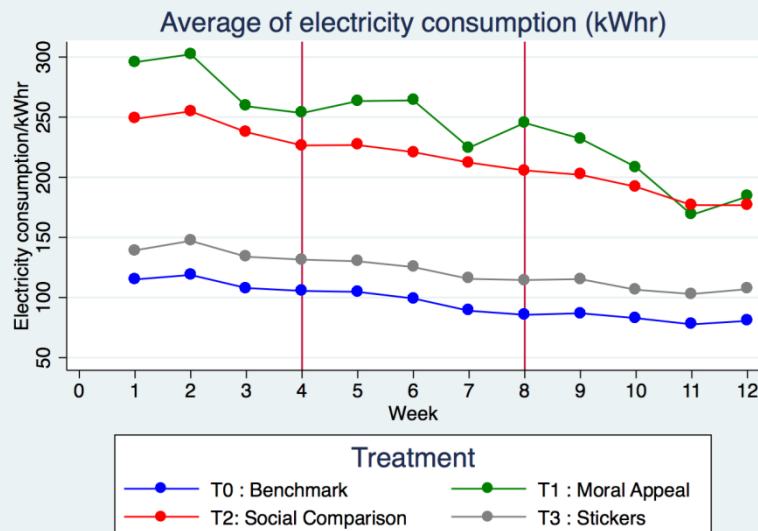
Results



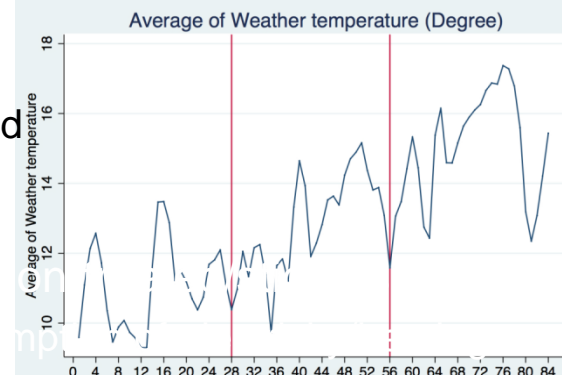
- Decrease of the average consumption



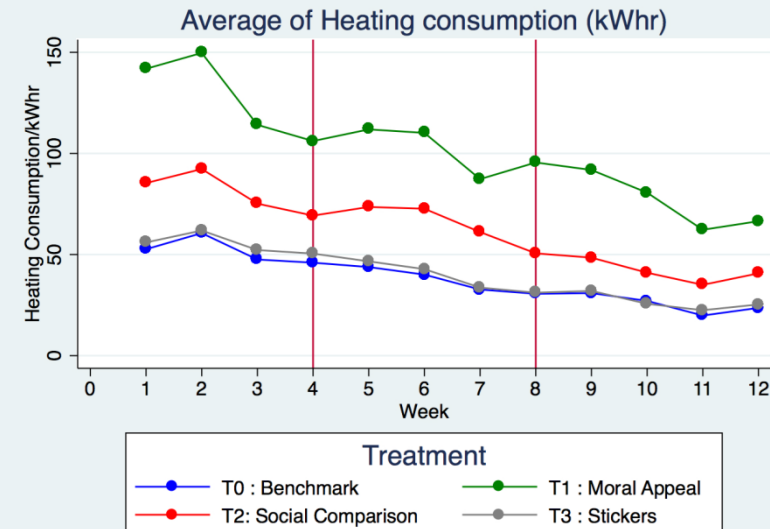
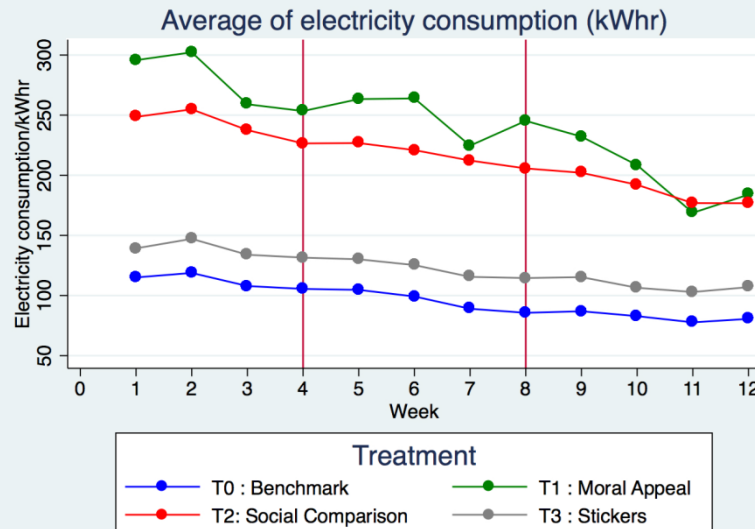
Results



- Decrease of the average consumption
 - Increasing trend of temperature over the period
 - Increase in the hours of sunlight



Results



- Decrease of the average consumption
 - Increasing trend of temperature over the period
 - Increase in the hours of sunlight
- Differences between treatments, except for non-treated/stickers
 - Stickers seems to have no effect on the consumption of electricity/heating
 - Moral appeal treatment is the most fluctuating treatment
 - Consumptions under the social comparison and moral appeal treatments seems to decrease more than what is observed in the non-treated group

Econometric analysis

- Panel data for electricity/heating consumption
 - For 47 sites over the 84 days
- A difference-in-difference analysis
 - External factors affecting both the sample and the control group between periods
 - Changes in weather temperature, socioeconomic characteristics over time, as well as behavioral factors directly or indirectly affecting energy consumption
- Moral appeal:
 - The time of experiment affects significantly the consumption
 - Interaction variable (effect of the combination between two treatments) → The moral appeal treatment alone does not significantly impact the consumption of electricity and heating but becomes effective when coupled with stickers
- Same trend for social comparison
- Stickers treatment alone does not affect energy consumption



Conclusion

- Interesting implications for business strategy and energy savings
 - A manager can use nudges to exert incentive and peer pressure
- Interesting information regarding the three different nudges we used (information delivery, social comparison, and moral appeal).
 - Alone, no significant effects
 - When combined with stickers, they become effective

→ The two nudges moral appeal and social comparison act more as means of creating awareness, while the stickers act more likely as “reminder” of right energy conservation everyday gestures
- *This result seems to be in line with the information delivered by the ex post survey we did after once the experiment ended*





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THANK YOU FOR YOUR ATTENTION !

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Annex - The Moral Appeal treatment

- The first treatment, *moral appeal*, consists in sending messages by email encouraging employees to adopt environmentally friendly behavior by reducing energy consumption.
- This nudge was tested in a field experiment on printing using duplex copiers in Norwegian Universities (Egebark and Ekström, 2016).

Week	Moral appeal message
5	Through our energy consumption we contribute to global warming. 2016, record melting of arctic sea ice. Be involved for change.
6	Through our energy consumption we contribute to global warming. One person moves every second for climatic reasons. Be involved for change.
7	Through our energy consumption we contribute to global warming. The oceans will see "their acidity increase by about 170% compared to pre-industrial levels by 2100" Great coral reefs under threat! Be involved for change.
8	Through our energy consumption we contribute to global warming. Between 2030 and 2050, it is expected that climate change causes more than 250 000 additional deaths per year. Be involved for change.
9	Through our energy consumption we contribute to global warming. Global warming decreases rainfall in the most arid regions and increases it in the most watered regions. Be involved for change.
10	Through our energy consumption we contribute to global warming. Rise of the oceans: The pace is accelerating dangerously. Be involved for change.
11	Through our energy consumption we contribute to global warming. Climate change threatens world food security. Be involved for change.
12	Through our energy consumption we contribute to global warming. Ongoing climate change could cause the extinction of a sixth animal species. Be involved for change.

Annex - The Stickers treatment

- The second treatment is based on visual messages that provide in a playful way, information on several everyday actions that might reduce the individual and overall energy consumption of the company.
- We combine this kind of nudge with several gestures of everyday life.
- Example: a sticker on the office setting thermostat indicating the recommended temperature level, and explaining that reducing the temperature of each room of 1C causes a decrease in individual energy consumption by 7%.

	Idea of this stickers	Stickers positions
1	Reducing the temperature of each room of 1°C causes a decrease in individual energy consumption by 7%. Privileging a sweater guarantees just as much comfort.	Placed near the thermostats.
2	Opening a window, even a few minutes for example to ventilate a room, must be accompanied by a heating cut-off so as not to waste energy during the opening period.	Placed next to the windows.
3	Anticipating the end-of-day heating cut: the inertia of buildings is generally sufficient to switch off the heating 1 to 2 hours before departure.	Placed either beside the thermostats or the heaters.
4	Standby at noon and turn off at night.	Placed on the computer screen, or close to the computer
5	If the laptop battery is sufficiently charged, no need to connect the device. Connect the notebook only if the battery is low.	Placed to the visible sockets commonly used to connect a laptop
6	Print only when necessary.	Placed on the printer.
7	Switch off equipment in case of absence and at the end of the day.	Placed on or near the printer or photocopier.
8	Do not leave a loaded device connected and do not leave a charger plugged into the socket because it consumes as long as it is plugged.	Placed near a plug, close to the office, in the vicinity of a plug used to recharge phones or others for example.
9	Turn-off lights in unoccupied rooms and in case of prolonged absence.	Placed close to the switches.
10	Do not use your desk lamp when daylight illuminates the room in which you work.	Placed near the desk lamps.
11	Be careful not to leave coffee makers switched on when not in use.	Placed on the coffee maker.
12	Reheat only the amount of water you need.	Placed on the kettle.

Annex – *Ex ante* survey informations

- Importance attached to environment in connection with energy consumption by employees
 - Majority of employees declares to attach importance to environment conservation and think that energy conservation is directly linked with it
- Adoption of energy conservative actions at home and at work
 - Simple actions such as switching off the light when leaving a room, and actions implying low costs such as taking care of the energy consumption of lighting and appliances, are found to be the most adopted.
 - More constraining, or more expensive, actions are less frequently adopted.
- Employees' position regarding the information delivered by the different nudges used in the field experiment
 - More information on the consequences on environment of energy consumption is seen by 70% of the respondents as an element that would have a positive impact on their electricity consumption. The nudge "moral appeal" delivering such information should therefore be effective.
 - In the same way the information on everyday energy conservation gestures given by the nudge "stickers" is positively evaluated by 66% of the answers.
 - The information delivered by the nudge "social comparison" obtains 70% of positive feedbacks



Annex – *Ex post* survey informations

- (For example) whereas the messages communicated with the “moral appeal” nudge have been read by 85%, considered as non-intrusive by 72%, and aroused the curiosity of 60% of the respondents who followed the Internet links proposed to get more information, only 28% of them think that these messages had real effects on their electricity consumption.
- The same kind of figure hold for the other nudges: 98% of the respondents read the messages on social comparison, but only 36% estimate that it has changed their electricity consumption, and 90% of the respondents noticed the stickers, with 16% only estimating they changed their electricity consumption.
- The *ex post* survey reveals that 47% (respectively 32%) of the surveyed employees confronted with the moral appeal nudge (respectively the social comparison) coupled with stickers during Phase 2 of the treatment estimates that stickers affected their electricity consumption. The importance attached to moral appeal and social comparison nudges seems therefore to be stronger when coupled with stickers.
- Finally, whatever the phase of the treatment peer pressure is revealed by the *ex post* survey. When they are asked if the change in the behavior of their colleagues they observe following the nudge influences positively their own electricity consumption, they are systematically more numerous to answer yes when they have talked about the nudge with colleagues.



Annex:

Difference-in-differences estimation results by treatment

Variable	Mean	Std.Dev.	Min.	Max.	N
Company size (area)	475.76	730.39	46	4812	4536
Nb Employees	18.65	28.19	1	120	4536
Days Worked	0.71	0.45	0	1	4536
Electricity consumption	157.58	191.06	3	2024	4536
Heating consumption	54.26	64.28	0.22	506	3696
Weather temperature	12.98	3.19	0.32	21.13	4536

	Appeal Moral (T1)		Social comparison (T2)		Stickers (T3)	
	Electricity consumption	Heating consumption	Electricity consumption	Heating consumption	Electricity consumption	Heating consumption
First period of Treatment (29-56 days)	-11.879**	-8.689**	-16.686**	-20.080***	-25.507***	-14.768***
Second period of Treatment (57-84 days)	-13.917*	-8.021*	-125.255***	-34.891***	-46.062***	-22.362***
Treated	84.546***	23.006***	63.126***	-0.541	26.109***	-3.783
First period of Treatment * Treated	-7.278	-7.937	-4.087	2.676	4.916	1.442
Second period of Treatment * Treated	-44.666***	-20.432**	-20.114*	-7.196	7.238	1.297
Days Worked	35.817***	17.588***	37.332***	7.247***	38.749***	21.694***
Weather temperature	-4.974***	-5.549***	-2.350***	0.671	2.466***	-2.229***
Company size (area)	-0.151***	0.006	0.074***	0.081***	0.1197***	0.085***
Nb Employees	17.039***	2.339***	1.376***	2.549***	3.121***	2.916***
Banking Company	447.631***		90.632***		121.04***	
Constant	-384.927***	92.277***	2.166	113.811***	-107.457***	27.849***
R-Squared	0.8574	0.6921	0.4894	0.4580	0.3224	0.4705
N	2016	1764	2100	1764	2016	1764

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.