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Can nudges affect students' green behaviour? A field experiment

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Abstract
Ecological behaviour is impeded both by financial and behavioural hurdles. A growing literature in behavioural economics and psychology suggests the use of non-price intervention nudges over other monetary incentives. We analyse whether nudges are indeed efficient in promoting recycling of resources among young people, and whether the combination of different types of nudges serve as better instruments. The study was performed on primary data from a field experiment conducted among university students in Pisa over a 60-day span. We collected data on 1849 instances of plastic cup recycling at a coffee vending machine at the Scuola Superiore Sant'Anna in Pisa. Recycling behaviour was measured by the number of plastic cups disposed in the proper dustbin, observed at the end of each day. Results of the experimental treatments showed a significant improvement in the amount of recyclable cups when a combination of nudges was applied.

JEL Classification: D03; D11; D78

Keywords
green behaviour — nudge — experiment — abehavioural change — policy

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Introduction

As the world's human population is constantly growing, only few places on the globe escaped the pervasive impact of our species. Many of the world's most difficult conservation problems result either directly or indirectly from people's everyday behaviour, contributing to air and water pollution, land degradation, deforestation, loss of water resources and climate change (Akerlof and Keneddy, 2013). The promotion of a sustainable use of natural resources and change of people's behaviour is one of the most important long-term social and policy challenges which our planet is facing.

Though awareness and readiness to recycle increased in Italy over the past years, a large number of consumers still refuses to dispose recyclable waste in stipulated containers. Even those Italians, who are willing to alleviate the environmental costs and the challenges of climate change, are discouraged to do so after the scandal of the Campania region hit the news (i.e., Mayr, 2014). For years, the Italian mafia has been dumping dangerous waste illegally around Naples in the Campania region[1]. This has resulted in cancer and death rates increase, as well as the highest infertility rate in Italy (Mayr, 2014). Although the Italian legislation attended the issue of waste disposal in 2001, the industry preferred (and still prefers) paying the Italian mafia for avoiding the cost of proper waste disposal. In addition to Italians being unaware of the necessity to recycle, this circumstance offers an excuse for those unwilling to dispose their waste properly and, at the same time, renders those insecure, who wish to contribute to environmental recovery.

While Italian public authorities provide proper waste collection schemes, Italy is still in need of a mechanism that promotes their acceptance and participation of citizens. A functioning mechanism has to go beyond legal measures or monetary incentives, and has to address three factors influencing recycling behaviour: awareness, attitudes and structural barriers (Shaw et al. 2007). Traditional policies of raising awareness and price-based as well as technology-based approaches turned out to be ineffective. Pertinent literature (e.g., Allcott and Mullainathan, 2010; Johnson and Goldstein, 2003; Thaler and Benartzi, 2004) suggests that behavioural approaches, which appeal to social norms, commitment devices, and default options, can be very powerful in changing behaviour.

A growing literature on behavioural economics and psychology recommends using non-price interventions via 'nudges' (e.g., Sunstein and Thaler, 2003; Thaler and Sunstein,

[1] The Camorra (the local mafia) has discovered illegal waste disposal in the Campania region to be a lucrative business. Factory operators in the industrial north paid the Camorra a fractional amount of what an adequate disposal would have cost. As a result, not only did cancer and death rates increase, but also high levels of toxins have been found in mozzarella cheese. See theguardian.com/world/2004/oct/14/italy.sophiearie

2008). *A nudge is defined as* a "helping hand" that will lead someone to make better decisions both for oneself and for the public welfare. The concept of nudges (Thaler and Sunstein, 2008) suggests a policy of libertarian paternalism, favouring simplicity, effectiveness and a relatively low cost of implementation. As suggested by Sunstein and Thaler (2003), 'libertarian' aspect refers to the necessity of respecting everyone's freedom to act, decide or even change their minds as it suits them.

This paper contributes to the literature on nudges as policy-making interventions, by testing whether nudges can affect young consumers' pro-environmental behaviour. We examine the efficiency of specific nudges, which promote recycling. In addition, we study the effect of combining nudges (in our case a social norm nudge with an 'easy to do' nudge), as well as the long lasting effect of nudges on pro-environmental behaviour.

The next section provides an overview of the current literature. The third section illustrates the methodology. Section 4 analyses the empirical results and Section 5 concludes.

Literature overview

Many studies show that appealing to social norms can affect individual behaviour (Cialdini, Reno and Kallgren, 1990; Goldstein, Cialdini and Griskevicius, 2008). People may follow others due to social penalties for non-compliance, or because they believe that others may have better and different information about benefits. Additionally, individuals conform to a norm of pro-social behaviour in order to signal benevolent intentions.

Cialdini and Griskevicius (2008), partnered with a hotel in Arizona to encourage guests to reuse their towels. In this field experiment, researchers signalled to guests that a majority of other hotel guest reuse their towels and ended with the message "Join Your Fellow Guests in Helping to Save the Environment". Inducing reutilization as a social norm, increased towel recycling by 34 percent. Similarly, Allcott (2011) conducted a field experiment on energy conservation and used social norms. Together with a company called OPOWER, home energy use reports were mailed to consumers. Reports included information on how to conserve energy, as well as social comparisons between a household's energy use and that of its neighbours. This monthly program reduced energy consumption by 1.9 to 2.0 percent. In the context of environmental protection, nudges implemented by Goldstein, Cialdini and Griskevicius (2008) and Alcott (2011) have provided supportive evidence that appealing to social norms can affect an individual behaviour.

Results of a recent body of research on default options in many different areas such as pension savings plan, organ donations, retail electricity supplier, show that people rarely choose to switch from a default option (e.g., Johnson and Goldstein, 2003; Alcott, 2011). Some programs obtained strong results by using a default option. In order to tackle the problem of inadequate pension saving in defined contribution plans, Thaler and Benartzi (2004) developed the plan "Save More Tomorrow" (SMT). This plan had components of default options and as a result, employees' average savings were increased by 400 percent. Moreover, Madrian and Shea (2001) found that participation rates in a corporate pension savings plan increased from 65 percent to 98 percent after the default option was changed from non-enrolment to enrolment. Similar results are observed in the context of organ donations in the European Union countries. Johnson and Goldstein (2003) examined the rate of agreement to become a donor across European countries and illustrated that defaults appear to make a significant difference. In countries, in which donation was a default, rates to opt-out of the organ's donation program was much lower compared to countries where opt-in was required.

Regarding the impact of raising awareness of end users on their willingness to recycle, Miranda and Blanco (2010) showed that environmental awareness is still the main factor, which influences paper recovery in European countries. According to Miranda and Blanco (2010), a large variety of tools are available for promoting the development of awareness, based on improving information and educational advertising. The better people are informed about the impact of recycling, the more likely they are willing to comply and the more satisfied they are with their choice to recycle.

The Waste and Resources Action Programme UK (WRAP UK, 2012) suggests that greater public awareness of recycling avenues can be achieved through a number of good practice measures, such as the provision of marketing materials or by developing public engagement. The Department for Environment, Food and Rural Affairs UK (DEFRA, 2008) has defined producers, consumers, retailers, local authorities and the waste management industry as key stakeholders, but emphasised that governments should focus on communicating policy targets to individuals and households by using awareness raising and policy interventions.

Based on Shaw et al. (2007), three factors determine recycling behaviour: awareness, attitudes, and structural barriers. Consequently, we address these factors via a number of different nudges: raising consciousness, conformity, and improving accessibility. Consciousness raising makes people aware that certain garbage is recycled and that only a small change in one's action can make a difference for the environment. The conformity effect can be channelled to induce an external norm and point of reference by illustrating behaviour of an influential reference group. Accessibility can be improved by allowing individuals to recycle in such a way that following the habitual pattern of action is in fact correct behaviour (e.g., by switching the default). This lowers cognitive requirements needed to make a correct decision (i.e., which bin has to be chosen?). Similarly, reducing structural barriers by improving accessibility reduces the cost of the act of recycling. Oftentimes the cognitively least demanding action is also the least physically demanding (e.g., the biggest trash bin) and we will thus not differentiate between an effect enhancing cognitive accessibility and one which improves physical accessibility.

We derive hypotheses:

H1: Using a non-price intervention nudge (social norm) combined with an awareness-raising message positively influences recycling behaviour by affecting awareness and attitude.

H2: Using a non-price intervention –an 'easy to do' nudge– positively affects recycling behaviour by improving *cognitive* and *physical* accessibility.

H3: Using these two nudges jointly will positively affect recycling behaviour more than if only a single nudge is applied.

These hypotheses will be tested and analysed in the remaining parts of this article.

Methods

We studied primary data from a field study conducted among university students in Pisa. Over a span of 60-days (from October to December 2013), we collected data on 1849 instances of plastic cup disposal at a coffee vending machine at the School of Advanced Studies Sant'Anna in Pisa. Users were unaware that they were participants in the study. Recycling behaviour was measured by the number of plastic cups recycled in dustbins at the end of a day. During the observation period, our team would count the number of cups recycled every day before the dustbins were cleaned in the morning. To ensure that participant were not aware that their recycling behaviour was being monitored, counting took place early in the morning when nobody was present near the coffee vending machines.

We used two different treatments for the experiment. During a control period of two weeks, we measured the number of recycled cups without any intervention. In the following, we applied the first and second treatment, each for two weeks. Three months after the experiment, in February 2014, we recollected data on recycled plastic cups for one week to examine the lasting effect of the second treatment.

For treatment 1, we created a message showing signs soliciting participation in a recycling programme. The message, which was designed to reflect the importance of recycling and the environment protection, was not only used to raise awareness, but included an external descriptive social norm. This external norm was induced by informing participants that the majority of other students at one of the world's leading universities recycle. Our message was the following: *Be different! Be better! RECYCLE! Choose the right bin, it is very easy. "Almost 70% of Harvard students RECYCLE". Do you want to lag behind?*[2].

At the School of Advanced Studies Sant'Anna, a majority of students are Italians, but the message was displayed both in Italian and in English to accommodate international students. Based on the foregoing analysis, we hypothesized that the message, which induced external social norm and raised awareness, would result in a larger share of the plastic cups being put in the recycling bin.

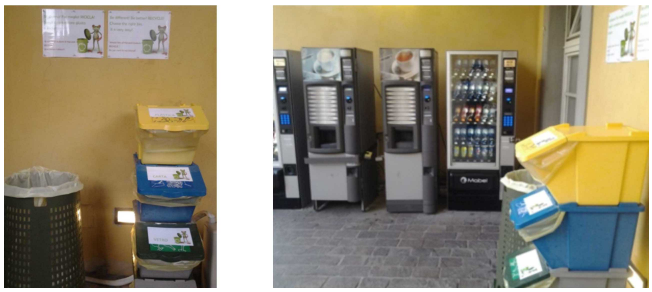

Figure 1. Treatment 1

For treatment 2, we used the 'easy to do' nudge in combination with the social norm. In this way, we made it is easier for subjects to recycle plastic cups by changing the recycling-bin-to-garbage ratio, as it can be seen on the picture below.

Figure 2. Treatment 2

We changed the choice architecture. The big green bin was reassigned for recycling and the small black bin for garbage.

Results

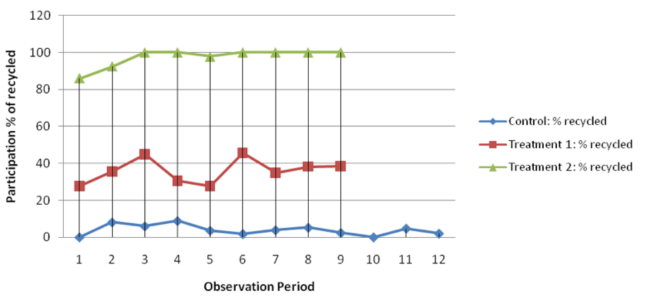

Figure 3. Percentage of recycled cups over the experimental period

[2] In Italian the message was: *Sii diverso! Fai meglio! RICICLA! Scegli il contenitore giusto: è facile. "Il 70% degli studenti di Harvard RICICLA". Vuoi restare indietro.*

In order to determine whether changes occurred in the number of recycled cups after the implementation of the nudges treatments, we first performed an ANOVA test on our data series[3]. ANOVA results illustrate a significant effect after the nudge treatments ($F(2,9) = 786.4$, $p < .0001$) and it shows that the means of the populations are not equal. Based on this result, we tested for differences between means in the control condition and in the treatments.

Consistent with our hypothesis, a t-test revealed that an awareness raising message in combination with the social norm (descriptive norm) nudge, yielded significantly higher recycling rates, increasing the average of 3.91 percent in the control condition to 36 percent in the first nudge treatment ($t(10) = 13.63$ with $p < .0001$). See figure 4 below.

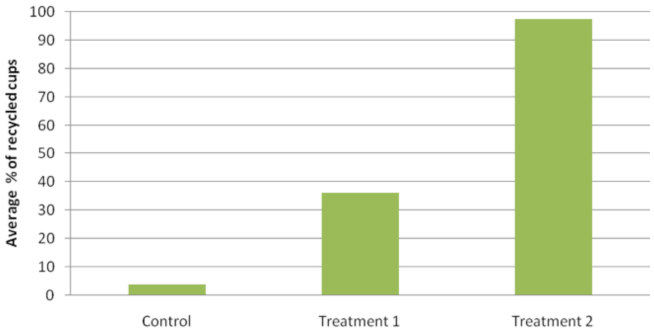

Figure 4. Average of percentage of recycled cups

In order to ensure that students did not dispose all garbage in the same big bin, but continue to recycle their waste, we counted also the properly attributed non-recyclable garbage during the treatment. The results show that the share of correctly disposed recyclable garbage was almost 98 percent and the share of correctly disposed non-recyclable garbage was almost 94 percent. See figure below.

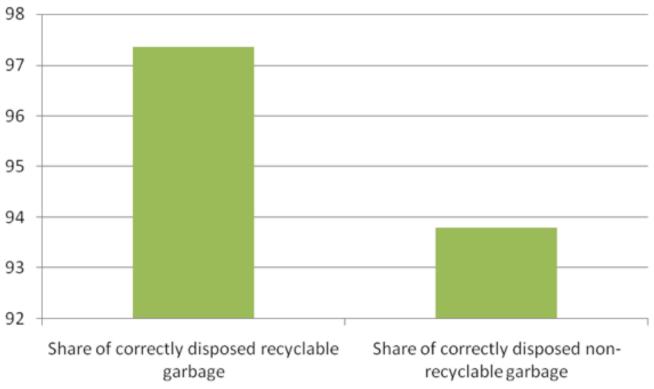

Figure 5. Treatment 2 – Share of correctly disposed recyclable and non-recyclable garbage

[3] Prior to performing ANOVA and t-tests we performed a Shapiro-Wilk test for normality of data. Results confirmed that our data in all the treatments were normally distributed.

In addition, a t-test revealed that the second treatment combining the 'easy to do' nudge and the social norm, positively affected the amount of recycled plastic cups. The second intervention yielded significantly higher recycling of the plastic cups 97.35% on average compared to the average of 3.91% in the control treatment (3.91; $t(13) = 48.53$ with $p < .0001$).

The combined treatment increased recycling of plastic cups with respect to the single nudge (social norm) treatment. A t-test at the .05 critical alpha level revealed that the two nudges condition yielded a significantly higher recycling (97.35%) than the one nudge (social norm) treatment (36.0; $t(15) = 22.31$ with $p < .0001$). Our hypotheses thus proved to accord with the data.

Three months after the experiment, participants were still recycling coffee cups at significant levels. A t-test revealed that the second treatment yielded a significantly higher recycling than the control treatment (68.8; $t(5) = 12.83$ with $p < .00001$) three months after the experiment.

Discussion and conclusion

In the control group, a very low percentage of subjects recycled plastic cups (on average 3.91 percent of recycled cups), illustrating a low level of pro-environmental behaviour and a limited awareness about recycling.

In our treatments, we used awareness raising and non-price intervention nudges. Going beyond existing literature, we studied the joint effect of a combination of nudges. Before the treatment, students threw their cups blindly into the biggest bin, without giving much thought as to whether these cups can be recycled. Since a large majority shared the same disregard, we assumed that students did not pay attention to recycling because either they did not know better or followed others for reasons of conformity, i.e. ignorance was paired with a norms of not caring. In addition, students disposed their plastic cups in the larger bin, not only because it was more salient than the much smaller bin, but mainly because it was also much more accessible.

In the first treatment, we thus triggered a behavioural change via two different effects: awareness raising and an externally imposed norm. The awareness raising effect in addition to the external norm led to a significant improvement in the share of recycled cups by 36 percent. These results are in line with the previous research on the impact of nudges (Goldstein, Cialdini and Griskevicius, 2008). Yet, students still bore the additional inconvenience of opening the correct rubbish bin in order to push their cups inside.

In the second treatment, we counteracted the inconvenience and low accessibility to recycling by reversing the mapping of the bin, making the large bin the one appropriate for recyclable plastic cups. This treatment aligned external norm, awareness, and the convenience of recycling of cups. As a result, cups were correctly attributed in almost 100 percent of the cases.

Both nudges (social norm and 'easy to do') had a significant impact on changing behaviour. Yet, in addition, the

'easy to do' nudge triggered the greatest behavioural change. Moreover, we analysed the long-term effect of the nudges applied and found a long lasting effect three months after the experiment.

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