



Research article

Evaluating the effectiveness of a water conservation campaign: Combining experimental and field methods

David Katz ^{a,*}, Amir Grinstein ^{b,c}, Ann Kronrod ^{b,d}, Udi Nisan ^e^a Department of Geography and Environmental Studies, University of Haifa, Haifa 39105, Israel^b D'Amore-McKim School of Business, Northeastern University, Boston, MA 02115, USA^c Faculty of Economics and Business Administration, VU University Amsterdam, The Netherlands^d Faculty Affiliate Cognitive Science, Michigan State University, East Lansing, MI 48824-1212, USA^e The Federmann School of Public Policy and Government, The Hebrew University of Jerusalem, Mt. Scopus, Jerusalem, Israel

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1. Introduction

Policymakers and social marketers use various policy instruments to influence behavior in order to enforce public policy and achieve social goals. A commonly used classification of policy instruments involves economic incentives, command and control type regulations, and social-marketing efforts that include informational and educational campaigns (Press and Arnould, 2009; Vedung, 1998; Weiss and Tschirhart, 1994). Incentives and regulations are widely used by public policymakers (Bemelmans-Videc et al., 2011; Stern and Dietz, 2002) and their various advantages over awareness-raising informational social-marketing-based efforts are often discussed in the public policy and economics literature. Specifically, it is suggested that policymakers typically employ informational campaigns during short and disruptive crises or when economic or regulatory instruments are not feasible (e.g.,

Stern and Dietz, 2002; Vedung, 1998). Still, despite their wide application, economic and regulatory instruments are not always effective (e.g., Press and Arnould, 2009; Wall, 2005) and suffer from serious limitations, such as imposing regressive cost burdens, being difficult to enforce, creating public antagonism, limiting people's free choice, and encouraging free riders (see, for example, Allcott, 2011; May, 2005; Rothschild, 1999). Conversely, in terms of promoting conservation efforts, two key strengths of informational and social-marketing campaigns over traditional policy instruments are that they create less public reactance and that they may create a longer and deeper change in behavior due to their educational nature (Dietz et al., 2009; Rothschild, 1999). In addition, informational campaigns can be deployed quickly and are often cheaper to implement. Therefore, it is not surprising that conservation campaigns have become a critical part of many regulators' arsenal of policy tools for natural resource management in general and water management in particular (March et al., 2015; Saurí, 2013).

Such conservation campaigns are often introduced or emphasized in times of shortages or crisis, along with other policy instruments, such as price increases, quotas, and other regulatory implements. This simultaneous use of multiple instruments is logical from the perspective of the regulator, as research confirms this strategy's effectiveness in promoting socially desired behaviors relatively to a strategy involving a single type of policy instrument (Dietz et al., 2009). However, the concomitant use of campaigns together with a mix of other policies hinders the ability to determine the actual effectiveness of the campaigns as it becomes difficult to disentangle the relative impacts of each policy instrument used (Michelsen et al., 1999; Syme et al., 2000).

Interest in social-marketing campaigns to promote policy goals has grown over time (Lefebvre, 2013). There is some evidence that such campaigns can be effective in changing behavior, especially for short periods of time and at a relatively low cost (Dietz et al., 2009; Saurí, 2013), however research directly juxtaposing marketing and policy instruments is scarce. Further, relatively little research has looked at the effectiveness of such campaigns over time (Saurí,

* Corresponding author.

E-mail addresses: katzd@geo.haifa.ac.il (D. Katz), a.grinstein@neu.edu (A. Grinstein), kronrod@msu.edu (A. Kronrod), udi.nisan@mail.huji.ac.i (U. Nisan).

2013). Thus, more longitudinal assessments are warranted (Grinstein and Nisan, 2009). To contribute to this evolution, there is thus a need to provide rigorous evidence regarding the benefits of such informational, social-marketing tools in social contexts to enable policymakers to make better use of them, either alone or combined with traditional policy instruments.

In this work we conducted two complimentary studies in the field and online to shed light on the effectiveness of water conservation campaigns. We first conducted a large-scale longitudinal controlled field experiment, in which we monitored actual daily water conservation behavior among 1000 households over a period of six months in order to assess the long-term effect of conservation messages mailed to the customers. The intervention focused on water conservation in Israel, a country which suffers from chronic water scarcity. Importantly, the experiment took place at a time in which the country was suffering from an extended drought. Thus, the experiment measured the effect of the intervention above and beyond general water conservation campaigns and policy measures that were being implemented at the time. Using a difference-in-difference econometric model, we compared water consumption rates for households who received the marketing messages (a set of three mail messages as we detail below) to those from a control group who received no mailing.

Further, in order to evaluate the cost-effectiveness of the campaign, we compare our intervention to other possible policy instruments currently widely in use in Israel and in other countries: one demand management oriented – price increases, an instrument commonly recommended by economists, both in general and in the context of water demand management in particular (Dalhuisen et al., 2003; Olmstead and Stavins, 2009), and the other supply management, in this case the cost of supplying additional water via desalination, which has become Israel's primary source of municipal water over the past decade.

Finally, the field experiment is complemented by an online two-stage experiment that replicates the findings in the field and sheds light on the underlying motivation for water conservation following the campaign. This experiment is also valuable in demonstrating the educational and longer-term value of campaigns relative to price increases, emphasizing that consumers are often unaware of price changes.

Overall, this paper makes three key contributions. First, we offer a longitudinal assessment of the effectiveness of a real-world water conservation campaign. This enables us to test the time boundaries of an effective campaign. Second, replicating the real-world findings in a clean setting sheds light on the underlying mechanism that drives the success of conservation campaigns. Finally, we compare the impact of our intervention with the effect of an alternative policy instrument, price increase, demonstrating the educational, economic and social advantages of campaigns as part of a conservation policy toolkit.

2. Literature review

2.1. Traditional policy instruments for water management

The depletion of water resources is an increasing concern for policymakers, given the critical role of water not only for provision of basic needs, but also for sustaining economic growth, political stability, and ecosystem health. Policymakers use a variety of instruments to address water resource scarcity, including both supply and demand management options.

Supply augmentation has been the traditionally preferred method of water managers for dealing with water shortages (Halich and Stephenson, 2009). However, demand management options are often viewed by policymakers and others as preferable

to supply-side solutions for both economic and environmental reasons (Gleick, 2003). Command and control regulatory instruments to reduce consumption include restrictions on water use (e.g., limitations on lawn irrigation or car-washing) and mandating conservation technologies (e.g., low-flow taps and toilets or grey-water systems). Economic instruments generally focus on water pricing or comparable policies, such as rebates for conservation. Economists especially tend to recommend pricing tools, claiming that they require less monitoring and enforcement, offer more freedom of choice and tend to be more reliable and more cost-efficient. Other advantages include the possibility of better reflecting actual costs and providing finance for what is often a highly subsidized commodity (e.g., Olmstead and Stavins, 2009).

An extensive literature exists on economic instruments for water management, including incentivizing conservation (for a review see Worthington and Hoffman, 2008). Price increases are a commonly recommended tool, however, there are several limitations and obstacles to its implementation. For one, urban and residential water demand tends to be inelastic (Bauman et al., 1998; Dalhuisen et al., 2003; Espey et al., 1997). The main reasons suggested for low elasticity of water demand are lack of substitutes for water and the relatively small share of water usage in the overall expenses of a typical household. A primary implication of relatively inelastic demand is that price increases generally need to be substantial in order to achieve significant reductions in water: Consumers often do not respond to small changes in the price of water (Bauman et al., 1998). Large price increases, however, may reduce the political acceptability of such policies.

Equity concerns can also impede use of price mechanisms in the case of controlling water demand, especially given the perception of water as a human right. Price increases also tend to be regressive, meaning that poorer households bear a proportionally larger share of the cost burden (Olmstead and Stavins, 2009). Such distributional concerns can be remedied with instruments such as rebates, but these tend to be complicated. Block tariff rates are a common method of addressing distributional concerns. Incentivizing conservation by raising prices on upper tiered blocks has the advantage of reducing the impact on low-use consumers, and targeting high-use consumers, who often are both better able to pay for water and can more easily change consumption patterns. However, because such a policy only affects a segment of all users, it necessarily entails even higher price increases relative to price increases for all tariff levels in order to achieve the same quantity of water savings. Moreover, empirical evidence shows that the increasing block tariffs (IBT) structure can have unintended consequences that can erode its effectiveness as a means of addressing equity considerations (Dahan and Nisan, 2007).

An additional problem with using price instruments is that residential water is generally not purchased at the time of use. Rather, consumers receive a bill only after the consumption has taken place, often weeks later. This can result in a time lag between the impact of the price increase and the change in consumer behavior, often decreasing the effectiveness of the price instrument (Gaudin, 2006). In order to avoid this lag, water utilities will often embark on a campaign in advance of the price changes to inform consumers. Such actions can themselves be a type of awareness-raising informational campaign. In general, consumers often take time to adjust to price changes. Several studies have found that short-term demand tends to be significantly more inelastic than long-term demand (e.g., Espey et al., 1997; Dalhuisen et al., 2003). Furthermore, as prices for water are usually regulated, the bureaucratic process of changing prices can often be lengthy. Thus, these lag times can be a significant disadvantage if a rapid response is desired, as in the case of responding to a seasonal drought.

A growing body of research has attempted to assess the impact

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