



Social proof is ineffective at spurring costly pro-environmental household investments

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ABSTRACT

One of the most popular techniques of persuasion in online marketing is social proof, also referred to as social validation. It takes advantage of the fact that when other individuals have decided in favor of a particular behavior people are more likely to follow that behavior as it is perceived as more valid. Yet there is a theoretical reason to be skeptical about the effectiveness of this persuasion technique for the encouragement of more costly investment decisions taken under high uncertainty. This study investigated the effectiveness of social proof in influencing consumer responses to calls for action on a bank's sustainable home improvement website. A first field experiment investigated whether participants engaged more with a webpage that provided a personalized testimonial or informed users that thousands of other clients had used the bank's sustainable home improvement services. A second field experiment encouraged clients to use the bank's services to obtain solar panels and we again investigated whether clients engaged more with a webpage that provided a personalized testimonial rather than without such a testimonial. Clients were directed to these webpages through a newsletter that is distributed to half a million clients of the bank. Overall, our evidence suggests that messages of social proof are ineffective at urging customers to consider larger pro-environmental household investments, let alone making those investments.

Keywords: social proof, complex contagion, pro-environmental investments, online marketing

INTRODUCTION

In the context of the energy transition, forms of social influence are used as a policy instrument for mobilizing collective behavior to fight climate change and allow countries to meet their climate goals (Ministry of Economic Affairs and Climate Policy, 2020). Social influence is often defined as a change in a person's attitudes or behavior due to interactions with other people. It can be distinguished from conformity and coercion, the latter referring to behavioral changes that occur more reluctantly and forcefully (Rashotte, 2007). There are many forms of social influence techniques and marketing practitioners are said to have "nearly limitless arrays of motivational strings to pull" to stimulate consumers to participate and purchase environmentally friendly products (Goldstein et al., 2007). Within the field of psychology and social influence, the universal principles of persuasion have been identified by Cialdini (2001) as liking, authority, social proof,

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scarcity, and reciprocation, which can be utilized off- and online to aid in persuading consumers. Thaler and Sunstein's (2009) book "Nudge", where persuasion principles are used to encourage desirable behavior, identified a form of social influence called "choice architecture", which gained much popularity in the behavioral sciences. However, despite their popularity and encouraging findings regarding low-threshold decisions, it remains uncertain if such persuasion techniques are also effective in the context of more costly pro-environmental investments whose returns are uncertain. Households encounter several types of decision situations, from adapting straightforward behavior and habits like adjusting one's room temperature to decreasing energy usage up to complex investment decisions such as insulating one's home or installing a new heating system with thousands of euros and permanent changes in living quality at stake.

The social network literature distinguishes two kinds of social contagion. The first is simple contagion: an adoption process for which only a single contact is required for transmission between a source and a destination (Centola & Macy, 2007). Examples are viruses, basic information, and risk-free behavioral changes with obvious benefits. In these cases, exposure is sufficient for propagation. The second kind is complex contagion, an adoption process for which adoption requires prior adoption by multiple network contacts (Centola & Macy, 2007). Examples are actions that violate an established norm or uncertain investment decisions that are only attractive if others confirm they are sensible. In complex contagions, an individual's threshold indicates the number or proportion of network neighbors who need to adopt a behavior before a focal individual will adopt it as well (Granovetter, 1978).

We argue that making costly pro-environmental investments with uncertain returns is a behavior that might not always spread through mere exposure or light forms of persuasion. It could be that such investment decisions are not able to spread unless reinforced through the prior adoption of many friends, colleagues, and neighbors in local networks. Therefore, it seems vital to examine if the often-used social proof persuasion techniques based on research that has focused on easier-to-adopt behavior are also applicable to larger pro-environmental investment behavior. We use social proof as it is described by Cialdini (2001, p. 78),

"One fundamental way that we decide what to do in a situation is to look to what others are doing or have done there. If many individuals have decided in favor of a particular idea, we are more likely to follow, because we perceive the idea to be more correct, more valid."

Investigating if social proof, one of the most popular principles of persuasion in the online realm (Fenko et al., 2017), is also effective for the proliferation of costly behavior, such as the making of pro-environmental investments, is the aim of this paper. More specifically we focus on the very first phase of making a larger investment, namely the orientation phase, by examining if the positive effect of social influence messages found for simple behavior remains relevant for the first step of information seeking before making more costly investment decisions.

LITERATURE REVIEW

We consider whether light persuasion techniques like social proof apply to high-cost/high-risk behavior by first examining the existing literature on the effectiveness of forms of social proof for encouraging more straightforward adoptions. Then we argue why a difference in effectiveness can be expected between the use of techniques for stimulating such straightforward behavior and convincing people to adopt larger, more complex behavior. We raise the question until when social proof techniques remain effective.

Due to the increasing importance of online orientation and purchasing this domain seems the most applicable to investigate the effects of social proof especially since corporations have spent millions on designing their corporate websites, yet many websites have failed to reach their organizations' goals resulting in the higher importance of online persuasion, and the research related to it (Hausman & Siekpe, 2009). Research investigating the effectiveness of persuasion techniques that focus on product popularity using claims such as "94% of consumers bought this product after viewing this site" indicate that such claims increase the quality perception of products and work particularly well among risk-averse consumers (Jeong & Kwon, 2012). With much of this research being based on Festinger's (1954) famous social comparison theory that explained that individuals compare themselves with others to determine their abilities and opinions. Among online shops, testimonials are attributed great importance in the success of marketing campaigns as

getting customer feedback has become a priority with companies' focus shifting towards the quality of service (Meyers, 2021). In the healthcare sector, the use of regular personal testimonials in marketing has been shown to increase perceptions of trust (Kemp et al., 2015).

Testimonials are fundamentally different from reviews as they are normally given to a company themselves and are solicited and used by those companies in marketing to provide a more specific description of what went well with regards to the experience with a product or service, whereas reviews tend to be shorter and are given to third-party websites having more influence through their quantity and independence (Donnell et al., 2022). Experimental research in the healthcare sector has shown that the effect of persuasive messages in the form of personal testimonials can be more effective in increasing risk perception and intention to get vaccinated compared to presenting objective statistics (de Wit et al., 2008). Testimonials have been shown to trigger pro-environmental behavior such as purchasing non-overpackaged goods, even when this is not the behavior of the majority (Elgaaied-Gambier et al., 2018). Furthermore, identification with a non-famous and normal endorser is shown to increase the credibility of advertisements (Elgaaied-Gambier et al., 2018).

For this study we focus on examples and research related to the pro-environmental behavior contexts, however, variations of social proof heuristics apply to a large variety of contexts, such as influencing the purchase of tickets for culture or entertainment events (Fenko et al., 2017). Meta-analysis has indicated that there are various ways of successfully utilizing social influence in the field of pro-environmental behavior (Abrahamse & Steg, 2013). Studies utilizing social proof as a social influence technique have done this successfully by presenting descriptive norms as a percentage or number of people following a certain norm (Goldstein et al., 2007; Han & Hyun, 2018). Recent findings even show that descriptive norms can encourage the adoption of pro-environmental behavior when it does not reflect the behavior of the majority, as long as the advertisement is seen as credible (Elgaaied-Gambier et al., 2018). Goldstein et al. (2007) show how social norms can motivate simple environmental conservation in hotels. In their experiments, they tested and compared social influence techniques by placing different signs urging guests to reuse their towels. They compared standard environmental messages that focus guests' attention on environmental protection, injunctive norms through a request to help the hotel save energy, and a descriptive norm message informing guests that a majority of other guests had participated in reusing their towels to help the environment, demonstrating that the latter was the most effective. Goldstein et al. (2007) argue that as part of a constant learning process people adapt behavior toward decisions that have led to the best outcome in the past. To simplify decision-making, especially in uncertain circumstances, individuals often generalize their own and others' previous experiences. Other studies that have focused on encouraging simple pro-environmental behavior utilizing a form of social proof to invoke social norms have demonstrated that this form of social influence can be effective in lowering electricity consumption (Schultz et al., 2018) as well as water conservation (Han & Hyun, 2018).

We aim at expanding this line of research and investigating to what degree these findings are translatable towards more costly investment decisions. As mentioned above, the social network literature indicates that there are two kinds of adoption processes through networks: simple contagion requiring only a single contact between a source and a destination for transmission (Centola & Macy, 2007), and complex contagion requiring adoption by multiple network contacts before it can be adopted by a target (Centola & Macy, 2007). An example from epidemiology that serves as an apt illustration of the difference between these two adoption processes is the ease with which HIV spreads contrasted with the great difficulty to get people to adopt preventative measures (Lehmann & Ahn, 2018). Infectious diseases are considered a simple contagion requiring only one activated source for transmission, while preventative measures that can be costly, difficult, or unfamiliar are complex contagion processes of behavior, attitudes, or beliefs requiring more extensive exposure and convincing. Following the theory of complex contagion, it seems that the effectiveness of social proof decreases with the cost and uncertainty associated with a focal decision. Complex contagions seem to undergo a process of stages ranging from the first time one hears about a pro-environmental investment opportunity up to the actual purchase decision, with several social influence stages in between.

We focus on one of the first stages, namely the beginning stage of orientation and information seeking. We argue that it is essential to examine if the often commercially used social influence technique of social proof is still effective in advocating behavior when it is more uncertain and costly. We, therefore, investigate

if individuals contemplating making a larger pro-environmental investment are still susceptible to social proof at the orientation phase, where social proof techniques are simply used to influence consumers to request more information. Since we are investigating this first and simple orientation step we base our hypotheses on the success of social proof studies so far.

We collaborate with one of the largest banks in the Netherlands to investigate if the mentioned findings of the social influence literature are also applicable to the orientation process for the more costly decisions of improving the sustainability of one's home or acquiring solar panels. We test if two variations of social proof, a more qualitative and personalized testimonial approach or a quantitative information and descriptive norms approach, are effective in encouraging clients to act and inform themselves about potential multi-thousand euro home investments. An additional explorative analysis is done to investigate whether one of the two approaches is more effective than the other.

The websites that include social influence information are therefore expected to result in more engagement with the website. Clients are expected to click more on the links that provide further information on how to finance sustainable home improvements, governmental subsidies, a tool to calculate how to increase the sustainability of their home, or a link to request a personal advice talk.

- H1.** The social influence technique of showing a testimonial leads to more website engagement than a control website without such a testimonial.
- H2.** The social influence technique of showing descriptive norms, in the form of the number of bank clients that have used a sustainable home improvement scan of the bank, leads to more website engagement than the control website without this information.

METHODOLOGY

We advised on the design and implementation of two field experiments conducted by the bank. The bank aims to make their sustainability websites as engaging as possible by providing information and stimulating their clients to use the bank's services and take up loans to invest in sustainable home improvements. For the first field experiment, three otherwise identical websites A, B, and C were built with the only difference being the kind of additional social influence information that was provided on each of these websites. For the second field experiment, two otherwise identical websites A and B were built with the only difference being the kind of additional social influence information that was provided on each of these websites. Experiment 1 promoted insulation, while experiment 2 promoted solar panels. The bank's clients received a newsletter with a link that randomly allocated participants among the three websites. The engagement with the websites is measured by comparing the number of views that were generated for each website with the number of clicks that occurred on each of these websites. By comparing the proportion of clicks made given the number of views that were made on each website, we can observe which website results in more website engagement.

Experiment 1

Nearly half a million homeowners ($n=492,148$) received a newsletter in February 2021 that included a link. When clients clicked this link ($n=9,117$), they were randomly forwarded to one of three websites, namely a control website (A), a website with a qualitative form of social proof in the form of a testimonial text (B), and a website with a quantitative form of social proof in the form of numerical facts about previous other clients' actions (C). Clients could also reach the websites through the bank's client portal leading to a total of 9285 clients viewing one of the websites. Clients could visit one of the three pages as often as they wanted and click every link on the websites. However, every unique internet protocol (IP) address was only assigned to one of the three websites, in order to avoid that clients saw different versions of the websites when they visited the website again. If clients visited the website from different devices and different IP addresses, they end up as multiple clients in the data, which might distort our data a bit, but we assume that this is a small portion of the observations we have. As we find similar results if we analyze effects only for people who access the website through their own newsletter, we can be quite sure that this is indeed the case.

Each website contained an identical setup, explaining the benefits of insulating one's home and informing the client that governmental changes might result in additional subsidy possibilities, followed by a link for further information by the Dutch Government. On websites B and C, the manipulation for each condition was

Many clients are on their way towards a better energy label

Choosing what sustainable investments you make can be challenging. Financing these sustainable investments plays an important role in these decisions. Your personal advisor can help in finding the best option for your specific situation.

H. B. (44) *"The bank really customized their services for me as a single man without children, mortgages or a lease car I am not a normal client. Without the bank's flexibility, I could have never realized this dream".*



Figure 1. Manipulation website B experiment 1 (Authors replication of the actual manipulation)

Many clients are on their way towards a better energy label

Choosing what sustainable investments you make can be challenging. Financing these sustainable investments plays an important role in these decisions.

Already **42,815** clients have used the house-scan to discover what sustainable investments they could take to improve the sustainability of their homes. Furthermore, **18,6%** of clients who have a mortgage with us have additionally financed sustainability related renovations to make their homes more sustainable.



Figure 2. Manipulation website C experiment 1 (Authors replication of the actual manipulation)

placed in the center of the website. The manipulation was a picture of a middle-aged man standing on a roof showing his solar panels and the title "many clients are on their way towards a better energy label". On website B, the manipulation, which can be seen in [Figure 1](#), had the shown layout and text (translated from Dutch to English).

The illustration in [Figure 1](#) replicates the actual manipulation as accurately as possible. The only differences are that the picture of the customer is not shown, that the initials of the customer are represented by H.B. instead of displaying the actual name of the customer that gave the testimonial text and that the bank's name is not shown. This is done for privacy reasons of the customer and to guarantee the bank's anonymity. Website C displays the same picture and title followed by numerical facts about previous other clients using the bank's services. The manipulation of website C was translated from Dutch to English and had the above layout as it can be seen in [Figure 2](#).

The illustration in [Figure 2](#) replicates the actual manipulation as accurately as possible. Just as for the manipulations of website B the only differences with the original manipulations of website C are that the picture of the customer is not shown and that the bank's name is not shown. This is done for privacy reasons of the customer and to guarantee the bank's anonymity.

On the websites, four main links serve as outcome variables for experiment:

1. a link for personal advice from a bank specialist,
2. a link for conducting a sustainability and insulation scan of the home called "house-scan" highlighted with an orange button,
3. a link for information about the bank's financing options, and
4. a link for information regarding government subsidies.

We did not influence the bank's website design or texts for these links and outcome variables as they are ongoing services the bank provides in collaboration with other businesses and the Dutch Government. Hypotheses 1 and 2 predict that these links will all be clicked more on websites that provide social proof (B and C) than the control website (A).

Additionally, we carry out explorative analyses to see whether either the testimonial treatment or the descriptive norm treatment in the form of client statistics are more effective and whether these social influence techniques are more or less effective for a specific action on the website.

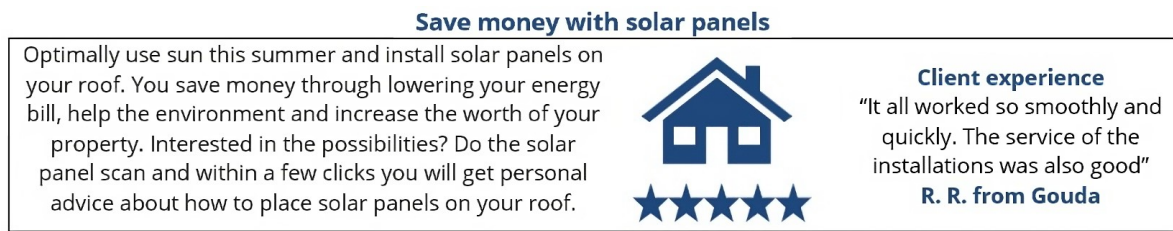


Figure 3. Manipulation website B experiment 2 (Authors replication of the actual manipulation)

Experiment 2

Experiment 2 was similar to the first. This time the aim of the websites was to encourage the clients (n=8,835) that were again recruited through a link in the banks newsletter to take a loan to finance getting solar panels. Clients could visit one of the two pages as often as they wanted and click every link on the websites. However, every unique IP address was only assigned to one of the two websites, in order to avoid that clients saw different versions of the websites when they visited the website again. For experiment 2, there were only two websites A and B. We compare a control website (A) with a website that additionally has a social proof element in the form of a testimonial text (B). Website A and B both included the text:

“Optimally use the sun this summer and install solar panels on your roof. You save money through lowering your energy bill, help the environment and increase the worth of your property. Interested in the possibilities? Do the solar panel scan and within a few clicks you will get personal advice about how to place solar panels on your roof” (translated from Dutch to English).

Website B additionally included a social proof element in the form of a quote from a past client that recommends using the bank’s service and help to get solar panels, next to an icon of a house that has solar panels and a five-star rating below it. The manipulation of website B for the second experiment is illustrated by **Figure 3** with the layout and text as shown (translated from Dutch to English).

Websites A and B were otherwise identical. The above illustration replicates the actual manipulation as accurately as possible. The only differences are that the initials of the customer are represented by R.R. instead of displaying the actual name of the customer that gave the testimonial text and that the banks name is not shown. This is done for privacy reasons of the customer and to guarantee the banks anonymity. Both provided a link to a solar panel scan in the middle of the website allowing clients to scan their roof to calculate how many solar panels they could install, how much money that would cost and how much money a client could potentially earn back. We again did not influence the bank’s website design or texts for these links and outcome variables. Hypothesis 1 now predicts that the link to the solar panel scan will be clicked more often on the website that provides an additional testimonial text compared to the control website.

Data

We received the bank’s aggregated Google Analytics data of the websites for experiments 1 and 2. The first dataset consists of the aggregated page views per website for the websites A, B, and C of experiment 1 and the number of clicks made on each of the four links highlighted on websites A, B, and C. We had agreed with the bank that they would not send us any demographic or other personal information of the clients following the GDPR and our ethics protocol. Therefore, we did not receive any individual-level data. We were only able to see on which website people clicked more. By using the page views and comparing the proportion of clicks made per pageviews for each website were able to make comparisons for the websites.

Similarly, we received data showing the aggregated page views for experiment 2 for websites A and B as well as the number of clicks made on each of the three links that were present on websites A and B. Again, we did not receive any demographic or other personal information of the clients nor any individual-level data. We were only able to see on which website people clicked more. By using the page views and comparing the proportion of clicks made per pageviews for each website were able to make comparisons for the websites.

For both experiments, we are therefore able to compute straightforward cross-table Fisher exact tests comparing the websites, using the aggregated page views per website and the clicks made on each website.

For experiment 1 an additional analysis was conducted. We investigated if there was a different website engagement of the clients that came to the website through the link that was shared in the newsletter. There were no differences in the results compared to analyzing all people who viewed the websites. The results of this extra analysis can be found in [Appendix A](#).

Variables experiment 1

The dependent variable is proportion of clicks made: It's the number of clicks made on a specific link on the website divided by the total amount of page views for that website.

Independent variables: Type of social influence message on separate websites, control (A), testimonial (B), or client statistics (C).

Variables experiment 2

The dependent variable is proportion of clicks made: It's the number of clicks made on a specific link on the website divided by the total amount of page views for that website.

Independent variables: Type of social influence message on separate websites, control (A), testimonial (B).

RESULTS

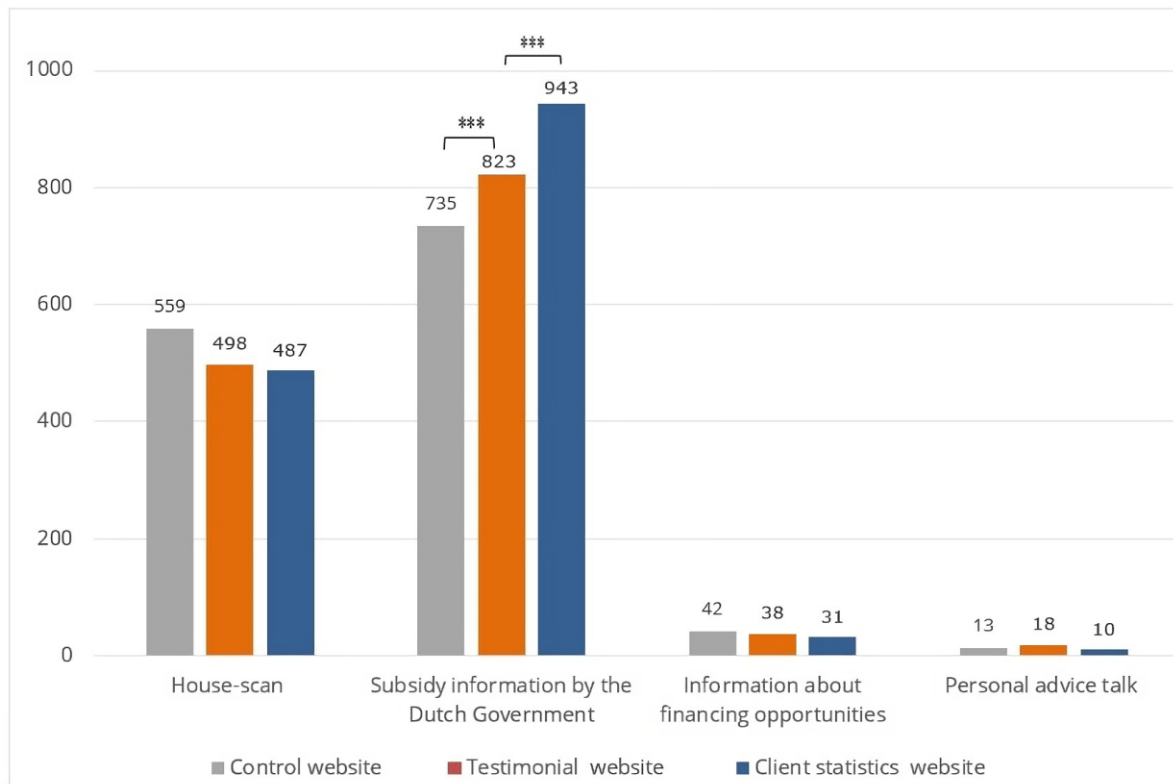
Experiment 1

For experiment 1, we first conduct one-sided Fischer exact tests for our hypotheses 1 and 2. We conduct these one-sided Fischer exact tests in STATA version 14 using as measures of engagement the page views of websites A, B, and C as well as the clicks on each of those websites on hyperlinks to the house-scan, subsidy information by the Dutch Government, information about financing opportunities, and a personal advice talk with a bank specialist. [Table 1](#) shows results for the four different hyperlinks that serve as outcome variables.

Table 1. Comparison of number of clicks that were made on each website compared to number of views for each of three websites A, B, & C of experiment 1 (proportion followed by number of clicks in brackets)

	Control (A)	Testimonial (B)	Client statistics (C)	Test diff A vs. B & test A vs. C: one-sided; test diff B vs. C: two-sided
Page views	3,120	3,088	3,077	Total: 9,285
House-scan	.179 (559)	.161 (498)	.158 (487)	Diff A vs. B: p=.967 Diff A vs. C: p=.970 Diff A vs. C: p=.754
Subsidy information by the Dutch Government	.236 (735)	.267 (823)	.307 (943)	Diff A vs. B: p=.003 Diff A vs. C: p<.001 Diff B vs. C: p=.001
Information about financing opportunities	.014 (42)	.012 (38)	.010 (31)	Diff A vs. B: p=.614 Diff A vs. C: p=.868 Diff B vs. C: p=.468
Personal advice talk	.004 (13)	.006 (18)	.003 (10)	Diff A vs. B: p=.227 Diff A vs. C: p=.649 Diff B vs. C: p=.184

The testimonial website B does not receive a higher proportion of clicks than the control website A for the house-scan (0.161) vs. (0.179), p=.967. Similarly, the client statistics website C does not receive a higher proportion of clicks than the control website A for the house-scan (.158) vs. (.179), p=.970. Neither is there a difference in the proportion of clicks made between the testimonial website B and the client statistics website C for the house-scan (.161) vs. (.158), p=.754. The testimonial website B does not receive a higher proportion of clicks than the control website A for information regarding financing opportunities by the bank (.012) vs. (.014), p=.614. Similarly, the client statistics website C does not receive a higher proportion of clicks than the control website A for information regarding financing opportunities by the bank (.010) vs. (.014), p=.614. Neither is there a difference in the proportion of clicks made between the testimonial website B and the client statistics website C for information regarding financing opportunities by the bank (.012) vs. (.010), p=.468. The testimonial website B does not receive a higher proportion of clicks than the control website A for planning a personal advice talk with a bank specialist (.006) vs. (.004), p=.227. Similarly, the client statistics website C does not receive a higher proportion of clicks than the control website A for planning a personal advice talk with a



Difference between clicks * $p < 0.05$, ** $p < 0.01$, & *** $p < 0.001$ (one-sided)

Figure 4. Comparison of number of unique clicks made by clients on each website for experiment 1 (Source: Authors)

bank specialist (.003) vs. (.004), $p = .649$. Neither is there a difference in the proportion of clicks made between the testimonial website B and the client statistics website C for planning a personal advice talk with a bank specialist (.006) vs. (.003), $p = .184$. In summary **Table 1** and **Figure 4** show that we do not find significantly more engagement and clicks for the two treatment websites B and C compared to the control website for the house-scan, information regarding financing opportunities by the bank, and personal advice talk.

For the information regarding subsidies of the government link, we do find that the proportion of clicks made by clients in the testimonial condition (.267) viewing website B, is significantly higher than the proportion of clicks made on the control website A (.236), $p = .003$. Similarly, we observe that the information regarding subsidies of the government link was also clicked more on the website C (.307) with client statistics, than the control website A (.236), $p < .001$. When comparing the proportions of clicks made for conditions B (.267) and C (.307), we find that the websites engaged clients differently for this link and that the numbers of clicks and website engagement were higher for website C, $p = .003$.

Experiment 2

For experiment 2, we also conduct one-sided Fisher exact tests to examine if providing social proof in the form of a testimonial leads to more engagement with a website that is advocating the purchasing of solar panels. However, our hypothesis is not supported as we do not observe significant differences for either of the three different links between the control website and the testimonial website. The testimonial website B does not receive a significantly higher proportion of clicks than the control website A for the solar panel scan (.962) vs. (.958), $p = .160$. Similarly, the testimonial website B does not receive a higher proportion of clicks than the control website A for a link for information about financial support by the bank (.126) vs. (.129), $p = .638$. The testimonial website B also does not receive a higher proportion of clicks than the control website A for the house-scan (.031) vs. (.039), $p = .160$. These results are summarized in **Table 2** and illustrated in **Figure 5**.

The engagement in experiment 2 is much higher than in experiment 1. This could be due to many factors, ranging from the subject of solar panels being more popular to the website being clearer. Both the control website ($N = 4425$) and the testimonial website ($N = 4410$) were viewed nearly equally often.

Table 2. Comparison of number of clicks that were made on each website compared to the number of views for each of two websites of experiment 2 (proportion followed by number of clicks in brackets)

	Control (A)	Testimonial (B)	Test diff A vs. B: one-sided
Page views	4,425	4,410	Number of observations 8,835
Solar panel scan	.958 (4,237)	.962 (4,242)	p=.160
Information about financial support by bank	.129 (569)	.126 (555)	p=.638
House-scan	.039 (171)	.031 (137)	p=.970

Figure 5 illustrates that there are no differences between the two conditions and that the additional testimonial text did not help in increasing the engagement of clients. The control website was already extremely effective in engaging clients. Thus, a huge improvement is not possible, yet due to our large sample size, we would have had enough power to notice even if there was just a small difference.

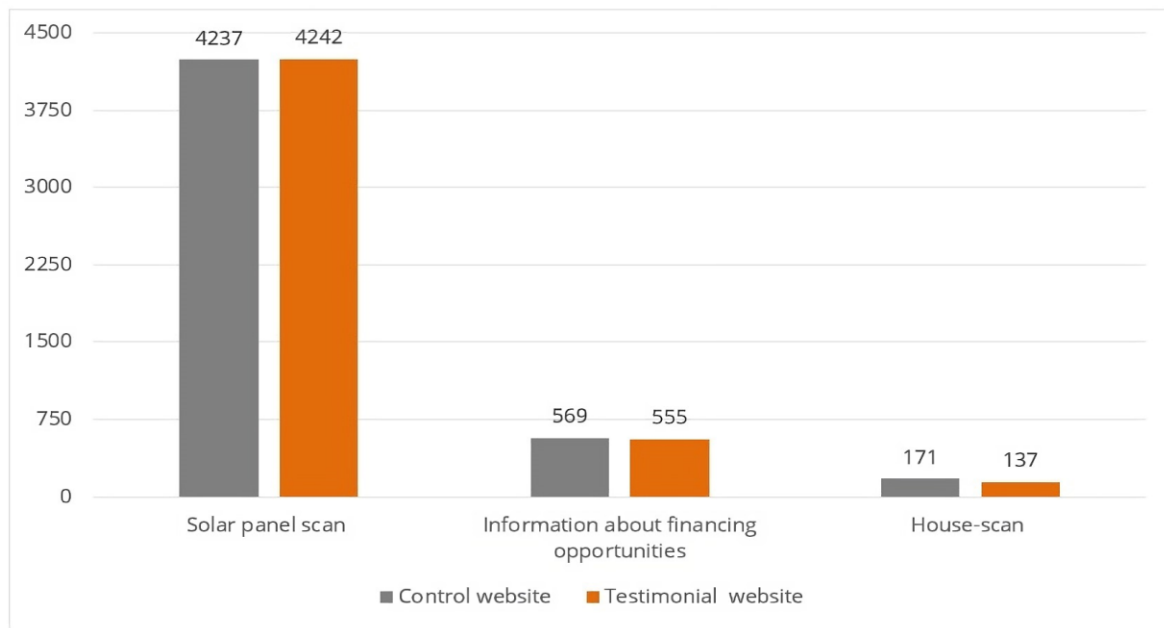


Figure 5. Comparison of number of clicks made on each website for experiment 2 (Source: Authors)

CONCLUSIONS

We collaborated on two field experiments with a large bank in the Netherlands to investigate if the social influence technique of social proof is also effective in increasing client engagement at the very beginning of a more complex decision process, namely orientating oneself to make multi-thousand euro sustainable home improvement investments. The social norms literature has revealed that invoking social norms can be effective in lowering electricity consumption (Schultz et al., 2018), encouraging the reuse of towels (Goldstein et al., 2007), or water conservation (Han & Hyun, 2018). We extend this research towards the very beginning phase of making more costly pro-environmental home improvement investments.

Experiment 1 gave us inconsistent results with the websites that included additional messages of social proof in the form of a testimonial text or client statistics not univocally leading to more website engagement. For three out of the four links that were highlighted on each of the websites, we did not notice an increase in clicks. For the information regarding subsidies of the government link, we do find that the clients that viewed the website that included a picture and a testimonial text clicked on that link significantly more than the clients that viewed the control website that did not include any social proof information. Similarly, we observe that the information regarding subsidies of the government link was also clicked more by those who viewed the website with the social proof in the form of client statistics. Given the multiple comparisons and the fact that the tests that are significant are not independent, it seems that social proof treatment did not elicit more engagement overall. The differences we do find, regarding client statistics leading to more clicks on the subsidies of government link than the website that showed the testimonial text, are more accidental findings.

In experiment 2, the additional testimonial did not lead to more clicks on either the highlighted solar panel scan feature, or the other house-scan, or financial information links. The social influence technique of displaying testimonials might increase engagement in certain contexts that are more emotional and rely on trust like the healthcare sector (de Wit et al., 2008). Within the larger pro-environmental investment context, we do not find such support. Experiment 2 was more efficient and specifically targeted desired website engagement. Namely, more than 95% of clients clicked on the solar scan that was highlighted on each of the two websites of experiment 2. Noticing a significant difference between the websites, therefore, becomes much more difficult. For experiment 1, we see that less than half of the clients who viewed one of the three websites clicked on one of the links that were highlighted on the website, whereas for experiment 2 more than 95% of clients clicked the highlighted solar panel scan for both websites.

We have to conclude that the much-applied social influence technique of social proof is not univocally effective for encouraging action towards making a more complex decision. These are important results, especially considering the popularity of this persuasion technique and that we deliberately examined whether social proof messages are effective in influencing and encouraging the very beginning and simple orientation processes before making multi-thousand-euro sustainable home improvement investments. It seems that the effect of social proof as a persuasion technique is scope conditioned by the cheapness of the decision.

Discussion

We argue that our results indicate that prior to using social proof messages to influence and encourage costly pro-environmental purchasing behavior more research is required. Marketing practitioners should be careful in transferring the findings of the effectiveness of rather simple purchasing decisions towards more complex investment decisions. Furthermore, more recent meta-analyses have indicated that similar social influence techniques such as nudging might have been attributed effects more due to a publishing bias for significant results than the treatments' actual effectiveness (Maier et al., 2022). Businesses and governments might be tempted to extend the use of these inexpensive and easily applicable persuasion techniques for societal problems such as encouraging pro-environmental behavior, yet we argue that it is vital to research when persuasion techniques like social proof can be effective and when other measures such as hard incentives, strong group pressure and the activation of local networks are needed. Our findings are an important addition to the literature as we demonstrate that the principle of simple vs complex behavior or trivial vs. nontrivial decisions is similarly important outside the context of diffusion, namely for social proof from anonymous others.

We are aware that we suggest that we are investigating behavior related to rather large investments but are actually comparing the number of clicks made during the orientation process before making such a big investment. We argue that this is the first step of orientation before a complex and costly decision is made. Informing oneself before investing tens of thousands of euros is part of a larger decision process, especially when compared to previous research having mostly investigated whether participants reuse towels or use less electricity, which is rather straightforward behavior. Given our results, we also feel this assumption is supported.

A limitation that affected which of the four links would be clicked in experiment 1 was that the newsletter that was sent to the clients of the bank to get them to visit the websites included a heading about a new governmental subsidy. This makes it difficult to do additional analyses as to which social proof technique is more effective. As it is likely that a self-selection process took place, with those clients interested in governmental subsidies being more likely to visit the website than, for example, those interested in the bank's house-scan. The treatment information is targeted at increasing the usage of the house-scan and how helpful the bank's services are. The increase in clicks on the governmental subsidies website is therefore a desired by-product, but not the initial target of the social influence text. Yet, given that the newsletter text was the same for all clients, the differences between the websites should only be caused by our manipulations. For future research on effects of website manipulations, it is important that the newsletter also focuses on emphasizing the topic related to the manipulation to avoid that the manipulation has additional unwanted or uninformative effects.

The layout for the website of experiment 1 changed for the treatment conditions as the manipulation texts were added in the middle of the websites changing the position of the links on the websites slightly, compared

to the control website, which did not have any text or picture added. It could be that website design influences the early orientation part of the purchasing processes (Hausman & Siekpe, 2009) and future studies should be aware of this risk. For experiment 2, the figure and text added did not change the layout of the website nor did it influence the placement of the links on the website. The websites for experiment 2 are therefore as similar as possible. Given that the website design for experiment 2 did not differ between treatments and we still did not find support for an effect of social proof in the orientation phase, we do not expect that we would have received different results for experiment 1 if the websites would have been identical.

Given the data we had, we could only focus on clicks as a measure of engagement, which does not provide a full picture of participants' website engagement. Future research could add analyzes of other measures of engagement such as time spent on the page, bounce rate or the number of pages visited to study whether the effect of stronger engagement is larger than for less extensive forms of engagement. In comparison to other studies that conduct experiments in an abstract context, our study reaches external validity as we are studying real behavior of actual people. However, the bank's clients are selective as they are homeowners interested in making their home more sustainable. For further generalizations a more representative sample of people is advisable for future research. Furthermore, our results are impacted by the Dutch cultural and contextual factors in which our experiments took place. Comparisons of individualistic and collectivistic cultures have shown that higher collectivism scores are associated with an increased desire to make social comparisons (Chung & Mallery, 1999). It is speculated that cultures with higher levels of collectivism lead to more upward self-improvement comparisons for the sake of the group (Chung & Mallery, 1999). The Netherlands is a more individualistic country, future research could take cultural aspects into account and test if social proof information is more influential in a more collectivistic context.

Future research should expand on our findings and examine when social proof is effective in stimulating behaviors and when it is not. More fundamentally, we would like to suggest that future research ought to examine when principles of persuasion are only effective in encouraging low-threshold decisions, and when they are also effective persuasion techniques in the context of more costly investments with uncertain returns.

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Data availability: A summary of the relevant data and the analysis code are available at <https://osf.io/ebav8/>.

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APPENDIX A

Experiment 1

Additional control analysis to check if it made a difference whether people arrived at the website only through the newsletter (N=9,117) or if we could use the total amount of clients that viewed the websites (N=9,285) and include the clients who landed on one of the websites through the bank's general interphase. As can be seen in **Table A1**, the results did not change when we control for the way people landed on the website.

Table A1. Comparison of number of clicks that were made on each website compared to number of views for each of three websites A, B, & C of experiment 1 for clients that were directed to websites through newsletter (n=9,117) (proportion followed by number of clicks in brackets)

	Control (A)	Testimonial (B)	Client statistics (C)	Test diff A vs. B & test A vs. C: one-sided; test diff B vs. C: two-sided
Page views	3,067	3,022	3,028	Total: 9,117
House-scan	.174 (535)	.157 (475)	.161 (454)	Diff A vs. B: p=.962 Diff A vs. C: p=.995 Diff A vs. C: p=.454
Subsidy information by the Dutch Government	.231 (707)	.264 (798)	.305 (922)	Diff A vs. B: p=.001 Diff A vs. C: p≤.001 Diff B vs. C: p=.001
Information about financing opportunities	.012 (38)	.013 (38)	.009 (27)	Diff A vs. B: p=.520 Diff A vs. C: p=.116 Diff B vs. C: p=.173
Personal advice talk	.004 (11)	.003 (8)	.003 (10)	Diff A vs. B: p=.335 Diff A vs. C: p=.512 Diff B vs. C: p=.814

