Financial Conduct Authority

Research Note

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Digital design for financial products and services: Consumer impact of sludge, deceptive design, timeliness and simplification

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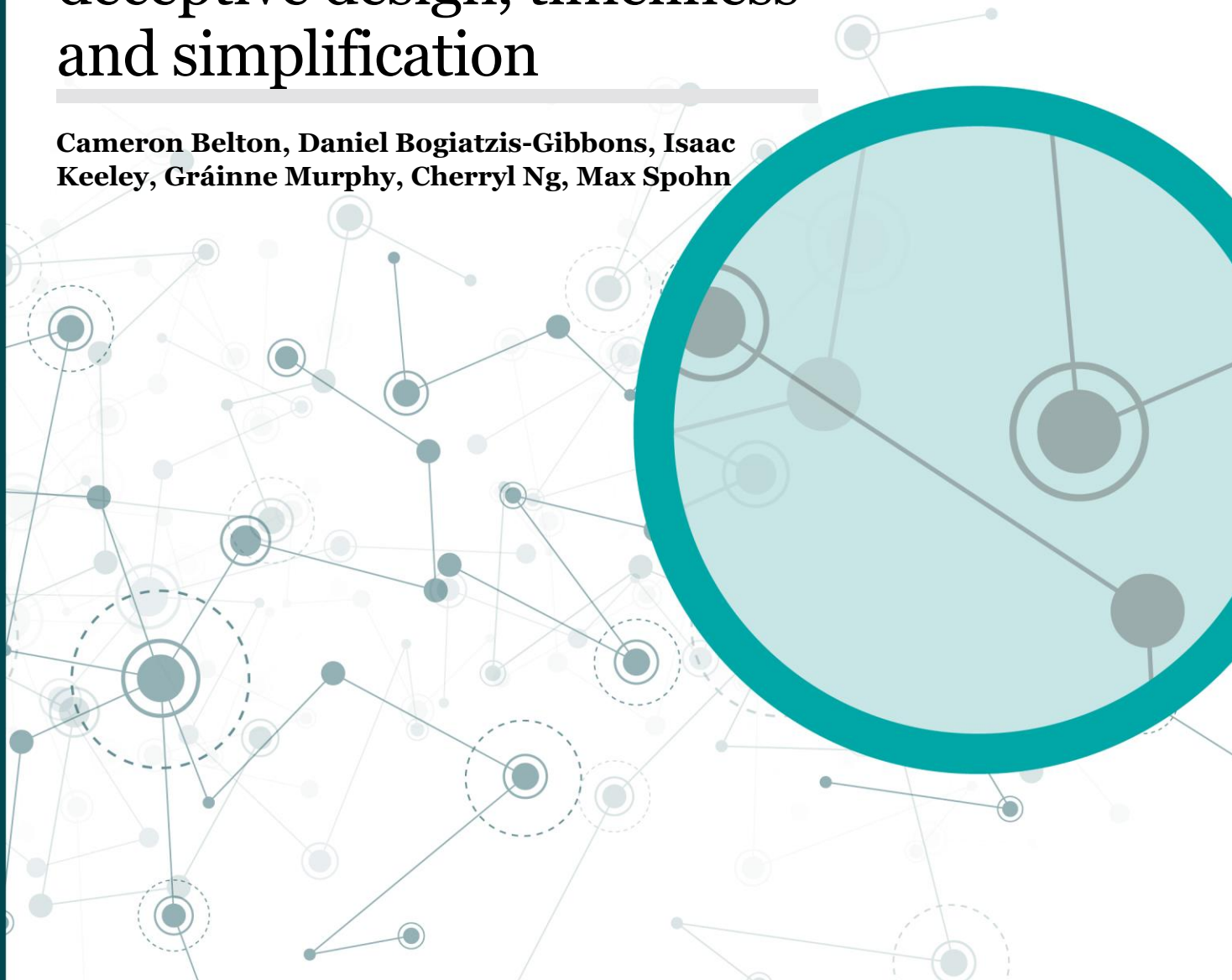

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Equality and diversity considerations

We have considered the equality and diversity issues that may arise from the proposals in this Research Note.

Overall, we do not consider that the findings in this Research Note adversely impact any of the groups with protected characteristics i.e. age, disability, sex, marriage or civil

partnership, pregnancy and maternity, race, religion and belief, sexual orientation and gender reassignment.

Contents

Summary

The FCA has been carrying out work to consider the potentially harmful impact digital design can have on consumer outcomes. This is increasingly relevant as the Consumer Duty places a responsibility on firms to equip retail customers to make decisions that are effective, timely, and properly informed. Selective online choice architecture, and the presence of sludge and deceptive design, can put this at risk. Firms now have a responsibility under the Consumer Duty (FCA, 2022a) to ensure that no aspect of their business unfairly exploits consumers' behavioural biases. This work focuses on two areas of concern within online choice architecture:

1. **Sludge[1]:**excessive friction that hinders consumers from making decisions in their interests, by taking advantage of their behavioural biases; and
2. **Deceptive design[2]:** user interface elements which may lead consumers into taking actions which may be against their best interests.

In this note, we report empirical evidence from an experimental study, undertaken in January 2022, designed to investigate the impact of sludge and deceptive design on financial decision making.

We conducted an online experiment to investigate how different presentations of information in a consumer credit customer journey affected participants' comprehension of key product features and the actions they took in the experiment. It examined the impact of obscured information, simplification, and whether information was presented in a timely way.

The key findings from the experiment were that digital design matters. Different designs can help or hinder comprehension as well as impacting choices.

- Obscuring information generally reduces product comprehension. These effects are especially pronounced for product-specific knowledge. However, the presentation of information had no effect on participants' ability to calculate interest payments, which was driven instead by financial literacy. Further work could help to explore how financial literacy may impact the effectiveness of information presentation choices.
- Simplifying information and showing it in a timely way increased comprehension of some information - the borrowing amount of the product.
- In this context, obscured information, simplification, and timeliness did not materially impact participants' likelihood of accepting the hypothetical credit offer or participants' requested borrowing amount. However, further work could explore if this finding holds in the real world or in other contexts.

[1] Consumer Duty, CP21/13 (FCA, 2021)

[2] While 'deceptive design' has been defined in various ways within the related literature (Gray, et al., 2018; Mathur, Mayer & Kshirsagar, 2021), the authors use it here (as in Gilchrist et al., 2024) as a general term to describe user interface elements which could lead consumers into taking actions which may be against their best interests.

This experimental test of the potential harms of sludge practices in a financial services product market contributes to the evidence that sludge and deceptive design practices should be taken seriously by regulators and industry. Under the Consumer Duty, firms are expected to provide support that meets customers' needs, including by considering any sludge in their journeys and how this can negatively impact customer outcomes. This research identifies such sludge, so we hope it serves as a valuable resource for practitioners.

1 Policy Context

The Covid-19 pandemic saw an unprecedented shift towards the digitalisation of financial services (FSB, 2022), including among consumers with characteristics of vulnerability. For example, the period April 2017 to February 2020 saw a 19% increase in the use of mobile apps in undertaking day-to-day banking activities (Croxson et al., 2022).

Since then, there have been increasing concerns that online businesses can manipulate consumers in new ways and with unprecedented ease. There has been an increased focus on this aspect of consumer protection by authorities and lawmakers in the UK, European Commission, and the US. For example, the UK government has proposed changes to the competition regime overseen by the Competition and Markets Authority (CMA), and new laws to prevent subscription traps and reviews (CMA, 2024). The Information Commissioner's Office (ICO) and CMA have also published a joint position paper on the consumer harm caused by online choice architecture, specifically in data protection (ICO, 2023). Elsewhere, the European Commission (Lupiáñez-Villanueva et al. 2022) has conducted a study into unfair commercial practices in the digital environment.

At the Financial Conduct Authority (FCA), the Consumer Duty (FCA, 2022a) came into force in the UK on 31 July 2023 for on-sale products and services. It aims to raise the standard of care that firms provide to consumers in retail financial services.

It also aims to tackle market practices which interfere with consumer decision-making. These practices include sludge, defined in the Consumer Duty as excessive friction that hinders consumers from making decisions in their interests, by taking advantage of their behavioural biases (FCA, 2021).

A related concept to sludge is 'deceptive design' (also referred to as 'dark patterns'), which have been the subject of recent attention from other UK regulators (CMA, 2022, ICO & CMA, 2023). While deceptive design has been defined in various ways within the related literature (Gray, et al., 2018; Mathur, Mayer & Kshirsagar, 2021), the authors use it here (as in Gilchrist et al., 2024) as a general term to describe user interface elements which could lead consumers into taking actions which may be against their best interests.

In this experimental study, undertaken in January 2022 - prior to the Consumer Duty being in place - we tested the impact of different deceptive design and sludge techniques (as well as ways to present information more simplistically and in a timely manner, in contrast to these), on consumers' comprehension levels and financial product choice decisions.

We have used a fictitious consumer credit higher-cost product as an example to explore how different online information presentation approaches affect consumers' decision-making. However, the findings go beyond this specific context. They highlight both the potential pitfalls and benefits of various approaches, which have wider application across the online customer journeys of financial products more generally.

Highlighting the benefits and pitfalls of different online information approaches should support practitioners to meet the Consumer Duty's requirement that firms act in good faith, avoid causing foreseeable harm and enable and support retail customers to pursue their financial objectives (FCA, 2022a).

2 Experimental study: Measuring the impact of sludge, deceptive design, simplification and timeliness in digital design

Behavioural context

Obscured information

In the academic literature, Mathur et al. (2021) state that there are two main channels through which deceptive design operates: either modifying the set of decisions a person can feasibly make or modifying the flow of information. Here we are concerned with the latter, notably obscured information, which refers to deceptive design practices where salient facts about a product or its price are made more difficult to access. Examples include where information is presented away from the main page of a website, where it is in difficult-to-read font or colours, or where it is placed at the bottom of a text-heavy webpage.

While this principle is intuitive, there is little existing evidence on the effects of small changes to the placement of information on websites, and its impact on comprehension and choice decisions, especially in a financial context.

Simplification and timeliness of information

If information is presented in a complex (e.g., containing jargon) and untimely manner (e.g., late in the decision-making process) it can hinder comprehension and manipulate choice in ways that could constitute sludge or deceptive design practice – whether intentional or not. Presenting information in a simplified, easy-to-read format and in a timely manner (e.g., on a front page of a website) may be a solution to those practices.

Text simplification here, as per Siddharthan (2014), refers to reducing the linguistic complexity of writing, which can be accomplished through conceptual simplification, elaborative modification (using redundancy and explicitness to emphasise key points) and text summarisation. The Department for Business, Energy & Industrial Strategy (BEIS) published a guide from the Behavioural Insights Team (2019) which includes a useful summary of simplification techniques that are likely to improve comprehension.

In financial markets, both simplicity and timeliness are especially important because information like repayment schedules or interest rates are complex by nature. In particular, poor timing of information delivery may be exacerbated by poor levels of numeracy in the UK – about half of the working population have numeracy skills comparable to primary-aged children (National Numeracy, 2022).

It might seem straightforward that simplification and timeliness would increase comprehension and ensure consumer choice is in line with consumer's best interest. However, research has shown that this is very context dependent. For instance, Gold et. al (2021) found that combining simplification with visual aids in the context of COVID-19 guidelines either did not affect or slightly reduced comprehension of guidance and intentions to stay-at-home, depending on the choice of statistical models used. Therefore, it is important to study the impact of these techniques in a specific financial product decision-making context.

Research design and analytical strategy

Experimental design

We conducted an online experiment in January 2022 to test the effects of sludge and deceptive design practices on product comprehension and consumer decisions, using a fictitious consumer credit higher-cost product as an example context. To test these features, we produced a mock-up of a fictitious website as the environment for our online experiment.

The design and analysis were pre-registered internally in a trial protocol, unless explicitly mentioned. Participants for the experiment were recruited through an online panel provider and were asked to complete a stylised consumer journey for a credit product. The journey consisted of three steps:

1. **Homepage:** On this first screen, participants were shown a landing page of a website, inspired by the design and functionality of existing websites in the sector at the time, to simulate a realistic experience for the participants. It included a representative loan example, trust ratings, product explanations, marketing elements, as well as a button that allowed participants to "apply for a loan". On the homepage we also implemented the Obscured Information treatment manipulations, as explained below. All participants in the experiment were required to apply for a loan at this stage to ensure a fully random sample.
2. **Application:** After selecting to "apply for a loan" participants were asked to complete an application for the product. They were asked to select the borrowing amount they wanted to apply for as well as provide us with various demographic datapoints. At this stage, we collected the loan amount that participants chose to apply for as one of our secondary outcome variables as well as the demographic information used as covariates in the following analyses.
3. **Quote:** Once participants completed the application, they were redirected to a screen that informed them that they had been approved for the borrowing amount they selected. They were provided with a summary of their loan and could decide whether to accept the offer or not. At this stage we implemented some parts of the Obscured Information treatment manipulations, as described below. We also collected participants' choice to accept the quote as an additional outcome measure.

Once participants made their choice on the quote page, they left the hypothetical consumer journey and were presented with three comprehension questions that captured our primary outcome variables. Each question was a multiple-choice question with 4 answers, one of which was correct.[3] The three comprehension questions were designed to test:

1. Participants' comprehension of repayments for their loan product.
2. Participants' comprehension of borrowing amounts for their loan product.
3. Participants' ability to calculate interest payments for their loan product.

Following the comprehension questions, participants were asked whether they would take out the loan product they saw in real life and what alternatives to the product they would consider. After a short set of standard financial literacy questions, participants left the experiment.

Treatments

In the experiment we wanted to understand how obscuring information impacts product comprehension and consumer behaviours. We manipulated how information was presented to participants – in particular, whether it was easily visible and digestible on the landing page, or whether participants had to click through the website to find the relevant product information. Table 1 below summarises the two different *Obscured Information* treatments and other treatments tested, as well as the hypothesised effects on product comprehension for each of these.

Table 1: Obscured information treatments

Treatment	Description	Hypothesis
Control	Participants see convoluted product information on the landing page.	
Navigation Bar Click	Participants do not see product information on the landing page. They first need to click on a menu item in the navigation bar to reach a separate page that includes the convoluted product information.	**Reduction** in comprehension due to obscured information
Link Click	Participants do not see product information on the landing page. They first need to click on a hyperlink on the page to reach a separate page that includes the convoluted product information.	**Reduction** in comprehension due to obscured information

[3] This means there was a 25% chance that participants would get a question correct by chance alone.

Drip Information	Participants do not see product information on the landing page. The convoluted information is only displayed on the quote page, after participants have applied for the product.	**Increase** in comprehension due to timeliness or **Reduction** in comprehension due to cognitive costs in having to piece together information
Simplification	Participants see simplified product information on the landing page.	**Increase** in comprehension due to simplification and salience
Timely Simplification	Participants see simplified product information on the landing page. In addition, the simplified product information is displayed again on the quote page, just before participants decide whether to accept the quote or not.	**Increase** in comprehension due to simplification, salience, and timeliness

Empirical strategy

We used a series of linear probability models and linear models with heteroskedasticity-robust standard errors to answer the main research questions. Unless noted otherwise, we ran regressions including the main effects of the treatments as well as interaction effects. We also included specifications with covariates, including age, gender, income, past financial difficulties, financial literacy, and confidence in financial literacy. We report the results of the linear regressions with covariates. Logistic regressions for binary outcome variables confirmed the results but are not reported for ease of interpretation. Table 2 below summarises the models used in the different steps of the analysis.

Table 2: Research questions, empirical strategy, and dependent variables

Research question	Empirical strategy and dependent variable

Primary analysis
 	
Does obscured information reduce participants' product comprehension?
	• Linear probability models:
	  ○ 1 if participant answered comprehension question correctly, 0 otherwise
	  ○ Specifications of treatment effects with covariates, and without covariates as robustness checks
	• Logistic regressions as robustness checks
	• Bonferroni corrections for multiple comparisons, to reduce the risk of false positives when testing multiple alternative treatments against a Control treatment

Secondary analysis I
 	
Does obscured information increase participants' likelihood of accepting the credit offer?
	• Linear probability models:
	  ○ 1 if participant chose to accept the credit offer, 0 otherwise
	  ○ Specifications of treatment effects, with and without covariates
	• Logistic regressions as robustness checks

Secondary analysis II
 	
Does obscured information increase the borrowing amount participants apply for?
	• Linear models:
	  ○ Selected borrowing amount as dependent variable
	  ○ Only treatment effects possible, specifications with and without covariates

Sample description and attrition

We collected a total of 6,665 responses and after excluding incomplete responses we worked with a final sample of 6,045 participants who had or expected to use these types of products. Our sample was 63% female, had an average age of 36 years, and is roughly representative geographically of the UK population. Annex 1 shows this and additional descriptive statistics of our final sample. The table also shows that the treatment groups are balanced on a range of demographic and financial literacy observable characteristics, which we confirmed with a series of statistical tests.

A total of 620 participants who saw the instructions, or 9%, did not complete the experiment. About 15% of dropouts did not proceed past the instructions – and therefore were never exposed to the treatments. In addition, more than 60% of these participants dropped out at the Application Screen where they had to provide personal and financial details – which was identical between treatments. Another 8% dropped out when they were asked to answer questions about the product they saw, which were again identical across treatments. This means that it is likely that only a few people dropped out due to the treatments. Chi-square tests confirm that the differences in the number of participants between treatment groups is likely driven by chance.

Annex 1 also shows the attrition rates in each treatment group. Since attrition rates were relatively low and likely unrelated to the treatments, we decided to drop these participants from subsequent analyses.

3 Results

Product comprehension

We found that obscuring information generally reduces product comprehension, while simplification and timeliness (either through timely simplification or drip feeding) of information improve product comprehension. These effects are pronounced for product-specific knowledge, but disappear for comprehension that is driven instead by financial literacy.

We first investigated how obscured information impacts comprehension of repayments of the loan product. The results show that obscured information significantly impacted comprehension of repayments. Participants who had to click on the navigation bar or a link to see the relevant information were about 13 and 11 percentage points (pp) respectively – or about 50% and 42% – less likely to understand the repayments, compared to the 26% baseline in the control group.[4]

On the other hand, being exposed to simplified or simplified and timely information made participants about 8pp and 13pp (30% to 50%) more likely to understand repayments. Participants in the drip information treatment displayed no change in comprehension.

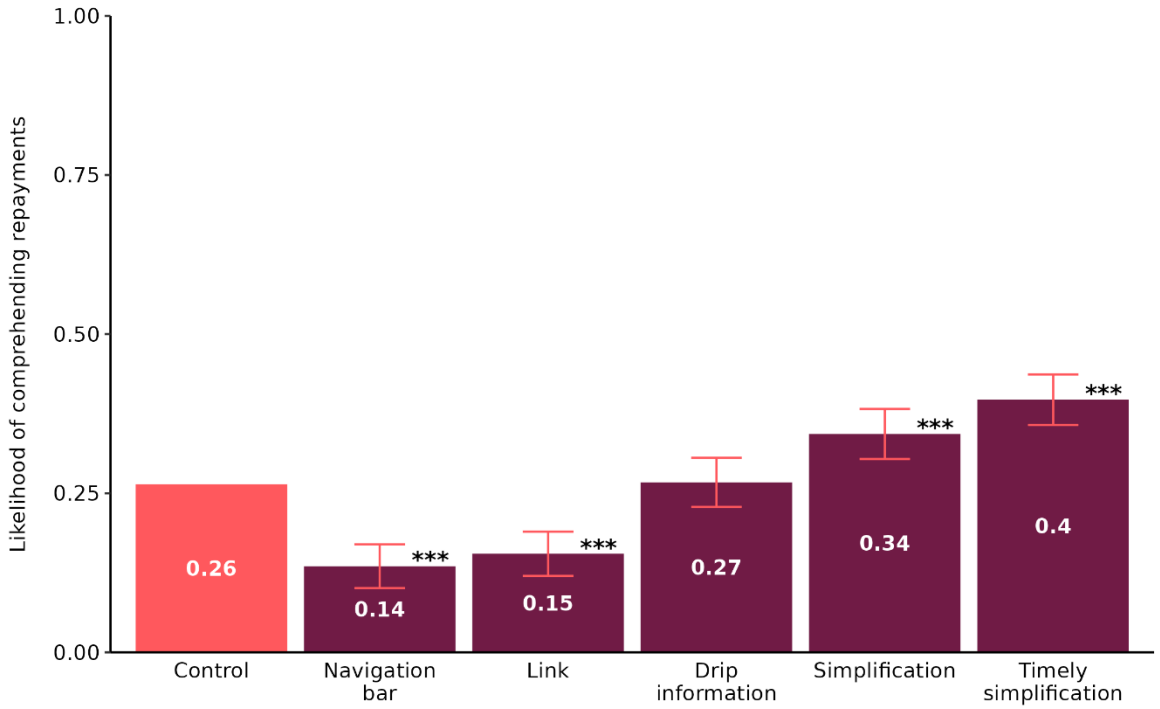
Pairwise comparisons further reveal that comprehension levels did not significantly differ between those in the navigation bar treatment and those in the link treatment. It appears that obscuring information in either way has similar impacts on comprehension. However, comprehension levels differed significantly between those who saw simplified and those who additionally saw simplified and timely information, suggesting that the timing of information affects comprehension even beyond its language and difficulty.[5]

The full results are reported in Table B1 in Annex 2. Figure 1 illustrates how obscuring information reduces comprehension, while simplification and timeliness of information improve comprehension of repayments.

[4] It is worth noting that the control group performed as you would expect by chance as the question was multiple choice out of 4, whereas participants exposed to the obscured information treatments did worse than chance.

[5] We did not correct for multiple comparison for these exploratory pairwise comparisons. While our main primary outcome measure was to compare the effect of all treatments against the control, we conducted these targeted pairwise comparisons because we were additionally interested in understanding what mechanisms were more or less effective in driving differences in comprehension between treatments designed to obscure information or to enhance timeliness and simplification.

Figure 1: Comprehension of repayments



N = 6045

***p<0.001; **p<0.01; *p<0.05

Note: Bonferroni adjusted p-values are used

Next, we investigated how obscured information impacts comprehension of the borrowing amount of the loan product. The results show largely similar effects to the comprehension of repayments. Participants who had to click on the navigation bar or a link to see the relevant product information were about 11pp and 6pp (or 23% and 13%) less likely to understand the borrowing amount, compared to the 48% baseline in the control group.

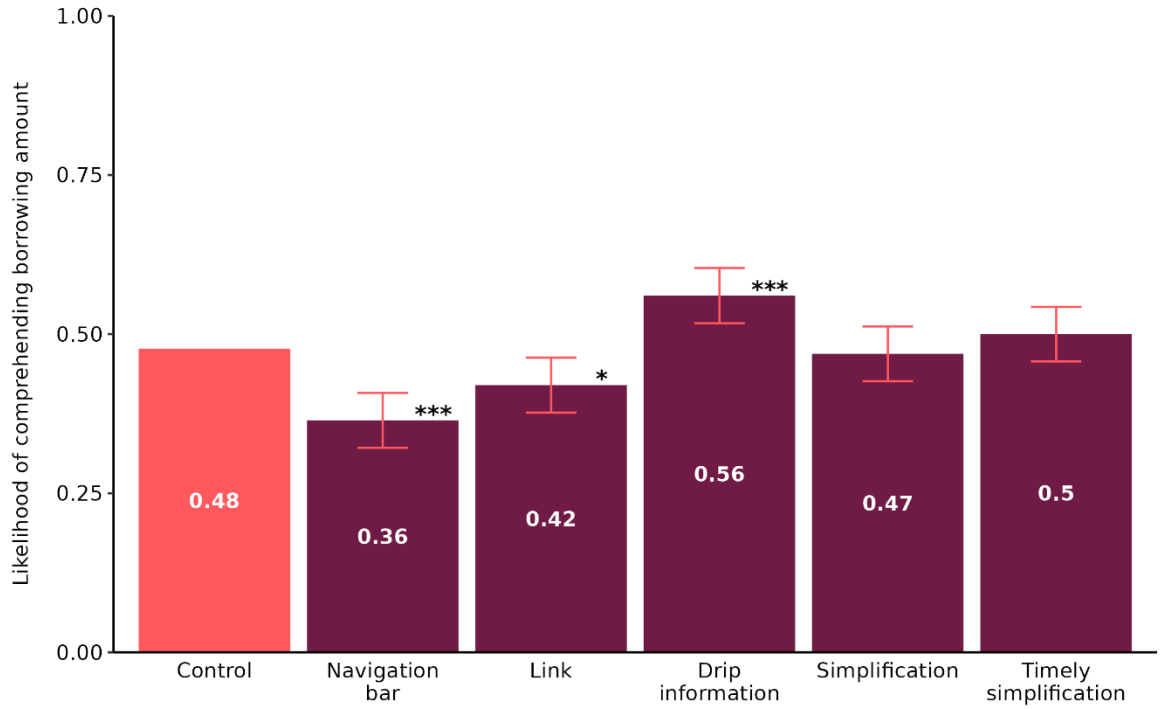
Being exposed to simplified or simplified and timely information had no impact on this comprehension question. However, participants in the drip information treatment were about 8pp (around 17%) more likely to comprehend the borrowing amount, compared to the control group.

Pairwise comparisons reveal that comprehension levels significantly differed between those in the navigation bar treatment and those in the link treatment. It appears that clicking a link for more information is somewhat easier than finding additional information in the menu bar.[6]

The full results are presented in Table B2 in Annex 2. Figure 2 illustrates how obscuring information reduces comprehension of the borrowing amount while simplifying of information did not improve comprehension.

[6] This is also supported by the fact that 15% of participants in the link treatment clicked through and saw the product information, compared to only 5% who clicked in the menu bar to see the product information in the navigation bar treatment.

Figure 2: Comprehension of the borrowing amount



N = 6045

***p<0.001; **p<0.01; *p<0.05

Note: Bonferroni adjusted p-values are used

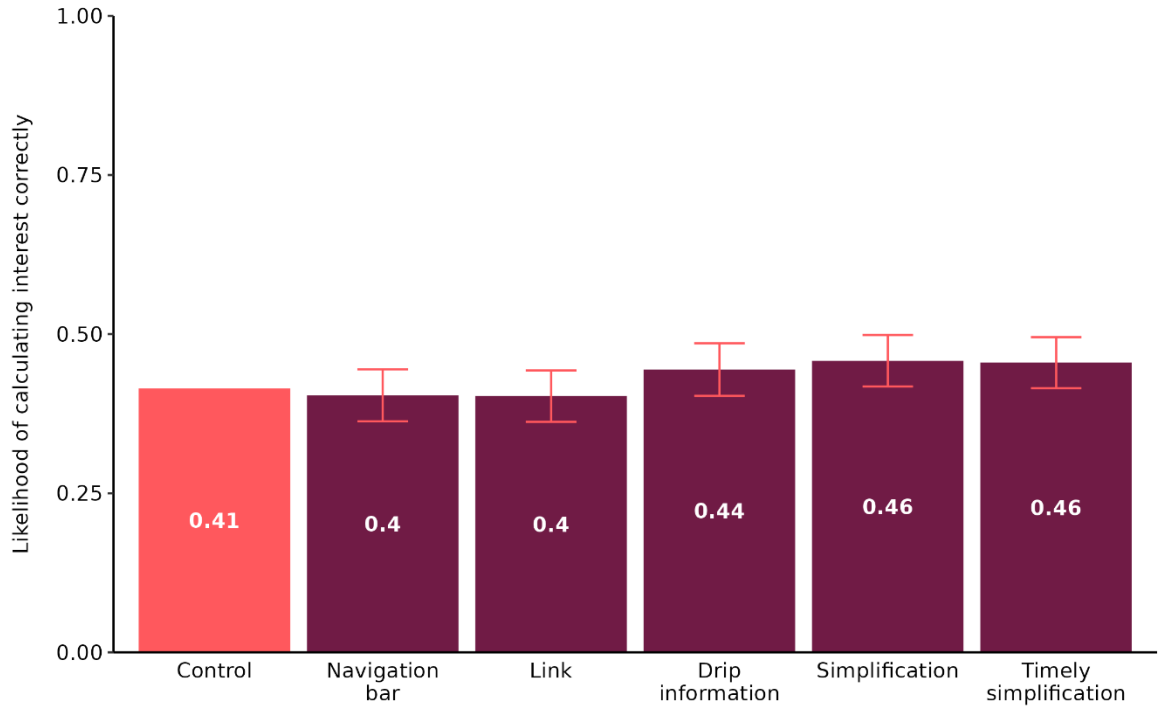
Finally, we investigated the effect of obscuring information on participants' ability to calculate interest payments correctly. The results show null effects for this comprehension question, suggesting that the presentation of product information only plays a minor role in understanding interest payments. Participants who had to click on the navigation bar or a link to see the product information were not significantly more or less likely to calculate interest payments correctly than participants in the control group. Similarly, being exposed to simplified or simplified and timely information had insignificant effects on comprehension.

Instead, financial literacy is a more important factor in calculating the interest payment correctly; participants with higher financial literacy were significantly more likely to calculate the interest correctly.[7] The full results are presented in Table B3 in Annex 2, and Figure 3 below illustrates the null effects of the treatments on interest payment calculation.[8]

[7] We also ran a model including interaction effects between the obscured information treatments and financial literacy, and found no interaction effects, so we are confident that financial literacy is a key driver for understanding interest rates.

[8] It is worth noting that when we ran our regression model without covariates, the simplification and timely simplification treatments were significant, which is documented in Table B3. However, since these findings become insignificant when covariates are added, we believe the effects are being driven by other factors.

Figure 3: Calculating interest payments correctly



N = 6045

***p<0.001; **p<0.01; *p<0.05

Note: Bonferroni adjusted p-values are used

Sub-group analyses revealed that the main effects did not differ much across participants, including between participants with different financial situations (past or present), or those with experience using similar products.

Overall, the results suggest that obscuring information significantly impacts consumers' product comprehension, particularly for product-specific information. This is further illustrated by the differences between participants who clicked on the navigation bar or link to be exposed to the product information, and those who did not. 40% understood how repayments worked, compared to 12% who did not click to see the information. Similarly, 68% understood the borrowing amount, compared to 36% who were not exposed to the information. Finally, 69% were able to calculate the interest payments correctly, compared to only 37% who did not click. Our analysis furthermore suggests that going beyond not obscuring information – by simplifying it and making it timely – may aid product comprehension even further.

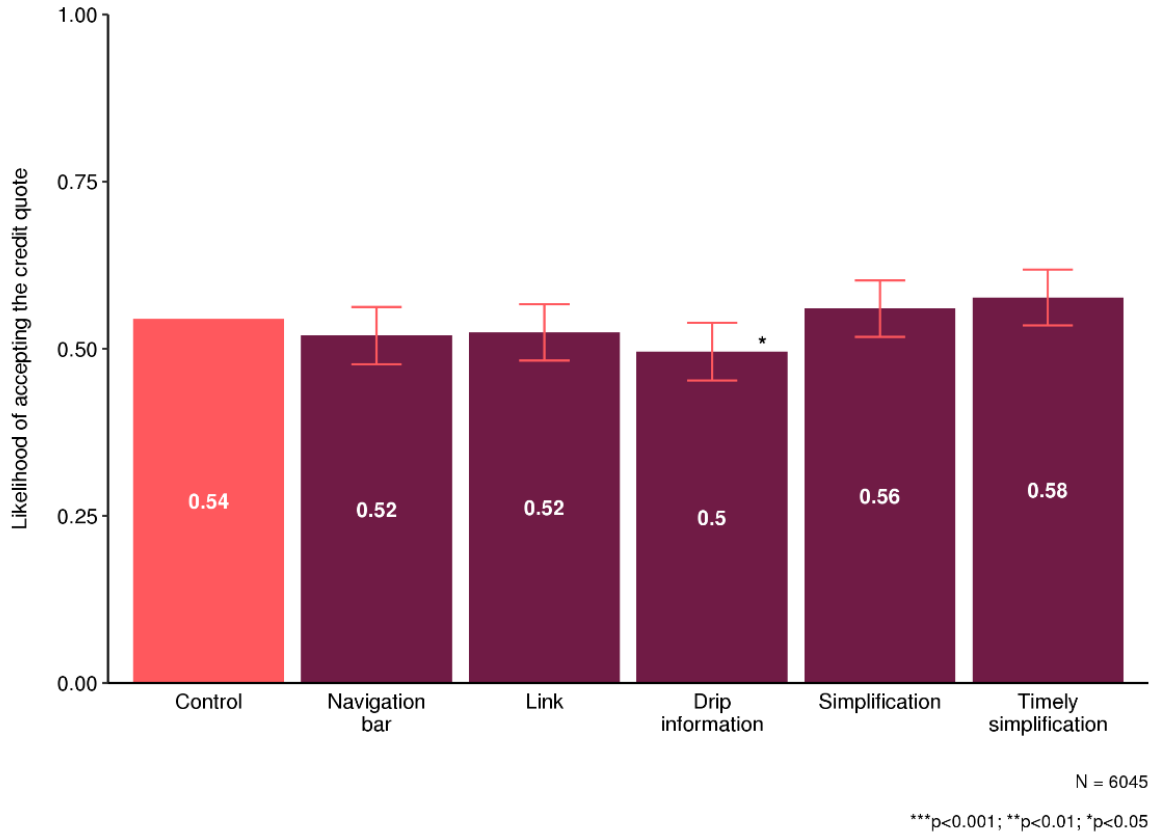
Accepting the credit quote

Beyond effects on product comprehension, we wanted to understand whether obscuring information influenced participants' behaviours – their likelihood to accept the quote for the hypothetical loan they applied for. Figures 4 and 5 show that neither acceptance of

the credit quote nor the requested borrowing amount were influenced by obscured information.

There is also little systematic evidence that simplified and/or timely information impacted choice decisions, although we saw that the drip information treatment significantly reduced acceptance of the credit quote by about 4.9pp (about 9%), compared to the 54% baseline in the Control treatment (see Figure 4).

Figure 4: Accepting the credit quote



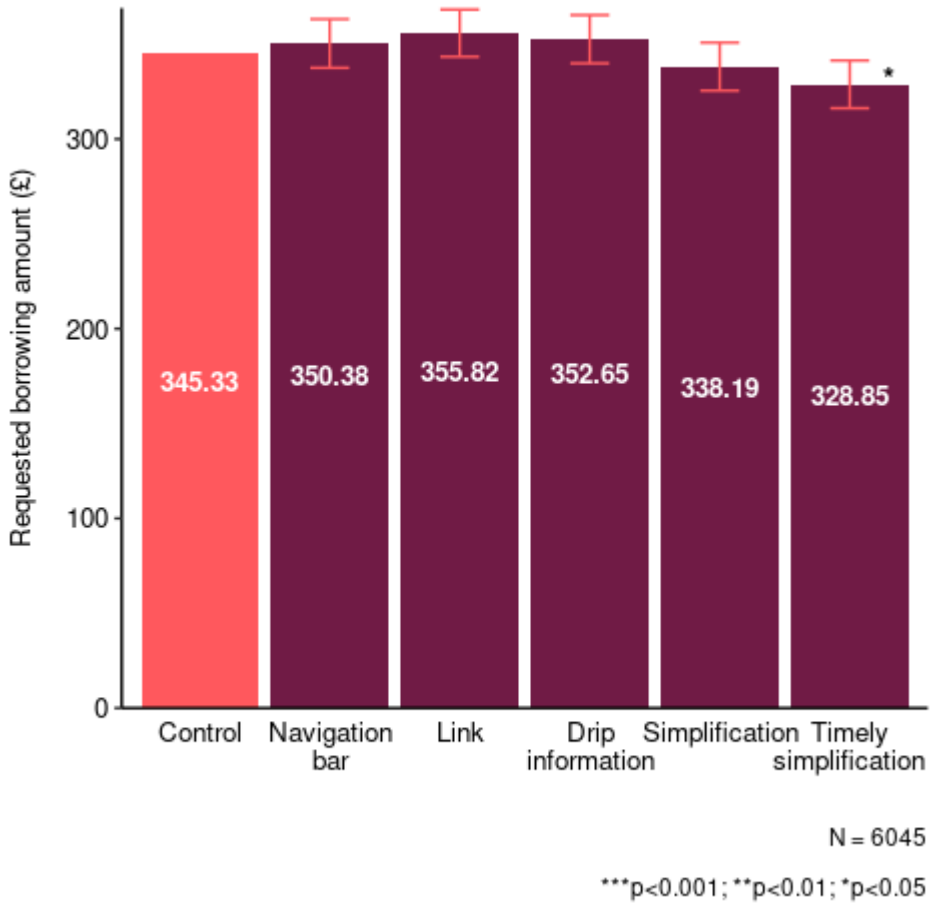
For the requested borrowing amount only those in the timely simplification treatment requested a significantly lower borrowing amount than those in the Control treatment (see Figure 5). Despite being statistically significant, the reduction of around £16.50 (~5%) is economically small at the individual level, when compared to the average amount of £345.33 in the Control treatment.

It should also be noted that up to the point where participants decided on a borrowing amount the simplification and timely simplification treatments were identical – since the "timely" aspect of the latter only appeared on the last screen. It is therefore not surprising that pairwise comparisons show no significant difference between these two treatments.

It is also worth highlighting that we did not correct for multiple comparisons among these behavioural outcomes, so we are less confident in the robustness of these findings.

Combined with the somewhat sporadic nature of the significant effects across treatments and choice decisions, these findings should be viewed as indicative.

Figure 5: Borrowing amount applied for



The full results for acceptance of the credit quote are presented in Table B4 in Annex 2 and for the requested borrowing amount are presented in Table B5 in Annex 2.

4 Discussion

Obscured information – evidence of the potential detrimental impact of sludge

This experiment finds strong effects for obscured information on the comprehension of a financial product, even though there were weaker effects on behaviours. Given that consumer protection regulations are in part focussed on giving consumers the ability to make reasoned and informed decisions, this justifies attention to cases where information is put even one click away.

In addition, given the potential for harm from lack of understanding in financial markets, this justifies further work into sludge and deceptive design practices, especially those that effect accessibility of information.

The positive power of simplification and timeliness

Time and again, FCA work has shown the importance of providing timely and simplified information, principles reinforced by the Consumer Duty guidance for firms (see 8.13 of FG22/5). Delias et al. (2022) found that simplified and behaviourally informed risk warnings increase consumers understanding of the risks involved in high-risk investments. Likewise, in Gilchrist et al. (2022), it was found that well-timed risk warnings reduce the chance that consumers will self-certify as competent to trade in high-risk investment products, towards the level of consumers we expect to self-certify.

This experiment is no exception – for instance, showing simplified product information just before the participant chose to accept the quote improved comprehension of repayments from 26 percent to 40 percent. It is worth noting that levels of comprehension are still low – showing that changes to information could only be part of the response to sludge and deceptive design practices that obscure information. Still, this points to a need to consider information presentation, not just content.

Additionally, it is worth noting that the way information was presented in this experiment did not impact participants' ability to calculate interest payments. Again, overall comprehension levels were low, which is concerning and suggests a need for further consideration on how to effectively communicate interest rates for better understanding.

Understanding differences in the impact of obscured information, simplification and timeliness on comprehension and behaviours

One potentially surprising result of the experiment is that obscured information and simplification had strong negative effects on product comprehension, but no effects on behavioural outcomes of accepting the credit quote or the borrowing amount applied for. Likewise, the use of simplification and/or timeliness had a positive effect on comprehension, and only weakly indicative effects on behavioural outcomes. This difference could indeed be genuine, and the behavioural impacts that affect comprehension may not manifest through to changes in subsequent behaviour.

However, one caveat to our findings is that participants completed an experiment in a superficial and highly stylised online setting. Participants' behaviours could not be incentivised and were therefore inconsequential – participants did not actually take out a real credit product. While we exerted considerable effort to make the scenario as realistic as possible, participants may have behaved differently than they would in real life. It is possible that the noisiness of decision-making in a hypothetical experiment made it difficult to detect any genuine differences that may be present in real conditions.

On the other hand, fundamental understanding of important information is less likely to be affected by whether the scenario itself is real or artificial. Our findings of the effect on comprehension, that obscured information can reduce comprehension of key product information and simplified and/or timely information can increase it, are therefore a key takeaway from this research. This is a valuable addition to the empirical evidence on the effect of deceptive design techniques and of the ways to improve outcomes for consumers in moving away from these. It also chimes with the Consumer Duty, which reminds firms of the importance of displaying information in a way that helps consumers meet their financial objectives (see Chapter 8, FG22/5).

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