



Contents lists available at ScienceDirect

## Journal of Behavioral and Experimental Finance

journal homepage: [www.elsevier.com/locate/jbef](http://www.elsevier.com/locate/jbef)

Full length article

Nudging credit union members to check their credit: Evidence from a field experiment<sup>☆</sup>

Madelaine L'Esperance

The University of Alabama, 305 Adams Hall, Tuscaloosa, AL 35487, United States of America

## ARTICLE INFO

## Article history:

Received 6 June 2022

Received in revised form 26 September 2022

Accepted 24 November 2022

Available online 1 December 2022

## JEL classification:

D91

D14

G51

## Keywords:

Personal finance

Consumer attention

Nudge

Credit union

## ABSTRACT

In this study, I explore whether emails that alert consumers to freely available credit score increase attention to personal financial accounts. A sample of credit union members are randomly assigned to receive an email message that highlights different motivations for viewing one's score, including a simple reminder, social information, and monitoring for identity theft and errors. I find that message receipt does not increase attention to credit union accounts overall as measured by online account login activity. However, the messages are effective for subgroups of the sample. Examination of the daily log in data using panel data methods reveals timing of the treatment response. This study shows the potential for messaging interventions to increase attention to financial accounts and implications for policy.

Published by Elsevier B.V.

## 1. Introduction

Consumer debt increased substantially from 2011 to 2019 while delinquency and late payment rates, indicators of difficulty managing debt, have also trended upward (Federal Reserve Bank of New York, 2021). The number of consumers who have a scoreable credit file increased to nearly 200 million individuals in 2018 (Consumer Financial Protection Bureau, 2019). Credit scores are used by lenders offering a variety of credit products to decide whether to approve a consumer who applies to borrow. Credit scores and reports have become more widely available for consumers to track their credit as many financial institutions now offer credit monitoring services complimentary to their customers to educate consumers about creditworthiness and managing debt as well as market credit products to consumers. Informing consumers about their credit history, including through credit monitoring service, may improve financial decisions.

A large literature finds that financial education improves credit behaviors (Kaiser et al., 2022; Harvey, 2019; Urban et al., 2020).

<sup>☆</sup> I gratefully acknowledge J. Michael Collins, Justin Sydnor, Lydia Ashton, Cliff Robb, and Rourke O'Brien as well as participants in the UW-Madison Center for Financial Security Fall Webinar Series for valuable comments. I also thank Chad LaFlash and Justine Kessler for their assistance throughout the project. University of Wisconsin-Madison BRITE Lab, United States of America provided funding support for this work. AsPredicted Pre-Registration 23386. IRB ID: 2019-0425, 2019-0351.

E-mail address: [mlesperance@ua.edu](mailto:mlesperance@ua.edu).

Improving disclosures serves as another avenue to better inform borrowers, however effects of disclosure on debt management are mixed (Jones et al., 2015; Agarwal et al., 2015). Informational nudges are a behavioral, low-cost alternative intervention that has been shown to have positive effects on credit outcomes, including attention to credit scores, however some consumers are negatively affected (Bursztyn et al., 2019; Medina, 2021; Homonoff et al., 2021). This paper addresses the question: Do nudges that offer information about available credit score increase consumer attention to their financial accounts?

Selective attention to finances has been studied extensively with findings pointing to anticipatory utility, information avoidance, and salience as mechanisms that underly this phenomenon. Early studies focused on selective attention to investment accounts leveraging receipt of 'good' and 'bad' news related to financial market activity (Sicherman et al., 2016). A recent set of studies have shifted focus toward a broader set of personal financial decisions, including money management application activity and credit card repayment. These studies find that selective attention helps us to understand why individuals log in to their financial accounts more frequently when they are paid and when their balances are high (Olafsson and Pagel, 2018). While these studies point to selective attention as an explanation for checking one's financial accounts, they do not provide evidence on the effects of more login activity on financial health. A few recent studies have begun to fill this gap in the literature. Carlin et al. (2022) find evidence that more attention improves financial behavior, that is, they find that non-sufficient funds fee payments

decline when users access financial information more often. Another study finds that text message nudges that make information about credit repayment more salient improve repayment, however, these messages also lead some consumers to focus on credit payment late fees at the cost of higher overdraft fees (Medina, 2021). A final study looks at interventions aimed at increasing attention broadly and their effects on decision-making. Altmann et al. (2022) find that while driving more attention to a decision improves choices in that area, it comes at the cost of reduced attention and quality of decisions in other areas. The present study contributes to this literature by offering evidence on the effectiveness of a single email that increases salience of a new tool available to monitor one's credit on personal financial account login activity.

Two recent studies most closely related to this study have focused on the effect of nudges on attention to one's credit score and financial behaviors. Among student loan borrowers, messaging about availability of one's credit score was effective at increasing probability of viewing one's score and view frequency (Homonoff et al., 2021). The study finds no evidence that repeated reminders relative to a single reminder improve financial behavior and no difference in effects with different messaging, including peer behavior and economic consequences. Fong and Hunter (2022) find that nudging consumers to check their score increases credit checks, however, depending on individual credit score history checking one's score may have positive or negative effects on credit score. They also find that creditworthiness diminishes for those whose credit scores are declining and improves for those whose credit scores are increasing or flat. Together these studies highlight nudges as an effective intervention to increase attention to creditworthiness in two diverse experimental contexts. Nudges targeted at groups who are already engaged with managing debt may be more successful at getting users to pay attention to their credit score and take action. The direction of effects on financial behaviors depends on the decision-making context and relative performance. The present study tests the effect of a nudge to view one's credit score on logging into a dashboard that presents credit score alongside other credit union account information. The study is also conducted in a distinct context at a credit union.

Overall, I find that delivering an email reminder regardless of message content is not effective at increasing log-in probability or frequency of logins to an online account dashboard that displays credit score. Past studies that explored effects of nudges on encouraging consumers to check their credit score examined samples who were engaged with debt management through student loan repayment or credit monitoring prior to the experiment. This study uses a random sample drawn from all members at a credit union many of whom use the credit union for deposit account services alone. Further analysis that leverages the high frequency daily log in data and examines heterogeneity reveal the dynamic response to treatment and for whom messaging is effective.

## 2. Experimental design

The experimental messaging highlights new information available in a credit union member's online account, their credit score and report. Depending on a consumer's financial behavior, the information gained from logging into one's account may represent a cost or benefit. Members may exhibit selective attention—choosing to log in to view their account if they expect the information gained to be positive or choosing not to log in if they expect to find negative information about their credit. The nudges received are randomly assigned to members and they include information about the credit monitoring tool that is framed as

negative or positive. These messages aim to test the effectiveness of nudges in focusing consumer attention on financial accounts.

The field experiment is conducted with a partner credit union ("credit union" henceforth) that serves more than 300,000 members in the Midwest. Credit unions offer a unique context to study an information intervention. They differ from banks in that they are non-profit organizations with explicit policies and programs that aim to serve low-to-moderate income households and those who may not have a strong credit record. These characteristics may improve trust of these financial institutions relative to retail banks, including messages delivered to consumers by the credit union. Feedback from the credit union was received to keep the messaging in line with past messaging to ensure the credibility of the email delivered to members. The email messages used in this study are assumed to be credible to consumers.<sup>1</sup>

The population for this experiment includes a random sample of 2045 credit union members who are not enrolled in the credit monitoring service six months after its introduction in October 2018. Members are eligible for the experiment if they are between 18 and 55 years old, have a credit score and report available, and are not enrolled in the credit monitoring service by April 1, 2019. Members who do not have a credit score and credit file available are excluded because they will not receive any information from the credit monitoring service and will not have a score available for view in their dashboard. Enrolled members are also excluded. Fig. 1 displays a timeline of the experiment, including dates for measurement of pre-treatment characteristics, email message delivery, and response measurement period.

In this experiment, there are five treatment arms: control, simple reminder, positive motivation I, positive motivation II, and negative motivation. The treatment is randomly assigned and delivered by the credit union at the individual level. From the members selected for the study, 1636 members were randomly assigned to each of the four email message conditions (409 members per condition) while another group of 409 members were randomly chosen to receive no email message from the credit union, the control condition. All email messages include the same subject line, informational video describing the credit monitoring service, additional body text, and a link to the credit monitoring service website on the credit union's website. The control group receives no email message.

The simple reminder group receives an email message that includes a header that reads, "Track Your Credit", and the following body text, "As a Credit Union member, you can check your credit score and monitor credit activity in Web Branch anytime for free". The email message also includes an image of the credit monitoring tool on a smartphone with a dashboard homepage for a consumer with a 810 point credit score (henceforth "high" credit score).

Two email messages are used to test the effectiveness of positive motivation, social information describing the prevalence of participation in the credit monitoring service among fellow credit union members. The first of the two positive motivation groups (Positive Motivation I) receives an email message that includes a call to action "Track & Improve Your Credit" and body text that reads "Thousands of Credit Union members are checking their credit for free. As a Credit Union member, you can check your credit score and monitor credit activity in Web Branch anytime for free". The email message includes an image of the credit monitoring tool dashboard displaying a "high" credit score on a smartphone. The second positive motivation group (Positive Motivation II) receives an email message with the same call to action and body text as Positive Motivation I. The email message

<sup>1</sup> This study was pre-registered on AsPredicted.org: "What Motivates Consumers to Check Credit? April 2019", (AsPredicted #23386).

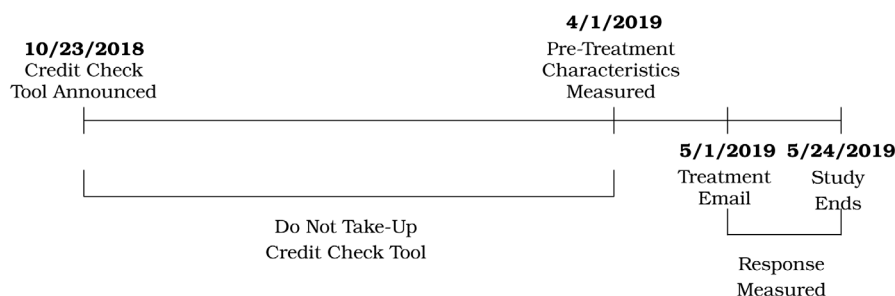


Fig. 1. Field experiment timeline.

displays a lower credit score, 690 point (henceforth “low” credit score), than all other email messages.

The negative motivation group receives an email message that includes a call to action, “Track & Protect Your Credit”, and body text that reads “Protect against identity theft and errors that may harm your ability to borrow in the future with free credit check. As a Credit Union member, you can check your credit score and monitor credit activity in Web Branch anytime for free.” The email message also includes an image of the credit monitoring tool displaying a “high” credit score on a smartphone. The condition details the negative financial consequences that may result from failing to check one’s credit.

2.1. Data

The credit union provided administrative data on credit union members selected to participate in the experiment from April 1, 2019 to May 23, 2019. The administrative data include treatment email assignment, email receipt, daily online member dashboard login activity, clickthrough to the credit monitoring service website, and credit monitoring service enrollments. The data also include demographic and pre-treatment account characteristics of members, including member age, deposit account tenure, deposit account balance, credit accounts at the financial institution, total fees accrued, delinquencies greater than 30 days, and credit score.

Logins to an online account serve as the key measure of attention to personal finances in this study (Medina, 2021; Olafsson and Pagel, 2018; Sicherman et al., 2016). When a member logs into their online account, their dashboard includes balances and activity for all credit union accounts, including checking, savings, credit card, and credit score. All members have their credit score displayed in their online dashboard by default. Members must opt out to not view their score when they log in to their online account. Members may view more detailed information about their credit record by clicking on their score from the dashboard. They may also sign up for a credit monitoring service.

Table 1 details summary statistics for the selected sample and statistics from the 2018 National Financial Capability Study (NFCS) weighted to be representative of the US population to compare study sample characteristics to that of a nationally representative sample. Almost two-thirds of the sample log in to their online account during the baseline period, a lower rate than the NFCS sample at over eighty percent. Members logged in to their dashboard an average of 6.6 times per month. Members held \$10,262 on average in their deposit accounts. The age distribution for the study sample skews younger than that of the nationally representative study with more than 50 percent of study participants between the ages of 18–34 years. Loan account rates were lower in the credit union sample relative to the NFCS sample. Only about a third had a credit card with the credit union while more than three-quarters of the NFCS sample reported having a credit card. Close to twenty percent reported having an auto loan

Table 1

Summary statistics for credit union sample and comparison to national financial capability study sample.

Source: Administrative data. National financial capability study 2018.

	Credit union	NFCS
Login count	6.63	–
Log in	0.61	0.84
Deposit account balance (in \$)	10,262	–
Age 18–24	0.23	0.12
Age 25–34	0.33	0.08
Age 35–39	0.15	0.10
Age 40–44	0.12	0.07
Age 45–49	0.09	0.08
Age 50–54	0.07	0.09
Age 55–59	0.02	0.09
Age 60–64	–	0.09
Age 65 or older	–	0.19
Have credit card?	0.36	0.79
Have auto loan?	0.19	0.33
Have student loan?	0.09	0.26
Have line of credit?	0.33	–
Have checking account?	0.78	0.91
Charged overdraft fee	0.01	0.19
Credit rating A+	0.57	0.42
Credit rating A	0.14	0.18
Credit rating B	0.11	0.17
Credit rating C	0.04	0.12
Credit rating D	0.14	0.04
Member tenure (in years)	8.79	–
Observations	2045	27,091

versus one-third in the NFCS sample. The student loan rate was lower in the study sample as well, 9% versus 26%. In addition to a lower rate of loan accounts, the study sample also had a lower checking account rate, 78% versus 91%. Overdraft fees were much less likely in the study sample with only 1% reporting being charged these fees. Credit rating distribution was similar with close to eighty percent of each sample reporting that they have a B or better rating. Members have belonged with the credit union for 8.8 years on average. Overall, the summary statistics for the study sample differ from nationally representative statistics that are available for comparison, including use of online account services, age, loan account rates, checking account rates, and overdraft rate. These differences illustrate limitations to external validity for the study. However, it is important to note that the data for this study come from administrative account data rather than self reported survey measures. Also, the measures used in this study only represent financial accounts held at the credit union while NFCS data asks survey respondents to report on accounts across financial institutions.

Table 2 details the balance test. The characteristics are largely balanced across the treatment conditions, though, there is a statistically significant difference in whether one has a “D” credit rating across the groups at the 10% level. The balance test reveals that randomization was largely successful for assignment

**Table 2**

Balance test and treatment cell size.

Source: Administrative data April 2019 to May 2019.

Variable	Control	Any email	Reminder	Positive-High	Positive-Low	Negative	Control vs. any email	Control vs. reminder	Control vs. positive-low	Control vs. positive-high	Control vs. negative
# of Logins	12.58	13.01	14.83	10.42	12.28	14.52	0.77	0.31	0.17	0.87	0.35
Login	0.67	0.67	0.67	0.67	0.66	0.68	0.89	0.82	0.82	0.71	0.71
Age (in years)	34.06	33.57	33.05	34.44	33.55	33.23	0.37	0.13	0.59	0.46	0.24
Account balance	10 326.08	10 246.23	11 173.70	8911.88	11 816.67	9082.68	0.97	0.78	0.51	0.57	0.55
Have credit card?	0.35	0.37	0.37	0.36	0.37	0.37	0.49	0.56	0.66	0.61	0.51
Have auto loan?	0.20	0.19	0.19	0.22	0.17	0.17	0.49	0.54	0.44	0.18	0.28
Have student loan?	0.09	0.10	0.10	0.10	0.10	0.08	0.51	0.47	0.47	0.40	0.80
Have line of credit?	0.34	0.32	0.33	0.32	0.31	0.34	0.59	0.71	0.60	0.41	1.00
Have checking account?	0.79	0.78	0.76	0.79	0.78	0.78	0.61	0.36	0.93	0.73	0.80
Member tenure	8.67	8.83	8.58	9.02	9.08	8.63	0.68	0.86	0.48	0.41	0.93
Credit rating A+	0.56	0.57	0.56	0.56	0.61	0.54	0.69	0.83	0.89	0.14	0.57
Credit rating A	0.15	0.14	0.16	0.12	0.13	0.13	0.48	0.77	0.27	0.42	0.49
Credit rating B	0.13	0.11	0.11	0.11	0.11	0.11	0.17	0.24	0.20	0.34	0.29
Credit rating C	0.03	0.04	0.03	0.06	0.04	0.05	0.06	0.83	0.02	0.19	0.14
Credit rating D	0.13	0.14	0.14	0.15	0.10	0.17	0.56	0.68	0.42	0.23	0.10
Observations	409	1636	409	409	409	409	2045	818	818	818	818

to treatment. Table 8 includes a balance test for treatment non-compliance. The table details the differences between those who comply with treatment assignment and open the email exposing themselves to the message compared to those who fail to comply and do not open the email. About 30% of those assigned to an email message comply with treatment assignment. Those who do not comply with treatment assignment are less likely to have logged into their online banking dashboard in the three weeks preceding treatment, 58.7% and 67.9% respectively. They are also less likely to have a credit card, 35.1% and 41.3%, and more likely to have a student loan with the credit union compared to those who do comply with treatment assignment, 11.2% and 5.2%. The analyses in this study will control for all pre-treatment characteristics, including pre-treatment outcomes, to account for these differences and improve precision of estimates.

## 2.2. Methods

In this study the email messages are randomly assigned. Causal effects may be estimated by simply regressing treatment on the outcomes of interest. The main outcome of interest for this study is consumer attention to information about their personal finances. The estimation of the effects of the messaging on consumer attention to financial information uses the econometric specification below:

$$Y_i = \alpha + \beta_1 I_i + \beta_2 X_i + \epsilon_i \quad (1)$$

$Y_i$  represents the two outcome measures: online banking log in indicator and login count.  $\beta_1$  is the coefficient of interest for this study: the effect of messaging on attention to one's credit.  $I_i$  is an indicator variable that equals one if the member is randomly assigned to treatment, zero if assigned to control.  $X_i$  is a vector of pretreatment characteristics including pretreatment login dummy and number of logins.  $\epsilon_i$  is the error term. I use ordinary least squares regression to estimate the effect of email assignment on attention to finances. Standard errors are clustered at the individual level which is the level of treatment assignment.

The identification strategy requires the assumption that there is no interference between units to be met in order for causal estimates to be credible. Because the messages are transmitted by email, they likely remain private to the individual. The balance test reveals that the treatment conditions were successfully randomly assigned. The treatment and control groups are balanced on a rich set of observed variables which supports the assumption that these groups are also balanced on unobserved characteristics. Panel data on outcomes and controlling for pretreatment outcomes in the regression specification rules out reverse causality and simultaneity. Administrative data is used in this study which limits measurement error that may result from using self-reported measures.

While treatment was randomly assigned, there was non-compliance in this experiment. The effects estimated using the above approach will yield intent to treat effects rather than average treatment effect on the treated. One-sided non-compliance occurs in this study, that is some members assigned to treatment do not open the email while no members assigned to the control group receive an email. In addition to the previous specification, this study exploits random assignment to a treatment message to estimate the effect of opening the message on attention to finances. This approach uses the random assignment to treatment as an instrument to predict opening the email. This approach yields the local average treatment effect of opening the message (LATE). The LATE represents the effect of treatment on those who are assigned to treatment who comply relative to a comparison group that includes those who are assigned to control who comply and those assigned to treatment who do not comply.

Random assignment to treatment will induce the treated units to open the email. Since the email message is randomly assigned, the exclusion restriction is satisfied. I will use two-stage least squares to estimate the effect of email review on attention to financial accounts. Although the instrumental variables approach allows for estimation of the treatment on the treated effect, it is important to remember that this represents the local average treatment effect (LATE) for compliers, those who viewed the email message rather than the population of interest sampled for this study.

Finally, I conduct a difference-in-differences estimation strategy to isolate the effect of email messaging on attention to finances. This strategy takes advantage of the daily login activity available in the administrative data before and after treatment. This strategy also allows difference-in-differences to control for time-invariant individual characteristics that I do not observe directly and time fixed effects. To implement the difference-in-differences approach, I estimate the following specification:

$$Y_{it} = \alpha + \beta_1 I_{it} * Post_t + \beta_2 I_i + \beta_3 Post_t + \epsilon_{it} \quad (2)$$

$Y_{it}$  represents the two outcome measures: online banking login activity, including indicator variable for whether login at all and count variable of number of logins.  $I_i$  is an indicator variable that equals one if the member is randomly assigned to treatment, zero if assigned to control.  $\beta_1$  is the coefficient of interest for this study: the effect of messaging on attention to one's credit.  $Post_t$  is an indicator variable that equals one if period is after treatment, zero if prior to treatment.  $\epsilon_{it}$  is the error term. Standard errors will be clustered at the individual level which is the level of treatment assignment.

## 3. Results

In this study, I analyze whether email messages highlighting the availability of a freely available credit monitoring service increases attention to personal finances. This section details the effects of email messaging on attention to information about creditworthiness measured by online dashboard log-in activity. First, I present the simple intent-to-treat (ITT) effects, the effects of treatment assignment on log in propensity and frequency. Treatment groups are separated out to explore mechanisms and all treatment groups pooled together for comparison with the control group. Next, I discuss local average treatment effects (LATE), that is the effects of opening the email message exploiting random assignment to treatment to instrument for opening the message. Third, I examine the effects of receiving an email on login activity using a difference-in-differences approach that exploits detailed daily logins available in the administrative data. Finally, I present additional analyses that explore heterogeneity of treatment effects as well as sensitivity and robustness of study findings.

### 3.1. Intent-to-treat effects: Effects of receiving email message

Table 4 Panel A details the intent-to-treat effects, that is the effects of receiving an email message on attention to online account dashboard that displays credit score. First, I examine the effect of receiving any email regardless of message content on login activity. I find that those randomly assigned to receive an email are not more likely to log in to their online account relative to the control group. This estimate is close to zero and not statistically significant indicating that email receipt is not effective at encouraging members to log in to their account. However, members who receive an email slightly increase the number of times that they log in although the estimated effect is not statistically significant. Next, I explore the effectiveness

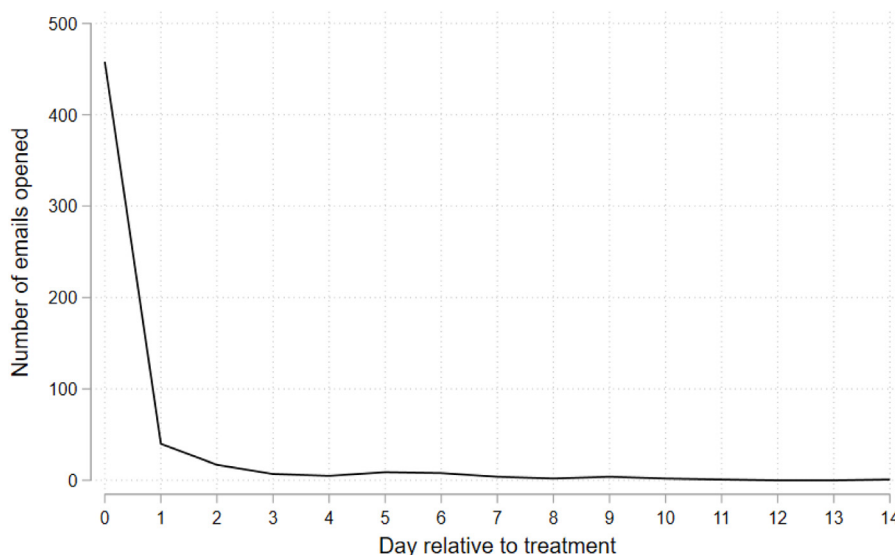


Fig. 2. Daily email message open rate for members randomly assigned to receive treatment email message.

Table 3

First stage estimate of treatment assignment on opening email message.

Source: Administrative data April 2019 to May 2019.

	Open email
Receive any email	0.271*** (0.011)
F-Stat	573.91
N	2045
R <sup>2</sup>	0.086

Robust standard errors in parentheses. +  $p < 0.10$ , \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ .

of different message content, including a simple reminder, positive motivation, and negative motivation. This analysis examines whether statistically significant effects of receiving any email mask differential effects by type of message content. The analysis reveals that none of the treatment messages increase propensity to log in to the online dashboard; estimates are close to zero and not statistically significant. All treatment messages increase number of logins slightly, especially positive motivation message that displays a high credit score, however these estimates are not statistically significant.<sup>2</sup>

### 3.2. Local average treatment effects: Effects of opening email message

Next, I examine the effect of opening the email message using an instrumental variables (IV) approach. The random assignment to an email message is used to instrument for opening the email. Fig. 2 displays the number of members who open the email each day following email delivery. The email is effective at attracting attention to those assigned to receive the message although the response to the message measured by open rate declines rapidly. The email open rate drops dramatically just one day after it is sent and the open rate is effectively zero two days after it is sent out. This figure illustrates the first stage for the two-stage least squares (2SLS) instrumental variables estimation employed

<sup>2</sup> I also estimate the effect of the simple reminder, which reflects the default communication from the credit union, offering a comparison of the effect of different message content compared to business as usual. I find that delivering a treatment message that differs from “business as usual” does not increase attention to finances.

to measure the effect of opening the email message on attention to online dashboard. Table 3 includes the results from the first-stage where email message assignment predicts whether a credit union member opens the email. The estimate is large and statistically significant—those who are assigned to treatment are 27.1 percentage points more likely to open the email. The F-statistic is very large, 573.91, random assignment to email message appears to be a strong instrument for a member opening the email. Since email message assignment is random, this approach allows for estimation of the effect of opening the message on online dashboard login activity a proxy for attention to personal finances. Table 4 Panel B details the 2SLS estimates from the IV approach. Those who open the email are 8.1 percentage points more likely to log-in to online banking where their credit score is displayed, however this estimate is not statistically significant. Those who are induced to open the email message by random assignment have 3.5 more logins. These estimated effects reveal that emails are effective at increasing attention to their credit score for those who open the email and presumably review the email message that they are assigned. These effects may be interpreted as the effects for members who take-up the treatment.

### 3.3. Difference-in-differences estimates

Figs. 3 and 4 display daily log-in activity including login rate and number of logins respectively, during the study period relative to treatment timing. The figures also include 95% confidence intervals represented by the shaded area. Using a difference-in-differences approach, I measure the effect of receiving an email on login activity. This approach allows me to control for time-invariant characteristics that may have been unobserved in the ITT approach that simply controls for observed characteristics, including pretreatment outcome variables. As previously shown in Table 2, pre-treatment login activity is balanced mitigating concerns that levels of outcome prior to treatment differ by treatment assignment. I aggregate login activity in the pre and post treatment periods to conduct a simple two period difference-in-differences analysis. I also test different levels of aggregation of outcomes, including weekly, 3 day, and daily, and the results are consistent regardless of selected interval. I choose to present estimates at the highest level of aggregation for ease of interpretation. Table 5 Columns 1 and 2 detail the effects of receiving an email regardless of message content on log in

**Table 4**  
Treatment effects of email message on attention to online dashboard.  
Source: Administrative data April 2019 to May 2019.

	Log in	# of Logins
Panel A: Intent-to-Treat (ITT) effects of receiving email message		
Receive any email	-0.004 (0.015)	0.445 (0.515)
Receive reminder email	0.007 (0.019)	0.414 (0.729)
Receive positive motivation-high score email	-0.015 (0.020)	0.742 (0.714)
Receive positive motivation-low score email	-0.003 (0.020)	0.343 (0.645)
Receive negative motivation email	-0.004 (0.020)	0.278 (0.671)
Panel B: Local Average Treatment Effects (LATE) of opening email message		
Open any email	0.081 (0.061)	3.509 + (1.993)
Control mean	0.645	7.318
N	2045	2045

Robust standard errors in parentheses. +  $p < 0.10$ , \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ .

**Table 5**  
Difference-in-differences estimates of treatment effects.  
Source: Individual-level fixed effects. Standard errors clustered at individual-level, the level of treatment assignment. Administrative data April 1, 2019 to May 23, 2019.

	Log in	# of Logins	Log in	# of Logins	Log in	# of Logins
Any email × Post	-0.003 (0.017)	0.111 (1.204)				
Reminder × Post			0.005 (0.020)	-1.347 (1.818)		
Positive - High score × Post			-0.015 (0.021)	2.396 * (1.189)		
Positive - Low score × Post			0.000 (0.021)	0.416 (1.506)		
Negative × Post			-0.002 (0.021)	-1.022 (1.683)		
Any positive email × Post					-0.008 (0.014)	2.196 * (0.960)
Post	-0.022 (0.015)	-5.262 *** (1.056)	-0.022 (0.015)	-5.262 *** (1.056)	-0.021 * (0.008)	-6.051 *** (0.747)
N	4090	4090	4090	4090	4090	4090
R <sup>2</sup>	0.007	0.048	0.007	0.051	0.007	0.050

+  $p < 0.10$ , \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ .

probability and number of logins. I find that receiving an email is not effective at increasing login activity. Next, I examine the effects of receiving different types of email message content in Columns 3 and 4. I find that those who receive a positive message with a high credit score displayed log in 2.4 times more in the period following treatment. While those who receive a positive message with a low credit score displayed also log in more following treatment, the magnitude is much smaller, 0.4 logins, and not statistically significant. Receiving the simple reminder email and negative email message result in a decrease in number of logins, however, these estimates are not statistically significant. Finally, in Columns 5 and 6, I examine the effect of receiving either of the positive message emails on login activity. I find that those who receive an email that includes a positive motivation to track one's credit log in to their online dashboard 2.2 more times relative to those who receive no email, receive a reminder email, or receive an email with negative motivation message. These findings reveal that emails that detail social information, revealing to some extent relative performance, are effective in increasing attention to personal finances measured by number of logins to an online account dashboard.

### 3.4. Additional analyses

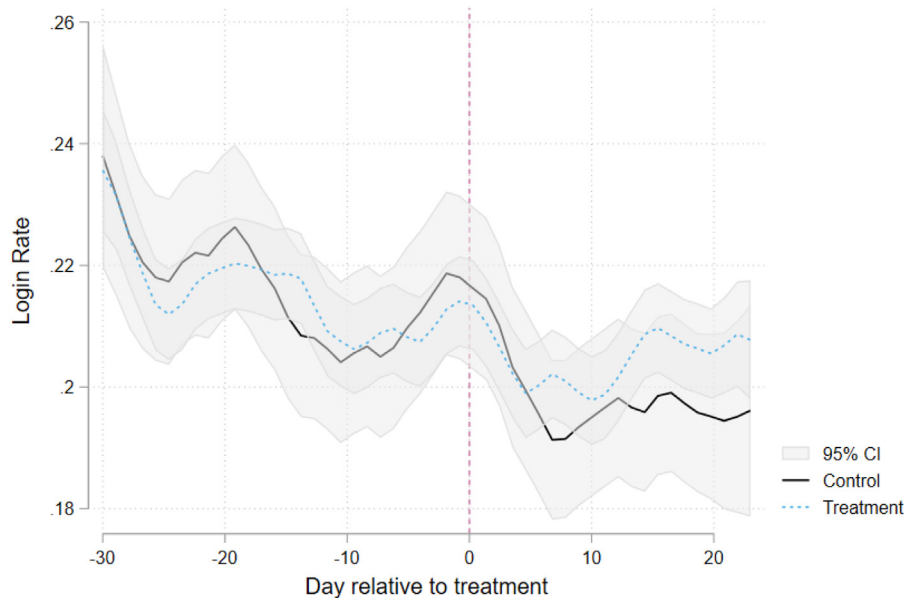
#### 3.4.1. Heterogeneous ITT effects of receiving email message

The effects of receiving any message for subgroups who may have different incentives to check their credit and, thus, responses to messaging are presented. Heterogeneous effects are estimated for those who have a low credit rating, possess no credit cards, young adults, and new credit union members. These characteristics may lead individuals who would likely benefit from check their credit through the free service to have inaccurate beliefs about their credit. Table 6 shows that the email messages do not have heterogeneous effects for the selected subgroups. Columns 1 and 2 detail the differential effects of any email message for those with low credit rating, defined as a rating of either "C" or "D", on online banking log in. Members with low credit rating who are assigned to an email message are 0.4 percentage points more likely to log in to their online banking where they can view their credit score. These members log in 1.4 fewer times. Finally, members with "low" credit ratings log in to their accounts 4.126 times more than those with high credit ratings. Columns 3 and 4 present the effects of messaging for members who do not

**Table 6**  
Heterogeneous ITT effects of receiving any email message on attention to online dashboard.  
Source: Administrative data April 2019 to May 2019.

	(1) Log In?	(2) # of Logins	(3) Log In?	(4) # of Logins	(5) Log In?	(6) # of Logins	(7) Log In?	(8) # of Logins
Low credit rating × Any message	0.059 +	0.066						
	(0.032)	(1.263)						
Low credit rating	0.002	3.217 *						
	(0.032)	(1.291)						
No credit card × Any message			0.005	0.476				
			(0.031)	(1.226)				
No credit card			-0.090 **	-1.455				
			(0.029)	(1.082)				
Age 18-35 × Any message					0.049	0.785		
					(0.033)	(1.006)		
Age 18-35					-0.025	-0.178		
					(0.034)	(1.163)		
New member × Any message							0.076 *	0.246
							(0.032)	(1.033)
New member							-0.059 +	0.768
							(0.032)	(0.990)
Any message	-0.021	0.425	-0.007	0.137	-0.033	-0.010	-0.036 +	0.311
	(0.019)	(0.562)	(0.023)	(1.106)	(0.027)	(0.742)	(0.020)	(0.737)
N	2045	2045	2045	2045	2045	2045	2045	2045
R <sup>2</sup>	0.667	0.412	0.666	0.412	0.667	0.412	0.667	0.413

Robust standard errors in parentheses. +  $p < 0.10$ , \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ .



**Fig. 3.** Daily online dashboard log in rate leading up to and following treatment.

have a credit card with the credit union. The messaging effect on logins for this group is zero. These members are 37.3 percentage points less likely to log in to their online banking than those who have a credit card, statistically significant at the 0.1% level. Those assigned to the treatment log in to online banking 0.067 times more than the control group. Members with no credit card log in 5.146 fewer times than those with credit cards through the credit union. Next, columns 5 and 6 include the differential effects of messaging for young adults age 18–35. Young adults assigned to email messaging are 6.2 percentage points more likely to log in to their online dashboard, and they have 1.552 more logins. Young adults are 7.5 percentage points more likely to log in to online banking and have 0.56 more logins than older members. Finally, columns 7 and 8 reveal that new members who receive an

email message are not more likely to check their online banking. These estimates are statistically insignificant. The emails are not differentially effective in encouraging these selected subgroups to log in to their online dashboard to check their credit.

### 3.4.2. Simple comparison of participants and non-participants

Finally, I conduct a simple comparison of participants and non-participants varying inclusion of the control group to contrast these estimates with those from the more rigorous instrumental variable approach. Table 7 details in the first row the effect of opening the email using a comparison of treated members who comply by opening the email and a comparison group composed of control members and members assigned to treatment who do not open the email. Those who open the email are 2.1



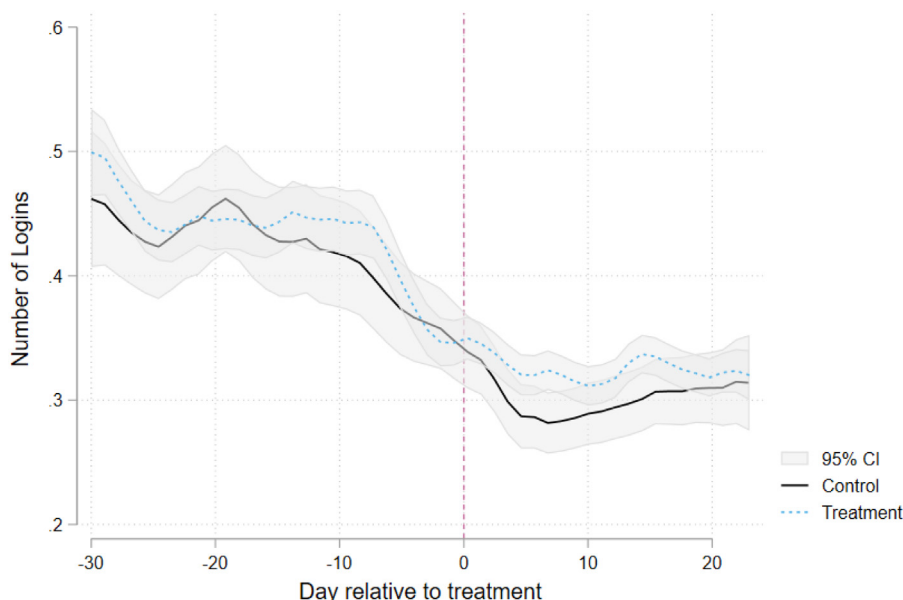


Fig. 4. Daily online dashboard logins leading up to and following treatment.

Table 7

OLS estimates of effects of opening email message on attention to online dashboard.

Source: Administrative data April 2019 to May 2019.

	Log in?	# of Logins	N
Open email	0.021 (0.016)	0.905 + (0.514)	2045
Open email (Excluding control group)	0.025 (0.016)	0.886 (0.545)	1636

Robust standard errors in parentheses. +  $p < 0.10$ , \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ .

percentage points more likely to log in to their online account dashboard, however this estimate is not statistically significant. Treated members log in to their online dashboard close to one additional time; this estimate is statistically significant at the 10% level. Next, I compare treated members to members assigned to treatment who do not open the email excluding control members in the second row of Table 7. Treated members are 2.1 percentage points more likely to log in to their online account and log in close to 1 additional time relative to members that receive a treatment message but fail to open it. Both estimates are not statistically significant.

#### 4. Limitations

Although this study uses randomization of treatment in a natural setting to evaluate the effects of messaging on attention to one's finances, there are several limitations that must be addressed. First, the identification strategy requires the stable unit treatment value assumption (SUTVA) that there is no interference between units to be met in order for causal estimates to be credible. Because the messages are transmitted by email, they likely remain private to the individual mitigating the concern of spillovers between members randomly assigned to treatment and control conditions. Second, participation in the treatment, that is opening the email message, was voluntary leading to one-sided treatment noncompliance. Almost three-quarters of members that received an email message failed to open the

email, thus not receiving the assigned email message. Although many members randomly assigned to treatment do not comply, the compliance rate, 27%, was high for a study that uses email to deliver treatment. Compliance rate was not statistically different between treatment arms as all treatments included the same subject line.<sup>3</sup> Members assigned to the control group do not receive email messages ruling out non-compliance in this treatment arm. Table 8 compares those who do not open the email to those who comply with treatment assignment and open the email. Members who comply with treatment assignment are largely similar to those who do not comply except that compliers are more likely to log in to their online dashboard prior to treatment, less likely to have a student loan serviced by the credit union, and more likely to have a credit union credit card. Since administrative data is used in this study outcomes are observed for all participants regardless of their treatment compliance. Since the email message was delivered by the credit union directly and mirrored communication that members would receive from the credit union, it is unlikely that member attrition resulted or outcomes were influenced by knowledge that members were part of an experiment. Finally, this study was conducted at a single credit union which limits generalization of study findings to other populations. Additionally, the sample was restricted to those who have not taken up the credit monitoring service in six months prior to experiment; these individuals may be difficult to encourage to use the tool.

#### 5. Discussion

Using a field experiment, this study aimed to measure the effectiveness of a one-time email message on credit union member attention to their online account dashboard where their credit score is freely available. Randomizing assignment to treatment message conditions, I find that members assigned to receive the treatment message overall do not change their log in activity, a

<sup>3</sup> A small scale study was conducted on Amazon Mechanical Turk (MTurk) to test effectiveness of different subject lines in encouraging individuals to open a hypothetical email from a bank or credit union. The subject line that was most effective was used for the emails delivered in this field experiment.

**Table 8**

Balance test by treatment compliance (Excluding control group).

Source: Administrative data April 2019 to May 2019. Control group excluded.

		Do not open	Open email	Overall	p-value
Age (in years)		33.403	34.005	33.566	0.278
Member tenure (in years)		8.892	8.646	8.825	0.529
Deposit account balance (in \$)		9527.72	12,181.19	10,246.23	0.205
Log in (Pre)		0.587	0.679	0.612	0.001
Login count (Pre)		6.731	6.609	6.698	0.886
Has a credit card?		0.351	0.413	0.368	0.021
Has an auto loan?		0.181	0.205	0.188	0.262
Has a student loan?		0.112	0.052	0.096	0.000
Has a line of credit?		0.320	0.332	0.323	0.655
Has a checking account?		0.780	0.774	0.778	0.819
Credit rating	A+	0.562	0.585	0.568	0.421
	A	0.142	0.124	0.138	0.339
	B	0.108	0.111	0.109	0.886
	C	0.047	0.038	0.045	0.456
	D	0.140	0.142	0.141	0.908
N	1193	443	1636		

proxy for attention to personal finances. However, members with low credit rating and new members are more likely to log into their account, two populations who may especially benefit from information about a no-cost credit monitoring service available at their financial institution. Those who open the email log in more frequently suggesting that the intervention works when members are motivated to review the message content. Leveraging panel data on logins and timing of treatment, I plot an event study and implement a difference-in-differences estimation strategy to better isolate the effect of receiving a treatment message using daily login activity. I find that members that receive an email appear to log in more frequently than the control group in the first two weeks following treatment. Email messages are effective at encouraging certain subgroups of credit union members to initiate checking their account online and the messages are effective at increasing number of logins in some contexts.

While this study used random assignment of treatment, administrative panel data, and rigorous estimation methods to measure the causal effects of email messaging on attention to one's finances, there are some limitations that should be noted. First, compliance with treatment assignment was not perfect leading to selection into being treated. Second, the measures of attention to finances are proxies used widely in the literature rather than a more direct measure of attention. Third, the study does not measure financial decisions after treatment, like credit rating, limiting the ability to understand the effects of email message on personal financial outcomes rather than attention alone. Finally, this study was conducted at a single credit union thus findings may not be readily extrapolated to other populations. Despite these limitations, this study offers causal evidence of the effectiveness of email messages on increasing logins to monitor financial accounts and credit activity.

The findings from this study help to inform policy that aims to improve financial well-being through improving information available to consumers. Consumers who are nudged to check their financial accounts do in fact respond to one-time messaging interventions. Understanding the messaging content, mode of delivery, timing, and frequency that are effective are important for optimally designing these interventions. Future research should continue to explore the effects of messaging in increasing attention to personal finances and how increased attention translates to improvements in financial outcomes and potential unintended consequences of directing consumer attention.

### CRediT authorship contribution statement

**Madelaine L'Esperance:** Study conception and design, Data collection, Analysis and interpretation of results, Manuscript preparation.

### Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

### References

- Agarwal, S., Chomsisengphet, S., Mahoney, N., Stroebel, J., 2015. Regulating consumer financial products: Evidence from credit cards. *Q. J. Econ.* 130 (1), 111–164.
- Altmann, S., Grunewald, A., Radbruch, J., 2022. Interventions and cognitive spillovers. *Rev. Econom. Stud.* 89 (5), 2293–2328.
- Bursztyzn, L., Fiorin, S., Gottlieb, D., Kanz, M., 2019. Moral incentives in credit card debt repayment: evidence from a field experiment. *J. Political Econ.* 127 (4), 1641–1683.
- Carlin, B., Olafsson, A., Pagel, M., 2022. Mobile apps and financial decision making. *Rev. Finance*.
- Consumer Financial Protection Bureau, 2019. The Consumer Credit Card Market. Technical Report, Consumer Financial Protection Bureau.
- Federal Reserve Bank of New York, 2021. Quarterly Report on Household Debt and Credit. Technical Report, Federal Reserve Bank of New York.
- Fong, J., Hunter, M., 2022. Can facing the truth improve outcomes? Effects of information in consumer finance. *Mark. Sci.* 41 (1), 33–50.
- Harvey, M., 2019. Impact of financial education mandates on younger consumers' use of alternative financial services. *J. Consum. Aff.* 53 (3), 731–769.
- Homonoff, T., O'Brien, R., Sussman, A.B., 2021. Does knowing your fico score change financial behavior? evidence from a field experiment with student loan borrowers. *Rev. Econ. Stat.* 103 (2), 236–250.
- Jones, L.E., Loibl, C., Tennyson, S., 2015. Effects of informational nudges on consumer debt repayment behaviors. *J. Econ. Psychol.* 51, 16–33.
- Kaiser, T., Lusardi, A., Menkhoff, L., Urban, C., 2022. Financial education affects financial knowledge and downstream behaviors. *J. Financial Econ.* 145 (2), 255–272.
- Medina, P.C., 2021. Side effects of nudging: Evidence from a randomized intervention in the credit card market. *Rev. Financ. Stud.* 34 (5), 2580–2607.
- Olafsson, A., Pagel, M., 2018. The Ostrich in Us: Selective Attention to Personal Finances. NBER Working Paper (23945).
- Sicherman, N., Loewenstein, G., Seppi, D.J., Utkus, S.P., 2016. Financial attention. *Rev. Financ. Stud.* 29 (4), 863–897.
- Urban, C., Schmeiser, M., Collins, J.M., Brown, A., 2020. The effects of high school personal financial education policies on financial behavior. *Econ. Educ. Rev.* 78, 101786.