Use of Reminders for Credit Card Payments:
Experimental Evidence from Chile

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I.   Introduction

In September 2022, there were more than 15 million active credit cards in Chile (CMF, 2023). This financial product allows consumers to incur debt and pay it back later in instalments, which must be settled at the right time to avoid additional interest and other costs.

In practice, many consumers do not fully and timely pay their credit card debt. For reference, in December 2022 the total overdue amount for credit cards in Chile was USD$672 million (CMF, 2023). In part, this is attributed to consumers' low repayment capacity, either due to over-indebtedness or a decline in their income (SERNAC, 2020). Another portion may be attributed to a lack of awareness of the consequences of non-payment, simple forgetfulness, or cognitive biases influencing debtors' decisions.

The evidence from behavioural sciences suggests that the use of heuristics and the impact of cognitive biases such as the status quo bias, present bias, optimism bias, or the anchoring effect (minimum payment as a reference point in payment decisions) can negatively influence consumer payment behaviour. Additionally, it advocates for the use of nudges, which are interventions that help consumers in making better decisions (Thaler & Sunstein, 2008).

One of the most studied nudges to improve payment behaviour is reminders, whose effectiveness has been demonstrated in multiple contexts and populations (DellaVigna & Linos, 2020). However, evidence regarding the specific content of a reminder is scarce. Therefore, this research aims to address this question. Specifically, what is the most effective reminder message to encourage the timely payment of credit card debts.

In the study, the effectiveness of four reminder messages (treatments) was evaluated through an online laboratory experiment involving 2,963 participants. The content of these messages was designed based on evidence from behavioural sciences, and their effect was contrasted with that of a simple, brief, and direct message (control message). The impact of the reminders was measured through four outcome variables: the action participants declared they would take after receiving the message, understanding and clarity of the content, and confidence in the received message. Additionally, questions were asked about participants' socio-economic characteristics, their subjective perception of the message, and attitudes regarding the use of credit cards.

The experiment concluded that the most effective message is the one labelled "Full Payment (T2)," which, in addition to reminding of the payment due date,

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encourages the payment of the total billed amount by informing that it is the only way to avoid additional interest charges. Overall, this treatment achieved the greatest impacts on the analysed outcome variables, and its appropriateness was also supported by the results of a qualitative evaluation.

The rest of the article is structured as follows: Section II provides a literature review, Section III describes the methodology used, Section IV presents the data, and Section V outlines the main results. Subsequently, Section VI presents the study's conclusions, and finally, Section VII proposes regulatory improvements.

II.   Literature review

Reminder-based interventions have demonstrated effectiveness in multiple contexts, including debt payments, utility bills, and taxes (BIT, 2019; Hoy et al., 2021; Collin et al., 2022); in healthcare (Sanders et al., 2019); and in education (Busso, 2015; Busso, 2017). A comprehensive literature review and meta-analysis on this topic can be found in DellaVigna & Linos (2020). These results have been found across diverse populations and in countries with varying levels of development. Therefore, it can be concluded that this is an intervention with proven external validity.

Regarding the use of reminders for credit card payments, significant impacts have been measured in multiple studies. For instance, a field experiment in Australia found that those who received SMS reminders increased their card payments by 28% compared to the control group, and this effect was persistent in the long term (BETA, 2019). Another study in Uganda found that reminders increased the likelihood of timely payments by 9 percentage points compared to the control group. Moreover, this intervention was proven to be highly cost-effective, outperforming other more expensive interventions (Cadena & Schoar, 2011). Finally, another field experiment in Brazil showed that sending a reminder reduced the probability of incurring late fees by 2.6 percentage points (Medina, 2021).

Other research has explored different aspects of reminders, such as the communication channel, frequency, and timing of the intervention. Regarding the communication channel, the evidence is mixed. A study by BETA (2019) supports the use of SMS over email, while others highlight email as equally or more effective than physical mail or other digital channels, recognizing it as a cost-effective option (Frascella et al., 2020; Ortega & Scartascini, 2020). As for frequency, results are contradictory, with some studies finding that frequency is not important (BIT, 2018), while others find that more frequent reminders are more effective (Antinyan, 2021). Regarding the timing of delivery, Gillitzer et al. (2020) conclude that this aspect does not influence the impact of the intervention.

Although the effectiveness of reminders is well supported by multiple studies, the evidence regarding the specific content of the messages is scarce. However, results from studies in behavioural sciences and financial literacy can help build hypotheses about what contents might be relevant.

Firstly, some studies suggest that lengthy messages with complex terms may confuse readers and lead to errors in financial decision-making (Agarwal et al., 2013). By contrast, the use of simple reminders has shown better results than alternatives involving more effort and costs (BIT, 2019; BETA, 2019). Therefore, it appears advisable to simplify the language of reminders.

On the other hand, the lack of financial knowledge makes individuals more prone to making poor financial decisions (Lusardi & Mitchell, 2014), which could help explain consumers' suboptimal payment decisions. In this regard, studies show that financial literacy in Chile is low and is associated with income, wealth, age, gender, and educational level of individuals. Additionally, people would overestimate their level of financial literacy, which can lead to poor decision-making (Behrman et al., 2010; Centro de Políticas Públicas UC, 2017). Consequently, it would be advisable to use reminders that educate consumers about the negative effects of untimely or incomplete credit card payments.

Another aspect to consider in the design of reminders is consumers' limited attention bias, as they do not use all available information when making decisions but focus only on the most salient elements, given that processing information is cognitively costly (Gabaix, 2017). It has been found that these biases even influence the decisions of individuals with high financial knowledge (Hilchey et al., 2023). Therefore, reminders should incorporate prominent elements that highlight the most relevant information for decision-making.

Furthermore, people tend to exhibit a present bias, a tendency to overvalue immediate gratifications, delaying the payment of costs (O'Donoghue & Rabin, 1999). This bias suggests that it is attractive to defer credit card payments until the next cycle, thereby increasing present consumption (Kuchler & Pagel, 2021). To mitigate this bias, reminders could emphasize the future benefits associated with debt payment in the present, encouraging consumers to appropriately balance the present and future benefits of their decisions.

Finally, another issue to consider is cognitive load and the theory of cognitive scarcity. Mani et al. (2013) conclude that a lack of money or time can worsen decision-making due to the cognitive load produced by these situations. In the same vein, it has been found that individuals experiencing high financial stress are more prone to making poor financial decisions (Bruijn & Antonides, 2022). This evidence suggests that a reminder proposal should emphasize the simplicity of the payment process, preventing it from becoming an additional concern due to its complexity.

III. Methodology

In this section, the tested reminders are described, along with the technical aspects of the experiment, such as the calculation of the sample size, the random assignment process, and the econometric model used for impact estimation.

A. Reminders

Based on the literature review from the previous section, five messages were proposed to be tested in the experiment—a control message and four treatments—which are described below:

"Simple message" (control). This message reminds the payment due date, along with the credit card information associated with the payment. A priori, one could expect it to be highly effective in encouraging timely credit card payments, since it is a simple, brief, and direct message.

> *Hello! Tomorrow is the last day to pay your credit card ****5465 on time.*

The treatments described below contain the same text as the control message, plus some additional text aimed at mitigating the effect of different behavioural biases.

"Minimum payment" Message (T1). This message emphasizes how to avoid some of the potential costs for the consumer resulting from not paying their credit card. However, it does not warn that paying the minimum amount does not prevent the payment of additional interest. Therefore, inducing the payment of the minimum amount may be considered a "dark nudge," that is, a stimulus that encourages suboptimal behaviour. Displaying the figure of the minimum amount serves as a reference point for the payment decision (anchoring effect), promoting consumers to choose an alternative that may have negative consequences in the future (SERNAC, 2021).

> *[Control] + Avoid late interest charges by paying the minimum amount for this month ($6.378).*

"Full payment" Message (T2). Similar to the previous message, this treatment explains how to avoid paying additional interest but encourages payment of the total billed amount (whereas it discourages paying the minimum amount) by stating that it is the only way to avoid additional interest charges.

> *[Control] + Avoid additional interest charges by paying the total amount for this month ($212,590). Paying the minimum will not prevent interest charges.*

"Late Fee" Message (T3). This message aims to highlight the consequences of delaying credit card payment, which may be unknown to many debtors due to low levels of financial literacy in Chile. In particular, the message points out that a late payment fee could be applied (corresponding to the maximum conventional rate) and possible additional payments for collection expense management.

> *[Control] + For each day of delay, 41.56% of the overdue amount will be added. After 20 days of delay, additional charges for collection expenses may also be applied.*

"Future cost" Message (T4). This reminder also aims to highlight the consequences of non-payment but emphasizes the long-term negative consequences of a consumer's poor decision.

> *[Control] + Consider that not paying may hinder your access to credit in the future or result in more expensive credit.*

B. Experimental design

The participants in the experiment come from the SERNAC complaint database, from which a representative sample of consumers was obtained. They received invitations to participate in the experiment via email during February 2023.

The experiment was conducted online using the Qualtrics platform for experiment presentation, data collection, and participant random assignment to experimental groups. During the survey, first, it was verified that consumers met the requirements of owning at least one credit card and having used it in the past year. Then, they were asked about their income level and age, and based on their responses, they were randomly assigned to each experimental group. Stratification based on income and age was done because these variables are considered relevant for financial decision-making (Awargal et al., 2013).

Next, participants were presented with a hypothetical scenario in which their financial institution sends them a text message (SMS) to their mobile phone reminding them to pay their credit card. The message that each participant observed varied according to their corresponding experimental group. The messages were the five reminders described earlier: the control and the four treatments.

After displaying the message, participants were asked, "After receiving this text message, what action would you take?" and the following alternatives were presented to them in random order: (1) "Nothing, I would continue with what I was doing before receiving the message," (2) "I would immediately pay the credit card through online banking or at a branch office," (3) "I would log into my online banking to check what they are charging me," or (4) "I would request not to receive this type of message in the future."

Then, consumers were asked about the level of confidence they would have in the message if their financial institution sent it, and the understanding and clarity of the message. These questions, along with the previously described action to be taken, constitute the main outcome variables of the experiment.

Subsequently, other qualitative questions were asked, such as the overall perception of the message, the willingness to receive this type of message and when, and about the payment behaviour of the participants, where they were asked to indicate how often they pay the total amount billed, the minimum, another amount, do not pay, or are delayed in payment. Finally, other questions assessed aspects such as knowledge about the consequences of paying less than the total, the financial literacy level of the participants, and their socio-economic characteristics.

C. Econometric model

The main issue in identifying the impacts of a treatment is selection bias, which occurs when the reasons an individual participates in a program are correlated with the outcomes. To address this problem, participants are randomly assigned to comparison groups. This way, the groups obtained are statistically equivalent in all their characteristics, except for the treatment received. Therefore, any difference in outcome variables can be attributed to the treatment.

To estimate the effect of the treatments, a linear regression model was employed, where the dependent variable is an outcome variable: the action the consumer

declares they would take after observing the reminder, the understanding and clarity of the message, and the confidence it inspires. All these variables are dichotomous, so a linear probability model is estimated.

The independent variables are the four treatments, represented by dummy variables that take the value of 1 if the individual receives the corresponding treatment and 0 otherwise, while the impact of the control group is captured by the model's intercept. Therefore, the causal effect of the treatments is given by the coefficient accompanying each dummy variable. These coefficients measure the average difference between the effect of the control message and that of each treatment.

Finally, to conduct inference, robust standard errors were estimated (White, 1980) to correct for the heteroscedasticity inherent in the linear probability model.

IV.   Data

In the study, 2,963 valid responses were considered, which are those surveys that were fully completed. Descriptive analysis of the data (Figure 1) shows that 50% of the participants identify as female, while 49% identify as male. The remaining 1% identified with another gender. On the other hand, most of the participants were in the 30 to 44 age range (45%), followed by the 45 to 59 age group (26%), while the younger group (18-29 years) and those over 60 represented approximately 15% each. Regarding the income level of the participants, 7% declared incomes below CLP$250,000 per month, 15% between CLP$250,000 and CLP$500,000, 27% between CLP$500,001 and CLP$900,000, 33% between CLP$900,001 and CLP$2,000,000, and 18% had incomes above CLP$2,000,000. Finally, regarding the highest educational level attained by the respondents, 60% have completed university or postgraduate education, 22% have completed technical higher education, and 18% have completed secondary or primary education.

Table 1 shows the averages of a set of variables that characterize the participants in each experimental group, along with the p-value from a mean difference test that compares the mean of each group with that of the control group. No significant differences are found at the 95% confidence level, suggesting that randomization was successful in producing comparable groups. Consequently, it can be asserted that the groups differ only in the treatment received, allowing for the proper identification of the impact of reminders (internal validity).

Figure 1. *Description of the sample*
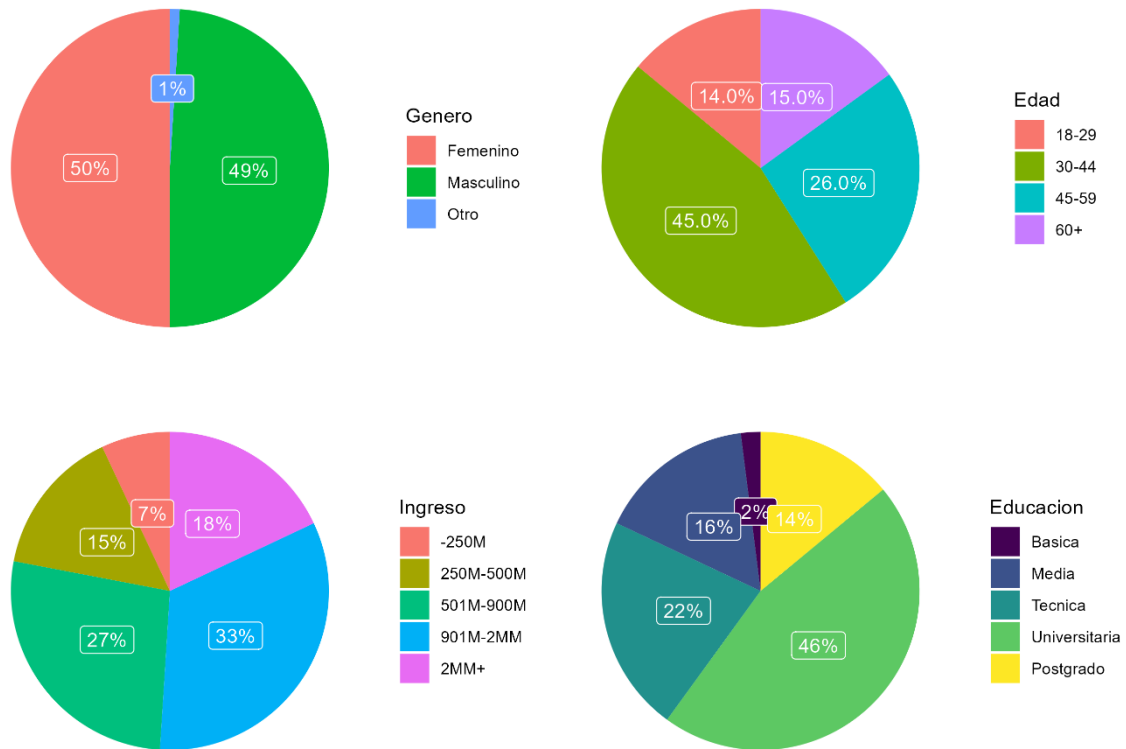
Table 1. *Means differences*

Variables	Control	T1	p-value	T2	p-value	T3	p-value	T4	p-value
Female	0.50	0.52	0.496	0.50	0.705	0.49	0.705	0.48	0.365
Male	0.48	0.47	0.605	0.49	0.623	0.50	0.623	0.52	0.233
Age: 18-29	0.14	0.14	0.915	0.15	0.887	0.14	0.887	0.14	0.941
Age: 30-44	0.46	0.44	0.568	0.44	0.611	0.45	0.611	0.44	0.400
Age: 45-59	0.25	0.26	0.943	0.26	0.726	0.26	0.726	0.27	0.464
Age: 60+	0.14	0.16	0.546	0.14	0.887	0.15	0.887	0.15	0.732
Income: -500	0.21	0.21	0.687	0.23	0.571	0.23	0.571	0.20	0.600
Income: 500-900	0.28	0.27	0.715	0.27	0.917	0.28	0.917	0.28	0.857
Income: 900-2M	0.33	0.35	0.409	0.34	0.692	0.32	0.692	0.33	0.871
Income: 2M+	0.18	0.17	0.867	0.17	0.993	0.18	0.993	0.19	0.576
Primary education	0.02	0.02	0.604	0.02	0.629	0.01	0.629	0.02	0.792
Secondary education	0.17	0.16	0.699	0.16	0.941	0.17	0.941	0.14	0.082
Technical education	0.20	0.23	0.292	0.23	0.314	0.23	0.314	0.22	0.574
University education	0.47	0.45	0.457	0.47	0.215	0.44	0.215	0.46	0.780
Postgraduate	0.14	0.14	0.969	0.13	0.415	0.15	0.415	0.17	0.159

Variables	Control	T1	p-value	T2	p-value	T3	p-value	T4	p-value
TC limit: -100	0.03	0.04	0.682	0.03	0.349	0.04	0.349	0.03	0.778
TC limit: 100-499	0.16	0.16	0.830	0.15	0.481	0.17	0.481	0.13	0.164
TC limit: 500-999	0.17	0.18	0.820	0.20	0.290	0.20	0.290	0.20	0.164
TC limit: 1000+	0.64	0.62	0.617	0.62	0.080	0.59	0.08	0.64	0.988
Trust in the industry	0.73	0.73	0.850	0.75	0.735	0.72	0.735	0.74	0.604
Does not trust in the industry	0.27	0.27	0.850	0.25	0.735	0.28	0.735	0.26	0.604
Financial literacy	1.59	1.56	0.575	1.54	0.881	1.60	0.881	1.61	0.741
N	596	580		608		591		588	

V. Results

Below are the results of the impact estimation of the reminders on the "action variables"—the action the consumer declares they would take after observing the reminder—, the understanding and clarity of the message, and the confidence it inspires. Additionally, some results from the qualitative assessment are presented, which reinforce the findings of the econometric analysis.

The impact of each reminder on three action variables was evaluated (Table 2): (1) checking the website or paying immediately (*broad action*), (2) only paying immediately (*paying action*), and (3) only checking the website (*checking action*). These variables were defined as dummies, taking a value of 1 when the respondent indicates that they would act in a specific way.

Regarding the **broad action**, 60% of respondents who received the control message would take one of the two actions of interest. The "late fee" reminder (T3) increases the percentage of respondents who would take any action by 16.1 percentage points (pp), while the "full payment" message (T2) increases it by 7.5 pp. Both differences are significant at the 99% confidence level. Similarly, the "minimum payment" reminder (T1) increases the probability of action by 7 pp with 95% confidence.

In the case of the **paying action**, 8.9% of respondents in the control group would pay their credit card immediately. Only one significant difference is found, between the control group and the "full payment" message (T2), with an increase of 3.3 pp, significant at the 90% confidence level.

Regarding the **checking action**, 50.7% of respondents in the control group would check their bank's website to see what they are being charged. The only significant differences, at the 99% and 95% confidence levels, were found for the "late fee" group (T3) (14.5 pp) and the "minimum payment" group (T1) (5.7 pp), respectively.

Table 2. Impacts on Action Variables

	Broad action	Paying action	Checking action
	(1)	(2)	(3)
Minimum payment (T1)	0.070**	0.013	0.057**
	(0.028)	(0.017)	(0.029)
Full payment (T2)	0.075***	0.033*	0.043
	(0.028)	(0.018)	(0.029)
Late fee (T3)	0.161***	0.016	0.145***
	(0.027)	(0.017)	(0.028)
Future cost (T4)	0.027	0.006	0.020
	(0.028)	(0.017)	(0.029)
Control (Constant)	0.596***	0.089***	0.507***
	(0.020)	(0.012)	(0.020)
N	2,963	2,963	2,963
R^2	0.013	0.001	0.010

Note: standard errors in parenthesis   *$p<0.1$; **$p<0.05$; ***$p<0.01$

The understanding and clarity of the message were measured through two outcome variables (Table 3): (1) the understanding and recall of the payment due date (*understanding*), and (2) the perceived clarity of the message (*clarity*).

All messages displayed contained the following text: "*Tomorrow is the last day to pay…*". To verify if the message was understood or remembered, respondents were asked, "When is the last day to pay?" The answer was translated into the *understanding* variable, which takes a value of 1 in the case of a correct response and 0 otherwise.

It is found that 28.5% of respondents in the control group answered the question about **understanding** the payment date correctly. In contrast, all treatments result in a lower rate of correct responses. The "late fee" message (T3) is the one that most reduces the understanding of the payment date, by -11.6 pp, followed by the "future cost" message (T4) (-7.8 pp) and the "minimum payment" message (T1) (-7.3 pp). The "full payment" message (T2) (-7 pp) is the one that reduces it the least compared to the control. All these differences are significant at the 99% confidence level. This result is consistent with evidence suggesting that simpler messages are often more effective (Agarwal et al., 2013; BIT, 2019; BETA, 2019).

Regarding **clarity**, it was defined as a dummy variable equal to 1 when participants indicated agreement with the statement that the message shown is clear and totally understandable, and 0 otherwise. 64.1% of respondents in the control group declared that the message is clear. Only the "full payment" group (T2) expressed significantly higher clarity, at the 90% confidence level, 5 pp more than the control group. On the contrary, only respondents in the "late fee" group (T3) declared in a lower proportion that the message is clear, 6.1 pp less than the control group. This difference is significant at the 95% confidence level.

On the other hand, the **confidence** variable is a dummy equal to 1 when respondents indicated that they would trust a message like the one shown if it

were sent by their financial institution, and 0 otherwise. When evaluating the result by treatment, it was found that 57.2% of respondents in the control group trust the message, while the only significant difference, at the 90% confidence level, occurs with the "late fee" message (T3), which decreases confidence by 5.1 pp (Table 3).

Table 3. Impacts in Understanding, Clarity and Trust

	Understanding (1)	Clarity (2)	Confidence (3)
Minimum payment (T1)	-0.073***	0.006	0.005
	(0.025)	(0.028)	(0.029)
Full payment (T2)	-0.070***	0.050*	-0.011
	(0.025)	(0.027)	(0.029)
Late fee (T3)	-0.116***	-0.061**	-0.051*
	(0.024)	(0.028)	(0.029)
Future cost (T4)	-0.078***	-0.018	-0.018
	(0.025)	(0.028)	(0.029)
Control (Constant)	0.285***	0.641***	0.572***
	(0.018)	(0.020)	(0.020)
N	2,963	2,963	2,963
R^2	0.008	0.006	0.002

Note: standard errors in parenthesis   *p<0.1; **p<0.05; ***p<0.01

In summary, the regression results show that, considering the whole set of outcome variables, the "full payment" reminder (T2) would be the most effective treatment. Regarding the action variables, this message has the second-highest impact on broad action and is the only one that increases payment action. Additionally, it is the one that least reduces the understanding of the payment date, relative to the control, and the only one that increases clarity. The "late fee" reminder (T3) has a significant impact on broad action and checking action, but it is the one that most reduces the understanding of the payment date and the only one that reduces clarity and confidence. Finally, in terms of understanding the payment date, the control was the most effective reminder.

Below is a list of **qualitative results** that, in general, reinforce the previous conclusion:

- Among those who trust in the industry, the "late fee" message (T3) is the one that generates less confidence in the message (61.2% vs. 65.7% in the control).

- Among those who do not trust in the industry, the control is the message that generates the most confidence (34.6%), followed by the "full payment" treatment (T2) (31.3%).

- The "full payment" (T2) and "late fee" (T3) messages are the ones that most help understand the importance of paying on time, with 61% and 62% of respondents agreeing with this statement, respectively.

- Respondents in the "late fee" group (T3) were the ones who most agreed with a series of negatively connoted statements: more information is needed about

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the total amount (65%), more information is needed about the consequences of payment (52%), more information is needed on how to pay (62%), the message should be shorter (38%).

Finally, participants were asked about their **willingness to receive reminders**. Overall, in all experimental groups, the agreement percentage is majority, around 55%, and there are no significant differences between treatments and control. Additionally, they were asked **when** they would like to receive the message. The majority of participants (53%) would like to receive it a week before, while 34% would like to receive it a day before the deadline. 9% would like to be reminded any day, and 3% on the same day of payment.

VI.   Conclusions

The use of reminders as nudges to encourage behaviour is a widely validated intervention in multiple contexts and populations, but the evidence regarding the specific content of messages is scarce. The aim of this study was to identify relevant aspects to consider in the elaboration of reminders for credit card payments, which was evaluated through an online experiment where five messages based on of the behavioural economics literature were tested.

The results showed that the best reminder was the "full payment" message (T2), which encourages payment of the total billed amount (and discourages minimum payment) by informing that it is the only way to avoid paying additional interest. This message achieved the second-best performance in broad action and was the only one that increases payment action compared to the control. Additionally, it is the only one that increases the clarity of the message.

Regarding the other messages, it is noteworthy that the "late fee" message (T3) had a significant impact on broad action and checking action but was the one that most reduced the understanding of the payment date and the only one that decreased clarity and confidence in the message. On the other hand, it is highlighted that the control message was the best in terms of understanding the payment date.

Finally, it is mentioned that 55% of the participants agreed to receive a reminder, while 43% disagreed, suggesting that, when implementing reminders, the option to unsubscribe from the service should be considered.

In conclusion, the results of the experiment show that a reminder containing information about the total billed amount, the payment date, and the consequences of paying the minimum amount helps encourage timely credit card payments. Accordingly, it is proposed that financial providers send a reminder to consumers through text messaging (SMS), as described below.

VII.   Policy proposal

Reminders to consumers for timely credit card payments should take the following into account:

1. **Content of the Reminder:** The message should specify the payment deadline, the total amount due, the benefits of paying the total amount, and the consequences of paying only the minimum.

2. **Delivery Channel**: Reminders should be sent via text messages (SMS) to credit card debtors.

3. **Frequency and Date of Reminders**: It is recommended to send reminders one day before the credit card payment deadline, with no cost to the consumer.

4. **Length of the Reminder**: The message should be brief; as longer messages are less likely to be understood or remembered. Consequently, it is suggested not to add additional information to the message unless strictly necessary according to regulatory requirements.

5. **Automatic Enrolment**: Automatic enrolment in receiving reminders is recommended. Without this, due to the status quo bias, individuals may not subscribe to receiving this type of information, despite its usefulness. However, providing an option to unsubscribe (opt-out) is suggested.

6. **Target Audience**: It is important that messages are not sent to consumers who have already made their credit card payment, as this could diminish the intervention's effectiveness over time and increase the unsubscribe rate. It is recommended to avoid messages that include phrases like "if you have already made your payment, disregard this message."

It is proposed to amend the Credit Card Consumer Information Regulation (D.S. 44/2012 MINECON), incorporating the obligation for financial providers to send a payment reminder to the consumer, as outlined above.

VIII.   References

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