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The Rise of a Nudge: Field Experiment and Machine Learning on Minimum and Full Credit Card Payments

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A massive field experiment introduces a “statement-balance warning” in credit card payment that informs the interest charges for paying less than the statement balance. The experiment also includes a minimum-payment warning. Results show a change in payment distribution depending on the warning, and adding a statement-balance warning increased payments.

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EXTENDED ABSTRACT

There are 2.8 billion credit cards in the world (Shift, 2021). While this payment method has offered convenience, it had also brought financial distress to people who cannot manage their debt payment (Hodson, Dwyer, & Neilson, 2014). As a partial solution, policy regulations in several countries have included a mandatory minimum payment warning in credit card statements. However, several studies using administrative data or laboratory-based experiments have shown that highlighting the minimum payment may cause lower full balance payments (e.g., Navarro-Martinez et al., 2011; Salisbury, 2014). For this reason, the minimum payment policy has been described as a perverse nudge due to the anchoring bias (The Economist, 2008; Wang & Keys, 2014; Stewart, 2009). This paper introduces a novel statement balance warning to answer whether and why a minimum and/or a statement balance warning can change credit card payment behavior. In addition, research from psychology distinguishes that when there is a hierarchy of goals, one is prioritized, and non-prioritized goals are ignored (Unsworth, Yeo, & Beck, 2014). For that, this paper uses a randomized preregistered field experiment with credit card debtors who received email payment reminders before their credit card payment was due.

Debtors (N=179,706) were randomly assigned to four experimental conditions. The Minimum Payment Warning condition included the sentence: "If you at least pay the minimum ([extract_itex]) before the due date, you will pay additional interest charges but avoid late fees." The Statement Balance Warning condition included the sentence: "If you pay the statement balance ([extract_itex]) before the due date, you will avoid additional interest charges." The Both Warnings condition included the statement balance and minimum payment warnings. Finally, the Control condition was a simple reminder that included neither the statement balance nor minimum payment warnings.

Results. All warning messages decreased the likelihood of paying less than the minimum compared to a simple payment reminder without warning messages. On average, debtors decreased their less-than-the-minimum payments by 7.9% more than debtors who received a simple payment reminder (an absolute difference of 0.77 percentage points; $ps < 0.01$). However, this masks a significant change in payment distribution depending upon the specific warning message. Debtors who received the statement balance warning were 1% more likely to pay in full than debtors who received the simple payment reminder (a difference of 0.64 percentage points; $ps < 0.01$). In contrast, debtors who received the minimum payment warning increased their minimum payment by 5.9% compared to the simple reminder (a difference of 0.52 percentage points; $p < 0.01$), and there was no sizable change in the likelihood of paying in full despite the precise estimate. This means that debtors who received the minimum-payment warning shifted their payment mostly toward the minimum amount (63% of the shift), and debtors who received a message including the statement-balance warning shifted their low payments almost entirely toward paying in full (87%).

Even though debtors who received both warning messages behave very similarly to those who received only the statement balance warning, their effect on the interests charged on the following billing cycle after the experiment is not the same. Debtors who received a message including both warning or the only minimum warning saw their delinquent interest (i.e., the interest generated by not paying at least the minimum) being reduced by 3.9% and 3.4% ($ps < 0.05$),

respectively, more than those who received the message with only the statement balance warning, and 8.0 and 7.5% ($ps < 0.01$), respectively, compared to debtors who received the simple reminder. Also, consequent to the changes in payment distribution, there is a difference in the revolving interest charged (i.e., the interest generated by paying less than the statement balance). Debtors who received both warnings or only the statement balance warning saw a reduction of 6.0 and 3.8% ($ps < 0.06$), respectively, more than debtors who received only the minimum warning message, and 9.0 and 6.9% than those who received the simple reminder ($ps < 0.01$).

In order to explore heterogeneous effects, the field experiment was combined with a recently developed machine learning technique, causal random forests (Wager & Athey, 2018). Although a large fraction of debtors increases the portion they paid of their statement balance because of receiving a message with both warnings, a small fraction reduces this outcome. Different factors explain a positive and large treatment effect in this regard: debtors with previous payments closer to the statement balance, a small distance between the minimum and statement balance amounts, and a considerable variation on previous percent payments. These factors are consistent with debtors prioritizing one warning depending on which becomes more relevant and reachable to them.

In conclusion, results show that a statement balance warning not only increases payments in full, but also decreases delinquency and revolving interest. This paper contributes to the literature on nudges and financial decision-making by testing in the field the role of the minimum payment warning and, more importantly, its interaction with a new statement balance warning.

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