Minimum Required Payment and Supplemental Information Disclosure Effects on Consumer Debt Repayment Decisions

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Repayment decisions—how much of the loan to repay and when to make the payments—directly influence consumer debt levels. The authors examine how minimum required payment policy and loan information disclosed to consumers influence repayment decisions. They find that though presenting minimum required payment information has a negative impact on repayment decisions, increasing the minimum required level has a positive effect on repayment for most consumers. Experimental evidence from U.S. consumers shows that consumers' propensity to pay the minimum required each month moderates these effects; U.K. credit card field data indicates that these effects are also moderated by borrowers' credit limit and balance due. However, increasing the minimum level is unlikely to completely eliminate the negative effect of presenting minimum payment information. In addition, disclosing supplemental information, such as future interest cost and time needed to repay the loan, does not reduce the negative effects of including minimum payment information and has no substantial positive effect on repayments. This research offers new insights into the debt repayment process and has implications for consumers, lenders, and public policy.

Keywords: consumer debt, credit cards, financial decision-making, information disclosure, public policy

Consumer debt levels are high, with many consumers struggling to pay down their debts. In the United States, total consumer debt was $2.4 trillion in late 2010, $806 billion of which was revolving debt. The average U.S. household has an estimated $7,300 in revolving debt, and credit card loan charge-off rates have more than doubled since 2007 (Federal Reserve Board 2009, 2011). In the United Kingdom, credit cards account for £63.9 billion of consumer debt. Approximately 47% of U.K. credit cardholders and 56% of U.S. cardholders carry a balance (Department for Business, Innovation and Skills 2010; Federal Reserve Bank of Boston 2008). In addition, an estimated 13% of U.S. credit cardholders and 14% of U.K. credit cardholders pay only the minimum required amount each month on their credit cards (Department for Business, Innovation and Skills 2010; Federal Reserve Bank of Boston 2008). Revolving debt (e.g., credit card debt) grows when consumers borrow more funds, but debt also grows as consumers' rate of repayment slows. Our focus in this research is on understanding debt repayment behavior.

In financially developed countries, credit cards constitute one of the main devices for consumers to engage in unsecured borrowing. Typically, each month a borrower makes a decision about how much of his or her loan to repay. An important mechanism that credit card firms employ to prevent borrower default is the minimum required payment policy, which includes disclosing information about the required minimum payment in borrowers' monthly credit card bills. Currently, virtually every lending institution operates under some minimum payment policy. Monthly minimum payments are typically calculated as a small percentage of the outstanding balance or a small fixed amount, whichever is larger. For example, in the United Kingdom, a minimum of 2.5% or £5 is typical. Cardholders who fail to repay the minimum are often charged a fee, and the slow repayment leads to greater (compounding) interest costs.

To illustrate the impact of minimum payment policy on debt, imagine a U.K. cardholder with an outstanding balance of £2,500 under a standard interest rate of 17% annual percentage rate

(APR) and a minimum payment policy of 2% or £5, whichever is larger. The time it would take to repay the debt and the total interest charged over that period for four different monthly repayment strategies are as follows:

Repay minimum required every month	38.4 years to pay off	£5,283 total interest
Repay £60 every month	5.3 years to pay off	£1,221 total interest
Repay £120 every month	2.1 years to pay off	£434 total interest
Repay £240 every month	1 year to pay off	£183 total interest

In the case in which only the minimum is repaid, the debt decreases extremely slowly, and the total interest charges are extremely high. Thus, debt can easily get out of control if consumers make only minimum repayments. The situation changes dramatically if consumers instead repay a moderately higher amount than the minimum each month. From the lender perspective, these consumer repayment decisions can also significantly influence the firm's revenues and profitability.

Minimum payments on credit card debt are controversial and have also been the focus of several regulations. Some U.S. and U.K. institutions have recently proposed increases in minimum payments. A prominent example is the change from 2% to 5% in minimum payments that Chase Bank, one of the largest credit card issuers in the United States, implemented in 2009. Another case is that of a white paper the Department for Business, Innovation and Skills (2009) presented to the British Parliament, in which it proposed a mandatory increase in minimum payments to the level of 5% (the proposal has since been rejected). The recently enacted U.S. Credit Card Accountability, Responsibility and Disclosure (CARD) Act of 2009 (H.R. 627, S.414) requires lenders to include a "minimum payment warning" in all monthly credit card statements. This warning discloses information to consumers on every monthly credit card statement, including the total interest cost and the amount of time it will take to pay off the card balance if consumers only make minimum monthly payments (hereinafter referred to as "supplemental information"). Both types of

interventions—raising the minimum payment level and disclosing supplemental information—aim to increase monthly repayment amounts. We examine the efficacy of each approach in this research.

Little research has examined the effects of minimum payment policies and loan cost information disclosure on individual-level consumer repayment decisions. It seems likely that increasing minimum requirements or providing supplemental loan cost information would influence consumers who would otherwise repay only the minimum. However, minimum payment policies and cost information could also have unintended effects on the larger group of consumers who tend to make higher repayments than the minimum. Stewart (2009) finds that the mere presence of minimum required payment information on a monthly credit card statement leads consumers to make *lower* monthly credit card repayments than if the information were not present. This finding (which we replicate with U.S. consumers) suggests that the current practice of requiring a minimum payment has a negative effect on consumer repayment behavior, and it calls into question whether or how the presence of other relevant information will affect debt repayment.

To understand how minimum payment policy and loan information influence consumers' repayment decisions, we examine the effect of varying the level of minimum payment required and disclosing three specific types of information: the minimum payment required, loan interest costs, and length of time to pay off the loan. Employing a multimethod approach—two controlled experiments with U.S. adult consumers and field data from 11 U.K. lenders—we find that increasing minimum required payment levels has positive effects on repayment decisions for most consumers. These effects are moderated by borrowers' credit limit, balance due, and propensity to pay the minimum required. Our experimental findings also suggest, however, that increasing the minimum payment level is unlikely to eliminate the strong negative effect of merely presenting minimum payment information. Finally, we find no evidence that disclosing supplemental loan information to consumers yields positive effects on repayment decisions.

This research offers important implications for marketing practice and public policy by providing insights into the following questions: What information should lenders disclose or make salient to consumers? What minimum payment policies might reduce the firm's credit risk by reducing default rates? and How can public policy makers strengthen interventions to improve consumer financial decision making?

CONCEPTUAL BACKGROUND

Debt repayment decisions entail the consumer choosing both how much and when to repay a loan. A relatively smaller payment allows the borrower to have more cash on hand to use for other purposes in the current month but, because of compounding interest rates, increases the future (and, thus, total) cost of the loan. A relatively larger payment leaves the consumer with less money available in the current month but reduces the future cost of the loan. Thus, the consumer must decide whether to repay more now (decreasing current utility) or repay more later (decreasing future utility). As such, the debt repayment decision can be conceived of as a trade-off between the desires to minimize current cost and minimize future, total cost over the life of the loan. Thus, salience of these costs should have an important impact on the repayment decision.

Salience can be influenced by the decision context, such as the type of information available to the consumer at the time the decision is made, which, in the case of revolving debt, is typically once per month. In addition to minimum payment information, credit card lenders typically provide interest cost information in terms of compound APR, but research has shown that consumers have difficulty understanding interest compounding (Eisenstein and Hoch 2007; Stango and Zinman 2009), and a surprisingly large number of consumers have poor knowledge of the cost of credit (Lee and Hogarth 1999). This is particularly problematic for borrowers of "flexible" loans that do not require the loan to be paid off within a fixed period. Estimating flexible loan duration is difficult for consumers, though interest cost information improves accuracy in some cases (Ranyard and Craig

1993).

Stewart (2009) reports results from a U.K. credit card repayment experiment, which shows an important, unexpected association between minimum payment and repayment behavior. In a hypothetical scenario-based experiment, using fictitious credit card bills presented to cardholders, he finds that omitting minimum payment information from the statements led to significantly higher repayments. Stewart links these patterns with the psychological phenomenon of "anchoring" (Tversky and Kahneman 1974; a similar suggestion can be found in Thaler and Sunstein 2008), suggesting that the presence of minimum payment information leads consumers to anchor on that small amount and thus make a smaller repayment.

Just as consumers use the credit limit information supplied by credit card lenders as an informative signal of their future earnings potential and ability to repay (Soman and Cheema 2002), so may debtors interpret minimum payment information as a signal of the amount that would be appropriate for repaying the loan in a timely manner. Such information might also be construed as a payment recommendation or implicit payment norm (McKenzie, Liersch, and Finkelstein 2006; Wansink, Kent, and Hoch 1998). Alternatively, increased attention to minimum payment information may increase salience of current costs and the desire to minimize them, leading to lower repayment. Each of these perspectives offers possible contributory mechanisms for the negative effects of minimum payment information. Although testing alternative explanations is outside the scope of this research, teasing apart these contributing factors is an important avenue for further research.

This research aims to identify practical public policy or lender interventions that have the potential to mitigate the negative effects of disclosing minimum payment information on repayment. One potential approach is to increase the minimum required level, effectively increasing the size of the "low anchor." This is likely to increase repayment, especially for borrowers prone to paying the

minimum required amount each month. If the minimum payment acts as a signal or recommendation, increasing its value is likely to increase the repayment amount.

A second approach is to disclose other supplemental loan information, such as future interest cost and time to pay off the loan, similar to that reported in the Credit CARD Act. A wealth of research in intertemporal decision making has shown that for decisions involving trade-offs of costs and benefits over time, consumers typically weigh immediate outcomes more heavily than distant-future outcomes (for reviews, see Frederick, Loewenstein, and O'Donoghue 2002; Read 2004). This might be the case for the consumers who pay only the minimum amount required every month, allowing the future cost of the loan to increase. If consumers weigh current (versus distant) outcomes more heavily, disclosing information that makes future outcomes more salient may lead them to shift more weight toward consideration of future costs. Information about future loan interest cost should bring debtors' attention to the long-term costs of paying only the minimum required. This would shift repayment considerations away from the minimum payment, potentially increase consideration to minimize future costs, and dampen the negative effect of minimum payment information on current repayment amount. The anchoring perspective would suggest a similar prediction, in which use of a "consider-the-opposite" strategy might reduce anchoring (Mussweiler, Strack, and Pfeiffer 2000).

Prior research also suggests that disclosing the time needed to pay off the loan affects repayment decisions. As goal proximity increases, effort toward attaining the goal increases (Kivetz, Urminsky, and Zheng 2006). Thus, prompting consumers to look ahead to how far they are from paying off their loan – such as time needed to pay off a credit card balance when only the minimum required amount is paid each month – could affect their motivation and effort to repay the debt (Cheema and Bagchi 2010). If the time to repay the loan is proximal, this would increase motivation to pay off the balance due and increase current repayment amount. For borrowers with high balances

and low minimum required payment levels, such information would indicate a very distant time horizon toward achieving their goal, reducing effort and repayment amount.

In summary, minimum payment policy and the information disclosed to the consumer at the time of repayment should affect repayment decisions. We examine the effects of varying minimum required payment levels, as well as providing supplemental information, on the consumer repayment decision. We expect the presence of minimum payment information to have a negative impact on repayment, as in prior research, but we also expect that effect to be moderated by increasing minimum requirement levels as well as disclosing supplemental information about future loan cost and time required to pay off the loan balance. We conducted studies to test these ideas: two experimental studies of U.S. consumers and a field study that examines credit card customers in the United Kingdom.

STUDY 1: EXPERIMENTS

Prior research with U.K. consumers reveals a negative effect of presenting minimum payment information on repayment amount (Stewart 2009). Our goal in Study 1 is to examine the effects of minimum required payment information and policy on U.S. consumers and also to examine the effects of disclosing other loan cost information to borrowers. To this end, we conducted two controlled experiments that explored three questions: (1) Does the presence of minimum payment information have a negative effect on repayment for U.S. consumers? (2) Does increasing the minimum required payment level affect repayment amount? and (3) Does presenting supplemental information—namely, loan interest cost and payoff time duration information—mitigate or enhance the effects of minimum payment information on consumers' debt repayment decisions?

Study 1A: Presenting Minimum Payment Information to U.S. Consumers

We tested whether the negative effect of presenting minimum payment information observed with U.K. consumers (Stewart 2009) would be replicated for a sample of U.S. adult consumers and

for a (higher) credit card balance due level closer to the U.S. average. To accomplish this, we conducted a two-cell between-subjects experiment similar to Stewart (2009).

A random sample of 127 U.S. adult consumers were presented with one of two hypothetical monthly credit card statements and asked to make a repayment decision. Participants were randomly assigned to each condition: (1) the "minimum payment absent" condition, which included information about the balance due and the APR and (2) the "minimum payment present" condition, which also included minimum required payment information (see Figure 1).

[Insert Figure 1 about here.]

Information on the statements. We chose the information on the statements to be consistent with values typical at the time of the study. The same account balance was presented to all participants: $1,937.28. We chose this value because it represented the average credit card balance for U.S. households at the time, and we wanted to avoid using any "round" numbers or other values that would not be typical in a credit card statement. We set the APR value at 14%, which represented an approximate average APR at the time of the study (Federal Reserve Board 2010); it was also presented to all participants. We calculated the minimum required payment amount as 2% of the balance due, or $38.74, which again reflects common practice for U.S. credit card lenders at the time; this appeared only in the minimum payment present condition.

Procedure. A random sample of adult consumers received an e-mail informing them of the study and inviting them to participate by clicking on the URL link embedded in the invitation. Participants completed the repayment decision task before the rest of tasks presented to them. In both conditions, they read the same instructions, as follows:

> Imagine you have a credit card and received your monthly credit card statement this morning. On the next screen, you will see the credit card statement, and you will be asked to make your payment. Please consider how much you can afford to pay, and treat your payment decision as you would in your everyday life.

Participants then saw a credit card statement (such as that in Figure 1) and entered their desired

repayment amount at the bottom of the statement.

Measures. The repayment decision is influenced by the extent to which a consumer considers and comprehends current and future loan costs. Thus, a person's temporal orientation and knowledge of interest compounding should influence repayment behavior. We measured both after the decision task to control for their impact on repayment behavior in our analyses.

Prior research has shown that decision makers' predisposition toward considering more immediate concerns versus future concerns influences credit card debt (Joireman, Kees, and Sprott 2010) and fiscal responsibility (Joireman, Sprott, and Spangenberg 2005). We measured predisposition toward consideration of future consequences (CFC) using Strathman et al.'s (1994) 12-item scale (Cronbach's $\alpha = .81$). Each scale item used a seven-point Likert format (1 = "extremely uncharacteristic," and 7 = "extremely characteristic"); scale items appear in Appendix A.

Financial knowledge is also likely to influence repayment decisions because it affects a person's ability to comprehend loan cost information. Evidence suggests that a surprisingly large number of consumers have poor knowledge of the cost of credit (e.g., Lee and Hogarth 1999). Revolving debt growth is directly influenced by interest rates and the speed of repayment relative to compounding interest growth. Thus, we were specifically interested in controlling for consumers' knowledge of interest compounding, which prior research has shown to be lacking (Eisenstein and Hoch 2007; McKenzie and Liersch 2011; Stango and Zinman 2009). We measured objective knowledge of interest compounding using three quiz-style questions in a manner similar to Lipkus, Samsa, and Rimer's (2001) numeracy measure. Knowledge values can range from 0 to 3; the questions appear in Appendix A. Finally, we measured annual household income, using a 15-point scale ranging from 1 ("less than $20,000") to 15 ("$150,000 or greater"), increasing in $10,000 increments. Table 1 provides a description of our consumer sample and summary measures.

[Insert Table 1 about here.]

Results. A one-way analysis of variance (ANOVA), with log-transformed repayment amount as the dependent variable[1], revealed a significant, negative effect of the presence of minimum payment information on repayment amount ($F(1, 112) = 6.20$, $p < .02$) across all participants. When we excluded participants who paid the full balance, the negative effect was even stronger ($F(1, 96) = 9.95$, $p < .003$). Consistent with prior research (Stewart 2009), participants tended to pay less when minimum payment information was present (versus absent), after we controlled for differences in temporal orientation, knowledge of interest compounding, and income level. Participants in the condition with minimum payment information present paid an average $119.82 less than those in the condition for which the information was absent ($M_{MR\ present} = \$376.39$, $M_{MR\ absent} = \$496.21$), and a similar difference in median values occurred ($50 vs. $175, respectively). Finally, a nonparametric Mann–Whitney test confirmed significant differences between the two conditions ($z = 2.49$, $p < .02$). Thus, the negative effect of minimum payment information on repayment amount that Stewart (2009) finds with U.K. consumers also occurred in our sample of U.S. consumers.

Study 1B: Potential Lender Interventions

Study 1A confirms that presenting minimum payment information has a negative impact on repayment for U.S. consumers, and this negative impact is robust to controlling for key differences across consumers. At the same time, as a practical matter, both lenders and policy makers would likely counter that some minimum required payment is necessary. Thus, the goal of Study 1B is to test two types of potential lender interventions aimed to mitigate the negative effect of minimum payment information on repayment decisions: increasing the minimum required payment amount and disclosing supplemental loan cost information. We conducted a between-subjects experimental design with a U.S.-based online consumer panel. A random sample of 481 U.S. adult consumers were presented with one of seven different hypothetical monthly credit card statements and made a repayment decision. Figure 2 illustrates an example of one condition: time to pay off the loan. We

designed the seven information conditions to enable testing of five specific interventions: increasing the minimum required payment level (conditions 1–3) and disclosing future interest cost, disclosing time to pay off the loan, disclosing future interest cost and time to pay off together, and disclosing time to pay off with information about the monthly repayment amount needed to pay off the loan in three years (conditions 1, 2, 4–7).

[Insert Figure 2 about here.]

Participants were randomly assigned to one of the following information conditions (conditions 2–7 also included balance due and APR information, just as in the control):

1. The control condition included information about the balance due and the APR;
2. The "2% minimum" condition included information about the minimum required payment amount, using 2% of the balance due as the minimum required level;
3. The "5% minimum" condition included information about the minimum required payment amount, using 5% of the balance due as the minimum required level;
4. The "future interest cost" condition included the 2% minimum payment information and information about the future total interest cost that would be incurred if the 2% minimum payment were made every month until the balance was paid off;
5. The "time to pay off" condition included the 2% minimum payment information and information about the number of years needed to pay off the balance if the 2% minimum payment were made every month;
6. The "future interest cost and time to pay off" condition included the 2% minimum payment information, future total interest cost information, and time to pay off information;
7. The "time to pay off and three-year payoff" condition included the 2% minimum payment information, time to pay off information, and information about the monthly repayment amount needed to pay off the current balance in three years (described in more detail

subsequently).

Information manipulation values. Our information manipulation values were consistent with Study 1A; some conditions included additional loan cost information as we describe here. All participants saw the same account balance due, $1,937.28, and APR value, 14%. We calculated the minimum required payment amount as either 2% of the balance due, or $38.74, as in Study 1A, or 5% of the balance due, or $96.86 (for the 5% minimum condition only). We calculated both the future interest cost, $2,159.20, and the number of years to pay off the balance, 19 years, assuming monthly interest compounding, and a 2% minimum payment, or $10, whichever is larger, is paid in each future month. Finally, mimicking the Credit CARD Act minimum payment warning, the time to pay off and three-year payoff condition included information about the monthly repayment amount required to pay off the current balance in three years: $66.21 every month for three years.[2] The experimental procedure was identical to that in Study 1A.

Measures. As in Study 1A, we measured individual differences in CFC (Cronbach's α = .84), objective knowledge of interest compounding, and income.[3] In addition, we assessed whether our information manipulations affected participants differently depending on past repayment behaviors with their own credit card loans. We asked participants the extent to which they tended to pay only the minimum required amount each month for their own credit cards, using a seven-point Likert scale ("I often make only the minimum payment on my credit card bills;" 1 = "strongly disagree," 7 = "strongly agree"). Table 1 provides a description of the consumer sample and summary measures.

Results: effects of increasing minimum payment level. We examined the impact of increasing the required minimum payment level. We analyzed the 2% minimum, 5% minimum, and control conditions to estimate the effect of varying minimum payment requirements on repayment behavior (controlling for CFC, knowledge, and income in all analyses). Using a one-way ANOVA, with log-

transformed repayment as the dependent variable, we found a significant effect of the minimum payment manipulation ($F(2, 181) = 4.70$, $p < .02$). Furthermore, an ordinary least squares regression analysis indicated that, after we controlled for the presence of minimum payment information, no statistically significant main effect of increasing the minimum required level occurred (presence of minimum payment information: $t = –2.21$, $p < .03$; minimum payment level: $t = –.70$, $p > .48$). Table 2 illustrates the mean differences between conditions. A nonparametric Kruskal–Wallis test confirmed the statistically significant differences across the three conditions ($\chi^2_2 = 7.537$, $p < .03$), and a Mann–Whitney test revealed statistically significant differences between the control and 2% minimum conditions ($z = 2.229$, $p < .03$) but no statistically significant difference between the 2% minimum and 5% minimum conditions ($z = –.161$, $p > .87$).

[Insert Table 2 about here.]

We also assessed whether borrower heterogeneity has a moderating influence on minimum payment level effects. More specifically, the effect of increasing the minimum required payment amount may vary for consumers with different inclinations to repay only the required minimum. We tested this prediction by adding an additional independent variable to our regression: participants' self-reported propensity to make the minimum required payment every month (recoded to range from 0 to 6, for analysis purposes). The results, summarized in Table 3, show a significant, negative effect of propensity to pay the minimum (PPM: $t = –4.03$, $p < .001$); this is the simple effect of propensity to pay the minimum for the case in which no minimum payment information is present. More important, we found a significant, *negative* interaction between propensity to pay the minimum and the presence of minimum payment information (MR × PPM: $t = –2.00$, $p < .05$) and a significant, *positive* interaction with minimum required level (MR5 × PPM: $t = 3.00$, $p < .004$).

[Insert Table 3 about here.]

The MR5× PPM interaction coefficient in Table 3 estimates the extent to which the effect of

increasing the minimum level from 2% to 5% varies with borrowers' propensity to repay only the required minimum. We conducted a spotlight analysis to "unpack" this moderating effect. We summarize the estimated effect of increasing the minimum level from 2% to 5% (MR5) at low, moderate, and high PPM levels as follows:

PPM	Estimated Effect of MR5 on Repayment	Spotlight Test of Significance
0	–.320	$t = -1.26$, $p > .20$
3	–.320 + (.424)(3) = .952	$t = 2.65$, $p < .01$
6	–.320 + (.424)(6) = 2.224	$t = 2.99$, $p < .01$

Consistent with Figure 3, Panel A, increasing minimum payment level is estimated to have a positive effect for borrowers with a moderate ($t = 2.65$, $p < .01$) to high ($t = 2.99$, $p < .01$) propensity to pay the minimum required. However, the effect of MR5 was nonsignificant ($t = -1.26$, $p > .20$) for borrowers with a low propensity to pay the minimum required. A similar spotlight analysis of the estimated effect of presenting minimum payment information (MR) at low, moderate, and high propensity to pay the minimum levels indicates significant, negative effects at all levels (low/0: $b = -.495$, $t = -2.09$, $p < .04$; moderate/3: $b = -1.311$, $t = -3.64$, $p < .001$; high/6: $b = -2.127$, $t = -2.90$, $p < .01$).[4]

[Insert Figure 3 about here.]

These results indicate that presenting minimum payment information has a negative effect on repayment amount, and this effect increases in magnitude (i.e., becomes more negative) as the debtor's propensity to pay the minimum required increases. In addition, the estimated effect of increasing minimum payment level is positive for borrowers whose propensity to pay the minimum is moderate to high. This is not the case for borrowers with a low propensity to pay only the minimum; this group of borrowers does not increase repayment with minimum payment level. The nonsignificant decrease in simple mean repayment depicted in Table 2—from $695.03 to $535.89

for all participants and from $177.42 to $146.60 for revolvers—masks this moderating effect of propensity to repay the minimum on the relationship between minimum payment level and repayment amount.

Results: disclosing supplemental information. We tested whether presenting supplemental interest cost information and/or payoff duration information would mitigate the negative effect of minimum payment information. To this end, we performed analyses of six of the experimental conditions: 2% minimum, future interest cost, time to pay off the loan, future interest cost and time to pay off, time to pay off and three-year payoff information, and the control condition. All but the control condition included a 2% minimum payment level (a typical level for U.S. lenders).

Unexpectedly, our analysis did not uncover any significant mitigating effects of additional information on repayment (see Figure 3). A one-way ANOVA, with log-transformed repayment amount as the dependent variable, showed a significant effect of information manipulation across conditions ($F(9, 355) = 2.84$, $p < .02$). This is consistent with a nonparametric Kruskal–Wallis test indicating significant differences across the six conditions ($\chi^2_5 = 15.257$, $p < .01$). However, this significant effect reflects only the effect of including a minimum payment on the bill (replicating Study 1A). An ordinary least squares regression, parsing out the effects of minimum payment information from other information types, showed a significant, negative effect of presenting minimum payment ($t = –2.16$, $p < .04$), but after we controlled for minimum payment information, no significant effects of future interest cost, time to pay off, or three-year information occurred (all $p > .18$). Similarly, a Kruskal–Wallis test for just the five supplemental information conditions indicated no significant difference across conditions ($\chi^2_4 = 2.398$, $p > .66$). Finally, we tested propensity to pay the minimum as a moderator of information effects but found no significant interaction effects.

Our analyses thus far suggest that none of the supplemental information manipulations

reduced the negative effects of including minimum payment information on the bill. Therefore, we conducted additional analyses to examine more closely whether supplemental information affects debtors' likelihood of repaying the minimum required amount, making a partial repayment, or repaying the full balance due. We examined this question using a series of three logit models. First, we estimated an ordered logit model, with three (ordered) payment categories as the dependent variable: repay the minimum required or less, repay more than the minimum but less than the full balance (a partial repayment), and repay the full balance. The observed portion of participants' repayment decisions falling into each of the three categories was 6.90%, 66.26%, and 26.85%, respectively. The model results reveal a significant, negative effect of future interest cost information (Table 4; $p < .04$) and a larger significant, *positive* interaction effect between future cost information and time to pay off information ($p < .03$). The presence of future cost information decreased the likelihood of a participant being in a higher repayment category, but the effect was mitigated when time to pay off information appeared with future interest cost. We found a marginally positive effect of disclosing three-year payoff information, but the effect did not achieve statistical significance ($p > .06$). The effects of all other information types, including minimum payment information, were nonsignificant.

[Insert Table 4 about here.]

We followed up the ordered logit analysis with two binary logit models, one that predicts the likelihood of paying the minimum required amount (or not) and one that predicts the likelihood of paying the full balance due (or not). We found no statistically significant effects of our information manipulations on the likelihood of paying the balance in full (all $p > .09$). However, we found a significant, positive effect of future interest cost information on the likelihood of paying only the minimum required amount (Table 4; $p <.04$). This effect was moderated by a significant, negative interaction effect with time to pay off information ($p < .03$): When information about time to pay off

the balance appeared with future interest cost, the effect of future interest cost was mitigated. Thus, participants were more likely to pay the minimum required when future interest cost was disclosed but not if the information was also accompanied by time to pay off information (see Figure 3, Panel B).

Results summary. The information available to consumers at the time they decide influences their repayment decisions. We examined whether increasing minimum required payment level or presenting supplemental loan cost information would have a positive effect on repayment and mitigate the negative effects of minimum payment information on repayment. We found a significant interaction between minimum payment level and propensity to pay the minimum required amount: The results indicate a positive effect of increasing minimum level for borrowers with a moderate to high propensity to pay the minimum and a nonsignificant effect for borrowers with a low propensity to pay the minimum. These findings highlight the importance of considering borrower heterogeneity in setting minimum payment policy.

We also found that, overall, disclosing supplemental information about interest cost and time to pay off the loan did not significantly attenuate the negative effects of presenting minimum payment information. Furthermore, disclosing future interest cost information increased the likelihood that consumers would pay only the minimum amount required. However, when information about time to pay off the balance appeared together with future interest cost information, the effect was mitigated. This finding suggests a cautionary note regarding the effectiveness of regulation requiring disclosure of similar types of loan cost information for changing borrower behavior.

STUDY 2: CREDIT CARD REPAYMENT FIELD DATA

Study 1 suggests that the effect of minimum required payment level on repayment amount decisions is positive for some consumers, but the effect is moderated by consumers' propensity to

pay the minimum each month. This underscores how different types of consumers can behave differently under the same intervention. Our goal in Study 2 is to further examine the effects of minimum required payment policy using real credit card repayment transactions for U.K. credit card customers. Specifically, we examine the extent to which variation in minimum payments is related to real-world repayment behavior. In doing so, we also explore whether borrowers' credit limit and loan balance moderate the influence of minimum payment on repayment decisions. We begin with a description of the data, followed by our modeling approach and results.

Data

We use credit card transaction data anonymously provided by 11 different U.K. credit card providers through the UK Cards Association in September 2009 (hereinafter denoted as Providers A through K). The data sample includes 955,014 credit card statements from 106,554 different credit cardholders, and the records span a period of 21 months. We excluded cardholders with accounts paid by automatic (predetermined) repayment and those with promotional rates and balance transfers from the sample to avoid mixing genuine monthly repayment decisions with other forms of repayment less relevant for our purposes. Our analyses focus on four variables: loan balance, minimum payment, credit limit, and actual repayment amount. These are the relevant variables for which we received full information from all the credit card companies. No demographic information was provided for the consumers in our data set.

Minimum payment policy structure. Minimum payment policies consist of a small predetermined percentage (between 1% and 5%) to be applied to the outstanding balance, or a small fixed amount (most often £5) to be paid if the corresponding percentage falls below the fixed amount. An important consequence of this is that if a particular cardholder has, for example, a low outstanding balance of £20, under a minimum payment policy of "2% or £5, whichever is larger," the cardholder will face an actual minimum of £5, which represents 25% of the balance (not the

predetermined 2%). Portions of our credit card statements have these small fixed amounts, representing widely varying percentages of the outstanding debt, and 99% of those statements have a minimum payment policy with the same fixed amount minimum of £5. In addition, the percentages of the balance these fixed amount minimums represent are perfectly correlated with the size of the balance. For these reasons, we focus our analysis on the repayment decisions made when borrowers were presented with the predetermined percentages as minimums (n = 602,850).[5]

Credit card provider types. Table 5 provides the number of observations for each of the different minimum payment policies and providers contained in our data set. Note that most of the variability in minimum payment policies occurs between providers; "single-policy" providers constitute the majority of our observations. However, three providers—B, F, and H—have a considerable amount of within-provider variation in their policies. These "policy-varying" providers are also distinct in that their overall correlation between stipulated minimum payment level and credit limit is quite high, negative, and statistically significant ($\rho = -.43$, $p < .001$). That correlation falls drastically among the single-policy providers ($\rho = -.07$, $p < .001$). Credit limit can serve as a proxy for key indicators, such as credit score and income, or as an internally determined risk measure by the financial institution (Scholnick, Massoud, and Saunders 2008). These factors suggest that the policy-varying providers are using criteria related to credit limits to classify more risky customers into policies with higher minimum payment levels. Such a segmentation scheme can greatly distort the actual relationship between minimum payment levels and repayment behavior. Thus, the analyses separately consider these two groups: single-policy providers, which do not vary their minimum payment policy across customers, and policy-varying providers, which do vary their minimum payment policies across customers.

[Insert Table 5 about here]

Descriptive Statistics

Figure 4 displays the overall distribution of outstanding balances, credit limits, and relative repayments (actual repayment/balance) for all statements and also for those excluding fixed amount minimums. The distribution of outstanding balances is strongly positively skewed (Figure 4, Panel A). Credit limit displays a more normal-like distribution, though it is somewhat positively skewed as well (Figure 4, Panel B), and credit limits are considerably higher than the outstanding balances. Panels C and D in Figure 4 exhibit the typical distribution of borrowers' relative repayments. A sizable proportion of the cardholders (more than 50%), represented by the rightmost spike in each graph, repay their outstanding debt in full. At the other extreme, a small proportion (less than 5%) does not repay anything at all. That is represented by the small leftmost spike in each graph. The rest of the consumers pay various amounts in between. The distribution of partial repayments is markedly positively skewed and shows clear bounds, or jumps, at the minimum required payments. Repayments that are equal to the minimum payment are represented by the slightly higher spikes at the corresponding levels (e.g., .02 for a minimum of 2%, .03 for a minimum of 3%) on the left-hand regions of the graphs.

[Insert Figure 4 about here]

Modeling Approach

We model the distribution of relative repayments as a mixture of three probability distributions: a point distribution representing the probability of a full repayment, a point distribution representing the probability of a minimum repayment, and a beta distribution capturing the location and dispersion of partial repayments. As Panels C and D in Figure 4 illustrate, these component distributions together characterize the overall distribution of repayments. Minimum payment policies are likely to have distinct effects on these different components of repayment practices, and consequently an appropriate analysis of repayment behavior should take this into account.

Our dependent variable in the model, R, is a modified version of the relative repayments

(repayment/balance), in which all the repayments equal to the minimum or lower are set to 0. Consequently, R is 1 if a full repayment of the outstanding debt is made, 0 if the repayment made is at the minimum or below, and between 0 and 1 if a partial repayment is made. For example, R = .2 means that a partial repayment representing 20% of the outstanding balance was made. We model R as a mixture of three different distributions: (1) a point mass at R = 0, which we call the "minimum repayment component" (MRC) and which captures the probability of making a minimum repayment; (2) a point mass at R = 1, which we call the "full repayment component" (FRC) and which captures the probability of making a full repayment; and (3) a continuous beta distribution of partial repayments, which we call the "partial repayment component" and which captures the location (LOC) and dispersion (DISP) of the partial repayments. The specification for each component of the repayment model appears in Appendix B.

The explanatory variables included in the model are credit card balance, relative minimum (i.e., minimum payment/balance), credit limit, the interactions between these variables, and a set of 19 dummy variables to control for possible effects of the different months in the sample.[6] Provider-specific dummy variables do not appear in the model because, as we explained previously, in our data set the differences in minimum payment levels come largely from the differences between the providers (see Table 5). For the sake of brevity, we report only the results for the main variables and their interactions here.[7] We standardize all the independent variables, subtracting the mean and dividing by the standard deviation in the sample to which the model is applied, to make the results more meaningful when the interaction terms are included. We estimated the model by maximum likelihood with statistical software R (R Development Core Team, 2007). The code used is available from the authors on request.

Results: Single-Policy Providers

Overall, for single-policy providers, the results suggest a mostly positive association between

minimum payment levels and actual real-world repayment practices, which is broadly consistent with Study 1B. Higher minimum payments were significantly associated with considerably higher proportions of *full* repayments of the outstanding debt, higher (and less dispersed) *partial* repayments, and moderately lower proportions of repayments at the *minimum* or below. These effects were moderated by the level of balance and credit limit, but they remained positive for the vast majority of cardholders.

[Insert Table 6 about here]

Effects of increasing minimum payment level. Table 6 summarizes the model estimation results for single-policy providers and displays the estimated coefficients for each of the four different aspects captured by the model: the full repayment component (FRC), the minimum repayment component (MRC), and the location (LOC) and dispersion (DISP) of the beta distribution of partial repayments. The results indicate a significant, positive main effect of minimum payment[8] level on the proportion of full repayments (b = .102, $p < .001$); a significant, positive main effect on the location (or size) of partial repayments (b = .059, $p < .001$); and a smaller but also significant, negative effect on their dispersion (b = –.016, $p < .001$); we also found a significant, positive main effect on the proportion of repayments at the minimum or below (b = .038, $p < .001$). Note, however, that the results for the minimum repayment component should not be directly interpreted from the estimated coefficients in Table 6, because these refer to the conditional probability (not the unconditional or absolute probability) of making a minimum repayment (for the model specification, see Appendix B). Figure 5, Panels A-C illustrate the actual effect on the proportion of minimum repayments. The largest effect of the minimum payment level is that on the proportion of full repayments. In addition, the results in Table 6 show a series of significant interactions between minimum payments and the other predictor variables.

[Insert Figure 5 and Table 6 about here]

To further illustrate these findings, we use the estimated model to predict the effects of different minimum payment levels in any possible scenario. Figure 5 illustrates the predicted effects of an increase in minimum payments from 2% to 3% and 5% (chosen because essentially no provider has a 4% minimum percentage), assuming a balance and a credit limit that are at the median (£761 and £5,700, respectively). In line with the results from Table 6, there is a strong positive effect of minimum payment on the proportion of full repayments (22% overall; Figure 5, Panel C). Partial repayments shift to higher levels, and their dispersion decreases, as the minimum payment increases (Figure 5, Panel B). Note also that the distribution of partial repayments includes fewer repayment decisions as the level of the minimum increases because of the increase in the proportion of full repayments. Finally, Figure 5 reveals that the absolute effect of the increase in minimum payments on the proportion of repayments at the minimum or below is small and negative (3% overall; Figure 5, Panel A). We also illustrate the overall positive effect of minimum level on repayments in the plot of mean relative repayments in Figure 5, Panel D. This highlights the broadly consistent results between these findings and those in Study 1B.

Moderating effects of balance and credit limit. Figure 6 illustrates the role of balance and credit limit in moderating the effect of minimum payments on full repayments and shows predicted effects of an increase in minimum payments on the proportion of full repayments at different levels of balance and credit limit (Panels A–C). Each figure is plotted at a different level of credit limit, and each line in the figures represents a different level of balance. In line with the coefficients in Table 6, the influence of increasing minimum payments on full repayments is mostly positive. This effect is qualified by the level of balance and credit limit, so that it becomes moderately negative for statements with low credit limits and high balances but positive for the vast majority of statements. Though not illustrated here, balance and credit limit also moderate the effect of minimum payments on partial repayments and minimum repayments.

[Insert Figure 6 about here]

Results: Policy-Varying Providers

Overall, for policy-varying providers, our estimation results indicate a strong negative relationship between minimum payment level and repayment among these providers. This relationship is directionally opposite to the effects we found for single-policy providers, suggesting that these companies may be segmenting consumers by classifying more risky customers into policies with higher minimum payment levels.

[Insert Table 7 about here]

We found a significant and strong negative main effect of minimum level on the proportion of full repayments (b = –1.650, $p < .001$; see Table 7); a significant, negative main effect on the location of partial repayments (b = –.083, $p < .001$); a negative effect on their dispersion (b = –.122, $p < .001$); and a significant and strong positive main effect on the proportion of repayments at the minimum or below (b = .406, $p < .001$). All these patterns are confirmed in the predictions at the median balance and median credit limit displayed in Figure 7. The predicted effects of increasing minimum payments on full repayments (Panel C) and on minimum repayments (Panel A) are quite extreme. Panels D–F in Figure 6 also reaffirm these results, showing a general and strong negative effect on the proportion of full repayments, for any level of balance and credit limit.

[Insert Figure 7 about here]

These results for policy-varying providers are consistent with segmentation in which more risky customers are assigned higher minimum payment levels. This confirms the account of these providers discussed previously and also reaffirms the significance of the results obtained for the single-policy providers. Specifically, when the relationship between minimum payment levels and repayments is predetermined by consumer segmentation, the relationship is negative, with higher minimum payment levels associated with lower proportions of full repayments, lower partial

repayments, and higher proportions of minimum repayments. These findings are the opposite of what we found in the main analysis with the single-policy providers.

Potential Field Data Limitations

One important potential concern with our field data results is that the effects of minimum payments obtained might be confounded with the effects of the interest rates consumers face. For example, it is plausible that setting higher minimum payments is associated with also setting higher interest rates, and if that is the case, the observed effects of higher minimum payments could just be effects of higher interest rates. As explained subsequently, we can rule out such an account.

We should clarify that we have access only to partial interest data—the total interest charges incurred each month—not the official interest rate policies set by providers. Consequently, we do not know the interest rates for a large proportion of statements that did not incur interest charges. In addition, we find that inferring *annual* interest rates from the total interest charges is unreliable because these amounts can include different charges unrelated to applying a fixed interest rate to the unpaid debt in the previous month. For these reasons, we do not include interest rates in our main analyses.

Despite these limitations, we can construct *monthly* interest rates for a subset of the statements from the information we have and analyze how they correlate with minimum payment levels. This exercise produces clear results. A high positive correlation exists between interest rates and minimum payments levels among the policy-varying providers ($\rho = .46$, $p < .001$), but that correlation disappears among the single-policy providers ($\rho = .02$, $p < .001$). This result is in line with our findings and largely rules out confounding effects of interest rates. It also shows that the policy-varying providers, which segment consumers and give more risky customers higher minimum payments, also tend to give them higher interest rates. With these providers, however, higher minimum payments are associated with lower repayments (see Figure 7), presumably

because the effect of the segmentation exceeds any other effects of minimum payments or interest rates. In contrast, with single-policy providers, there is no association between a higher minimum payment and a higher interest rate, so there is no room for distorting effects of interest rates.

Finally, as with all uncontrolled real-world data, other relevant selection effects not contemplated in the models may exist. For example, it might be that providers with different minimum payment levels also have other characteristics (unknown to us) that lead to different types of consumers self-selecting into or differentially qualifying for credit card companies with different minimum payment policies. Another aspect that we could not account for with our data is that some consumers have a debt portfolio, which can include, for example, spending on more than one credit card. Understanding how consumers deal with the debt in different components of their portfolios might shed new light on the role of minimum payment levels in repayment decisions. We considered as many aspects of repayments as the data allowed, and these issues remain as interesting questions for further research.

Results Summary

The results of Study 2 show that there is a mostly positive association between minimum payment levels and actual real-world repayment practices, which is broadly consistent with our findings in Study 1. Our main results, for single-policy providers, show that higher minimum payments are significantly associated with considerably higher proportions of full repayments of the outstanding debt, higher (and less dispersed) partial repayments, and moderately lower proportions of repayments at the minimum or below. These effects are moderated by the level of balance and credit limit, but they remain positive for the vast majority of cardholders. The moderating effects we uncovered here and in Study 1 (for propensity to repay the minimum) highlight the need for lenders to consider consumer heterogeneity when setting minimum payment polices.

Our estimation results for policy-varying providers (B, F, and H) confirm that these companies

appear to be segmenting consumers by classifying more risky customers into policies with higher minimum payment levels. This creates a strong negative relationship between minimum payment level and repayment among these providers: a negative effect on likelihood to pay in full, a negative effect on location and dispersion of partial repayments, and a positive effect on likelihood to pay the minimum. These findings clearly reflect the nature of the segmentation undertaken by credit card companies and reaffirms the significance of the results obtained among the single-policy providers.

DISCUSSION AND CONCLUSION

We examined the effects of varying the level of minimum required payment and disclosing supplemental loan information on debt repayment decisions. Our findings have implications for public policy, consumers, and financial service firms. Our experiments with U.S. consumers confirm that including minimum payment information in credit card bills has a strong negative effect on repayment behavior (see also Stewart 2009). Given this effect, our studies shed light on the question whether increasing the percentage of the outstanding balance required to be paid each month would increase repayments. Our field study suggests that such a change would have mostly positive effects on consumers' repayment practices, and these effects are moderated by the level of balance and credit limit. Our experimental results also show that borrowers' propensity to repay the minimum moderates the effect of increasing the minimum required level. More important, our experiments suggest that increasing the minimum payment level is unlikely to offset the strong negative effect of presenting minimum required payment information. This aspect is difficult to judge from the field data. To the best of our knowledge, no credit card providers offer credit cards without minimum payments or do not include minimum payment information on their bills. Consequently, the effect of not including minimum payments in real credit card bills is an empirical question yet to be answered.

Assuming that the presence of minimum payments in credit card debt is a given, our findings

suggest that increasing their level could reduce this debt for consumers and help achieve higher repayments (with the caveats explained above). As indicated in the introduction, such a measure is in line with the change from 2% to 5% in minimum payments carried out by Chase Bank in August 2009, as well as the (rejected) proposal for a mandatory increase in minimum payments to 5% presented to the British Parliament by the Department for Business, Innovation and Skills (2009). This last measure assumes that consumers would benefit from such an increase, mainly in the sense that cardholders who opt to repay the minimum would be more protected against the risks of increasing debt because they would presumably repay a larger portion of their debt each month. Our analysis also suggests that increasing minimum payments could benefit the majority of the larger group of customers who opt to repay their debt in full, though this might negatively affect a minority. From the perspective of financial services firms, the moderating effects of the level of balance and credit limit in the field study and of the propensity to repay the minimum in the experimental results suggest that a segmentation approach that accounts for these individual differences could be worth exploring when setting minimum payment levels.

The second category of potential interventions that we examined involved disclosing supplemental information about the time to pay off the loan if only the minimum is repaid, the future interest cost incurred, and the monthly repayment required to pay off the loan in three years. Overall, disclosing such supplemental information did not significantly mitigate the negative effects of presenting minimum payment information. Moreover, we found that disclosing future interest cost information significantly increased the likelihood of paying only the minimum required, though this effect was attenuated when information about the time to pay off the balance also appeared. These three types of information (time to pay off the loan, future interest cost, and repayment needed to pay off the balance in three years) are exactly what the recently enacted Credit CARD Act requires lenders to include in their bills. Our research suggests that relying on this information disclosure

alone is not likely to offset the negative effects of including minimum payment information in the bills and probably will not increase debtors' monthly repayments to the levels expected. Additional forms of intervention, such as credit counseling services or financial literacy education, may be required to improve repayment practices. Recent research on savings growth (McKenzie and Liersch 2011) shows that interventions at the time of the repayment decision that highlight the exponential growth of debt due to compound interest might be effective.

We are not implying that lower debt levels are always better for all the agents involved in financial transactions. The functioning of the financial system is a complex issue that involves parties with fundamentally conflicting interests and goals. From one perspective, statistics show that some American consumers are carrying unhealthy levels of debt and measures that nudge them into healthier repayment practices can be understood as beneficial. Recent industry statistics report average outstanding credit card debt for households with credit cards as a high as $10,679, with approximately 13.9% of consumers' disposable income going to service credit card debt in the fourth quarter of 2008 (Nilson Report 2009; U.S. Congress Joint Economic Committee 2009, cited in Wilcox, Block, and Eisenstein 2011). Alternatively, there are situations in which consumer debt may actually be beneficial or necessary (to make ends meet). In addition, the financial firms that set the minimum payment policies have as a primary objective to increase their profits, which under the right conditions can help the financial system as a whole. Policy makers and regulators should ideally aim to maximize overall consumer welfare, which involves making complex decisions about which agents to favor or protect. Rather than prescribing specific policy interventions, our findings provide relevant insights into the credit card debt repayment process that can be useful for policy makers, financial institutions, consumers, and researchers.

Our results suggest that neither including minimum payment information in credit card bills nor disclosing additional information (e.g., as mandated by the U.S. Credit CARD Act) works as

intended, and therefore we advocate a "clinical trials" approach to regulation in which further changes are tested experimentally before a broader introduction. A recent memorandum from the U.S. Office of Management and Budget (Sunstein 2010) also advocates such an approach.

Great potential exists for further research in this area. A fruitful next step would be to conduct additional experiments to further examine the effects of the types of information mandated by the Credit CARD Act and compare them with alternative approaches, such as more thorough financial education. As part of this approach, it would also be useful to elicit consumers' beliefs about the consequences of credit and analyze whether these beliefs change after consumers receive different types of information. Further research could also examine the effects of anchors that are higher than the typical minimum payments consumers face—for example, different levels of repayment recommendations. It would also be worthwhile to examine further actual credit card repayment behavior using lenders' monthly credit card statement transaction data (similar to our U.K. field data) to compare, for example, repayment behavior before and after the Credit CARD Act regulations went into effect in 2010. Further research addressing these important issues is critical for both consumers' and financial service providers' well-being.

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FOOTNOTES

[1] We use the logarithmic transformation of observed repayment amount to reduce positive skewness; for ease of exposition, we refer to this simply as "repayment amount" throughout the remaining discussion.

[2] The Credit CARD Act minimum payment warning includes information about the monthly payment amount required to pay off the entire balance in three years. Given the $1,937.28 balance due and 14% APR in our scenario, the monthly amount would be $66.21.

[3] We also measured consumers' attitude toward debt and found that it was statistically insignificant in all our analyses; thus, for the sake of parsimony and brevity, we omit if from our discussion and analyses reported here.

[4] Casual observation suggests a smaller simple effect of the presence of minimum payment information at high (5–6) than at moderate (2–4) propensity to pay the minimum in Figure 3, Panel A, which is contrary to the larger effect size reported for high propensity to pay the minimum in our spotlight analysis. This contrast is due to the use of log(repayment) in the regression analysis, but not in Figure 3, Panel A.

[5] We also estimated a model for the statements with fixed amount minimum payments; however, the results of such estimation do not meaningfully inform us about the effects of varying the fixed amount minimum, and thus we do not reported them here. The results are available on request.

[6] We cluster the last two months together because of the reduced number of observations in the final month.

[7] A more detailed description of the results is available on request.

[8] For ease of exposition, we use the term "minimum payment" to refer to the model variable "relative minimum" in our discussion of the results.

Table 1

STUDY 1: CONSUMER SAMPLE DESCRIPTION AND SUMMARY MEASURES

Summary Measures	Study 1A	Study 1B
Sample Size	127	481
% Men	45.9%	46.4%
% Women	54.1%	53.6%
Median age	45–54 years	35–44 years
Median education	Some college	Some college
Median income	$40,000–$49,999	$50,000–$59,999
Average # credit cards	3.5	3.3
Average current balance, most frequently used card	$1,671.36	$1,776.65
Knowledge of interest compounding, proportion (%) at levels {0, 1, 2, 3}	{20.5, 27.0, 27.0, 25.4}	{17.1, 29.9, 28.5, 24.5}
Proportion who paid full balance due	13.39%	27.03%
Proportion who paid minimum required or less*	9.45%	8.52%
Average repayment, all	$436.77	$667.01
Average repayment, revolvers only	$204.87	$181.84

Notes: Proportion who paid minimum required or less assumed a minimum amount of $38.74 for all conditions except the "5% minimum required" condition in Study 1B, which assumed $96.86.

"Revolvers" refers to participants who paid less than the full balance due.

Education level was measured with ordinal categories; "some college" was the median value.

Table 2

STUDY 1B: REPAYMENT BY INFORMATION CONDITION

Information Condition	Proportion Paying 2% of Balance or Less	Proportion Paying 5% of Balance or Less	Proportion Paying Full Balance	Mean Repayment All	Mean Repayment Revolvers
Control	1.45	15.94	36.23	$875.83	$266.52
2% minimum	5.88	33.82	29.41	$695.03	$177.42
5% minimum	.00	18.84	21.74	$535.89	$146.60
Future interest cost (IC)	16.18	42.65	23.53	$577.47	$150.53
Time to pay off (TP)	7.25	30.43	21.74	$580.44	$203.54
IC and TP	5.71	42.86	24.29	$662.38	$169.62
TP and three-year payoff payment	4.41	45.59	32.35	$742.29	$170.79

Notes: “Revolvers” refers to participants who paid less than the full balance due.

Table 3

STUDY 1B: THE EFFECT OF MINIMUM PAYMENT LEVEL ON REPAYMENT

Model Variable	Coefficient	SE	t	*p*-Value
Minimum payment information present (MR)	–.495	.237	–2.09	**.038**
Minimum increase from 2% to 5% (MR5)	–.320	.253	–1.26	.208
Propensity to pay minimum required (PPM)	–.296	.073	–4.03	**.000**
MR × PPM	–.272	.136	–2.00	**.047**
MR5 × PPM	.424	.141	3.00	**.003**
CFC	.159	.108	1.48	.142
Knowledge of interest compounding	.375	.089	4.21	**.000**
Income	.044	.023	1.94	.054
Intercept	4.803	.597	8.04	**.000**

Notes: The dependent variable is the logarithmic transformation of repayment; model $R^2 = .393$.

Independent variables, MR and MR5, are coded as 0–1 indicator variables.

PPM required is recoded to range from 0 to 6 for this analysis.

Boldface indicates statistical significance at the 5% level.

Table 4

STUDY 1B LOGIT MODEL ESTIMATES: SUPPLEMENTAL INFORMATION

EFFECTS

	Ordered Logit: Likelihood of {Minimum, Partial, Full}			Binary Logit: Likelihood of Repaying Minimum		
Model Variable	**Coefficient**	**SE**	***p*-Value**	**Coefficient**	**SE**	***p*-Value**
Minimum payment information present	–.593	.397	.135	1.279	1.179	.278
Future interest cost (IC)	–.885	.422	**.036**	1.469	.702	**.036**
Time to pay off (TP)	–.643	.412	.119	.624	.771	.418
IC × TP	1.350	.588	**.022**	–2.373	1.046	**.023**
Three-year pay off	.764	.411	.063	–.758	.776	.328
CFC	.599	.158	**.000**	–.292	.283	.302
Knowledge	.324	.122	**.008**	–.336	.222	.130
Income	.146	.033	**.000**	–.1689	.081	**.036**
Intercept	--	--	--	–1.489	1.611	.355

Notes: The ordered logit log-likelihood is –253.237; the binary logit log-likelihood is –78.479.
Boldface indicates statistical significance at the 5% level.
"Minimum" refers to minimum required payment or less.

Table 5

STUDY 2 FIELD DATA: SAMPLE SIZE BREAKDOWN AND DESCRIPTIVE STATISTICS

Minimum Payment Policy	Credit Card Provider											
	A	**B***	**C**	**D**	**E**	**F***	**G**	**H***	**I**	**J**	**K**	**Total N**
1% or int+£5	0	8,507	0	0	0	0	0	0	0	0	0	8,507
2% or £5	0	55,440	93,805	0	0	5,284	0	0	0	0	0	154,529
2.25% or £5	160,006	36,589	0	0	0	0	0	0	0	0	0	196,595
2.25% or int+£5	0	0	0	0	0	0	0	1,214	0	0	0	1,214
2.5% or £5	0	0	0	0	0	0	118,515	0	118,233	0	149,639	386,387
2.75% or int+£5	0	0	0	0	0	0	0	196	0	0	0	196
2.85% or int+£5	0	0	0	0	0	0	0	6	0	0	0	6
3% or £25	0	0	0	0	0	0	0	1,891	0	0	0	1,891
3% or £5	0	0	0	11,237	785	35,049	0	0	0	115,895	0	162,966
3.25% or int+£5	0	0	0	0	0	0	0	108	0	0	0	108
4% or £5	0	0	0	0	0	24	0	0	0	0	0	24
5% or £10	0	0	0	0	0	0	0	11,344	0	0	0	11,344
5% or £25	0	0	0	0	0	0	583	0	0	0	0	583
5% or £5	0	0	0	0	0	17,183	0	0	0	0	0	17,183
5% or int+£10	0	0	0	0	0	0	0	8	0	0	0	8
unknown% or £5	0	9,729	0	0	3,744	0	0	0	0	0	0	13,473
Total N	160,006	110,265	93,805	11,237	4,529	57,540	119,098	14,767	118,233	115,895	149,639	955,014
Descriptive Statistics:												
Mean balance (£)	929	798	936	1,044	429	1,368	1,830	414	845	751	657	970
Mean credit limit (£)	6,184	6,234	6,330	4,526	--	3,671	9,120	7,144	5,343	5,496	4,867	5,991
Proportion paying full balance:												
All	.58	.88	.61	.59	.71	.16	.57	.63	.61	.62	.73	.62
Predetermined Pct.	.45	.83	.47	.47	.18	.10	.53	.17	.49	.52	.63	.52

Notes: Providers B, F, and H systematically vary their minimum payment policy across customers.
Credit limit data were unavailable for Provider E.
The observations labeled as "unknown or £5" are cases with a fixed minimum payment of £5 for which the official percentage in the policy could not be determined. Note also that some of the policies add the interest to the fixed amount.

Table 6

STUDY 2: MODEL ESTIMATES FOR SINGLE-POLICY PROVIDERS

Model Variable	Minimum Repayment Component (MRC)			Full Repayment Component (FRC)		
	Coefficient	**SE**	***p*-Value**	**Coefficient**	**SE**	***p*-Value**
Balance (B)	.310	.005	**.000**	–1.544	.008	**.000**
Relative minimum (RM)	.038	.006	**.000**	.102	.004	**.000**
Credit limit (CL)	–.168	.008	**.000**	.793	.005	**.000**
B × RM	–.002	.006	.388	–.158	.008	**.000**
B × CL	–.016	.001	**.000**	.128	.002	**.000**
RM × CL	.079	.007	**.000**	.232	.006	**.000**
B × RM × CL	–.019	.004	**.000**	.005	.007	.245
Intercept	–1.319	.036	**.000**	–.106	.022	**.000**
Model Variable	**Location (LOC)**			**Dispersion (DISP)**		
	Coef.	**SE**	***p*-value**	**Coef.**	**SE**	***p*-value**
Balance (B)	–.470	.004	**.000**	–.235	.004	**.000**
Relative minimum (RM)	.059	.003	**.000**	–.016	.004	**.000**
Credit limit (CL)	.257	.005	**.000**	.165	.005	**.000**
B × RM	–.051	.004	**.000**	–.054	.005	**.000**
B × CL	.081	.002	**.000**	.031	.002	**.000**
RM × CL	.016	.004	**.000**	–.006	.005	.104
B × RM × CL	.032	.002	**.000**	.037	.002	**.000**
Intercept	–1.169	.020	**.000**	–.797	.023	**.000**

Notes: The overall log-likelihood of the estimated model is –288,993.

Boldface indicates statistical significance at the 1% level.

Table 7

STUDY 2: MODEL ESTIMATES FOR POLICY-VARYING PROVIDERS

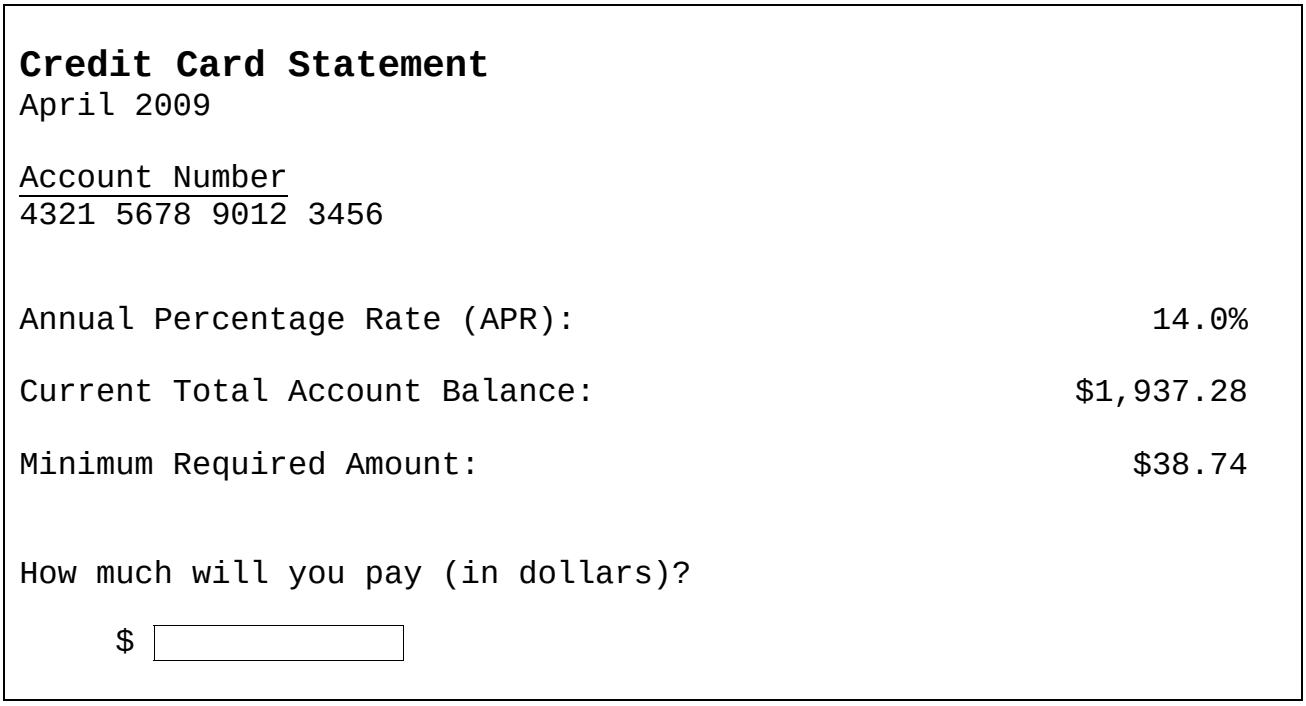
Model Variable	Minimum Repayment Component (MRC)			Full Repayment Component (FRC)		
	Coef.	**SE**	***p*-value**	**Coef.**	**SE**	***p*-value**
Balance (B)	.290	.015	**.000**	–2.088	.024	**.000**
Relative minimum (RM)	.406	.019	**.000**	–1.650	.021	**.000**
Credit limit (CL)	–.551	.020	**.000**	.515	.012	**.000**
B × RM	–.159	.018	**.000**	–.490	.039	**.000**
B × CL	.017	.007	**.009**	.252	.018	**.000**
RM × CL	.281	.019	**.000**	.300	.017	**.000**
B × RM × CL	.061	.010	**.000**	–.108	.027	**.000**
Intercept	–1.894	.058	**.000**	–.966	.068	**.000**
Model Variable	**Location (LOC)**			**Dispersion (DISP)**		
	Coef.	**SE**	***p*-value**	**Coef.**	**SE**	***p*-value**
Balance (B)	–.552	.008	**.000**	–.498	.011	**.000**
Relative minimum (RM)	–.083	.009	**.000**	–.122	.010	**.000**
Credit limit (CL)	.376	.008	**.000**	.370	.010	**.000**
B × RM	–.052	.009	**.000**	–.125	.011	**.000**
B × CL	.106	.005	**.000**	.098	.006	**.000**
RM × CL	–.016	.009	.036	.131	.011	**.000**
B × RM × CL	.051	.005	**.000**	.043	.007	**.000**
Intercept	–1.615	.028	**.000**	–1.446	.038	**.000**

Notes: The overall log-likelihood of the estimated model is –34,418.

Boldface indicates statistical significance at the 1% level.

Figure 1

STUDY 1A "MINIMUM PAYMENT INFORMATION PRESENT" CONDITION



Credit Card Statement
April 2009

Account Number
4321 5678 9012 3456

Annual Percentage Rate (APR): 14.0%

Current Total Account Balance: $1,937.28

Minimum Required Amount: $38.74

How much will you pay (in dollars)?

$

Figure 2

STUDY 1B: "TIME TO PAY OFF" CONDITION

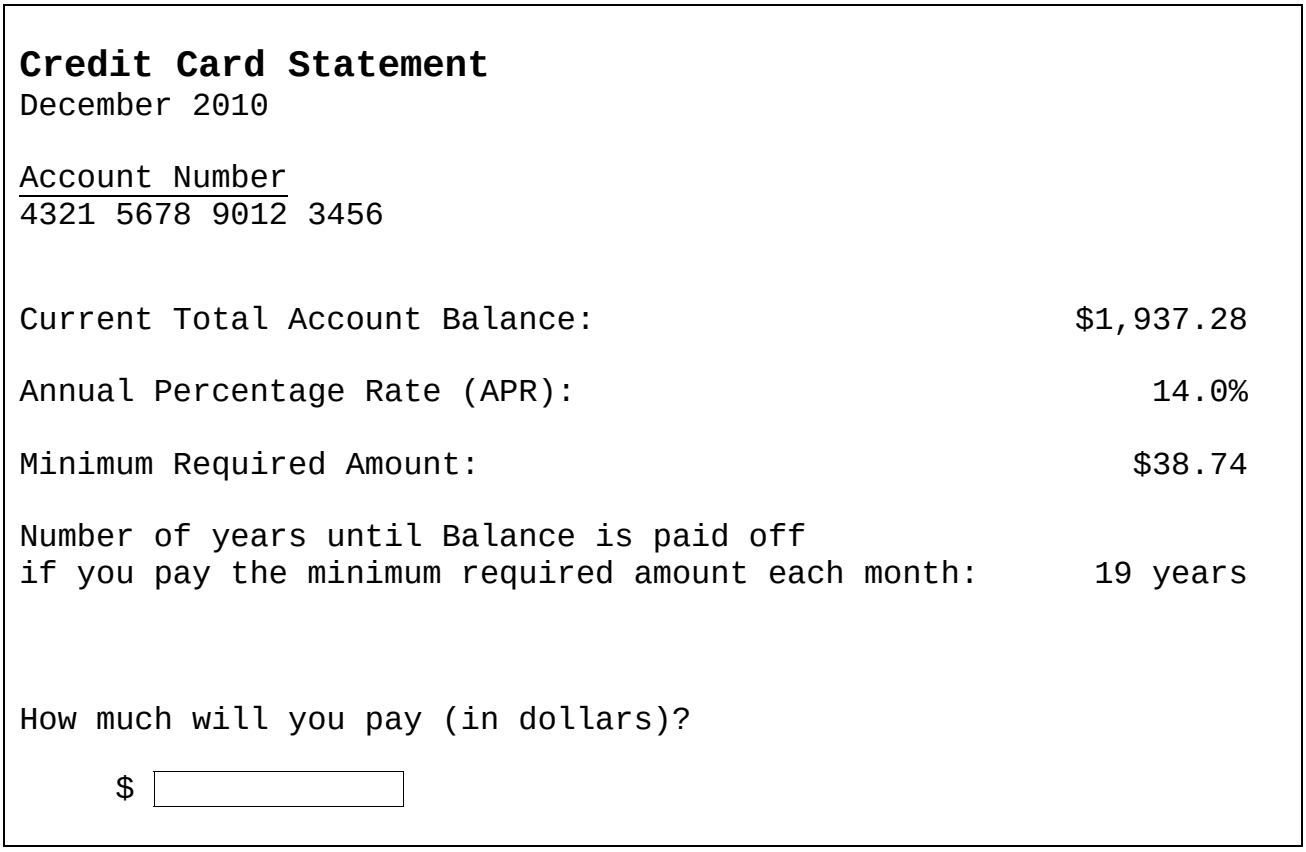
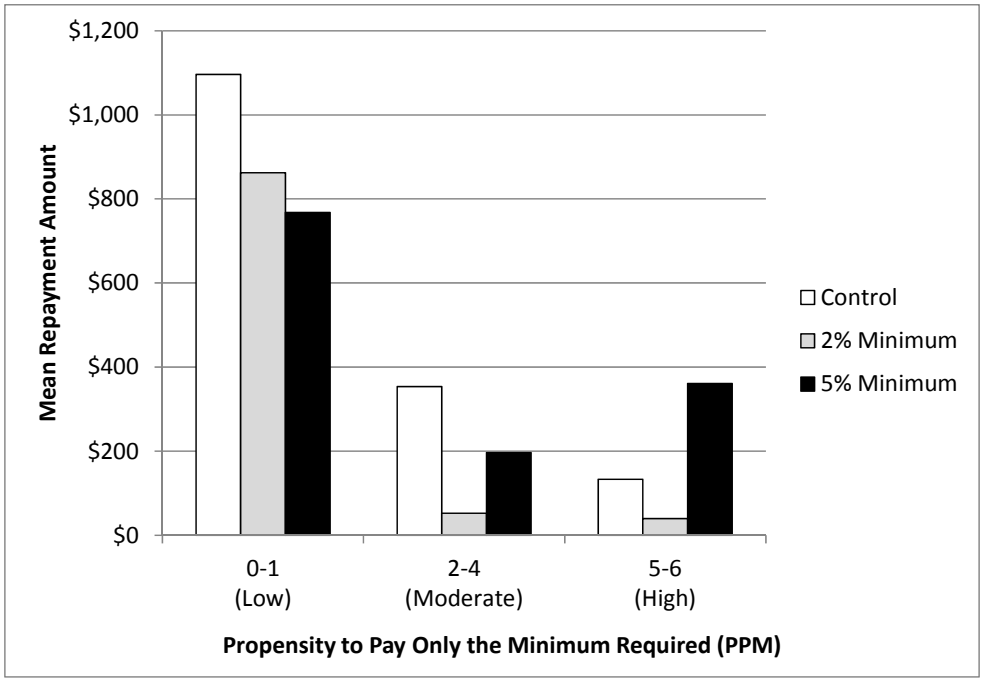


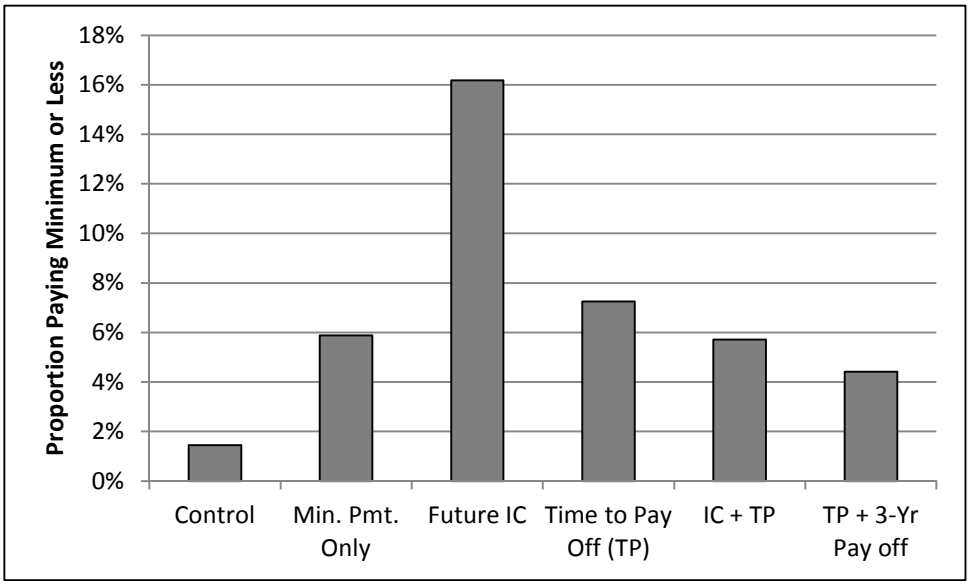
Figure 3

STUDY 1B: EFFECTS OF MINIMUM LEVEL AND SUPPLEMENTAL INFORMATION

A. Mean Repayment Amount by Minimum Payment Condition and PPM



B. Proportion of Participants Repaying the Minimum or Less

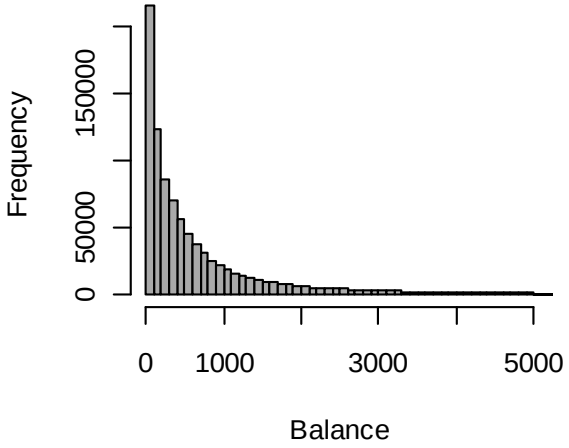


Note: All conditions, except Control, have 2% minimum payment information.

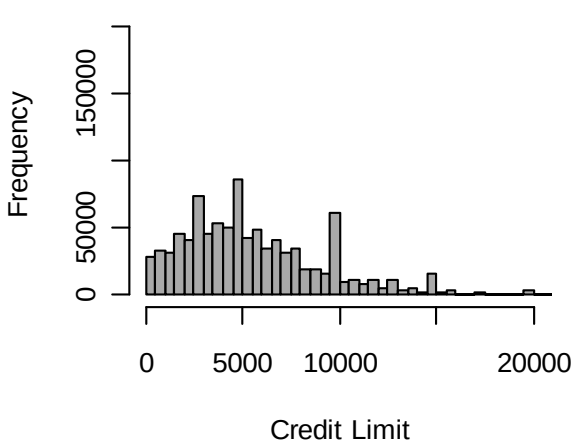
Figure 4

STUDY 2: DISTRIBUTION OF BALANCES, CREDIT LIMITS, AND REPAYMENTS

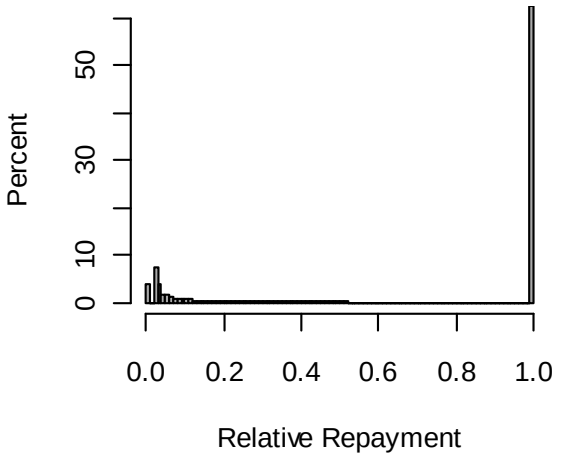
A. BALANCES



B. CREDIT LIMITS



C. REPAYMENTS, ALL



D. REPAYMENTS, PREDETERMINED PERCENTAGE

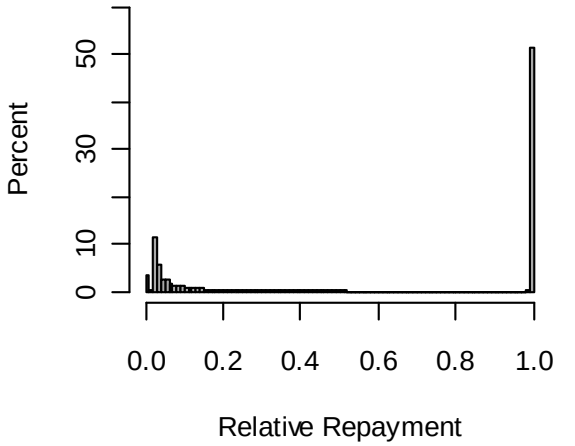
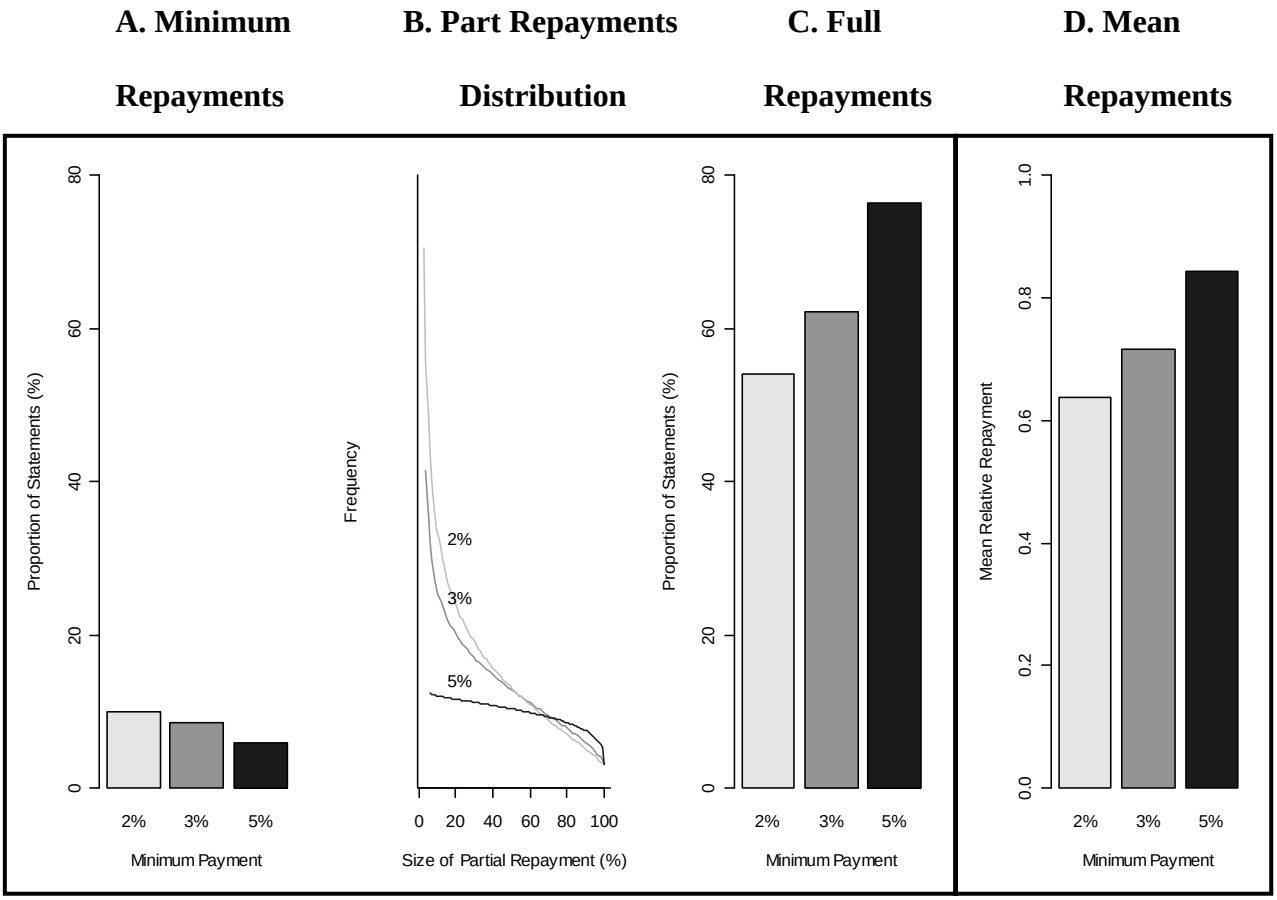


Figure 5

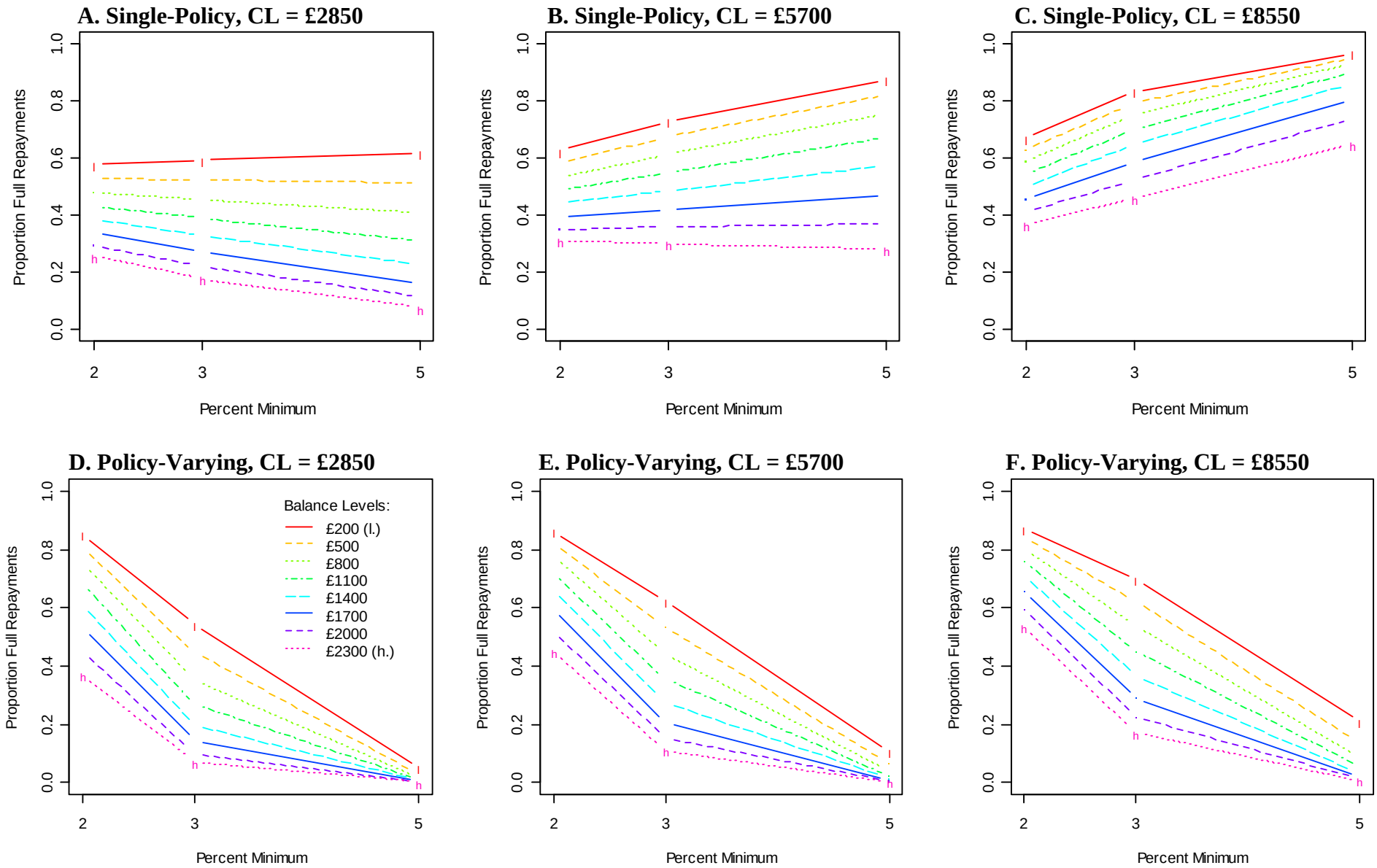
STUDY 2: PREDICTED EFFECTS OF INCREASING MINIMUM PAYMENTS, SINGLE-POLICY PROVIDERS



Notes: Predictions assume the median balance (£761) and median credit limit (£5700).

Figure 6

STUDY 2: PREDICTED PROPORTIONS OF FULL REPAYMENTS BY BALANCE AND CREDIT LIMIT

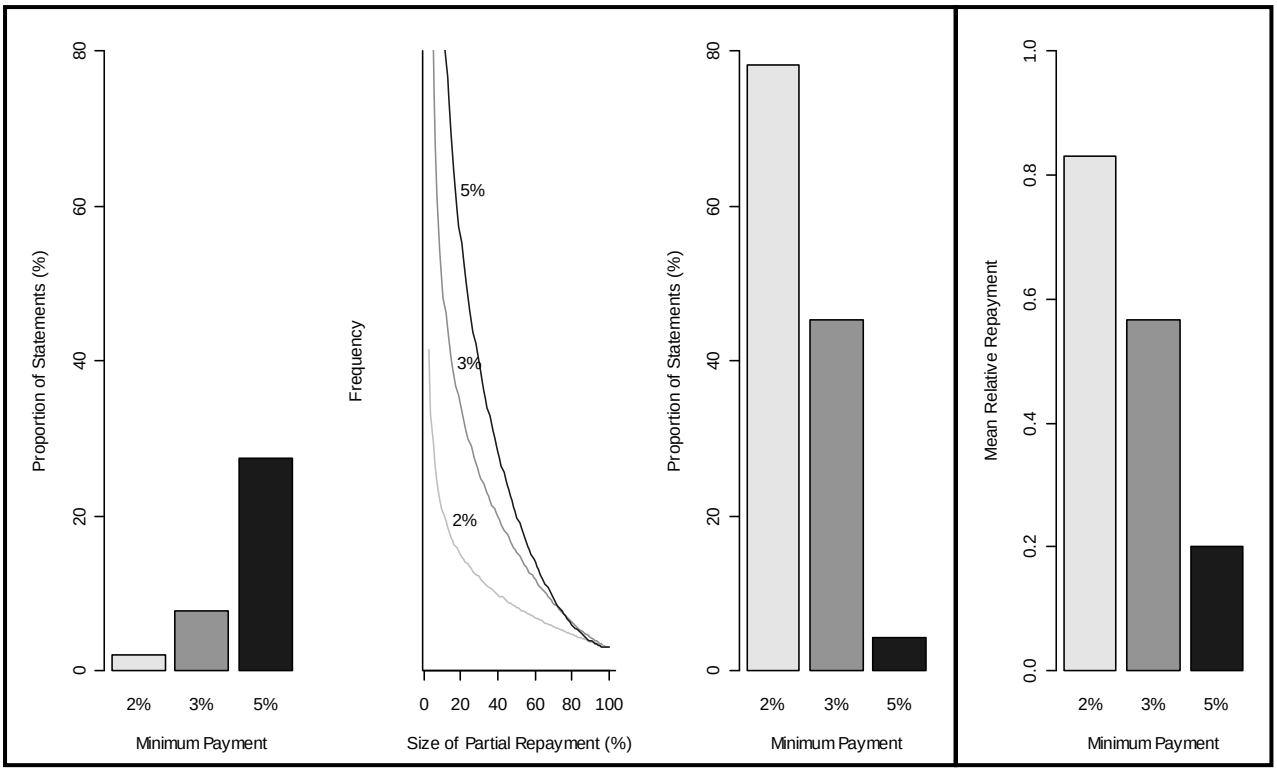


Notes: The credit limits (CL) illustrated here represent one-half of the median credit limit (£2,850), the median credit limit (£5700), and the median plus one-half of the median (£8,850). The balances go from £200 to £2300, which encompasses 89% of all the statements.

Figure 7

STUDY 2: PREDICTED EFFECTS OF INCREASING MINIMUM PAYMENTS, POLICY-VARYING PROVIDERS

A. Minimum Repayments **B. Part Repayments Distribution** **C. Full Repayments** **D. Mean Repayments**



Notes: Predictions assume the median balance (£761) and median credit limit (£5700).

APPENDIX A: MEASUREMENT SCALES (STUDY 1)

CFC (Strathman et al. 1994)
1 = "extremely uncharacteristic," and 7 = "extremely characteristic."
Items 3, 4, 5, 9, 10, 11, and 12 are reverse scored.

1. I consider how things might be in the future, and try to influence those things with my day to day behavior.
2. Often I engage in a particular behavior in order to achieve outcomes that may not result for many years.
3. (-) I only act to satisfy immediate concerns, figuring the future will take care of itself.
4. (-) My behavior is only influenced by the immediate outcomes of my actions (that is, outcomes occurring in a matter of days or weeks).
5. (-) My convenience is a big factor in the decisions I make or the actions I take.
6. I am willing to sacrifice my immediate happiness or well-being in order to achieve future outcomes.
7. I think it is important to take warnings about negative outcomes seriously even if the negative outcome will not occur for many years.
8. I think it is more important to perform a behavior with important distant consequences than a behavior with less-important immediate consequences.
9. (-) I generally ignore warnings about possible future problems because I think the problems will be resolved before they reach crisis level.
10. (-) I think that sacrificing now is usually unnecessary since future outcomes can be dealt with at a later time.
11. (-) I only act to satisfy immediate concerns, figuring that I will take care of future problems that may occur at a later date.
12. (-) Since my day to day work has specific outcomes, it is more important to me than behavior that has distant outcomes.

Knowledge of Interest Compounding
Knowledge score is calculated by allocating 1 point for each correct answer (underlined); score range is 0–3.

1. Do you believe the following statement is true or false? A loan with a 3% monthly interest charge is a better deal than a loan with a 20% annual interest charge. {True; <u>False</u>; Not sure}

2. Which of the following do you think would be worth more in two years?

   <u>{$100 received today, and then put in a savings account at an interest rate of 10%, compounded annually</u>; $120 received two years from today; They would be worth the same amount; I'm not sure which would be worth more.}

3. If you borrowed $100 today at an APR of 12%, approximately how much interest would you owe at the end of 1 month? {$2.00; $12.00; <u>$1.00</u>; $4.00; I'm not sure.}

APPENDIX B: MODEL SPECIFICATION (STUDY 2)

The minimum and full repayment components (MRC and FRC) of the model simply assume, respectively, that repayments are at R = 0 (the minimum or lower) or at R = 1 (full repayment). The probability of a full repayment, p_{FR}, is given by:

(A1) $$\log\left(\frac{p_{FR}}{1-p_{FR}}\right) = X_{FRC}\beta_{FRC},$$

where X_{FRC} is the matrix of independent variables and β_{FRC} the vector of coefficients. To ensure a well behaved likelihood function, we estimate the probability of a minimum repayment conditional on the cardholder repaying less than the full balance, as obtained from:

(A2) $$\log\left(\frac{p_{MR|R<1}}{1-p_{MR|R<1}}\right) = X_{MRC}\beta_{MRC}.$$

The unconditional probability of a minimum repayment is given by $p_{MR} = p_{MR|R<1}(1 - p_{FR})$.

The partial repayment component is based on Smithson and Verkuilen's (2006) beta regression model. The beta distribution is characterized by two parameters, *a* and *b*. We re-parameterize it using $a = \mu\varphi$ and $b = \varphi - \mu\varphi$, where μ represents location, φ represents "precision", and variance, $\sigma^2 = \mu(1-\mu)/(\varphi + 1)$, decreases with φ. We specify two different sub-models, one for location (LOC) and one for dispersion (DISP). The location sub-model can be expressed as:

(A3) $$\log\left(\frac{\mu}{1-\mu}\right) = X_{LOC}\beta_{LOC}.$$

The dispersion sub-model is specified as:

(A4) $$\log(\varphi) = -X_{DISP}\beta_{DISP}.$$

The negative sign here makes β_{DISP} interpretable as dispersion rather than precision. Finally, the probability density for the beta distribution is scaled by the probability of a partial repayment ($1 - p_{FR} - p_{MR}$), so that probability sums to 1 over the different components of the model.