Adverse Selection and Learning in Consumer Credit Markets*

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Abstract

This paper highlights a trade-off in credit markets between regulatory safeguards for informed consent and the informational frictions they can amplify. In our empirical setting, we find that requiring banks to garner explicit consent prior to raising clients' credit limits induces disproportionately higher take-up among riskier borrowers, worsening the risk profile of accounts receiving limit increases. In response, we find that banks decreased the size of the average credit limit increase and simultaneously gave more frequent limit increases. We develop a precautionary savings model with endogenous credit limits to study the role of learning and adverse selection in markets with incomplete information. We show that learning from acceptance decisions can rationalize our empirical results. Our model suggests that requiring consumer consent had negligible effect on consumer surplus but led to a slight decline in lender profits. Our key counterfactual demonstrates that the decline in credit provision from requiring consumer consent would be amplified with less patient lenders.

Keywords — Adverse Selection, Credit Limits, Bayesian Learning, Credit Card Lending
JEL Classification Numbers — D82, G28, G21, D14, D83

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1 Introduction

In markets with incomplete information, such as consumer credit markets, consumers select products based on their private information and lenders face adverse selection. Lenders typically offer a combination of interest rates and credit limits that can vary over time depending on repayment behavior. In credit card markets, interest rates typically remain unchanged throughout the lifespan of an account (Ausubel, 1991; Drechsler et al., 2025; Knittel & Stango, 2003) while credit limits vary substantially across borrowers and within borrower over time (Agarwal et al., 2018; Aydin, 2022; Fulford, 2015).

In this paper, we highlight a trade-off between regulatory safeguards for informed consent and the informational frictions they can amplify. We exploit heterogeneous compliance with Canada's *Credit Business Practices Regulations* (CBP) under the *Consent for increases in credit limits* (CG5) guidelines as a laboratory to study the role of adverse selection and learning in credit markets. We find evidence of greater adverse selection as a result of the policy. Borrowers who received credit limit increases under the express consent provisions of CBP increased utilization and were riskier over longer horizons, as measured by late payments, delinquency, and charge-offs. Our estimates suggest that borrowers who selected into credit limit increases saw a 4.6 percent increase in the amount of past due payments, a 4.4 percent increase in the amount delinquent, and a 1.7 percent increase in lender charge-offs relative to those for whom credit limit increases were automatically applied.

As a result of increased adverse selection, CBP-compliant lenders reduced the size of credit limit increases, consistent with Stiglitz and Weiss (1981). However, they also increased the frequency of credit limit increases by 2.05% per year. The combined effect is a small decline of $54 per account per year. We develop a model of precautionary savings with adverse selection and learning that rationalizes the effect of CG5 on the observed size and frequency responses of CBP-compliant lenders. We calibrate the model to moments in the Canadian data and use it to evaluate how requiring express consent affected consumer and lender surplus. We validate our model by comparing our model's predictions on the frequency and size of credit limit increases to data from the pre- and post-CG5 periods. We find that the policy had little effect on consumer surplus, but decreased lender profits. Finally, to study how consent regulations interact with lender patience, we lower the lender discount factor in a counterfactual exercise. With less patient lenders, CG5 generates a larger decline in total credit provision.

Following the Great Recession, the Government of Canada implemented CBP to limit business practices deemed not beneficial to consumers (Government of Canada, 2009b). The express consent provisions of these policies, under the CG5 guidelines, required Federally Regulated Financial Institutions (FRFIs) to obtain borrower express consent before increasing a borrower's credit limit (Government of Canada, 2009a). Prior to CBP, Canadian FRFIs could increase borrower credit limits at will, as is still the case in the United States.

The express consent provisions of CBP intended to give borrowers greater control of their finances and prevent lenders from raising limits to levels that do not benefit the consumer, however, these laws may also amplify adverse selection in the consumer credit card market. Borrowers who anticipate future financial distress or expect to revolve higher balances may be more likely to accept any offers of an increase compared to more stable or risk-averse borrowers. As a result, the pool of borrowers who select into higher credit limits may be riskier, potentially leading to greater delinquency and charge-offs.[1] As a result, the policy could lead FRFIs to offer credit limit increases less frequently or to reduce the size of offered credit limit increases.

We argue that this policy also introduced a new channel for FRFIs to learn about borrowers' riskiness. By offering borrowers credit limit increases, lenders can learn about borrower riskiness based on their decision to accept or not. Because the credit market is built on long-term relationships between lenders and customers, FRFIs may have an incentive to use this new mechanism to learn more about their borrowers. As a result, it is possible that express consent policies, like those in CBP, can lead to greater credit provision, despite the introduction of an additional source of adverse selection.

Related Literature: This paper contributes to a large literature on adverse selection. Chiappori and Salanie (2000) test for adverse selection and moral hazard in the insurance market. Einav et al. (2012) test for adverse selection in the consumer credit market. Other papers have used randomized trials of credit card offers (Agarwal et al., 2024) and loan terms (Hertzberg et al., 2018), to measure adverse selection and screening in credit markets. We contribute by documenting a novel form of adverse selection arising from consumer consent regulations.

A large literature has developed studying the role of information and learning in credit

[1] See Appendix A for an illustrative example of how the risk profile for a given lender can worsen following the implementation of express consent credit limit regulations.

markets. Given the importance of reputation in markets with adverse selection (Diamond, 1989), borrowers have incentives to signal their private information and lenders have incentives to learn about borrowers to overcome these frictions. Athreya et al. (2012), Einav et al. (2013), and Drozd and Serrano-Padial (2017) attribute much of the rise in consumer credit to improvements in lenders' ability to access information about consumers' credit history. Other papers have focused on optimal public information reporting in credit markets, such as Foley et al. (2020) and Blattner et al. (2022). Agarwal et al. (2015) show that the U.S. CARD Act's fee and repricing restrictions reduced borrowing costs by roughly 1.6–1.7 percent of average daily balances, while Keys and Wang (2019) demonstrate that minimum-payment disclosures causally shift repayment behavior and debt paydown, underscoring the importance of disclosure design. Nelson (2025) shows that while the CARD Act's interest-rate constraints exacerbated adverse selection, they benefited consumers by preventing lenders from price discriminating. This paper contributes to this literature by showing that lender learning incentives in credit markets can generate unintended consequences for regulations aiming to limit credit provision.

Our paper also contributes to the literature on credit card credit limits. Early work shows that limits shape spending and delinquency: Gross and Souleles (2002a) find effects for both binding and slack borrowers, consistent with precautionary saving, and Gross and Souleles (2002b) link higher limits to greater risk taking and default. Subsequent studies—including Agarwal et al. (2018) using FICO-score discontinuities, as well as Aydin (2022) and Xu (2023)—corroborate that credit limit increases can lead to increased borrowing and risk. Related, Matcham (2024) analyzes the UK market, where limits are individualized but interest rates are not. This paper documents the effects of consent regulations on consumer credit limits and highlights the endogenous response of lenders. Bord et al. (2025) uses micro data to study potential regulation surrounding credit limit increases. We exploit a natural experiment in credit limit regulation to directly study the effects of these regulatory policies.

To rationalize our empirical results, evaluate CG5, and run counterfactuals, we develop a model based on the quantitative macro model of Chatterjee et al. (2023). Our key innovation is introducing an endogenous credit limit. We allow a monopolist lender to choose credit limits for consumers subject to incomplete information. Consumers differ in their type. Since types are persistent, the lender can learn about the consumer's type from the consumer's actions — whether the consumer defaults, how much the consumer saves or

borrows, and, post-CG5, whether the consumer accepts or rejects a credit limit increase. Market power and long-term relationships interact with the profit motive to generate incentives for the lender to learn about the consumer's riskiness in order to choose optimal credit limits. Because impatient consumers are more likely to borrow and default, those consumers are more likely to accept credit limit increases. As a result, post-CG5 the lender faces greater adverse selection as the set of consumers who choose to accept the credit limit increase are riskier than the overall pool.

We estimate the model parameters using pre-CG5 data and solve the model under both pre- and post-CG5 regulations. We validate the model by showing it matches our key empirical results. We first use the model to evaluate CG5 and find that it had negligible effects on consumer surplus, but decreased lender surplus. Thus, our model suggests that although lenders benefit from learning, the costs of adverse selection makes them worse off under CG5. This may rationalize why not all lenders complied with the regulation. Finally, we use the model to run counterfactuals to study the interaction between monetary policy and credit limit regulations. We find that under contractionary monetary policy, CG5 would have led to an even greater reduction in credit provision. This suggests that there may be important interaction between credit regulations and monetary policy decisions.

2 Institutional Details

2.1 Canadian Credit Card Market

The Canadian credit card market is dominated by the "Big Five" banks—The Royal Bank of Canada, Toronto-Dominion Bank, Bank of Montreal, Scotiabank, and Canadian Imperial Bank of Commerce. These banks collectively control the vast majority of banking assets and hold 88 percent of credit card outstanding balances in Canada (Ho et al., 2022). On the network side, most Canadian credit card payments flow through Visa and Mastercard (Welte & Molnar, 2020).

Credit cards are widely held in Canada and central to how Canadians make purchases—during our sample period, 89 percent of adults have at least one credit card, and cards accounted for 56 percent of transaction value and 39 percent of transaction volume at the point of sale (Henry et al., 2018). For context, US consumers made 31 percent of their 2022 payments with credit cards, and 80 percent of families held at least one card (Foster et al.,

2023).

Credit limit increases are either offered by lenders or requested by consumers. In Canada, the demand channel is small. According to the Financial Consumer Agency of Canada's (FCAC) *Survey of Canadians' Use of Banking Products and Services*, less than 5 percent of respondents who contacted their bank and received financial help said they obtained a credit limit increase on a credit card or personal line of credit (Government of Canada, 2021). As a result, our results are likely driven by lender initiated credit limit increases.[2]

2.2 Credit Limits, CBP, and CG5 Guidelines

In response to the 2008 global financial crisis and rising credit card debt, the Government of Canada introduced CBP in January 2010 to "enhance the protection of consumer financial products," and "limit financial institutions' business practices that are deemed not to be beneficial to consumers" (Government of Canada, 2010). Following the introduction of CBP, regulators clarified how financial institutions should implement the express-consent provisions through the CG5 guidelines. CG5 clarified that FRFIs are required to "obtain express consent from consumers prior to increasing the credit limit on their credit card accounts." Regulators argued that these new requirements would allow consumers to be better informed about their credit. Monitoring and implementation of the CBP is conducted by the FCAC. Failure to comply with the regulation can result in regulatory penalties, reputational damage, and increased scrutiny or supervision by regulators.

On April 28, 2011, the FCAC issued further guidance on compliance with the regulations after discovering that several unnamed institutions implemented a process to obtain a one-time or "evergreen" consent from borrowers. Under an "evergreen" agreement, borrowers provided consent for any and all future credit limit increases, undermining the spirit of the regulation. The FCAC argued that evergreen consent contracts did not meet the standard of express consent that is required under the Credit Business Practices Regulations (Government of Canada, 2010).

Starting on April 28, 2011, the CG5 guidance required FRFIs to obtain express consent in *each instance* of a proposed credit limit increase and to do so at the time the increase is offered (Government of Canada, 2010). We define the pre-CG5 period as January 1, 2009 to

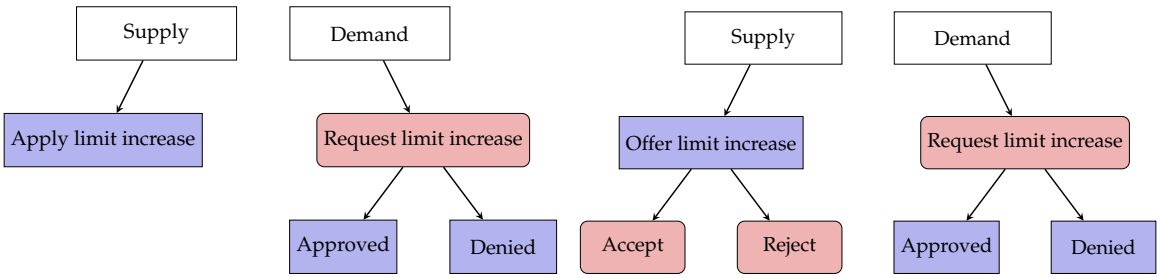
[2]Bord et al. (2025) find that 80% of credit card credit limit increases as initiated by the lender in the United States.

December 31, 2009 and the post-CG5 period as May 1, 2011 to December 31, 2017 in our data. Given that the regulatory guidance was unclear, we drop the period from January 2010 to April 2011.

Figure 1 graphically illustrates the changes in borrower decision points after the government publishes the CG5 guidelines. Prior to CG5, if a bank wished to increase a borrower's credit limit, it could simply apply it to the borrower's account. After CG5, a bank must first *offer* the borrower the credit limit increase and then wait for their consent before applying it to their account. This change effectively created a new point at which the borrower can self-select based on private information. For instance, a borrower who expects future financial distress or expects to revolve higher balances may be more likely to accept the increase, while many other consumers are likely to either decline or ignore the request. As a result, the pool of borrowers who select into higher credit limits could become riskier.

Notably, in the United States, issuers can raise a customer's credit limit without explicit prior consent, provided they have assessed the customer's ability to pay under the Credit Card Act's requirements (111th Congress, 2009; Consumer Financial Protection Bureau, 2024). Canada's regime is stricter: banks must obtain express consent each time they offer a credit limit increase. Australia's rules are most restrictive, prohibiting unsolicited credit limit increase offers altogether (Australia Securities & Investments Commission, 2019; Australian Government, 2009). Canada's consent requirement lies midway between the more permissive U.S. system and Australia's outright ban on unsolicited credit line increases.

Figure 1: CG5 Policy Graphical Representation



(a) Pre-CG5 **(b)** Post-CG5

Notes: Figure 1 illustrates the changes in borrower decision nodes pre- and post-CG5 implementation. Panel (a) illustrates the decision nodes of firms and borrowers pre-CG5. Panel (b) illustrates the decision nodes post-CG5. Blue boxes represent firm decision nodes. Red boxes represent borrower decision nodes. Following the introduction of the current version of CG5 in April 2011, borrowers have an additional set of decision nodes under the supply channel of CG5, wherein firms offer credit limit increases to borrowers. Borrowers may now accept or reject any credit limit offer from firms that complied with the policy.

2.3 Violations of CBP

By notice of violation issued on May 6, 2019, the FCAC alleged that Canada's largest bank, The Royal Bank of Canada (RBC), committed a violation of the Credit Business Practices in relation to credit card limit increases from February 1, 2015 to March 16, 2017. The Agency reviewed RBC's control framework, including sales procedures, training materials and oversight policies and practices relating to pre-approved credit limit increases. The agency found that "the sales procedures for both in-branch and phone-channel sales did not include scripts to guide the employee on how to present the offer or how to properly obtain the customer's consent." FCAC staff also found that "the procedures did not present the regulatory requirement for express consent and did not capture the expectation that the offer be presented clearly and simply, with a clear explanation and a clear request to either accept or decline the offer." Moreover, "RBC's training manual in place at the time for pre-approved credit limit increases was also inadequate as it contained only one reference to express consent, which related to joint cards," (Financial Consumer Agency of Canada, 2020).

Most notably, in the published decision, it is stated that RBC objected to its name being made public, and that "RBC's view is that the concept of express consent has evolved since the Regulations came into force on January 1, 2010," (Financial Consumer Agency of Canada, 2020). The FCAC explicitly stated that it did not review materials from RBC prior to 2015. In our analysis, we assume that RBC only adhered to the full spirit of CG5 starting in 2019, following the FCAC investigation. Whether RBC intended to violate CBP or misunderstood the legislation, is irrelevant for our analysis. We simply use the fact that the FCAC found them non-compliant with CBP to test the impact of compliance on borrower outcomes. This gives us a control group for a difference-in-differences research design to evaluate the effects of the policy.

Given the FCAC's published decision on RBC's violations of CBP from February 1, 2015 to March 16, 2017, accounts opened with RBC were effectively operating as if the express consent provisions of CBP were not in place. To study the effects of the express consent provisions of CBP, we compare borrowers with credit card accounts from CBP-compliant Canadian banks to borrowers with accounts from non-compliant banks, controlling for demographic differences across the two groups and borrower unobserved heterogeneity. In Appendix C, D and F, we conduct robustness checks by studying effects on different

horizons for long-term outcomes, including additional control variables, and reporting our main results on a one-to-one propensity score-matched sample, respectively.

3 Data

3.1 Canadian Consumer Credit Bureau data

We use anonymized TransUnion credit report data from the universe of Canadians with a credit product. We use the full sample of borrowers with at least one credit card product between January 1, 2009 and December 31, 2017. For every individual, we observe monthly account-level information, even for accounts that are no longer active or have been closed. For each month and card, we observe the issuer of the card, the card's credit limit, current balance, payments, any amount past due, delinquent, or charged-off, and the account age. For the borrower, we observe their credit score, their age, their region of residence, and consumer-level measures of the account-level data.[3]

We focus on active credit card accounts with credit limits between $250 and $50,000. To compare borrower at compliant and non-compliant banks, we restrict to accounts from the largest five Canadian banks. To maintain a large enough sample of regional borrowers, we also include accounts from President's Choice Financial. In total, our sample includes 24,063,547 borrowers and approximately 1.58 billion account-month observations.

3.2 Measuring Credit Limit Increases and Outcomes

We measure credit limit increases as instances when the credit limit reported on a given borrower's account increases from the value recorded in the previous month. Given that we have account level information, instances when the account credit limit increases are distinct from when the borrower receives a new card.

In Table B.3, we report probit regressions for the probability of receiving a credit limit increase in period $t+1$, estimated separately for the pre- and post-CG5 periods. We present marginal effects evaluated at mean levels of existing credit limits, utilization rates, credit scores, age of the account, and age of consumer. We find that higher existing credit limits and utilization rates increase the probability of receiving a credit limit increase, while account

[3]Borrower information is for the primary card holder. Supplementary cards are not reported in the credit bureau data—all activity is attributed to the primary account holder. In the rare instances where a card is jointly owned, we observe both cardholders.

age and borrower age decrease it. The magnitudes of the estimated average marginal effects do not differ significantly across the two periods. Banks in our sample give credit limit increases more frequently to active borrowers who are younger.

Our four main outcomes of interest are measured as follows. **Amount past due** is the amount on any missed payment reported to the credit bureau by the lender. Missed payments occur when a borrower fails to pay the minimum payment on a credit card statement by the statement date.[4] **Maximum amount delinquent** is the maximum amount of any missed payment appearing in the borrower's credit history that is overdue for 30 days or more. **Amount charged-off** is measured as any unpaid delinquent amount the lender is no longer attempting to collect from the borrower, writing it off their balance sheets as a loss. **Utilization** is measured as the ratio of current balance of the account to the credit limit at the time of reporting.

For robustness checks in Appendix C, we also look at an indicator for late payments, defined as having positive amount past due value, as an indicator for delinquency, defined as having positive delinquent value, and an indicator of having charge-offs, defined as having positive charge-off value.

3.3 Summary Statistics

3.3.1 Credit Limits vs. New Cards

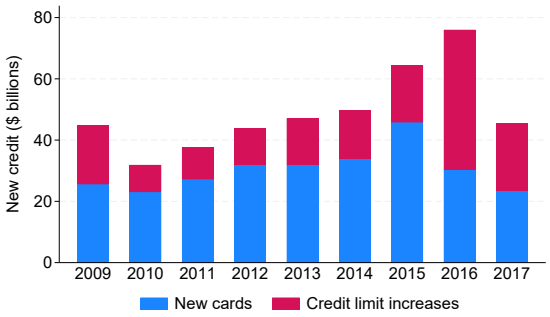
We begin by illustrating the importance of credit limits to borrowers' access to credit. In Figure 2, we document the amount of new credit in the Canadian credit market from either new cards or credit limit increases on existing cards over time. Over 2009 to 2017, the share of credit derived from credit limit increases is between 30-50 percent of the total new credit added to the market each year, as seen in Panel (a). In Panel (b), we see that, in a typical year, there are as many credit limit increases as new credit card issues.

3.3.2 Statistics by Bank Compliance with CG5

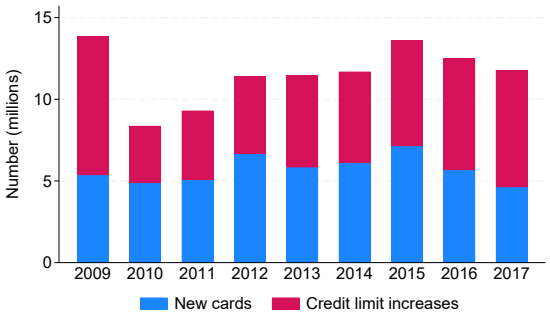
Table B.1 provides an overview of borrower-account characteristics and outcomes, by bank compliance with the express consent provisions of CBP, over the pre-CG5 period. Table B.2 summarizes the same variables by CBP compliance over the whole sample period.

[4] Minimum payments are inclusive of any interest, fees, and repayment of capital (Allen et al., 2024).

Figure 2: Extensive and intensive margins of new credit



(a) Credit from new cards vs. credit limit increases



(b) Number of new cards vs. number of cards that receive credit limit increases

Notes: All graphed series in Figure 2 are computed by the authors using the full TransUnion Canada accounts-level data set. Panel (a) summarizes the total amount of credit added per year from new credit card accounts (blue) and from credit limit increases on existing credit card accounts (red). Panel (b) plots the total number of new credit card accounts added (blue) and the total number of existing credit card accounts that received credit limit increases (red) by year.

In our sample, approximately 21 percent of borrowers have credit cards from both a CBP-compliant and non-compliant bank. Borrowers have a 1.6-2.1 percent probability of receiving a credit limit increase in any given month pre-CG5. The average size of credit limit increases are similar for both types institutions, around $3,000 over the whole sample. Utilization is also similar—27 and 24 percent at CBP non-compliant and compliant institutions, pre-CG5. Accounts from both groups have a 1.6-1.9 percent probability of being past due, a 1.7-2.2 percent probability of being delinquent, and similar average credit scores of approximately 770.[5]

Noticeably, the CBP non-compliant institution has higher average credit limits during the pre-CG5 period than the other institutions. Their average credit limit is around $10,306, whereas CBP compliant-institutions average around $8,113. The median account at a CBP non-compliant institution has a current balance of $2,363, compared to $1,901 at CBP compliant institutions. Overall, all types of institutions have similar customers along a number of observable dimensions. In our main empirical test of adverse selection, we control for variables that differ between compliant and non-compliant institutions. As robustness checks, we also employ one-to-one propensity-score matching to test on similar accounts from the two compliance groups in Appendix F.

[5]Credit scores in Canada typically range from 300 to 900, as opposed to a maximum of 850 in the United States.

4 An Empirical Test for Adverse Selection

In this section, we use a difference-in-differences approach exploiting the FCAC's finding of non-compliance with CG5 by RBC to test for the presence of increased adverse selection. The key to this test lies in the fact that for the lenders who complied, the borrowers *selected* into credit limit increases post-CG5. We regress long-term borrower outcomes on an indicator of whether the borrower's credit limit increased using data from the post-CG5 period. We find that borrowers who had credit cards with compliant lenders, on average, had worse outcomes conditional on receiving a credit limit increase compared to borrowers from RBC who were given credit limits without express consent. We take these findings as evidence that CG5 guidance increased adverse selection in the Canadian credit market.

4.1 Empirical Approach

We examine whether CG5 increased adverse selection for the lenders that complied. We compare the difference in several indicators of long-term outcomes: the amount that is past due, the maximum amount that is delinquent, and the amount charged-off by the lender. We construct forward-looking moving averages over 12, 24, and 36 months of each outcome variable to form $\overline{Y}$. To retain zeros, we apply the inverse-hyperbolic-sine transformation to variables measured in dollars. We estimate:

$$\begin{aligned}\overline{Y}_{ij,t+k} = \beta_1 \, \text{CLIncrease}_{ijt} + \beta_2 \, \text{CBPCompliant}_{ij} \\ + \beta_3 \left(\text{CLIncrease}_{ijt} \times \text{CBPCompliant}_{ij}\right) \\ + \mathbf{X}_{ijt} \, \boldsymbol{\gamma}' + \eta_i + \eta_{r(i)} + \eta_{y(t)} + \varepsilon_{ijt},\end{aligned} \tag{1}$$

where $\overline{Y}_{ij,t+k}$ are the forward looking moving averages from $t+1$ to $t+k$ of the outcome variables of interest. Additionally, CLIncrease_{ijt} is an indicator variable equal to 1 if borrower i received a credit limit increase on account j in time t and 0 otherwise. CBPCompliant_{ij} is an indicator variable equal to 1 if borrower i's credit card account j is from a compliant bank and 0 otherwise. $\mathbf{X}_{ijt}$ are borrower- or account-level time-varying characteristics, η_i are borrower fixed effects, $\eta_{r(i)}$ are forward sortation area (FSA) fixed effects, $\eta_{y(t)}$ are year fixed effects, and ν_{ijt} are error terms.[6] The key parameter of interest for these regressions is β_3, the effect of a credit limit increase by a compliant lender on borrower outcomes.

[6] Forward sortation areas are geographical regions defined by the first three characters of Canadian postal codes.

Although (1) resembles a standard difference-in-differences specification, we interpret it as a test for adverse selection rather than as an average treatment effect. A positive and significant β_3 implies that, conditional on receiving a credit limit increase, borrowers at compliant lenders exhibit worse subsequent outcomes than comparable borrowers at RBC. Further, given we only use post-CG5 data, the parallel trends assumption requires the outcome variables have the same trends for accounts *before receiving a credit limit increase* for compliant and non-compliant lenders. If outcomes of accounts that receive credit limit increases move in the pre-period toward the post-level, the pre-post gap for compliant lenders shrinks, and our estimates would be biased towards zero. If, however, non-compliant lenders' outcomes trended towards the post-level *faster* in the pre-period than compliant lender's, then the estimates are biased upwards. We provide evidence that the parallel trends assumption holds in Appendix E.1. To account for compositional changes and spillovers to controls, we control for borrower fixed-effects in some specifications. Under additional assumptions of noncompliance from RBC throughout May 2011 to March 2017, monotonicity, and SUTVA, our estimates can also be interpreted as a local average treatment effect (Goodman-Bacon, 2021).

4.2 Results

We focus on borrower outcomes over a 24-month horizon. The results for other horizons are similar. Figure 3 plots the time trends in our outcome variables before and after a credit limit increase during the post-CG5 period. Panel (a) plots the time trends of the amount past due, Panel (b) plots the amount delinquent, Panel (c) plots the amount charged off by the lender, and Panel (d) plots the utilization rate. The x-axis of each subplot is the event time where 0 marks the month an account receives a credit limit increase. Trends look generally parallel, 6 months prior to a credit limit increase.

Table 1 reports the results of regression (1) using all aforementioned outcome variables of interest over a 24-month horizon. For similar regressions at other horizons, and using other dependent variables and additional controls, see Appendix C.

In column (1), the dependent variable is the average amount past due during periods $t+1$ and $t+24$. We control for time-varying borrower characteristics like credit score and age, as well as borrower unobserved heterogeneity through a borrower fixed-effect. The estimated coefficient on the interaction of receiving a credit limit increase and being an account from

Table 1: Adverse selection test results on various outcomes of interest, 24 months forward

	(1) Amount past due	(2) Amount delinquent	(3) Amount charged off	(4) Utilization
Credit limit increased	-0.0349***	-0.0453***	-0.0139***	0.0120***
	(0.000301)	(0.000337)	(0.000196)	(0.0000722)
Credit limit increased × CBP compliant	0.0461***	0.0444***	0.0166***	0.0108***
	(0.000386)	(0.000425)	(0.000256)	(0.0000858)
Credit limit ($)	0.0727***	0.0332***	0.0203***	0.0189***
	(0.0000427)	(0.0000521)	(0.0000298)	(0.00000943)
Credit score	-1.393***	-2.348***	-1.009***	-0.443***
	(0.000759)	(0.000849)	(0.000583)	(0.000124)
Age of account	0.0102***	0.0555***	0.00785***	0.00181***
	(0.0000264)	(0.0000326)	(0.0000176)	(0.00000631)
Age of consumer	-0.00880***	0.108***	0.0311***	-0.0194***
	(0.000345)	(0.000400)	(0.000225)	(0.0000754)
Bank-Year FE	Yes	Yes	Yes	Yes
FSA FE	Yes	Yes	Yes	Yes
Borrower FE	Yes	Yes	Yes	Yes
R-squared	0.604	0.688	0.566	0.761
N	1,181,742,883	1,181,742,883	1,181,742,883	1,181,742,485

Notes: The dependent variable for each column is the average of the listed variable for periods $t+1$ to $t+24$. The dependent variable in (1) is the amount past due, (2) is the max. amount delinquent, (3) is the amount charged off, and (4) is the utilization. Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. All variables except the probability dependent variables are inverse-hyperbolic-sine-transformed, which preserves all 0 values in dollar variables.

a compliant lender is positive and significant. This result is robust to all of our horizons and with additional controls in Appendix C. This result is also robust to using a one-to-one propensity score-matched sample in Appendix F. Our estimates suggest that a borrower who accepts a credit limit increase from one of the institutions that complied with CG5 sees a 4.6 percent increase of the amount past due compared to a borrower who receives a credit limit increase from RBC. This estimate translates to an average of $6.63 more past due per account, per year, using pre-CG5 statistics.

Similarly, in columns (2) and (3), we see positive and significant estimated coefficients for the amount of money delinquent and the amount charged off by the lender, respectively. Controlling for time-varying borrower characteristics and borrower unobserved heterogeneity, a borrower who accepts a credit limit increase from a CBP-compliant institution sees a 4.4 percent increase in the amount delinquent and a 1.7 percent increase in the amount charged off compared to a borrower who receives a credit limit increase from RBC. A 4.4 percent increase in the amount delinquent equates to approximately to an additional $7.27 delinquent per account, per year, and a 1.7 percent increase in the amount charged off is equivalent to approximately an additional $3.28 charged off per account, per year, using

pre-CG5 statistics.

Column (4) shows that card utilization also increases more for borrowers receiving credit limit increases at CBP-compliant institutions than RBC. Controlling for time-varying borrower characteristics and borrower unobserved heterogeneity, a borrower who accepts a credit limit increase from a CBP-compliant institution sees a 1.8 percent increase in their card utilization compared to a borrower who receives a credit limit increase from RBC. Higher utilization of cards at CBP-compliant institutions shows that credit limit increases can also serve as a tool to stimulate (or re-stimulate) borrowing activity and compete with other lenders.

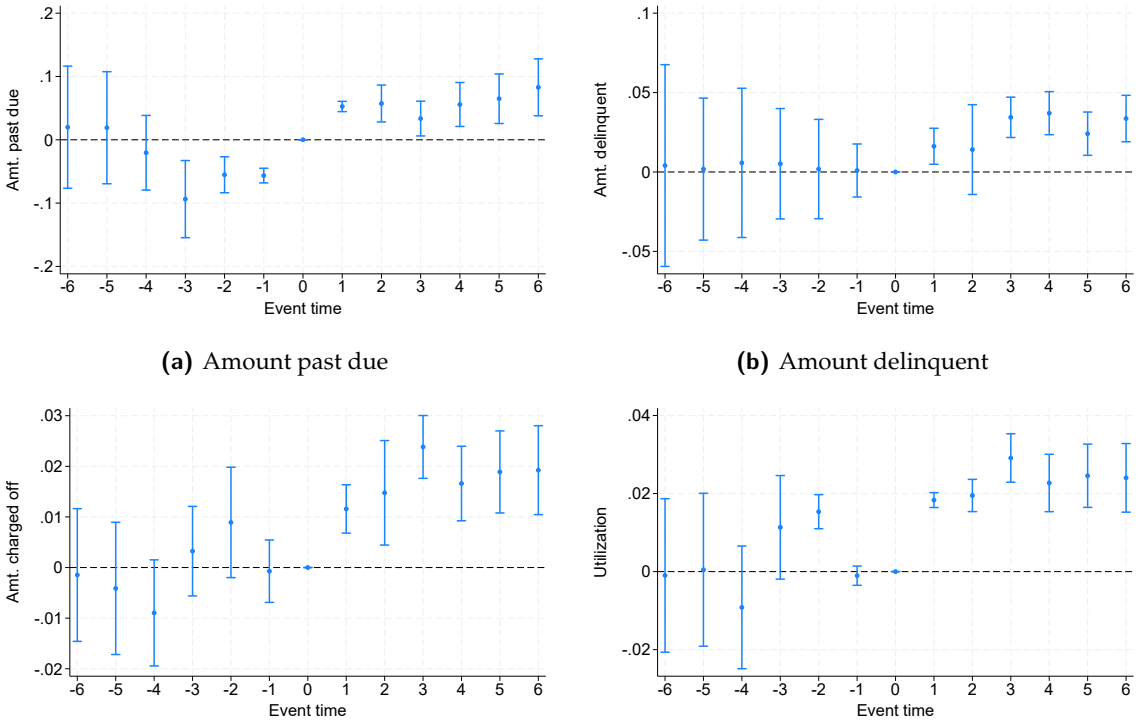
These results suggest that credit limit increase offers made by CBP-compliant lenders were accepted by borrowers with worse ex-post outcomes. Herein lies the trade-off for lenders when offering credit limit increases to clients—while credit limit increases can help identify active borrowers, stimulate borrowing activity, and compete with other lenders, they can also lead to larger losses on lender balance sheets. Higher utilization may lead to high interest payments for lenders if a large share of their borrowers are revolvers and *do not default on their debt*.[7] Thus, we take these results as indicative that CBP-compliant lenders faced increased adverse selection when providing credit limit increases which led to greater losses on their balance sheets. However, identifying which borrowers were active, non-defaulters likely increased interest payments on card utilization which may offset these losses. Financial institutions, therefore, would like to identify which borrowers are profitable (high utilization but with repayment) and which are not (defaulters).

5 Effect of CG5 on lender behavior

In this section, we use a difference-in-differences approach to study how lenders responded to CG5. Given increased adverse selection, lenders may choose to provide less credit to borrowers post-CG5. To study how CG5 affected the extensive and intensive margins of credit limit increases using an indicator of whether a borrower received a credit limit increase and a variable of the size of the credit limit increases, respectively. We find that compliant lenders decreased the size of credit limit increases post-CG5, but the probability

[7] A revolver is a credit card owner who does not pay off their entire monthly balance and is charged interest on borrowing. The share of revolvers in Canada is relatively low compared to the US, at around 27 percent of Canadians during 2013 to 2022 (Henry et al., 2024). The Federal Reserve estimates the share of revolvers in the US to be around 45 percent (Adams et al., 2022).

Figure 3: Trends adverse selection outcomes



(a) Amount past due

(b) Amount delinquent

(c) Amount charged off

(d) Utilization

Notes: Plotted series in Figure 3 are the monthly differences between CG5 compliance group in event time with 99 percent confidence intervals. The dependent variable in Panel (a) is the amount past due. The dependent variable in Panel (b) is the amount of delinquent. The dependent variable in Panel (c) is the amount charged off. The dependent variable in Panel (d) is the utilization rate. The x-axis is the event time where 0 marks the month an account received a credit limit increase.

of credit limit increases increased.

5.1 Empirical Approach

We examine whether CG5 increased the frequency and magnitude of credit limit increases given by lenders. We compare the difference between compliant and non-compliant lenders in two outcome variables: an indicator of a credit limit increase and the amount of credit limit increases. All variables in dollar values are transformed with the inverse-hyperbolic-sine function. All outcome variables are taken in period $t+1$ to account for reporting delays, controlling for time-varying borrower characteristics in time t. We estimate:

$$\begin{aligned} Y_{ij,t+1} = \alpha_1 \, \text{CG5}_t + \alpha_2 \, \text{CBPCompliant}_{ij} + \alpha_3 \left(\text{CG5}_t \times \text{CBPCompliant}_{ij}\right) \\ + \mathbf{X}_{ijt} \, \gamma' + \eta_i + \eta_{r(i)} + \eta_{y(t)} + \varepsilon_{ijt}, \end{aligned} \tag{2}$$

where $Y_{ij,t+1}$ are the outcome variables of interest, an indicator denoting a borrower i with

credit card account j received a credit limit increase in $t+1$ and the amount of a credit limit increase, conditioning on receiving a credit limit in $t+1$. Moreover, CG5_t is an indicator that equals 1 if t is May 2011 or later and 0 otherwise. CBPCompliant_{ij} is an indicator that equals 1 if borrower i's credit card account j is from a compliant lender and 0 otherwise. $\mathbf{X}_{ijt}$ are borrower- or account-level time-varying characteristics, η_i are borrower fixed effects, $\eta_{r(i)}$ are FSA fixed effects, $\eta_{y(t)}$ are year fixed effects, and ε_{ijt} are error terms. The key parameter of interest for these regressions is α_3.

We present our analysis of parallel trends in the unconditional average value of our outcome variables in Appendix E.2. Under additional assumptions of monotonicity and SUTVA, we aim to identify the local average treatment effect.

5.2 Results

Figure 4 plots the monthly differences of the outcome variables of interest between the two CG5 compliance groups in event time. Time 0 marks the beginning of CG5 guidance. We see that there is evidence that parallel trends generally holds between compliant and non-compliant lenders, although the probability of credit limit increase shows non-compliant lenders appeared to preempt April 2011 but significantly increasing limit increases the month before.

Table 2 reports the estimated coefficients of interest on our outcomes of interest. Columns (1) and (2) report the estimated coefficients of interest using an indicator that a credit limit is increased in period $t+1$ as the outcome variable. Columns (3) and (4) report the estimated coefficients of interest using the amount of a credit limit increase in period $t+1$, conditional on receiving a credit limit increase, as the outcome variable. Tables with additional controls are reported in Appendix D.

Columns (1) and (2), show that, after observable characteristics and unobserved borrower heterogeneity, the coefficient of interest on $CG5 \times CBPCompliant$ is around 0.00171. These estimates are both significant at the 0.1 percent level, and suggest that, on average, compliant lenders increased the rate of credit limit increases by approximately 0.171 percent, per account, per month. Annualized, this aggregates to approximately 2.05 percent increase in the probability of receiving a credit limit every year.

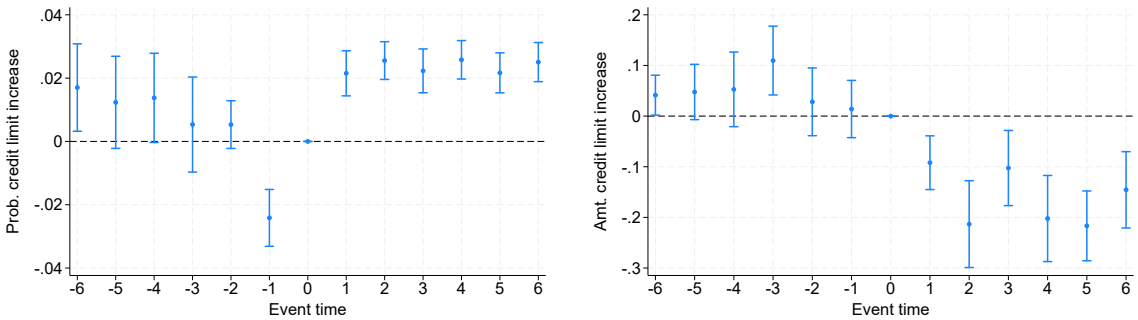
While the probability of a credit limit increase rose for compliant institutions, columns (3)

Table 2: Effect of CG5 on credit limit increases given by firms

	Prob. credit limit increase		Amt. credit limit increase	
	(1)	(2)	(3)	(4)
CBP compliant	-0.00394***	-0.00570***	0.0509***	-0.00663**
	(0.0000425)	(0.0000458)	(0.00121)	(0.00251)
CG5 × CBP compliant	0.000433***	0.00171***	-0.274***	-0.191***
	(0.0000435)	(0.0000461)	(0.00129)	(0.00238)
Credit limit ($)	0.000383***	-0.00439***	0.292***	0.249***
	(0.00000380)	(0.00000665)	(0.000291)	(0.000599)
Utilization	0.0283***	0.0326***	-0.382***	-0.178***
	(0.0000168)	(0.0000230)	(0.000902)	(0.00143)
Credit score	0.0324***	0.0516***	2.478***	1.254***
	(0.0000449)	(0.0000819)	(0.00391)	(0.00752)
Age of account	-0.00134***	0.000816***	-0.0319***	-0.00681***
	(0.00000269)	(0.00000364)	(0.000262)	(0.000551)
Age of consumer	-0.00759***	0.00532***	-0.0336***	0.454***
	(0.0000107)	(0.0000560)	(0.000689)	(0.00843)
Year FE	Yes	Yes	Yes	Yes
FSA FE	Yes	Yes	Yes	Yes
Borrower FE	No	Yes	No	Yes
R-squared	0.00630	0.0409	0.246	0.731
N	1,088,293,769	1,087,956,877	14,644,854	10,114,430

Notes: The dependent variable for columns (1)-(2) is the probability of credit limit increase in $t+1$. The dependent variable for regressions (3)-(4) is the amount of credit limit increases in $t+1$, conditional on a credit limit increase. Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. All non-indicator variables are inverse-hyperbolic-sine-transformed, which preserves all 0 values in dollar variables.

Figure 4: Trends in credit limit increases



(a) Probability of credit limit increase

(b) Amount of credit limit increases

Notes: Plotted series in Figure E.2 are the monthly differences between CG5 compliance group in event time with 99 percent confidence intervals. The dependent variable in Panel (a) is the probability of a credit limit increase. The dependent variable in Panel (b) is the amount of credit limit increases. Time 0 marks the start of CG5 guidance in April 2011.

and (4) show that the average size of increases declined. Our estimates suggest that, after controlling for observables and unobserved borrower heterogeneity, the size of a credit limit increase decreased by around 19.1 percent. These estimates correspond to roughly a $514 smaller increase, conditional on receiving a credit limit increase.

Combining these results, borrowers who had cards with compliant lenders saw more frequent credit limit increases than borrowers who had cards with RBC. The average size of credit limit increase offers, however, decreased as a result of CG5. The overall effect of increasing frequency and decreasing sizes is an average decrease of $54 per year, per account.

6 Model

To interpret our results and evaluate the effects of CBP with CG5 guidelines, we develop a model of consumer and lender behavior. We base our model on Chatterjee et al. (2023), but innovate by adding a consumer's credit limit as an endogenous state variable. We allow the lender to update a consumer's credit limit in response to new information. To quantify the effects of the policy change, we evaluate the model in two settings; one where credit limit increases are automatically applied to consumers (pre-CG5) and one where consumers choose to accept or decline a credit limit increase (post-CG5). Adverse selection arises post-CG5 because consumers who are most likely to accept a credit limit increase are those who are most likely to default. However, this selection allows the lender to learn about a consumer's private type based on their actions.

We validate our model by studying how implementing CG5 in our model affects the frequency and size of credit limit increases. We match both the slight increase in the frequency of credit limit increases and the decline in the average size of credit limit increases post-CG5. We then use the model to evaluate the effects of CG5 on consumer surplus and lender profits. We find that consumer surplus is relatively unaffected, while lender profits decline slightly. We then run a decomposition exercise where we prevent the lender from learning from consumer's decisions to accept or reject credit limit increases. We find that credit provision declines for low FICO consumers, as the lender can no longer learn from offering them credit limit increases. Finally, we use the model to run counterfactuals to study how policies like CG5 would affect credit provision, consumer defaults, consumer surplus, and lender profits in a higher interest rate environment. We find that in a higher

interest rate environment, with less patient lenders, CG5 would lead to a greater reduction in credit provision.

6.1 Model Environment

Time is discrete and infinite horizon with periods denoted by $t \in \{1, 2, \dots\}$. Consumers are differentiated by exogenous and endogenous factors. The factors that evolve exogenously are the consumer's age, $a \in \{1, 2, \dots, A\}$, their type, $i \in \{H, L\}$, and their income e. We assume the lender cannot directly observe the consumer's type, but has to learn about this hidden type by the consumer's actions. We allow for multiple types to capture adverse selection concerns. We include age to capture the ability of lenders to learn about a consumer's type over time. We include variable income to provide a reason for credit limits – they allow consumers to borrow during times of low income to smooth consumption across time. The factors that evolve endogenously are the consumer's wealth w, their credit limit, l and their credit score s. Because consumers have long lasting relationships with lenders, consumers can signal their type through their actions. The lender can then learn about the consumer's type overtime, update their belief s, and offer credit limit increases accordingly.

We let type H consumers have a higher discount factor than type L consumers (i.e. $\beta_H > \beta_L$). The lender assigns a "type score" given by $s = Pr(\beta = \beta_H)$. The lender updates a consumer's type score via Bayes' rule using observable actions — whether the consumer defaults or not ($d' \in \{0, 1\}$) and how much the consumer chooses to save or borrow (w'). These observable actions, denoted (d', w'), determine lender posterior beliefs, $s' = Pr(\beta = \beta_H | d', w')$.

At the beginning of each period, the lender decides whether to offer a consumer a credit limit increase from l to $l' > l$. Pre-CG5, this credit limit increase is automatically applied. Post-CG5, the consumer chooses whether to accept or reject the credit limit increase. In the post-CG5 setting, lender's can then update their beliefs about the consumer type based on whether they accepted or rejected. Pre-CG5, lender's cannot learn from the consumer's actions because credit limit increase is automatically applied.

In the middle of the period, the consumer observes their income, which is composed of two sources — a persistence component e and an idiosyncratic component z. If the consumer borrowed the previous period ($w < 0$), they decide whether to default or not. If they default, they lose $1 - \kappa_1$ percentage of their income for that period. They are also excluded from the

credit market in the next period. To capture the slow removal of defaults from a consumer's credit history, each period after default the consumer has a δ probability of rejoining the credit market. To capture the long term effects of delinquency, we let $1 - \kappa_2$ be the fraction of income lost per period that they are excluded from the credit market.[8] If a consumer does not default, they choose their wealth for the next period w' and their consumption c subject to their credit limit.

Finally, at the end of each period, the consumer's type can change from β to β'. We denote by $Q^{\beta}(\beta'|\beta)$ the transition matrix. We allow a consumer's type to change to capture the evolution of a consumer's FICO scores over time. The persistent component of income can also change. We denote by $Q^{e}(e'|e)$ the transition matrix for the persistent income process. The consumer's age, a, can either increase by one or not. We denote by $Q^{a}(a'|a)$ the age transition matrix.[9] When the consumer exceeds the maximum age, $\bar{A}$, they switch to another credit card. We interpret the maximum age and the probabilistic aging as capturing the varying duration of relationships between credit card users and credit card lenders. Each period there is a small chance of exiting the credit market entirely. For simplicity, we use $Q(\beta', e', a'|\beta, e, a)$ to capture these exogenous transition probabilities.

6.2 Model Timing

1. At the beginning of each period:
   (a) The lender chooses whether to offer a credit limit increase $l' \geq l$.
   (b) Case 1 (Pre-CG5): The lender's credit limits are automatically applied.
   (c) Case 2 (Post-CG5): The consumer decides whether to accept the new credit limit l' or reject it and keep their current credit limit l. The lender then updates their beliefs about the consumer's type to s'.
2. At the middle of each period
   (a) Consumers observe their income.
   (b) Consumers who are borrowers (i.e. $w < 0$) choose whether to default or not ($d' \in \{0, 1\}$).
   (c) Consumers who do not default repay any previous borrowing and choose assets

[8] This is standard in the literature (see Livshits et al. (2007) and Chatterjee et al. (2023)). In Canada, bankruptcy stays on credit reports for seven years (Government of Canada, 2025).

[9] Since the model is monthly, there is a $\frac{1}{12}$ chance of a consumer aging by a year.

and consumption for next period (w', c) subject to their credit limit l.

(d) The lender updates their credit score $s''(s', d', w')$ based on consumers' actions.

3. At the end of each period

(a) Consumer's income e, type β, and age a, evolve subject to the transition matrices Q^e, Q^β and Q^a, respectively. Consumers of the age $a = \bar{A}$ exit. The lender observes change in income and age, but does not observe β or β'.

(b) A new set of consumers enter at age $a = 1$.

6.3 Consumer Problem

Let the state variable be denoted by: $\Omega = \{l, w, e, s, \beta, a\}$. At the beginning of the period, the consumers value function is given as follows:

$$W_c(\Omega) = pr(A' = 1)V_c(l', w, e, s, \beta, a) + (1 - pr(A' = 1))V_c(l, w, e, s, \beta, a). \tag{3}$$

Pre-CG5, $pr(A' = 1) = 1$ as credit limit increases are automatically applied, while Post-CG5, the $pr(A' = 1) \neq 1$ as the consumer can choose to reject the offer.

Then, having observed their income, $(z + e)$, the problem for a consumer with credit limit l, wealth w, persistent income e, idiosyncratic income z, type score s, type β, and age, $a < \bar{A}$ is given by:

$$\begin{aligned} V_c(\Omega) = \\ \max_{d'} \Bigg\{ 1_{\{d' \neq 1\}} \underbrace{\left(\max_{a'} u(c) + \epsilon_{w'} + \sum_{\beta', e', a'} Q(\beta', e', a' | \beta, e, a)\, \beta'\, V_c\big(l'(w', s'), w', e', s'(w'), \beta', a'\big) \right)}_{\text{value not defaulting}} \\ + 1_{\{d'=1\}} \underbrace{\left(u(\kappa_1 e + z) + \epsilon_{d'} + \sum_{\beta', e', a'} Q(\beta', e', a' | \beta, e, a)\, \beta'\, V_d(w = 0, e', s'(d' = 1), \beta', a') \right)}_{\text{value defaulting}} \Bigg\}, \end{aligned} \tag{4}$$

where

$$c = \begin{cases} z + e - w' + (1 + r_{borrow})w & \text{if } w < 0 \\ z + e - w' + (1 + r_{save})w & w \geq 0, \end{cases} \tag{5}$$

and

$$|w'| \leq l \text{ if } w' < 0. \tag{6}$$

The first term in Equation 4 captures the value of not defaulting and the second term captures the value of defaulting. We put possible asset choices on a grid and consumers receive type-1 Extreme Value shocks for both their default decision, ($\epsilon_{d'}$), and their asset choice decision conditional on not defaulting ($\epsilon_{w'}$). Equation 5 defines consumption conditional on not defaulting, which involves repaying previous debt at interest rate r_{borrow} or earning interest rate r_{save} on previously held assets. Equation 6 is the consumer's credit constraint. They cannot borrow more than their credit limit l.

The value function of a consumer who has defaulted is given by:

$$\begin{aligned} V_d(\Omega) = \max_{w'} \; u(c) + \epsilon_{w'} + \delta \underbrace{\sum_{\beta',e',a'} Q(\beta',e',a'|\beta,e,a)\, \beta'\, V_c\big(l'(w',s'),w',e',s'(w'),\beta',a'\big)}_{\text{value regain credit market access}} \\ + \underbrace{(1-\delta) \sum_{\beta',e',a'} Q(\beta',e',a'|\beta,e,a)\, \beta'\, V_d(w',e',s'(w'),\beta',a')}_{\text{value do not regain access}}, \end{aligned} \tag{7}$$

where

$$c = \kappa_2 e + z - w' + (1 + r_{save})w, \tag{8}$$

and

$$w' \geq 0. \tag{9}$$

The first term in equation 7 captures the value for the consumer of rejoining the credit market, which happens with probability δ, while the second term captures the value of remaining in the default state. Consumption is defined in equation 8. Equation 9 requires that the consumer not hold debt as they cannot access the credit market.

In the final period of a consumer's relationship with the lender, i.e. $a = \bar{A}$, the consumer's problem is given by:

$$\begin{aligned} V_c(\Omega) = \max_{d} \Bigg\{ 1_{\{d=0\}} \Big(\max_{w'} u(c) + \epsilon_{w'} + \beta \mathbb{E}[V(l,w',e,s,\beta,1)] \Big) \\ + 1_{\{d=1\}} \Big(u(\kappa_1(z+e)) + \epsilon_d + \beta \mathbb{E}[V_d(0,0,e,s,\beta,1)] \Big) \Bigg\}, \end{aligned} \tag{10}$$

where the consumer is subject to the same constraints in equations 5 and 6. The future value captures the value of the consumer's next credit relationship.

In addition to the standard consumption-savings trade-off, consumers also consider how their actions affect their type score s'. A consumer's credit score matters because the lender uses it to inform their credit limit decision. Since lenders are more likely to offer credit limit increases to high type consumers (who are unlikely to default), consumers may choose to mimic high types in order to receive credit limit increases in the future. In the model, consumers benefit from higher credit limits for two reasons. First, with a high credit limit, consumers can smooth consumption when they face shocks to their income. Having a higher credit limit allows consumers to borrow during times of low persistent income and when they experience negative idiosyncratic shocks to their income. Second, consumers with high credit limits also get more type-1 Extreme Value shocks, which has a small effect on their value.

6.4 Consumer's Credit Limit Decision

To capture the introduction of the CG5 guidelines, we allow consumers to accept or reject offered credit limit increases.

Following an offer of a credit limit of size l', the consumer chooses to accept or reject, denoted $A' \in \{0, 1\}$. The value of accepting for a consumer with credit limit l, assets w, income e, type score s, type β, and age a is given by:

$$V(A' = 1, l', \Omega) = V_c(l', w, e, s'(A' = 1), \beta, a) + \epsilon_A. \tag{11}$$

The value of rejecting is given by:

$$V(A' = 0, l', \Omega) = V_c(l, w, e, s'(A' = 0), \beta, a). \tag{12}$$

Given the type-1 Extreme Value shock, the probability of choosing to accept the offer is given by:

$$pr(A' = 1) = \frac{exp(V_c(A' = 1, l', \Omega))}{exp(V_c(A' = 0, l', \Omega)) + exp(V_c(A' = 1, l', \Omega))}, \tag{13}$$

with the probability of rejecting, $pr(A' = 0)$, being defined analogously.

Post-CG5, the lender faces adverse selection when offering credit limit increases if consumers of different types have different valuations for higher credit limits. In our calibration, we find that low-type consumers are more likely to accept credit limit increases as they are more likely to borrow. As a result, the set of consumers who accept an offered credit limit increase will be selected toward low type consumers. On the otherhand, post-CG5 the lender can learn about consumers' type based on their decision to accept or reject a credit limit increase. This provides a new opportunity for consumers to signal their type and for the lender to learn about the consumer's type.

6.5 Lender's Problem

We assume that there is a single monopolist lender. Interest rates are exogenously given, so the only choice for the lender is the consumer's credit limit.[10] The lender's profit for a consumer with credit limit l, wealth w, who chooses to default or not, d', and chooses to hold wealth w' the next period is given by:

$$\pi(l, w, e, w', d') = \begin{cases} R \cdot min(e - w', l) + (1 + r) \cdot 1_{w \leq 0}|w| - 1_{w \leq 0}|w'| & \text{if } d' = 0 \\ 0 & \text{if } d' = 1. \end{cases} . \quad (14)$$

We assume lending is unsecured. If the consumer defaults, the lender is not paid back on previous borrowing and recovers nothing. If the consumer does not default, the lender's profit is given by net merchant fees, R, times consumption on the credit card, plus the repayment of previous borrowing with interest r, and less any new borrowing.[11]

The lender chooses individualized credit limits to maximize their value function subject to imperfect information. The lender observes the persistent component of income e and wealth w, as well as the consumer's credit market decisions each period—whether they default, d', and how much they save or borrow, w'. However, the lender cannot observe the consumer's type β, the idiosyncratic income shocks z, or the type-1 Extreme Value shocks. Since type is persistent, actions can signal type.

[10] Interest rates typically remain unchanged throughout the lifespan of an account (Ausubel, 1991; Drechsler et al., 2025; Knittel & Stango, 2003).

[11] We assume the consumer can continue to spend above their credit limit using cash, but the lender does not get merchant fees.

The expected profit for a consumer of type score s with income e, wealth w, age a, and credit limit l is given by:

$$\mathbb{E}[\pi(l,w,e,s,a)] = \sum_{i\in\{H,L\}} pr(\beta=\beta_i)\sum_{w'} pr(w'|l,e,w,i,s,a)\pi(l,w,w',d'(l,w,e,i,s,a)), \tag{15}$$

where $pr(\beta=\beta_H)=s$ and $pr(\beta=\beta_L)=1-s$.

The lender's value function, pre- and post-CG5, is given by equations 16 and 17, respectively.

$$\begin{aligned} V_f^{\text{pre}}(l,w,e,s,a) = \max_{l'\geq l}\ & \mathbb{E}[\pi(l',w,e,s,a)] - C\{l'\neq l\} \\ & + 1_{\{d'\neq 1\}}\beta_f \sum_{e',a'} Q(e',a'|e,a)V_f(l',w',e',s'(d',w'),a'), \end{aligned} \tag{16}$$

$$\begin{aligned} V_f^{\text{post}}(l,w,&e,s,a) = \\ \max_{l'\geq l}\ & pr(A'=1)\Big\{\mathbb{E}[\pi(l',w,e,s'(A'=1),a)] + 1_{\{d'\neq 1\}}\beta_f \sum_{e',a'} Q(e',a'|e,a)V_f(l',w',e',s''(d',w'),a')\Big\} \\ & + pr(A'=0)\Big\{\mathbb{E}[\pi(l,w,e,s'(A'=0),a)] + 1_{\{d'\neq 1\}}\beta_f \sum_{e',a'} Q(e',a'|e,a)V_f(l,w',e',s''(d',w'),a')\Big\} \\ & - C\{l'\neq l\} \end{aligned} \tag{17}$$

The variable C captures the cost of adjusting a consumer's credit limit. The lender faces this cost regardless of whether the consumer accepts the credit limit increase. When the consumer reaches the maximum age, $a=\bar{A}$, the lending relationship ends. Any borrowing is repaid to the lender in the form of a balance transfer.[12]

6.6 Learning and Adverse Selection

Lenders learn about the type of consumer from their actions. They learn based on whether a consumer defaults or not, $d'\in\{0,1\}$, and they save or borrow, w'. Post-CG5, lenders also learn from whether consumers accept or reject a credit limit increase, $A'\in\{0,1\}$.

If a consumer chooses to accept a credit limit increase, then:

[12] To speed up the computation, we add small T1EV shocks to the lender's choice of l'.

$$s' = Pr(\beta = \beta_H | s, A' = 1) = \frac{Pr(A' = 1 | \beta = \beta_H) \cdot Pr(\beta = \beta_H)}{Pr(A' = 1)} = \frac{Pr(A' = 1 | \beta = \beta_H) \cdot s}{Pr(A' = 1 | \beta = \beta_H) \cdot s + Pr(A' = 1 | \beta = \beta_L) \cdot (1 - s)}. \tag{18}$$

If a consumer defaults:

$$s' = Pr(\beta = \beta_H | s, d' = 1) = \frac{Pr(d' = 1 | \beta = \beta_H) \cdot Pr(\beta = \beta_H)}{Pr(d' = 1)} = \frac{Pr(\beta = \beta_H | s, d' = 1) \cdot s}{Pr(\beta = \beta_H | s, d' = 1) \cdot s + Pr(\beta = \beta_L | s, d' = 1) \cdot (1 - s)}. \tag{19}$$

If a consumer does not default and chooses wealth w', then:

$$s' = Pr(\beta = \beta_H | s, d' = 0, w = w') = \frac{Pr(d' = 0 \ \& \ w = w' | \beta = \beta_H) \cdot Pr(\beta = \beta_H)}{Pr(d' = 0 \ \& \ w = w')} = \frac{Pr(\beta = \beta_H | s, d' = 0, w = w') \cdot s}{Pr(\beta = \beta_H | s, d' = 0, w = w') \cdot s + Pr(\beta = \beta_L | s, d' = 0, w = w') \cdot (1 - s)}. \tag{20}$$

As a result, if high and low type consumers make different decisions, the lender will, over time, learn about their type. Post-CG5, the lender can also learn about consumers based on whether they accept or reject credit limit increases. Given that L types are more likely to borrow and, hence, value credit limits more, in equilibrium L types are more likely to accept credit limit increases than H types. As a result, the lender faces adverse selection when offering credit limit increases. However, given type persistence and the long-term relationships between the lender and consumers, the lender may value learning about a consumer's type and may offer credit limit increases to learn.

6.7 Equilibrium

Taking prices $\{r_{save}, r_{borrow}, R\}$ as given, a **Markov Perfect Equilibrium** is a set of consumer value functions $\{w_c, v_c, v_d\}$, firm value function v_f, consumer policy functions $\{d', w', A'\}$ firm policy functions l', and firm type scoring function, $\{s'\}$, such that:

1. The consumer's value functions, W_c, and V_c, solves (3) and (4).

2. The consumer's default and savings decisions, d' and w', maximizes (4) given shocks.

3. The firm's value function, V_f, solves (16).

4. The firm's credit limit function, l', maximizes (16).

5. The type scoring function, s' is consistent with Bayes rule as outlined in Equations (19), (20), and (18).

6. The transition probabilities of the consumer are consistent with Q^e, Q^β, and Q^a, the policy functions d', w', A', l' and the type scoring function s'.

6.8 Parameterization, Calibration, and Validation

In Table 3, we present the parameter values and the calibration targets. The period of the model is a month. We calibrate the model using Simulated Method of Moments. About half of the parameters are calibrated outside the model and the other half are calibrated inside the model. We calibrate merchant fees and interest rates to match the data from Welte and Molnar (2021) and Ho et al. (2022), respectively. We select the savings rate and the lender discount factor to match the average target overnight rate. We adopt the income process and transitions of Chatterjee et al. (2023). We choose the probability of returning to credit markets to reflect the length of time a default stays on a consumer's credit history. A person enters the credit market at age $a = 1$. We define the maximum age, $\bar{A} = 6$, as six years to match the average length of credit card relationships. We also incorporate a small exogenous probability of exiting the credit market entirely to capture death.

The remaining parameters are chosen to match data from the Canadian credit card market in the pre-CG5 period. After solving the model, we compute the long run distribution of consumers over the state space. There are three distinct populations – new consumers who enter at age $a = 1$, consumers who age out of their credit card relationship but remain in the credit market, and consumers who exit the credit market entirely. We solve for a distribution where all three groups are in steady state and the size of the new consumers matches the size of the exiting consumers. We estimate discount factors and discount factor transition probabilities to match the probability of borrowing and the share of consumers who switch from high to low FICO scores. Our estimated discount factors and discount factor transition probabilities are similar to those in Chatterjee et al. (2023). We calibrate the size of income shocks to match the variance of spending. We calibrate the income lost in default parameters, κ_1 and κ_2 to match the probability of default in the data by low and

Table 3: Parameters and Targets (Annualized)

Parameter	Notation	Value	Target
***Panel A**: Calibration pre-solution*			
Lender Annual Discount Factor	β_f	0.99	Average Target Overnight Rate
Merchant Fees	R	0.010	Average Merchant Fees
Borrowing Annual Interest Rate	r_{borrow}	0.22	Average Credit Card Annual Interest Rate
Savings Rate	r_{save}	0.01	Average Target Overnight Rate
Prob. of Rejoining Credit Market†	δ	$\frac{1}{7}$	Duration a Default Remains on Credit History
Risk Aversion	γ	3.0	Estimates in the Literature
Maximum Age	$\bar{A}$	6	Average Length of Credit Relationship
Prob. Exit	$pr(Exit)$	$\frac{1}{42}$	Ages 18-60
Income States and Transition Probabilities			Chatterjee et al. (2023)
***Panel B**: Calibration post-solution*			
High Type Annual Discount Factor	β_H	0.96	Prob. of borrowing for Low FICO
Low Type Annual Discount Factor	β_L	0.72	Prob. of borrowing for High FICO
Prob. Remain High Type	$Q^{\beta}(\beta_H\|\beta_H)$	0.99	Annual Prob. of Remaining in High FICO
Prob. Remain Low Type	$Q^{\beta}(\beta_L\|\beta_L)$	0.98	Annual Prob. of Remaining in Low FICO
Income Shock Size	z	$\frac{max(e)}{7}$	Variance of Annual Spending
% of Income Lost on Default (Short-Term)	$1-\kappa_1$	5.00	Prob. of Default for High FICO
% of Income Lost on Default (Long-Term)	$1-\kappa_2$	13.00	Prob. of Default for Low FICO
Cost of Changing Credit Limits	C	0.02	Frequency of Credit Limit Increases
Variance of Asset Choice Shock	ϵ_a	0.048	Variance of Utilization Rates
Variance of Default Choice Shock	ϵ_d	0.123	Variance of Default Probability
Variance of Credit Limit Choice Shock	ϵ_A	0.002	Variance of Size of Credit Limit Increase

Notes: Table 3 presents the model calibration. Parameters in Panel A are calibrated without solving the model and parameters in Panel B are calibrated after solving the model. We choose credit scores below 670 to correspond to "Low FICO" types and above 740 to correspond to "High FICO" types based on TransUnion's definition of "fair" and "very good" types. The variances of shocks to agent choices, ϵ, are presented for the high type. Shocks are normalized relative to the consumer's discount factor so the are the same "size" for low type consumers. †Bankruptcies stay on credit history reports for seven years in Canada (Government of Canada, 2025).

high FICO score consumers, respectively. We calibrate the cost of altering credit limits to match the frequency of credit limit increases pre-CG5. We calibrate the type-1 Extreme Value shocks for defaulting and savings decisions to match the variance of utilization rates and default probabilities. The only parameter calibrated using post-CG5 data is the type-1 Extreme Value shock for accepting a credit limit increase. We calibrate it using the variance of the size of credit limit increases.

In Table 4, we present the calibration results. We match the probability of borrowing, probability of default, and the share of consumers who maintain similar credit ratings across time well for high FICO scores. For low FICO consumers, we underestimate the probability of borrowing and the share of consumers who maintain similar credit ratings, and overestimate the probability of default. We slightly underestimate the frequency of credit limit increases and the variance of spending. Our calibration matches the variances of utilization rates, default probability, and of credit limit increases.

In Table 5, we present our main validation. We compute the frequency of credit limit

Table 4: Calibration Results

Moment	Calculation	Data Value	Model Value
Prob. of Borrowing High FICO	$Pr(w' < 0 \mid s \geq \hat{s})$	16.6%	20.0%
Prob. of Borrowing Low FICO	$Pr(w' < 0 \mid s < \hat{s})$	53.5%	32.1%
Annual Prob. of Remaining High FICO	$Pr(s' \geq \hat{s} \mid s \geq \hat{s})$	96.8%	89.5%
Annual Prob. of Remaining Low FICO	$Pr(s' < \hat{s} \mid s < \hat{s})$	90.1%	69.3%
Annual Prob. of Default for High FICO	$Pr(d' = 1 \mid s \geq \hat{s})$	0.8%	0.6%
Annual Prob. of Default for Low FICO	$Pr(d' = 1 \mid s < \hat{s})$	1.3%	3.5%
Annual Frequency of Credit Limit Increases	$Pr(l' > l)$	10.9%	9.4%
Variance of Monthly Spending to Annual Income	$var(\frac{c}{12 \times mean(e)})$	1.0	0.049
Variance of Utilization Rates	$var(\frac{c}{l})$	0.125	0.029
Variance of Annual Default Prob.	$var(d')$	0.006	0.012
Variance of Credit Limit Increase to Annual Income	$var(\frac{l'-l}{12 \times mean(e)} \mid l' > l)$	0.00132	0.001

Notes: Table 4 presents computed moments in the data and corresponding moments computed in the model. High FICO is defined as having a credit score above 740. Low FICO is defined as having a credit score below 670. All empirical moments are computed in the pre-CG5 period except the last moment (variance of size of credit limit increase). Given this shocks the choice of accepting credit limit increases for consumers, and consumers could only accept credit limit increase offers, we compute this moment on the post-CG5 sample, excluding RBC accounts. †We define borrowing as having positive spending that is at least 2 standard deviations above the within-borrower median. ‡We compute the within-borrower average of inverse-hyperbolic sine transformed credit limit increases and then take the variance across borrowers to compute the variance of size of credit limit increase.

Table 5: Model Validation

Moment	Data Pre-CG5	Data Post-CG5	Model Pre-CG5	Model Post-CG5
Freq. Credit Limit Increases	10.87%	11.09%	9.42%	9.57%
Avg. Size Credit Limit Increase to Annual Income	4.27%	3.46%	3.20%	3.17%

Notes: Table 5 presents moments computed in the data pre-CG5, the change from our regression analysis, and corresponding moments computed in the model pre- and post-CG5. We calibrate the model to match the frequency of credit limit increases pre-CG5, but do not target any of the other moments.

increases and the average size of credit limit increases to annual income in both the pre- and post-CG5 periods. We compute the analogous moments in the model. We match the increase in the frequency of credit limit increases as well as the decline in the average size of credit limit increases.

7 Model Results & Counterfactuals

7.1 Policy Evaluation

To evaluate express consent in the framework of the model, we solve the model both pre- and post-CG5. We then compute the long run distribution of consumers in each setting. Then, we compute key moments in the two settings, such as the frequency and size of credit limit increases, average credit limits, the share of consumers who borrow and default, consumer surplus, and lender profit. Table 6 presents the results.

Comparing the pre- and post-CG5 results, we find a slight decline in credit provision. This is driven by a slight increase in the frequency of credit limit increases, but a larger decline

Table 6: Policy Evaluation

Coefficient	(1) Pre-CG5	(2) Post-CG5	(3) % Change
Freq. of Credit Limit Increase	9.42%	9.57%	+1.59%
Freq. of Credit Limit Increase (High FICO)	10.88%	10.93%	+0.46%
Freq. of Credit Limit Increase (Low FICO)	4.76%	5.42%	+10.07%
Avg. Size Credit Limit Increase to Annual Income	3.21%	3.17%	-1.03%
Prob. Accept Credit Limit Increase	100.00%	80.36%	-19.64%
Prob. Accept Credit Limit Increase (High Type)	100.00%	76.97%	-23.03%
Prob. Accept Credit Limit Increase (Low Type)	100.00%	83.43%	-16.57%
Avg. Credit Limit to Annual Income	9.78%	9.75%	-0.05%
Avg. Credit Limit to Annual Income (High FICO)	10.39%	10.37%	-0.18%
Avg. Credit Limit to Annual Income (Low FICO)	9.36%	9.41%	+0.54%
Share Borrowing (High FICO)	20.00%	19.65%	-1.69%
Share Borrowing (Low FICO)	32.07%	31.61%	-1.40%
Prob. of Default (High FICO)	0.58%	0.56%	-3.37%
Prob. of Default (Low FICO)	3.53%	3.45%	-2.42%
Avg. Consumer Surplus	142.48	142.50	+0.01%
Per Person Lender Profit (High FICO) (as % of Monthly Income)	0.26%	0.26%	-0.38%
Per Person Lender Profit (Low FICO) (as % of Monthly Income)	0.36%	0.36%	+0.23%
Per Person Lender Profit (as % of Monthly Income)	0.28%	0.28%	-0.18%

Notes: Table 6 reports and compares the model estimates for credit provision, default rates, borrowing, consumer surplus, and lender profit in the pre-CG5 and post-CG5 models. Column (1) reports estimated values for the pre-CG5 model, which requires consumers to accept all credit limit increases. Column (2) reports estimated values for the post-CG5 model, which allows consumers to accept or reject any credit limit increase. For each model we compute the long run distribution of consumers and present results in the steady state. Column (3) reports the percent change in the estimated values from the pre-CG5 steady state to the post-CG5 steady state.

in the average size of increases, just as in the data. After the policy, adverse selection occurs as low type consumers accept 83.43% of offered credit limit increases, whereas high type consumers accept 76.97% of the time. As a result, following an offer, the pool of consumers who accept has a higher share of low types than the pool of consumers who were initially given the offer. In addition, because different type consumers accept with different probabilities, the lender can learn about a consumer's type based on their decision to accept or not.

We also find that the policy led to a decline in borrowing and default, as a result of lower average credit limits. We find little change in consumer surplus as a result of the policy, but a slight decline in lender profit, which may rationalize why lenders did not give consumers the option to accept or reject credit limit increases absent regulation.

7.2 Learning and Adverse Selection

To illustrate the importance of learning from a consumer's decision to accept or reject a credit limit increase, we re-solve the model under the assumption that the lender cannot update their beliefs based on the consumer's action to accept or reject a credit limit increase. In this counterfactual, we solve the model with the requirement that in Equation 18, $s'' = s'$.

Table 7: Counterfactual Absent Learning

Coefficient	(1) Post-CG5	(2) Post-CG5 w/o Learning	(3) % Change
Prob. Accept Credit Limit Increase (High Type)	76.97%	77.28%	+0.41%
Prob. Accept Credit Limit Increase (Low Type)	83.43%	83.67%	+0.29%
Avg. Credit Limit to Annual Income	9.75%	9.74%	-0.03%
Avg. Credit Limit to Annual Income (High FICO)	10.38%	10.39%	+0.22%
Avg. Credit Limit to Annual Income (Low FICO)	7.84%	7.78%	-0.81%
Avg. Consumer Surplus	142.50	142.50	+0.00%
Per Person Lender Profit (High FICO) (as % of Monthly Income)	0.26%	0.26%	+0.23%
Per Person Lender Profit (Low FICO) (as % of Monthly Income)	0.36%	0.35%	-0.84%
Per Person Lender Profit (as % of Monthly Income)	0.28%	0.28%	-0.04%

Notes: Table 7 reports the model estimates for credit limits, consumer surplus, and lender profit in the post-CG5 model with and without lender learning. Column (1) reports estimates under the post-CG5 model, where consumers accept or reject any credit limit increase offer. Column (2) reports estimates from the counterfactual post-CG5 model where lenders do not learn from the consumer's decision to accept or reject, but still internalize the probability of consumer's accepting or rejecting credit limit increases.

We then recompute the long-run distribution of consumers in that environment. We present the results of this counterfactual in Table 7.

By preventing the lender from updating their beliefs about the consumer's type from the consumer's acceptance or rejection decisions, we isolate the effects of adverse selection separately from those of learning. In this setting, the consumer's decision to accept or reject a lender's credit limit increase creates adverse selection as low types accept more frequently, but the lender cannot use the information generated to update their beliefs about the consumer's type. Here, the lender faces adverse selection without the benefits from learning.

In this setting, we find a slight increase in the acceptance rate, as consumers no longer face the cost of being perceived as a low type for accepting. We find a slight increase in credit provision to high FICO consumers, but a much larger decline to low FICO consumers. This is because the lender can no longer learn from offers to low FICO consumers. Consumer surplus is relatively unchanged, but lender profit declines further without the learning channel.

More broadly, our model suggests that consent-based regulations such as CG5 interact with the economy's learning technology. When lenders can learn from consent decisions, consent can partially "pay for itself" by improving screening. However, when that learning channel is shut down, consent policies operate primarily through adverse selection and induces tighter credit supply to low FICO borrowers.

Table 8: Counterfactual Results

Moment	(1) Baseline	(2) Increase β_f
Freq. of Credit Limit Increase	+1.59%	+1.37%
Avg. Size Credit Limit Increase	-1.03%	-0.88%
Avg. Credit Limit to Annual Income	-0.05%	-0.07%
Share Borrowing (High FICO)	-1.69%	-1.69%
Share Borrowing (Low FICO)	-1.40%	-1.37%
Prob. of Default (High FICO)	-3.37%	-3.27%
Prob. of Default (Low FICO)	-2.42%	-2.31%
Avg. Consumer Surplus	+0.01%	+0.01%
Per Person Lender Profit (as % of Annual Income)	-0.18%	-0.21%

Notes: Table 8 presents the percent change in values of interest for a baseline model and the counterfactual with higher lender patience. For each model, we solve for the steady state in both the pre-CG5 and post-CG5 settings and compute the percent change between them. In column (1), we present the estimates of the baseline model. The baseline model presents the same results as the policy evaluation in Table 6. In column (2), we report the results of increasing the interest rate from 1% to 3% and decreasing β_f from 0.99 to 0.97. This can be interpreted as a permanent contraction in monetary policy.

7.3 Lowering Lender Patience

We study the interaction between consumer consent regulations and lender patience. To do so, we decrease the lender's discount factor by 2%.[13] The lender's patience determines how much they value short-term profits compared to longer-term profits. To evaluate this counterfactual, we re-solve the model under permanently lower β_f in both the pre-CG5 and post-CG5 settings and compute the long run steady state distribution. We then compute the percent change for each moment from the pre-CG5 setting to the post-CG5 setting as we did in the third column of Table 6. We present the results of this counterfactual in Table 8. The first column presents the percent change from pre- to post-CG5 in our baseline and the final column presents the percent change from pre- to post-CG5 under lower lender patience

By decreasing the lender's discount factor, the costs of adverse selection become more important while the benefits of learning about a consumer's type become less valuable. With lower lender patience, the frequency of credit limit increases increases by less, while the decrease in the size of credit limits is smaller. Taken together CG5 would have led to a larger decline in credit provision with less patient lenders, as credit provision declines by 0.07% instead of 0.05%. This suggests that the effects of CG5 on total credit provision would have been greater in a high interest rate environment. As a result, there may be important interactions between monetary policy, lender discount rates, and consumer regulations in credit markets.

[13]This can be interpreted as a decrease in the discount factor due to permanent contractionary monetary policy.

8 Conclusion

Our findings demonstrate that regulatory safeguards aimed at enhancing consumer autonomy can have complex, and sometimes counterintuitive, effects in markets with incomplete information. Canada's CG5 guidelines created adverse selection by requiring express consent for credit limit increases. Borrowers who opted into higher limits were riskier than those for whom increases were automatically applied, as measured by higher subsequent past-due amounts, delinquencies, and charge-offs. Yet compliant lenders offered more frequent credit limit increases albeit of smaller average size. We interpret this as evidence that the informational value of acceptance decisions partially offsets the higher default risk, consistent with lender learning in our calibrated model. These results highlight an important trade-off: policies that promote consumer choice and increase transparency can also reshape the information environment in ways that alter lender incentives and market outcomes. Policymakers should account for these informational channels when evaluating consent-based regulations in consumer credit markets.

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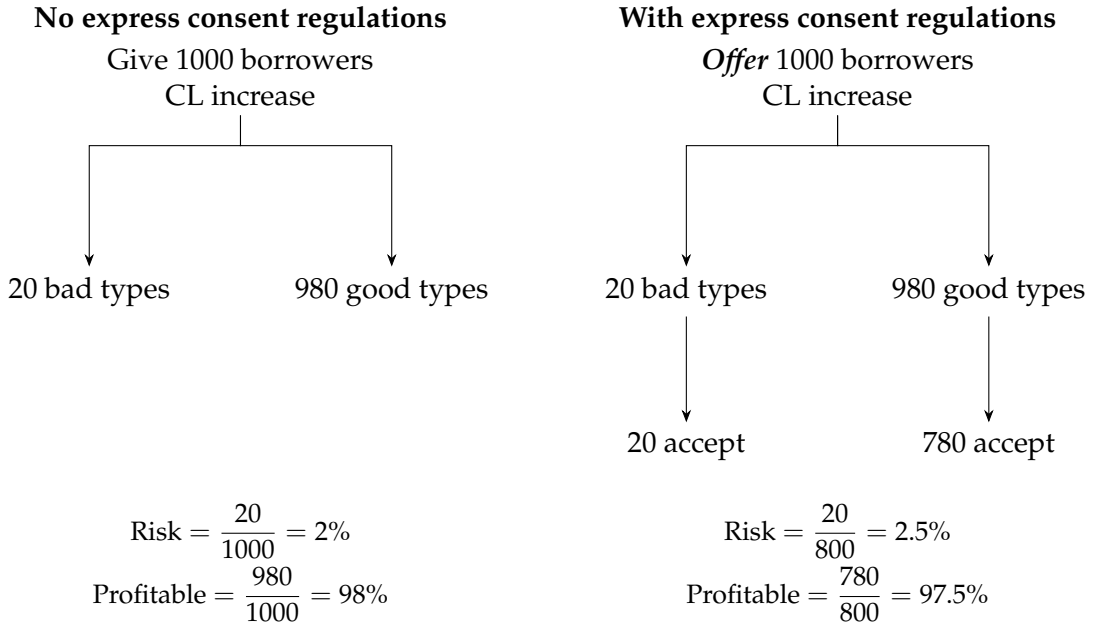
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Appendix A Example of Worsening Risk Profile

Figure A.1: Example of worsening risk profile induced by requiring lenders to ask for express consent before raising customer credit limits



Notes: Figure A.1 illustrates an example of how the risk profile of the pool of consumers at a given lender can increase after implementing regulations that require lenders to obtain express consent for any future credit limit increases. The left decision tree denotes an environment where lenders can give credit limits without obtaining consumer consent. Since all consumers who are given credit limits have it automatically applied to their accounts, the share of the pool with higher credit limits that is a bad type is 2 percent. The right decision tree denotes an environment where lenders can offer consumers credit limit increases, but they must express consent for it to be applied to their accounts. In this scenario, since all bad types select into the higher credit limit while some of the good types do not, the share of the pool with higher credit limits that is a bad type becomes 2.5 percent.

Appendix B Summary Statistics Tables

Table B.1 provides an overview of borrower-account characteristics and outcomes, by bank compliance with CG5, over the pre-CG5 period. Panel (a) summarizes key variables of interest for accounts associated with RBC, the institution found by the FCAC to have violated CG5. Panel (b) summarizes the same variables for CBP-compliant institutions.

Table B.1: Summary statistics by CG5 compliance, pre-CG5 period

	Mean	SD	P1	P25	P50	P75	P99
Panel A: *RBC*							
Probability of credit limit increase	0.021	0.155	0	0	0	0	1
Amount of credit limit increase ($)	2193.46	1581.79	500	1500	2000	2500	9000
Probability of credit limit decrease	0.004	0.063	0	0	0	0	0
Amount of credit limit decrease ($)	5423.25	5063.06	100	1500	4000	7500	21500
Number of accounts	1.070	0.271	1	1	1	1	2
Credit limit ($)	10306.01	7830.78	1000	4000	9000	15500	30000
Current balance ($)	2363.43	4299.38	0	0	515	2589	20417
Utilization	0.268	0.367	0	0	0.064	0.444	1.149
Probability past due	0.019	0.138	0	0	0	0	1
Amount past due ($)	43.06	720.85	0	0	0	0	263
Probability delinquent	0.022	0.147	0	0	0	0	1
Max. delinquent amount ($)	47.55	750.86	0	0	0	0	406
Probability positive charged-off	0	0	0	0	0	0	0
Amount charged off ($)	0	0	0	0	0	0	0
Highest amount borrowed ($)	6129.22	6637.91	0	1491	4135	8687	28007
Credit score	773.16	100.79	450	716	809	851	873
Age of account (mo.)	118.81	107.38	2	35	87	167	409
Age of consumer (mo.)	557.99	211.78	0	397	557	705	1033
Panel B: *Other institutions*							
Probability of credit limit increase	0.016	0.124	0	0	0	0	1
Amount of credit limit increase ($)	2691.28	2375.75	49	1250	2000	3500	12000
Probability of credit limit decrease	0.011	0.106	0	0	0	0	1
Amount of credit limit decrease ($)	4303.96	4634.67	25	1000	3000	5600	21500
Number of accounts	1.588	0.838	1	1	1	2	4
Credit limit ($)	8112.84	7445.90	400	2550	5600	11000	33500
Current balance ($)	1900.63	4110.74	0	0	220	1805	20570
Utilization	0.235	0.351	0	0	0.038	0.344	1.075
Probability past due	0.016	0.126	0	0	0	0	1
Amount past due ($)	12.00	303.40	0	0	0	0	93
Probability delinquent	0.017	0.130	0	0	0	0	1
Max. delinquent amount ($)	13.77	322.76	0	0	0	0	114
Probability positive charged-off	0.003	0.052	0	0	0	0	0
Amount charged off ($)	16.06	449.64	0	0	0	0	0
Highest amount borrowed ($)	3495.88	118103.30	0	0	1075	4401	29000
Credit score	776.65	98.54	458	721	812	852	874
Age of account (mo.)	98.62	103.82	1	24	62	134	435
Age of consumer (mo.)	581.12	206.84	0	432	582	724	1034

Notes: Table B.1 summarizes key borrower-account characteristics and outcome variables by firm compliance with CG5 over the pre-CG5 period. All observations are account-month level. Panel A summarizes characteristics of accounts associated with RBC, the bank credibly found by the FCAC to have not complied with CG5. Panel B summarizes characteristics of accounts associated with other, large Canadian institutions.

Table B.2 summarizes these borrower-account characteristics and outcomes, by bank compliance with CG5, over the whole sample period. Similarly to Table B.1, Panel (a) summarizes key variables of interest for accounts associated with RBC, the institution found by the FCAC to have violated CG5. Panel (b) summarizes the same variables for CBP-compliant institutions.

In Table B.3, we report probit regressions for the probability of receiving a credit limit increase in period $t+1$, estimated separately for the pre- and post-CG5 periods. We present

Table B.2: Summary statistics by CG5 compliance

	Mean	SD	P1	P25	P50	P75	P99
Panel A: *RBC*							
Probability of credit limit increase	0.016	0.124	0	0	0	0	1
Amount of credit limit increase ($)	3157.88	2265.72	500	2000	3000	4000	10500
Probability of credit limit decrease	0.002	0.048	0	0	0	0	0
Amount of credit limit decrease ($)	6158.69	5915.67	100	1500	4500	9000	25000
Number of accounts	1.087	0.302	1	1	1	1	2
Credit limit ($)	10652.39	8435.88	1000	4000	9000	15900	35000
Current balance ($)	2549.13	4571.36	0	5	644	2858	21909
Utilization	0.277	0.364	0	0.001	0.080	0.466	1.132
Probability past due	0.017	0.131	0	0	0	0	1
Amount past due ($)	46.51	780.25	0	0	0	0	161
Probability delinquent	0.038	0.191	0	0	0	0	1
Max. delinquent amount ($)	66.39	920.17	0	0	0	0	608
Probability positive charged-off	0.004	0.062	0	0	0	0	0
Amount charged off ($)	36.13	747.03	0	0	0	0	0
Highest amount borrowed ($)	7092.03	7474.41	0	1835	4868	10053	32154
Credit score	773.12	80.53	536	725	789	836	898
Age of account (mo.)	132.92	117.75	2	41	98	191	475
Age of consumer (mo.)	579.41	209.61	0	415	577	730	1049
Panel B: *Other institutions*							
Probability of credit limit increase	0.012	0.108	0	0	0	0	1
Amount of credit limit increase ($)	3012.52	2813.31	20	1200	2500	4000	15000
Probability of credit limit decrease	0.005	0.073	0	0	0	0	0
Amount of credit limit decrease ($)	3846.84	4972.64	9	500	2000	5000	23000
Number of accounts	1.54	0.82	1	1	1	2	4
Credit limit ($)	8306.47	7672.97	500	2500	5600	11500	35000
Current balance ($)	2000.71	4150.61	0	0	327	1983	20789
Utilization	0.258	0.360	0	0	0.058	0.422	1.082
Probability past due	0.017	0.128	0	0	0	0	1
Amount past due ($)	18.77	435.95	0	0	0	0	99
Probability delinquent	0.032	0.175	0	0	0	0	1
Max. delinquent amount ($)	27.59	497.38	0	0	0	0	360
Probability positive charged-off	0.004	0.061	0	0	0	0	0
Amount charged off ($)	26.16	612.49	0	0	0	0	0
Highest amount borrowed ($)	4625.94	106313.95	0	167	2076	6150	30992
Credit score	770.62	80.34	536	721	785	834	895
Age of account (mo.)	100.33	104.05	1	25	65	138	462
Age of consumer (mo.)	590.21	207.13	227	428	593	740	1044

Notes: Table B.2 summarizes key borrower-account characteristics and outcome variables by firm compliance with CG5 over the sample period of 2009 to 2017. All observations are account-month level. Panel A summarizes characteristics of accounts associated with RBC, the bank credibly found by the FCAC to have not complied with CG5. Panel B summarizes characteristics of accounts associated with other, large Canadian institutions.

average marginal effects, controlling for existing credit limits, utilization rates, credit scores, age of the account, and age of consumer. We find that higher existing credit limits and utilization rates increase the probability of receiving credit limits, while age of the account and consumer decreases the likelihood. The magnitudes of the estimated average marginal effects do not differ significantly across the two periods. Banks in our sample give credit limit increases more frequently to active borrowers who are younger.

Table B.3: Average marginal effects of factors on the probability of receiving a credit limit increase

	Pre-CG5	Post-CG5
	(1)	(2)
Credit limit ($)	0.000000898***	0.000000835***
	(1.62e-09)	(4.53e-10)
Utilization	0.0168***	0.00669***
	(0.0000429)	(0.0000114)
Credit score	0.0000490***	-0.0000146***
	(0.000000179)	(5.79e-08)
Age of account	-0.0000220***	-0.0000551***
	(0.000000147)	(4.65e-08)
Age of consumer	-0.0000352***	-0.0000197***
	(7.46e-08)	(1.94e-08)
N	115,463,829	1,214,426,330

Notes: Table B.3 reports the estimated average marginal effects using a probit model for the probability of receiving a credit limit increase. The dependent variable for both columns is an indicator variable of whether the account received a credit limit increase in period $t + 1$. Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. All independent variables are inverse-hyperbolic-sine-transformed, which preserves all 0 values in dollar variables.

Table B.4: Average marginal effects of factors on the probability of receiving a credit limit increase, pre-CG5

	RBC Pre-CG5		CBP-compliant Pre-CG5	
	(1)	(2)	(3)	(4)
Credit limit ($)	0.000000957***	0.000000961***	0.000000837***	0.000000837***
	(5.05e-09)	(5.04e-09)	(1.67e-09)	(1.67e-09)
Utilization	0.0127***	0.0128***	0.0174***	0.0174***
	(0.000128)	(0.000127)	(0.0000447)	(0.0000446)
Credit score	0.0000844***	0.0000693***	0.0000428***	0.0000414***
	(0.000000548)	(0.000000556)	(0.000000184)	(0.000000189)
Age of account	-0.0000405***	-0.0000389***	-0.0000216***	-0.0000215***
	(0.000000407)	(0.000000407)	(0.000000159)	(0.000000159)
Age of consumer	-0.0000400***	-0.0000395***	-0.0000325***	-0.0000324***
	(0.000000211)	(0.000000211)	(7.85e-08)	(7.85e-08)
Amount past due ($)		-0.00107***		-0.0000379***
		(0.0000382)		(0.00000148)
Max. delinquent amount ($)		-0.000198***		0.000000570
		(0.00000569)		(0.000000480)
N	20,028,407	20,028,407	95,435,422	95,435,422

Notes: Table B.4 reports the estimated average marginal effects using data from the pre-CG5 period and probit models for the probability of receiving a credit limit increase. We report results for CBP-compliant and non-compliant banks separately. Columns (1)-(2) reports results for RBC (non-compliant). Columns (3)-(4) reports results for CBP-compliant banks. The dependent variable for all columns is an indicator variable of whether the account received a credit limit increase in period $t+1$. Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. All independent variables are inverse-hyperbolic-sine-transformed, which preserves all 0 values in dollar variables.

Appendix C Additional adverse selection results

In the following sections, we present results from Table 1 at different horizons, for different and related outcome variables, and with additional controls. These tables demonstrate that our main adverse selection results are robust to a variety of different measures of outcomes of interest, and when looking at different horizons for our long-term forward looking moving averages.

C.1 12-month

Table C.1: Effects of credit limit increase on avg. probability of being past due, 12 months forward

	(1)	(2)	(3)	(4)	(5)	(6)
Credit limit increased	-0.00699***	-0.00480***	-0.00531***	-0.00701***	-0.00491***	-0.00545***
	(0.0000260)	(0.0000258)	(0.0000258)	(0.0000260)	(0.0000258)	(0.0000258)
CBP compliant	0.00144***	0.00235***	0.00271***			
	(0.0000120)	(0.0000119)	(0.0000119)			
Credit limit increased × CBP compliant	0.00802***	0.00685***	0.00667***	0.00813***	0.00704***	0.00688***
	(0.0000379)	(0.0000372)	(0.0000373)	(0.0000379)	(0.0000373)	(0.0000373)
Credit limit ($)	0.00336***	0.00377***	0.00212***	0.00344***	0.00403***	0.00236***
	(0.00000452)	(0.00000456)	(0.00000472)	(0.00000468)	(0.00000470)	(0.00000487)
Credit score		-0.285***	-0.275***		-0.286***	-0.275***
		(0.000103)	(0.000103)		(0.000103)	(0.000103)
Age of account		0.00234***	0.00198***		0.00243***	0.00202***
		(0.00000271)	(0.00000287)		(0.00000277)	(0.00000304)
Age of consumer		0.0104***	0.0107***		0.0101***	0.0104***
		(0.0000372)	(0.0000372)		(0.0000372)	(0.0000372)
Current balance ($)			0.00111***			0.00112***
			(0.000000767)			(0.000000782)
Highest amount borrowed ($)			0.0000720***			0.000152***
			(0.000000994)			(0.00000119)
Year FE	Yes	Yes	Yes	No	No	No
Bank-Year FE	No	No	No	Yes	Yes	Yes
FSA FE	Yes	Yes	Yes	Yes	Yes	Yes
Borrower FE	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.487	0.500	0.501	0.487	0.501	0.501
N	1,180,656,090	1,180,655,658	1,180,649,173	1,180,656,090	1,180,655,658	1,180,649,173

Notes: Dependent variable for all columns (1)-(6) is the average probability of the consumer having positive amount past due value during periods $t+1$ to $t+12$. Standard errors in parentheses. * $p<0.05$, ** $p<0.01$, *** $p<0.001$. All variables except the dependent variable are inverse-hyperbolic-sine-transformed, which preserves all 0 values in dollar variables.

Table C.2: Effects of credit limit increase on avg. amount past due, 12 months forward

	(1)	(2)	(3)	(4)	(5)	(6)
Credit limit increased	-0.0595***	-0.0439***	-0.0503***	-0.0584***	-0.0435***	-0.0502***
	(0.000287)	(0.000285)	(0.000285)	(0.000287)	(0.000285)	(0.000285)
CBP compliant	0.0274***	0.0337***	0.0376***			
	(0.000101)	(0.0000997)	(0.0000996)			
Credit limit increased × CBP compliant	0.0608***	0.0525***	0.0502***	0.0603***	0.0526***	0.0505***
	(0.000378)	(0.000374)	(0.000374)	(0.000378)	(0.000374)	(0.000374)
Credit limit ($)	0.0524***	0.0555***	0.0354***	0.0532***	0.0575***	0.0371***
	(0.0000390)	(0.0000396)	(0.0000407)	(0.0000403)	(0.0000405)	(0.0000418)
Credit score		-2.022***	-1.890***		-2.026***	-1.891***
		(0.000770)	(0.000772)		(0.000771)	(0.000773)
Age of account		0.0162***	0.0124***		0.0169***	0.0123***
		(0.0000244)	(0.0000258)		(0.0000249)	(0.0000272)
Age of consumer		0.0352***	0.0395***		0.0363***	0.0398***
		(0.000335)	(0.000335)		(0.000336)	(0.000335)
Current balance ($)			0.0139***			0.0141***
			(0.00000726)			(0.00000737)
Highest amount borrowed ($)			0.0000293**			0.00112***
			(0.00000917)			(0.0000108)
Year FE	Yes	Yes	Yes	No	No	No
Bank-Year FE	No	No	No	Yes	Yes	Yes
FSA FE	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.489	0.498	0.499	0.489	0.498	0.499
N	1,180,656,090	1,180,655,658	1,180,649,173	1,180,656,090	1,180,655,658	1,180,649,173

Notes: Dependent variable for all columns (1)-(6) is the average amount past due during periods $t+1$ to $t+12$. Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. All variables except the dependent variable are inverse-hyperbolic-sine-transformed, which preserves all 0 values in dollar variables.

Table C.3: Effects of credit limit increase on avg. probability of being delinquent, 12 months forward

	(1)	(2)	(3)	(4)	(5)	(6)
Credit limit increased	-0.00969***	-0.00595***	-0.00534***	-0.00954***	-0.00604***	-0.00549***
	(0.0000451)	(0.0000448)	(0.0000448)	(0.0000452)	(0.0000449)	(0.0000449)
CBP compliant	-0.00165***	0.00191***	0.00213***			
	(0.0000196)	(0.0000193)	(0.0000193)			
Credit limit increased × CBP compliant	0.00846***	0.00730***	0.00746***	0.00880***	0.00776***	0.00800***
	(0.0000587)	(0.0000577)	(0.0000577)	(0.0000587)	(0.0000578)	(0.0000578)
Credit limit ($)	-0.00146***	-0.00243***	-0.00101***	-0.00210***	-0.00236***	-0.00132***
	(0.00000777)	(0.00000784)	(0.00000819)	(0.00000795)	(0.00000796)	(0.00000835)
Credit score		-0.466***	-0.476***		-0.467***	-0.478***
		(0.000134)	(0.000135)		(0.000134)	(0.000135)
Age of account		0.0111***	0.0109***		0.0110***	0.0104***
		(0.00000474)	(0.00000492)		(0.00000481)	(0.00000512)
Age of consumer		0.0276***	0.0273***		0.0272***	0.0267***
		(0.0000619)	(0.0000619)		(0.0000619)	(0.0000618)
Current balance ($)			-0.00134***			-0.00138***
			(0.00000148)			(0.00000150)
Highest amount borrowed ($)			0.000782***			0.00121***
			(0.00000160)			(0.00000197)
Year FE	Yes	Yes	Yes	No	No	No
Bank-Year FE	No	No	No	Yes	Yes	Yes
FSA FE	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.611	0.624	0.624	0.611	0.624	0.625
N	1,180,656,090	1,180,655,658	1,180,649,173	1,180,656,090	1,180,655,658	1,180,649,173

Notes: Dependent variable for all columns (1)-(6) is the average probability of the consumer being delinquent during periods $t+1$ to $t+12$. Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. All variables except the dependent variable are inverse-hyperbolic-sine-transformed, which preserves all 0 values in dollar variables.

Table C.4: Effects of credit limit increase on avg. amount delinquent, 12 months forward

	(1)	(2)	(3)	(4)	(5)	(6)
Credit limit increased	-0.0751***	-0.0511***	-0.0479***	-0.0747***	-0.0522***	-0.0493***
	(0.000319)	(0.000316)	(0.000316)	(0.000320)	(0.000317)	(0.000317)
CBP compliant	-0.00275***	0.0180***	0.0195***			
	(0.000128)	(0.000126)	(0.000126)			
Credit limit increased × CBP compliant	0.0595***	0.0512***	0.0520***	0.0620***	0.0546***	0.0558***
	(0.000415)	(0.000409)	(0.000409)	(0.000416)	(0.000409)	(0.000409)
Credit limit ($)	0.0213***	0.0168***	0.0241***	0.0191***	0.0186***	0.0236***
	(0.0000492)	(0.0000495)	(0.0000515)	(0.0000504)	(0.0000504)	(0.0000527)
Credit score		-3.011***	-3.067***		-3.019***	-3.073***
		(0.000881)	(0.000890)		(0.000882)	(0.000890)
Age of account		0.0641***	0.0626***		0.0644***	0.0606***
		(0.0000306)	(0.0000320)		(0.0000311)	(0.0000335)
Age of consumer		0.158***	0.156***		0.155***	0.152***
		(0.000397)	(0.000396)		(0.000397)	(0.000396)
Current balance ($)			-0.00707***			-0.00716***
			(0.00000930)			(0.00000944)
Highest amount borrowed ($)			0.00446***			0.00682***
			(0.0000106)			(0.0000130)
Year FE	Yes	Yes	Yes	No	No	No
Bank-Year FE	No	No	No	Yes	Yes	Yes
FSA FE	Yes	Yes	Yes	Yes	Yes	Yes
Borrower FE	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.618	0.630	0.630	0.618	0.630	0.630
N	1,180,656,090	1,180,655,658	1,180,649,173	1,180,656,090	1,180,655,658	1,180,649,173

Notes: Dependent variable for all columns (1)-(6) is the average maximum amount delinquent during periods $t+1$ to $t+12$. Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. All variables except the dependent variable are inverse-hyperbolic-sine-transformed, which preserves all 0 values in dollar variables.

Table C.5: Effects of credit limit increase on avg. probability of charge-offs, 12 months forward

	(1)	(2)	(3)	(4)	(5)	(6)
Credit limit increased	-0.00314***	-0.00194***	-0.00193***	-0.00334***	-0.00219***	-0.00219***
	(0.0000149)	(0.0000148)	(0.0000148)	(0.0000149)	(0.0000148)	(0.0000148)
CBP compliant	-0.00117***	-0.000709***	-0.000451***			
	(0.00000883)	(0.00000874)	(0.00000878)			
Credit limit increased × CBP compliant	0.00257***	0.00191***	0.00189***	0.00281***	0.00220***	0.00222***
	(0.0000227)	(0.0000224)	(0.0000224)	(0.0000227)	(0.0000225)	(0.0000225)
Credit limit ($)	0.000867***	0.00112***	0.000916***	0.000842***	0.00118***	0.000996***
	(0.00000305)	(0.00000309)	(0.00000321)	(0.00000315)	(0.00000317)	(0.00000329)
Credit score		-0.157***	-0.156***		-0.157***	-0.157***
		(0.0000760)	(0.0000762)		(0.0000761)	(0.0000764)
Age of account		0.00116***	0.000895***		0.00124***	0.000966***
		(0.00000167)	(0.00000176)		(0.00000172)	(0.00000187)
Age of consumer		0.00463***	0.00468***		0.00438***	0.00434***
		(0.0000235)	(0.0000235)		(0.0000236)	(0.0000236)
Current balance ($)			-0.0000152***			-0.0000438***
			(0.000000581)			(0.000000595)
Highest amount borrowed ($)			0.000345***			0.000343***
			(0.000000630)			(0.000000743)
Year FE	Yes	Yes	Yes	No	No	No
Bank-Year FE	No	No	No	Yes	Yes	Yes
FSA FE	Yes	Yes	Yes	Yes	Yes	Yes
Borrower FE	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.424	0.434	0.434	0.424	0.435	0.435
N	1,180,656,090	1,180,655,658	1,180,649,173	1,180,656,090	1,180,655,658	1,180,649,173

Notes: Dependent variable for all columns (1)-(6) is the average probability charged-off during periods $t+1$ to $t+12$. Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. All variables except the dependent variable are inverse-hyperbolic-sine-transformed, which preserves all 0 values in dollar variables.

Table C.6: Effects of credit limit increase on avg. amount charged-off, 12 months forward

	(1)	(2)	(3)	(4)	(5)	(6)
Credit limit increased	-0.384***	-0.351***	1.013***	-0.134***	-0.0949***	0.690***
	(0.00256)	(0.00305)	(0.0596)	(0.00293)	(0.00282)	(0.0483)
CBP compliant	-0.0939***	-0.0464***	-0.0103***			
	(0.00107)	(0.000930)	(0.000942)			
Credit limit increased × CBP compliant	0.294***	0.164***	0.106***	0.0711***	0.0547***	0.0245***
	(0.00400)	(0.00414)	(0.00392)	(0.00376)	(0.00361)	(0.00342)
Credit limit ($)	-0.0735***	0.102***	0.0775***	0.0637***	0.0585***	0.0277***
	(0.000339)	(0.000375)	(0.000395)	(0.000376)	(0.000377)	(0.000394)
Credit score		-6.371***	-6.362***		-3.325***	-3.364***
		(0.00593)	(0.00610)		(0.00713)	(0.00728)
Age of account		0.0537***	0.0426***		0.0352***	0.0201***
		(0.000233)	(0.000244)		(0.000231)	(0.000250)
Age of borrower		0.119***	0.128***		0.374***	0.389***
		(0.000895)	(0.000897)		(0.00205)	(0.00205)
Current balance ($)			0.0128***			0.0123***
			(0.0000911)			(0.0000762)
Highest amount borrowed ($)			0.0274***			0.0231***
			(0.000105)			(0.000124)
Year FE	Yes	Yes	Yes	No	No	No
Bank-Year FE	No	No	No	Yes	Yes	Yes
FSA FE	Yes	Yes	Yes	Yes	Yes	Yes
Borrower FE	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.424	0.434	0.434	0.424	0.434	0.435
N	1,180,656,090	1,180,655,658	1,180,649,173	1,180,656,090	1,180,655,658	1,180,649,173

Notes: Dependent variable for all columns (1)-(6) is the average amount charged-off during periods $t+1$ to $t+12$. Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. All variables except the dependent variable are inverse-hyperbolic-sine-transformed, which preserves all 0 values in dollar variables.

Table C.7: Effects of credit limit increase on avg. utilization, 12 months forward

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Credit limit increased	0.00820***	0.0132***	0.00212***	0.00980***	0.0145***	0.00325***		
	(0.0000828)	(0.0000809)	(0.0000772)	(0.0000826)	(0.0000807)	(0.0000771)		
CBP compliant	-0.0262***	-0.0240***	-0.0164***					
	(0.0000248)	(0.0000244)	(0.0000216)					
Credit limit increased × CBP compliant	0.0164***	0.0138***	0.00973***	0.0155***	0.0129***	0.00936***		
	(0.0000980)	(0.0000957)	(0.0000913)	(0.0000976)	(0.0000955)	(0.0000912)		
Credit limit ($)	0.0232***	0.0243***	-0.0111***	0.0184***	0.0201***	-0.0138***		
	(0.00000980)	(0.00000981)	(0.00000911)	(0.0000101)	(0.0000100)	(0.00000938)		
Credit score		-0.643***	-0.414***		-0.639***	-0.413***		
		(0.000136)	(0.000123)		(0.000136)	(0.000122)		
Age of account		0.00550***	-0.00212***		0.00378***	-0.00340***		
		(0.00000665)	(0.00000613)		(0.00000671)	(0.00000639)		
Age of consumer		-0.0237***	-0.0161***		-0.0170***	-0.0111***		
		(0.0000810)	(0.0000763)		(0.0000801)	(0.0000759)		
Current balance ($)			0.0239***			0.0236***		
			(0.00000198)			(0.00000200)		
Highest amount borrowed ($)			0.00132***			0.00136***		
			(0.00000197)			(0.00000251)		
Year FE	Yes	Yes	Yes	No	No	No		
Bank-Year FE	No	No	No	Yes	Yes	Yes		
FSA FE	Yes	Yes	Yes	Yes	Yes	Yes		
Borrower FE	Yes	Yes	Yes	Yes	Yes	Yes		
R-squared	0.719	0.728	0.772	0.722	0.730	0.773		
N	1,180,655,652	1,180,655,220	1,180,648,931	1,180,655,652	1,180,655,220	1,180,648,931		

Notes: Dependent variable for all columns (1)-(6) is the average utilization during periods $t+1$ to $t+12$. Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. All variables except the dependent variable are inverse-hyperbolic-sine-transformed, which preserves all 0 values in dollar variables.

C.2 24-month

Table C.8: Effects of credit limit increase on avg. probability of being past due, 24 months forward

	(1)	(2)	(3)	(4)	(5)	(6)
Credit limit increased	-0.00572***	-0.00397***	-0.00444***	-0.00568***	-0.00400***	-0.00450***
	(0.0000242)	(0.0000241)	(0.0000241)	(0.0000243)	(0.0000241)	(0.0000241)
CBP compliant	0.00159***	0.00230***	0.00264***			
	(0.0000112)	(0.0000111)	(0.0000111)			
Credit limit increased × CBP compliant	0.00669***	0.00575***	0.00558***	0.00673***	0.00586***	0.00570***
	(0.0000348)	(0.0000343)	(0.0000344)	(0.0000348)	(0.0000344)	(0.0000344)
Credit limit ($)	0.00370***	0.00404***	0.00250***	0.00374***	0.00422***	0.00266***
	(0.00000424)	(0.00000430)	(0.00000444)	(0.00000440)	(0.00000442)	(0.00000458)
Credit score		-0.229***	-0.219***		-0.229***	-0.219***
		(0.0000944)	(0.0000944)		(0.0000945)	(0.0000945)
Age of account		0.00182***	0.00149***		0.00188***	0.00149***
		(0.00000255)	(0.00000270)		(0.00000261)	(0.00000286)
Age of consumer		0.00839***	0.00872***		0.00833***	0.00858***
		(0.0000342)	(0.0000342)		(0.0000342)	(0.0000342)
Current balance ($)			0.00103***			0.00103***
			(0.000000720)			(0.000000733)
Highest amount borrowed ($)			0.0000695***			0.000158***
			(0.000000924)			(0.00000110)
Year FE	Yes	Yes	Yes	No	No	No
Bank-Year FE	No	No	No	Yes	Yes	Yes
FSA FE	Yes	Yes	Yes	Yes	Yes	Yes
Borrower FE	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.567	0.576	0.576	0.567	0.576	0.577
N	1,181,743,315	1,181,742,883	1,181,736,265	1,181,743,315	1,181,742,883	1,181,736,265

Notes: Dependent variable for all columns (1)-(6) is the average probability of the consumer having positive amount past due value during periods $t+1$ to $t+24$. Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. All variables except the dependent variable are inverse-hyperbolic-sine-transformed, which preserves all 0 values in dollar variables.

Table C.9: Effects of credit limit increase on avg. amount past due, 24 months forward

	(1)	(2)	(3)	(4)	(5)	(6)
Credit limit increased	-0.0466***	-0.0359***	-0.0430***	-0.0451***	-0.0349***	-0.0423***
	(0.000301)	(0.000300)	(0.000300)	(0.000301)	(0.000301)	(0.000301)
CBP compliant	0.0326***	0.0367***	0.0410***			
	(0.000105)	(0.000104)	(0.000104)			
Credit limit increased × CBP compliant	0.0524***	0.0465***	0.0439***	0.0516***	0.0461***	0.0437***
	(0.000388)	(0.000386)	(0.000386)	(0.000388)	(0.000386)	(0.000386)
Credit limit ($)	0.0690***	0.0716***	0.0493***	0.0693***	0.0727***	0.0501***
	(0.0000411)	(0.0000417)	(0.0000428)	(0.0000423)	(0.0000427)	(0.0000440)
Credit score		-1.389***	-1.244***		-1.393***	-1.244***
		(0.000758)	(0.000760)		(0.000759)	(0.000760)
Age of account		0.00982***	0.00556***		0.0102***	0.00532***
		(0.0000259)	(0.0000272)		(0.0000264)	(0.0000286)
Age of consumer		-0.0117***	-0.00692***		-0.00880***	-0.00499***
		(0.000344)	(0.000344)		(0.000345)	(0.000344)
Current balance ($)			0.0154***			0.0156***
			(0.00000788)			(0.00000801)
Highest amount borrowed ($)			0.0000343***			0.00114***
			(0.00000957)			(0.0000114)
Year FE	Yes	Yes	Yes	No	No	No
Bank-Year FE	No	No	No	Yes	Yes	Yes
FSA FE	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.600	0.603	0.605	0.600	0.604	0.605
N	1,181,743,315	1,181,742,883	1,181,736,265	1,181,743,315	1,181,742,883	1,181,736,265

Notes: Dependent variable for all columns (1)-(6) is the average amount past due during periods $t+1$ to $t+24$. Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. All variables except the dependent variable are inverse-hyperbolic-sine-transformed, which preserves all 0 values in dollar variables.

Table C.10: Effects of credit limit increase on avg. probability of being delinquent, 24 months forward

	(1)	(2)	(3)	(4)	(5)	(6)
Credit limit increased	-0.00871***	-0.00552***	-0.00508***	-0.00854***	-0.00556***	-0.00518***
	(0.0000433)	(0.0000431)	(0.0000431)	(0.0000433)	(0.0000431)	(0.0000431)
CBP compliant	-0.00125***	0.00185***	0.00212***			
	(0.0000190)	(0.0000188)	(0.0000188)			
Credit limit increased × CBP compliant	0.00723***	0.00626***	0.00637***	0.00755***	0.00668***	0.00686***
	(0.0000559)	(0.0000551)	(0.0000551)	(0.0000559)	(0.0000552)	(0.0000552)
Credit limit ($)	-0.000387***	-0.00126***	-0.000332***	-0.00101***	-0.00126***	-0.000693***
	(0.00000748)	(0.00000757)	(0.00000790)	(0.00000766)	(0.00000769)	(0.00000806)
Credit score		-0.397***	-0.404***		-0.398***	-0.405***
		(0.000125)	(0.000127)		(0.000126)	(0.000127)
Age of account		0.00972***	0.00945***		0.00960***	0.00892***
		(0.00000460)	(0.00000477)		(0.00000467)	(0.00000497)
Age of consumer		0.0226***	0.0224***		0.0224***	0.0221***
		(0.0000586)	(0.0000586)		(0.0000586)	(0.0000586)
Current balance ($)			-0.000962***			-0.000997***
			(0.00000141)			(0.00000143)
Highest amount borrowed ($)			0.000692***			0.00113***
			(0.00000154)			(0.00000191)
Year FE	Yes	Yes	Yes	No	No	No
Bank-Year FE	No	No	No	Yes	Yes	Yes
FSA FE	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.656	0.666	0.666	0.656	0.666	0.666
N	1,181,743,315	1,181,742,883	1,181,736,265	1,181,743,315	1,181,742,883	1,181,736,265

Notes: Dependent variable for all columns (1)-(6) is the average probability of the consumer being delinquent during periods $t+1$ to $t+24$. Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. All variables except the dependent variable are inverse-hyperbolic-sine-transformed, which preserves all 0 values in dollar variables.

Table C.11: Effects of credit limit increase on avg. amount delinquent, 24 months forward

	(1)	(2)	(3)	(4)	(5)	(6)
Credit limit increased	-0.0638***	-0.0450***	-0.0431***	-0.0629***	-0.0453***	-0.0439***
	(0.000338)	(0.000337)	(0.000337)	(0.000339)	(0.000337)	(0.000337)
CBP compliant	0.00183***	0.0196***	0.0216***			
	(0.000131)	(0.000130)	(0.000130)			
Credit limit increased × CBP compliant	0.0475***	0.0416***	0.0419***	0.0496***	0.0444***	0.0452***
	(0.000429)	(0.000425)	(0.000425)	(0.000429)	(0.000425)	(0.000425)
Credit limit ($)	0.0365***	0.0319***	0.0351***	0.0345***	0.0332***	0.0341***
	(0.0000507)	(0.0000512)	(0.0000531)	(0.0000519)	(0.0000521)	(0.0000543)
Credit score		-2.341***	-2.369***		-2.348***	-2.374***
		(0.000849)	(0.000857)		(0.000849)	(0.000858)
Age of account		0.0553***	0.0533***		0.0555***	0.0510***
		(0.0000321)	(0.0000335)		(0.0000326)	(0.0000351)
Age of consumer		0.109***	0.109***		0.108***	0.106***
		(0.000400)	(0.000400)		(0.000400)	(0.000400)
Current balance ($)			-0.00406***			-0.00416***
			(0.00000946)			(0.00000959)
Highest amount borrowed ($)			0.00405***			0.00679***
			(0.0000110)			(0.0000135)
Year FE	Yes	Yes	Yes	No	No	No
Bank-Year FE	No	No	No	Yes	Yes	Yes
FSA FE	Yes	Yes	Yes	Yes	Yes	Yes
Borrower FE	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.681	0.688	0.688	0.681	0.688	0.688
N	1,181,743,315	1,181,742,883	1,181,736,265	1,181,743,315	1,181,742,883	1,181,736,265

Notes: Dependent variable for all columns (1)-(6) is the average maximum amount delinquent during periods $t+1$ to $t+24$. Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. All variables except the dependent variable are inverse-hyperbolic-sine-transformed, which preserves all 0 values in dollar variables.

Table C.12: Effects of credit limit increase on avg. probability of charge-offs, 24 months forward

	(1)	(2)	(3)	(4)	(5)	(6)
Credit limit increased	-0.00289***	-0.00181***	-0.00184***	-0.00302***	-0.00199***	-0.00203***
	(0.0000150)	(0.0000149)	(0.0000149)	(0.0000150)	(0.0000150)	(0.0000150)
CBP compliant	-0.00142***	-0.00102***	-0.000762***			
	(0.00000849)	(0.00000842)	(0.00000845)			
Credit limit increased × CBP compliant	0.00248***	0.00189***	0.00186***	0.00265***	0.00211***	0.00211***
	(0.0000222)	(0.0000220)	(0.0000220)	(0.0000222)	(0.0000220)	(0.0000220)
Credit limit ($)	0.00116***	0.00140***	0.00111***	0.00112***	0.00143***	0.00118***
	(0.00000297)	(0.00000301)	(0.00000311)	(0.00000306)	(0.00000308)	(0.00000320)
Credit score		-0.141***	-0.139***		-0.141***	-0.140***
		(0.0000715)	(0.0000717)		(0.0000716)	(0.0000718)
Age of account		0.00101***	0.000747***		0.00108***	0.000825***
		(0.00000164)	(0.00000173)		(0.00000169)	(0.00000184)
Age of consumer		0.00425***	0.00431***		0.00413***	0.00411***
		(0.0000225)	(0.0000225)		(0.0000226)	(0.0000226)
Current balance ($)			0.0000515***			0.0000247***
			(0.000000554)			(0.000000567)
Highest amount borrowed ($)			0.000316***			0.000301***
			(0.000000617)			(0.000000729)
Year FE	Yes	Yes	Yes	No	No	No
Bank-Year FE	No	No	No	Yes	Yes	Yes
FSA FE	Yes	Yes	Yes	Yes	Yes	Yes
Borrower FE	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.501	0.509	0.509	0.501	0.510	0.510
N	1,181,743,315	1,181,742,883	1,181,736,265	1,181,743,315	1,181,742,883	1,181,736,265

Notes: Dependent variable for all columns (1)-(6) is the average probability charged-off during periods $t+1$ to $t+24$. Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. All variables except the dependent variable are inverse-hyperbolic-sine-transformed, which preserves all 0 values in dollar variables.

Table C.13: Effects of credit limit increase on avg. amount charged-off, 24 months forward

	(1)	(2)	(3)	(4)	(5)	(6)
Credit limit increased	-0.0210***	-0.0132***	-0.0144***	-0.0213***	-0.0139***	-0.0151***
	(0.000197)	(0.000196)	(0.000196)	(0.000197)	(0.000196)	(0.000196)
CBP compliant	-0.00859***	-0.00565***	-0.00284***			
	(0.0000785)	(0.0000782)	(0.0000784)			
Credit limit increased × CBP compliant	0.0199***	0.0156***	0.0150***	0.0205***	0.0166***	0.0163***
	(0.000257)	(0.000256)	(0.000256)	(0.000257)	(0.000256)	(0.000256)
Credit limit ($)	0.0188***	0.0205***	0.0151***	0.0181***	0.0203***	0.0156***
	(0.0000287)	(0.0000292)	(0.0000300)	(0.0000296)	(0.0000298)	(0.0000309)
Credit score		-1.010***	-0.980***		-1.009***	-0.984***
		(0.000582)	(0.000585)		(0.000583)	(0.000585)
Age of account		0.00734***	0.00449***		0.00785***	0.00539***
		(0.0000172)	(0.0000181)		(0.0000176)	(0.0000191)
Age of consumer		0.0302***	0.0314***		0.0311***	0.0314***
		(0.000225)	(0.000225)		(0.000225)	(0.000225)
Current balance ($)			0.00240***			0.00220***
			(0.00000540)			(0.00000550)
Highest amount borrowed ($)			0.00282***			0.00231***
			(0.00000647)			(0.00000768)
Year FE	Yes	Yes	Yes	No	No	No
Bank-Year FE	No	No	No	Yes	Yes	Yes
FSA FE	Yes	Yes	Yes	Yes	Yes	Yes
Borrower FE	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.562	0.566	0.566	0.562	0.566	0.566
N	1,181,743,315	1,181,742,883	1,181,736,265	1,181,743,315	1,181,742,883	1,181,736,265

Notes: Dependent variable for all columns (1)-(6) is the average amount charged-off during periods $t+1$ to $t+24$. Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. All variables except the dependent variable are inverse-hyperbolic-sine-transformed, which preserves all 0 values in dollar variables.

Table C.14: Effects of credit limit increase on avg. utilization, 24 months forward

	(1)	(2)	(3)	(4)	(5)	(6)
Credit limit increased	0.00717***	0.0106***	0.00155***	0.00872***	0.0120***	0.00274***
	(0.0000735)	(0.0000724)	(0.0000699)	(0.0000732)	(0.0000722)	(0.0000698)
CBP compliant	-0.0244***	-0.0230***	-0.0165***			
	(0.0000232)	(0.0000230)	(0.0000208)			
Credit limit increased × CBP compliant	0.0136***	0.0117***	0.00837***	0.0127***	0.0108***	0.00788***
	(0.0000873)	(0.0000861)	(0.0000830)	(0.0000870)	(0.0000858)	(0.0000829)
Credit limit ($)	0.0220***	0.0229***	-0.00635***	0.0175***	0.0189***	-0.00915***
	(0.00000917)	(0.00000924)	(0.00000875)	(0.00000942)	(0.00000943)	(0.00000901)
Credit score		-0.448***	-0.259***		-0.443***	-0.258***
		(0.000125)	(0.000115)		(0.000124)	(0.000115)
Age of account		0.00341***	-0.00309***		0.00181***	-0.00446***
		(0.00000625)	(0.00000589)		(0.00000631)	(0.00000614)
Age of consumer		-0.0261***	-0.0198***		-0.0194***	-0.0147***
		(0.0000763)	(0.0000728)		(0.0000754)	(0.0000722)
Current balance ($)			0.0196***			0.0193***
			(0.00000187)			(0.00000189)
Highest amount borrowed ($)			0.00143***			0.00162***
			(0.00000188)			(0.00000241)
Year FE	Yes	Yes	Yes	No	No	No
Bank-Year FE	No	No	No	Yes	Yes	Yes
FSA FE	Yes	Yes	Yes	Yes	Yes	Yes
Borrower FE	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.755	0.759	0.790	0.757	0.761	0.791
N	1,181,742,917	1,181,742,485	1,181,736,054	1,181,742,917	1,181,742,485	1,181,736,054

Notes: Dependent variable for all columns (1)-(6) is the average utilization during periods $t+1$ to $t+24$. Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. All variables except the dependent variable are inverse-hyperbolic-sine-transformed, which preserves all 0 values in dollar variables.

C.3 36-month

Table C.15: Effects of credit limit increase on avg. probability of being past due, 36 months forward

	(1)	(2)	(3)	(4)	(5)	(6)
Credit limit increased	-0.00501***	-0.00349***	-0.00394***	-0.00494***	-0.00348***	-0.00395***
	(0.0000224)	(0.0000223)	(0.0000223)	(0.0000224)	(0.0000223)	(0.0000223)
CBP compliant	0.00148***	0.00209***	0.00240***			
	(0.0000107)	(0.0000106)	(0.0000106)			
Credit limit increased × CBP compliant	0.00602***	0.00520***	0.00503***	0.00603***	0.00526***	0.00511***
	(0.0000324)	(0.0000320)	(0.0000321)	(0.0000324)	(0.0000321)	(0.0000321)
Credit limit ($)	0.00371***	0.00401***	0.00255***	0.00371***	0.00413***	0.00265***
	(0.00000408)	(0.00000414)	(0.00000427)	(0.00000422)	(0.00000425)	(0.00000440)
Credit score		-0.198***	-0.189***		-0.199***	-0.189***
		(0.0000896)	(0.0000897)		(0.0000897)	(0.0000898)
Age of account		0.00156***	0.00125***		0.00160***	0.00123***
		(0.00000245)	(0.00000258)		(0.00000250)	(0.00000273)
Age of consumer		0.00731***	0.00762***		0.00735***	0.00759***
		(0.0000324)	(0.0000324)		(0.0000324)	(0.0000324)
Current balance ($)			0.000983***			0.000983***
			(0.000000688)			(0.000000699)
Highest amount borrowed ($)			0.0000496***			0.000146***
			(0.000000873)			(0.00000104)
Year FE	Yes	Yes	Yes	No	No	No
Bank-Year FE	No	No	No	Yes	Yes	Yes
FSA FE	Yes	Yes	Yes	Yes	Yes	Yes
Borrower FE	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.610	0.617	0.618	0.611	0.617	0.618
N	1,182,267,376	1,182,266,944	1,182,260,240	1,182,267,376	1,182,266,944	1,182,260,240

Notes: Dependent variable for all columns (1)-(6) is the average probability of the consumer having positive amount past due value during periods $t+1$ to $t+36$. Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. All variables except the dependent variable are inverse-hyperbolic-sine-transformed, which preserves all 0 values in dollar variables.

Table C.16: Effects of credit limit increase on avg. amount past due, 36 months forward

	(1)	(2)	(3)	(4)	(5)	(6)
Credit limit increased	-0.0361***	-0.0293***	-0.0366***	-0.0348***	-0.0282***	-0.0358***
	(0.000288)	(0.000288)	(0.000288)	(0.000289)	(0.000288)	(0.000289)
CBP compliant	0.0310***	0.0335***	0.0376***			
	(0.000106)	(0.000105)	(0.000105)			
Credit limit increased × CBP compliant	0.0451***	0.0412***	0.0386***	0.0447***	0.0411***	0.0386***
	(0.000371)	(0.000370)	(0.000370)	(0.000371)	(0.000370)	(0.000370)
Credit limit ($)	0.0742***	0.0762***	0.0535***	0.0738***	0.0763***	0.0535***
	(0.0000416)	(0.0000423)	(0.0000433)	(0.0000427)	(0.0000432)	(0.0000445)
Credit score		-0.890***	-0.741***		-0.892***	-0.740***
		(0.000731)	(0.000733)		(0.000731)	(0.000733)
Age of account		0.00540***	0.00133***		0.00557***	0.000942***
		(0.0000261)	(0.0000274)		(0.0000266)	(0.0000288)
Age of consumer		-0.0471***	-0.0422***		-0.0435***	-0.0395***
		(0.000344)	(0.000343)		(0.000344)	(0.000343)
Current balance ($)			0.0158***			0.0160***
			(0.00000807)			(0.00000819)
Highest amount borrowed ($)			-0.000362***			0.000684***
			(0.00000955)			(0.0000114)
Year FE	Yes	Yes	Yes	No	No	No
Bank-Year FE	No	No	No	Yes	Yes	Yes
FSA FE	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.666	0.667	0.668	0.666	0.667	0.668
N	1,182,267,376	1,182,266,944	1,182,260,240	1,182,267,376	1,182,266,944	1,182,260,240

Notes: Dependent variable for all columns (1)-(6) is the average amount past due during periods $t+1$ to $t+36$. Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. All variables except the dependent variable are inverse-hyperbolic-sine-transformed, which preserves all 0 values in dollar variables.

Table C.17: Effects of credit limit increase on avg. probability of being delinquent, 36 months forward

	(1)	(2)	(3)	(4)	(5)	(6)
Credit limit increased	-0.00785***	-0.00503***	-0.00467***	-0.00768***	-0.00505***	-0.00473***
	(0.0000410)	(0.0000408)	(0.0000408)	(0.0000410)	(0.0000409)	(0.0000409)
CBP compliant	-0.00129***	0.00150***	0.00177***			
	(0.0000185)	(0.0000183)	(0.0000183)			
Credit limit increased × CBP compliant	0.00642***	0.00559***	0.00567***	0.00672***	0.00598***	0.00613***
	(0.0000529)	(0.0000524)	(0.0000524)	(0.0000529)	(0.0000524)	(0.0000524)
Credit limit ($)	0.000123***	-0.000690***	0.0000432***	-0.000513***	-0.000763***	-0.000377***
	(0.00000726)	(0.00000736)	(0.00000767)	(0.00000743)	(0.00000747)	(0.00000782)
Credit score		-0.349***	-0.355***		-0.350***	-0.356***
		(0.000119)	(0.000121)		(0.000120)	(0.000121)
Age of account		0.00878***	0.00851***		0.00863***	0.00796***
		(0.00000447)	(0.00000463)		(0.00000453)	(0.00000482)
Age of consumer		0.0188***	0.0186***		0.0187***	0.0184***
		(0.0000556)	(0.0000555)		(0.0000556)	(0.0000556)
Current balance ($)			-0.000798***			-0.000837***
			(0.00000136)			(0.00000138)
Highest amount borrowed ($)			0.000631***			0.00108***
			(0.00000148)			(0.00000184)
Year FE	Yes	Yes	Yes	No	No	No
Bank-Year FE	No	No	No	Yes	Yes	Yes
FSA FE	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.689	0.696	0.696	0.689	0.696	0.697
N	1,182,267,376	1,182,266,944	1,182,260,240	1,182,267,376	1,182,266,944	1,182,260,240

Notes: Dependent variable for all columns (1)-(6) is the average probability of the consumer being delinquent during periods $t+1$ to $t+36$. Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. All variables except the dependent variable are inverse-hyperbolic-sine-transformed, which preserves all 0 values in dollar variables.

Table C.18: Effects of credit limit increase on avg. amount delinquent, 36 months forward

	(1)	(2)	(3)	(4)	(5)	(6)
Credit limit increased	-0.0526***	-0.0383***	-0.0373***	-0.0517***	-0.0385***	-0.0378***
	(0.000328)	(0.000328)	(0.000328)	(0.000328)	(0.000328)	(0.000328)
CBP compliant	0.000954***	0.0163***	0.0183***			
	(0.000131)	(0.000130)	(0.000130)			
Credit limit increased × CBP compliant	0.0377***	0.0339***	0.0341***	0.0399***	0.0367***	0.0372***
	(0.000414)	(0.000412)	(0.000412)	(0.000414)	(0.000412)	(0.000412)
Credit limit ($)	0.0436***	0.0387***	0.0398***	0.0412***	0.0392***	0.0381***
	(0.0000509)	(0.0000515)	(0.0000534)	(0.0000521)	(0.0000524)	(0.0000546)
Credit score		-1.752***	-1.766***		-1.758***	-1.769***
		(0.000809)	(0.000817)		(0.000809)	(0.000817)
Age of account		0.0485***	0.0465***		0.0484***	0.0439***
		(0.0000324)	(0.0000338)		(0.0000329)	(0.0000354)
Age of consumer		0.0612***	0.0610***		0.0610***	0.0598***
		(0.000393)	(0.000393)		(0.000394)	(0.000394)
Current balance ($)			-0.00235***			-0.00249***
			(0.00000942)			(0.00000954)
Highest amount borrowed ($)			0.00338***			0.00631***
			(0.0000110)			(0.0000136)
Year FE	Yes	Yes	Yes	No	No	No
Bank-Year FE	No	No	No	Yes	Yes	Yes
FSA FE	Yes	Yes	Yes	Yes	Yes	Yes
Borrower FE	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.728	0.731	0.731	0.728	0.731	0.731
N	1,182,267,376	1,182,266,944	1,182,260,240	1,182,267,376	1,182,266,944	1,182,260,240

Notes: Dependent variable for all columns (1)-(6) is the average maximum amount delinquent during periods $t+1$ to $t+36$. Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. All variables except the dependent variable are inverse-hyperbolic-sine-transformed, which preserves all 0 values in dollar variables.

Table C.19: Effects of credit limit increase on avg. probability of charge-offs, 36 months forward

	(1)	(2)	(3)	(4)	(5)	(6)
Credit limit increased	-0.00263***	-0.00166***	-0.00170***	-0.00272***	-0.00179***	-0.00184***
	(0.0000140)	(0.0000140)	(0.0000140)	(0.0000141)	(0.0000140)	(0.0000140)
CBP compliant	-0.00168***	-0.00132***	-0.00109***			
	(0.00000823)	(0.00000817)	(0.00000820)			
Credit limit increased × CBP compliant	0.00237***	0.00183***	0.00180***	0.00250***	0.00200***	0.00200***
	(0.0000210)	(0.0000208)	(0.0000208)	(0.0000210)	(0.0000209)	(0.0000209)
Credit limit ($)	0.00129***	0.00151***	0.00121***	0.00125***	0.00153***	0.00127***
	(0.00000289)	(0.00000293)	(0.00000303)	(0.00000298)	(0.00000300)	(0.00000311)
Credit score		-0.127***	-0.125***		-0.127***	-0.126***
		(0.0000684)	(0.0000686)		(0.0000685)	(0.0000688)
Age of account		0.000882***	0.000650***		0.000951***	0.000725***
		(0.00000160)	(0.00000169)		(0.00000164)	(0.00000179)
Age of consumer		0.00384***	0.00391***		0.00379***	0.00378***
		(0.0000215)	(0.0000215)		(0.0000216)	(0.0000216)
Current balance ($)			0.0000796***			0.0000535***
			(0.000000533)			(0.000000545)
Highest amount borrowed ($)			0.000271***			0.000258***
			(0.000000594)			(0.000000698)
Year FE	Yes	Yes	Yes	No	No	No
Bank-Year FE	No	No	No	Yes	Yes	Yes
FSA FE	Yes	Yes	Yes	Yes	Yes	Yes
Borrower FE	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.553	0.560	0.560	0.553	0.560	0.560
N	1,182,267,376	1,182,266,944	1,182,260,240	1,182,267,376	1,182,266,944	1,182,260,240

Notes: Dependent variable for all columns (1)-(6) is the average probability charged-off during periods $t+1$ to $t+36$. Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. All variables except the dependent variable are inverse-hyperbolic-sine-transformed, which preserves all 0 values in dollar variables.

Table C.20: Effects of credit limit increase on avg. amount charged-off, 36 months forward

	(1)	(2)	(3)	(4)	(5)	(6)
Credit limit increased	-0.0171***	-0.0111***	-0.0128***	-0.0172***	-0.0115***	-0.0132***
	(0.000216)	(0.000216)	(0.000216)	(0.000216)	(0.000216)	(0.000216)
CBP compliant	-0.0121***	-0.00983***	-0.00708***			
	(0.0000873)	(0.0000872)	(0.0000873)			
Credit limit increased × CBP compliant	0.0171***	0.0138***	0.0130***	0.0175***	0.0145***	0.0141***
	(0.000279)	(0.000278)	(0.000278)	(0.000279)	(0.000278)	(0.000278)
Credit limit ($)	0.0262***	0.0275***	0.0208***	0.0251***	0.0268***	0.0210***
	(0.0000324)	(0.0000329)	(0.0000338)	(0.0000332)	(0.0000336)	(0.0000347)
Credit score		-0.778***	-0.739***		-0.776***	-0.742***
		(0.000613)	(0.000615)		(0.000613)	(0.000616)
Age of account		0.00565***	0.00286***		0.00610***	0.00385***
		(0.0000195)	(0.0000205)		(0.0000199)	(0.0000217)
Age of consumer		0.0211***	0.0226***		0.0227***	0.0234***
		(0.000250)	(0.000250)		(0.000251)	(0.000251)
Current balance ($)			0.00352***			0.00330***
			(0.00000611)			(0.00000621)
Highest amount borrowed ($)			0.00234***			0.00172***
			(0.00000730)			(0.00000862)
Year FE	Yes	Yes	Yes	No	No	No
Bank-Year FE	No	No	No	Yes	Yes	Yes
FSA FE	Yes	Yes	Yes	Yes	Yes	Yes
Borrower FE	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.642	0.644	0.644	0.643	0.644	0.644
N	1,182,267,376	1,182,266,944	1,182,260,240	1,182,267,376	1,182,266,944	1,182,260,240

Notes: Dependent variable for all columns (1)-(6) is the average amount charged-off during periods $t+1$ to $t+36$. Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. All variables except the dependent variable are inverse-hyperbolic-sine-transformed, which preserves all 0 values in dollar variables.

Table C.21: Effects of credit limit increase on avg. utilization, 36 months forward

	(1)	(2)	(3)	(4)	(5)	(6)
Credit limit increased	0.00669***	0.00945***	0.00130***	0.00819***	0.0108***	0.00247***
	(0.0000678)	(0.0000671)	(0.0000649)	(0.0000675)	(0.0000669)	(0.0000648)
CBP compliant	-0.0229***	-0.0218***	-0.0158***			
	(0.0000223)	(0.0000222)	(0.0000202)			
Credit limit increased × CBP compliant	0.0123***	0.0108***	0.00778***	0.0114***	0.00983***	0.00724***
	(0.0000808)	(0.0000800)	(0.0000774)	(0.0000805)	(0.0000797)	(0.0000772)
Credit limit ($)	0.0213***	0.0220***	-0.00443***	0.0170***	0.0182***	-0.00729***
	(0.00000880)	(0.00000889)	(0.00000848)	(0.00000902)	(0.00000906)	(0.00000872)
Credit score		-0.357***	-0.187***		-0.353***	-0.186***
		(0.000117)	(0.000108)		(0.000116)	(0.000108)
Age of account		0.00281***	-0.00321***		0.00128***	-0.00469***
		(0.00000600)	(0.00000570)		(0.00000606)	(0.00000593)
Age of consumer		-0.0247***	-0.0190***		-0.0182***	-0.0141***
		(0.0000721)	(0.0000692)		(0.0000713)	(0.0000687)
Current balance ($)			0.0176***			0.0173***
			(0.00000180)			(0.00000181)
Highest amount borrowed ($)			0.00153***			0.00189***
			(0.00000180)			(0.00000231)
Year FE	Yes	Yes	Yes	No	No	No
Bank-Year FE	No	No	No	Yes	Yes	Yes
FSA FE	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.778	0.781	0.807	0.780	0.783	0.808
N	1,182,267,011	1,182,266,579	1,182,260,050	1,182,267,011	1,182,266,579	1,182,260,050

Notes: Dependent variable for all columns (1)-(6) is the average utilization during periods $t+1$ to $t+36$. Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. All variables except the dependent variable are inverse-hyperbolic-sine-transformed, which preserves all 0 values in dollar variables.

Appendix D Additional lender response results

Tables D.1 and D.2 present estimated results of the implementation of CG5 on the lender credit limit increases, with additional controls. In each table, columns (1)-(4) control for year fixed effects, and columns (5)-(8) control for both year fixed effects and borrower fixed effects. In columns (3)-(4) and (7)-(8), we control for credit limit utilization to show that the estimates on our key parameter of interest do not qualitatively change.

Table D.1: Effects of CG5 on probability of credit limit increase

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CBP compliant	-0.00498***	-0.00391***	-0.00425***	-0.00394***	-0.00634***	-0.00547***	-0.00509***	-0.00570***
	(0.0000425)	(0.0000426)	(0.0000425)	(0.0000425)	(0.0000458)	(0.0000460)	(0.0000460)	(0.0000458)
CG5 × CBP compliant	0.000968***	0.000667***	0.000743***	0.000433***	0.00127***	0.00137***	0.00122***	0.00171***
	(0.0000435)	(0.0000437)	(0.0000435)	(0.0000435)	(0.0000461)	(0.0000463)	(0.0000463)	(0.0000461)
Credit limit ($)	-0.00105***	-0.00317***	-0.000928***	0.000383***	-0.00316***	-0.00644***	-0.00450***	-0.00439***
	(0.00000334)	(0.00000354)	(0.00000362)	(0.00000380)	(0.00000654)	(0.00000706)	(0.00000677)	(0.00000665)
Current balance ($)		0.00215***				0.00211***		
		(0.000000935)				(0.00000128)		
Highest amount borrowed ($)		0.000125***				0.000206***	0.000386***	
		(0.000000965)				(0.00000129)	(0.00000128)	
Utilization			0.0285***	0.0283***			0.0322***	0.0326***
			(0.0000166)	(0.0000168)			(0.0000231)	(0.0000230)
Credit score			0.0264***	0.0324***			0.0521***	0.0516***
			(0.0000441)	(0.0000449)			(0.0000821)	(0.0000819)
Age of account				-0.00134***				0.000816***
				(0.00000269)				(0.00000364)
Age of consumer				-0.00759***				0.00532***
				(0.0000107)				(0.0000560)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
FSA FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Borrower FE	No	No	No	No	Yes	Yes	Yes	Yes
R-squared	0.00114	0.00574	0.00548	0.00630	0.0379	0.0404	0.0409	0.0409
N	1,088,294,675	1,087,327,939	1,088,294,154	1,088,293,769	1,087,957,781	1,087,004,052	1,087,004,052	1,087,956,877

Notes: Dependent variable for all columns (1)-(8) is an indicator variable for whether the consumer's credit card account receives a credit limit increase at time $t+1$. All independent variables are values at time t. Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. All non-indicator variables are inverse-hyperbolic-sine-transformed, which preserves all 0 values in dollar variables.

Table D.2: Effects of CG5 on amount of credit limit increase

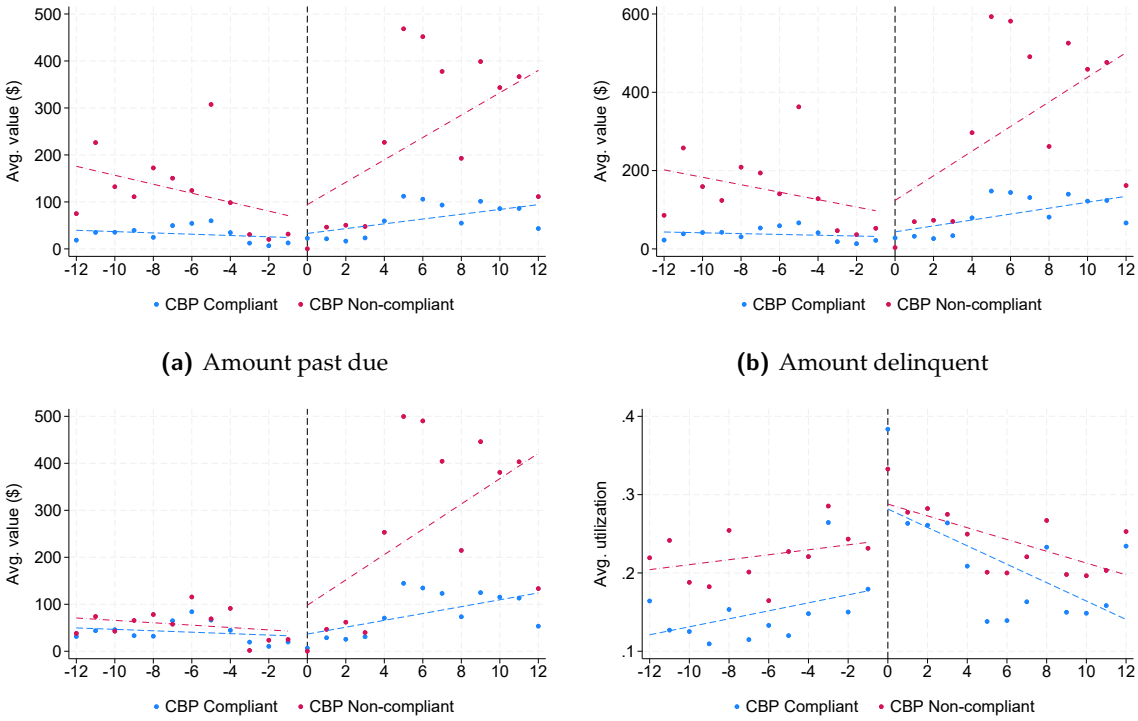
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CBP compliant	0.0159***	0.102***	0.0560***	0.0509***	-0.0133***	-0.00129	0.00472	-0.00663**
	(0.00106)	(0.00112)	(0.00121)	(0.00121)	(0.00251)	(0.00253)	(0.00253)	(0.00251)
CG5 × CBP compliant	-0.276***	-0.347***	-0.276***	-0.274***	-0.188***	-0.200***	-0.197***	-0.191***
	(0.00115)	(0.00120)	(0.00129)	(0.00129)	(0.00237)	(0.00238)	(0.00238)	(0.00238)
Credit limit ($)	0.334***	0.384***	0.277***	0.292***	0.258***	0.277***	0.249***	0.249***
	(0.000254)	(0.000259)	(0.000253)	(0.000291)	(0.000565)	(0.000588)	(0.000568)	(0.000599)
Current balance ($)		-0.0666***				-0.0179***		
		(0.000102)				(0.000149)		
Highest amount borrowed ($)		0.0173***				0.00165***	0.00265***	
		(0.000119)				(0.000184)	(0.000181)	
Utilization			-0.392***	-0.382***			-0.181***	-0.178***
			(0.000899)	(0.000902)			(0.00145)	(0.00143)
Credit score			2.419***	2.478***			1.260***	1.254***
			(0.00386)	(0.00391)			(0.00752)	(0.00752)
Age of account				-0.0319***				-0.00681***
				(0.000262)				(0.000551)
Age of consumer				-0.0336***				0.454***
				(0.000689)				(0.00843)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
FSA FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Borrower FE	No	No	No	No	Yes	Yes	Yes	Yes
R-squared	0.147	0.172	0.245	0.246	0.727	0.727	0.731	0.731
N	14,644,858	14,640,587	14,644,856	14,644,854	10,114,430	10,111,949	10,111,949	10,114,430

Notes: Dependent variable for all columns (1)-(8) is the amount a consumer receives in a credit limit increase at time $t+1$. All independent variables are values at time t. Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. All non-indicator variables are inverse-hyperbolic-sine-transformed, which preserves all 0 values in dollar variables.

Appendix E Additional parallel trends analysis

E.1 Adverse selection variables

Figure E.1: Trends adverse selection outcomes



(a) Amount past due

(b) Amount delinquent

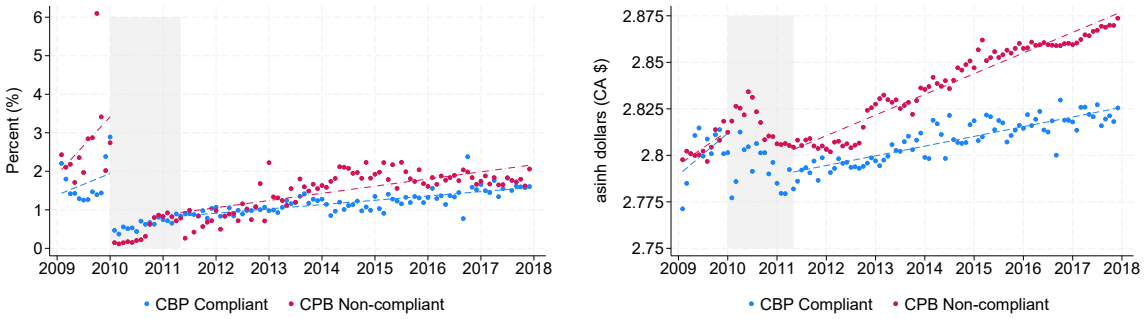
(c) Amount charged off

(d) Utilization

Notes: Plotted series in Figure E.1 are month-year unconditional averages by CG5 compliance group. The dependent variable in Panel (a) is the amount past due. The dependent variable in Panel (b) is the amount of delinquent. The dependent variable in Panel (c) is the amount charged off. The dependent variable in Panel (d) is the utilization rate. Blue series are compliant lenders and red series are non-compliant lenders. All dashes lines plot the average linear trend across time of their respective colored scatter plots. The x-axis is the event time where 0 marks the month an account received a credit limit increase.

E.2 Lender response variables

Figure E.2: Trends in credit limit increases



(a) Probability of credit limit increase

(b) Amount of credit limit increases

Notes: Plotted series in Figure E.2 are month-year unconditional averages by CG5 compliance group. The dependent variable in Panel (a) is the probability of a credit limit increase. The dependent variable in Panel (b) is the amount of credit limit increases. Blue series are the institutions complying with CG5 and red series are RBC, the institution who was found to have violated CG5. All dashes lines plot the average linear trend across time of their respective colored scatter plots. The gray bars in both panels plot the time from January 2010 to April 2011, the period of the first stage of CG5 implementation when "evergreen" contracts were improperly used by several institutions to comply with the policy.

Appendix F Propensity score-matched sample results

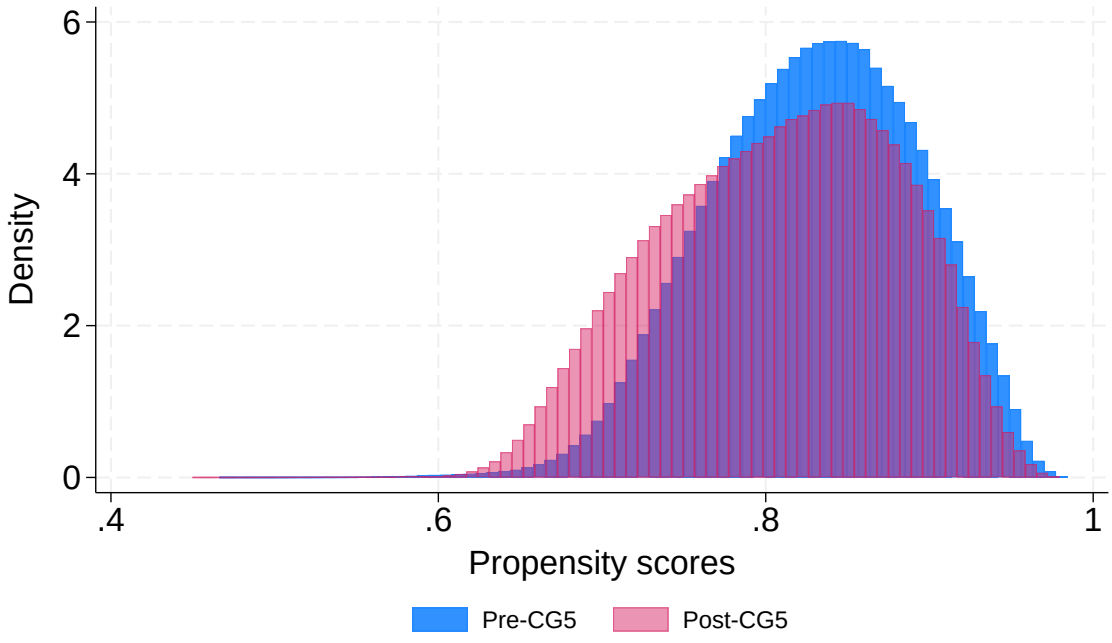
F.1 Matching Methodology

We employ one-to-one propensity score-matching with replacement using a probit model. We match similar RBC accounts to similar accounts from CG5-complying banks based on existing credit limit, utilization rate, credit score, account age, and consumer age.

For the adverse selection test, given our main results only use post-CG5 data, we estimate the propensity score on the same sample. For lender response regressions, due to the fact that CG5 can change the nature of which types of accounts receive credit limits, we estimate propensity scores for the pre- and post-CG5 periods separately. In essence, we treat receiving a credit limit increase as a Markov process in the matching process and abstract away from the ability of credit limit increases to endogenously change an account's characteristics.

Figure F.1 plots the distribution of the estimated propensity scores for the pre- and post-CG5 periods. We see that the two series have significant overlap.

Figure F.1: Distribution of estimated propensity scores



Notes: Figure F.1 plots the distribution of the estimated propensity scores for the pre- and post-CG5 periods. The blue series plots the pre-CG5 estimates and the red series plots the post-CG5 estimates.

F.2 Adverse selection results using matched sample

Table F.1 reports the adverse selection test results using a one-to-one propensity score-matched sample to adjust for imbalances in the controls across CG5-complying and non-complying banks. The dependent variable for each column is the average of the listed variable for periods $t+1$ to $t+24$. The dependent variable in (1) is the amount past due, (2) is the maximum amount delinquent, (3) is the amount charged off, and (4) is the utilization. In these regressions, we do not control for borrower fixed effects because matching occurs on account-month level data and does not guarantee repeated observations of any one borrower. The coefficient on Credit limit increased $\times$ CBP-compliant is consistent with our main findings that CBP-compliant banks faced greater adverse selection as a result of the policy.

Table F.1: Adverse selection test results on various outcomes of interest, 24-months forward, propensity score-matched sample

	(1) Amount past due	(2) Amount delinquent	(3) Amount charged off	(4) Utilization
Credit limit increased	-0.0281***	-0.0350***	-0.0114***	0.00763***
	(0.000167)	(0.000180)	(0.000107)	(0.0000400)
Credit limit increased $\times$ CBP compliant	0.0409***	0.0348***	0.0144***	0.0169***
	(0.000301)	(0.000326)	(0.000202)	(0.0000625)
Credit limit ($)	0.0695***	0.0302***	0.0191***	0.0170***
	(0.0000380)	(0.0000469)	(0.0000268)	(0.00000851)
Credit score	-1.369***	-2.299***	-1.004***	-0.437***
	(0.000637)	(0.000716)	(0.000495)	(0.000104)
Age of account	0.00989***	0.0563***	0.00789***	0.00151***
	(0.0000234)	(0.0000294)	(0.0000157)	(0.00000564)
Age of consumer	-0.0141***	0.123***	0.0329***	-0.0220***
	(0.000309)	(0.000360)	(0.000203)	(0.0000681)
Bank-Year FE	Yes	Yes	Yes	Yes
FSA FE	Yes	Yes	Yes	Yes
Borrower FE	Yes	Yes	Yes	Yes
R-squared	0.668	0.752	0.647	0.807
N	1,863,010,000	1,863,010,000	1,863,010,000	1,863,009,790

Notes: Table F.1 reports the adverse selection test results using a one-to-one propensity score-matched sample to adjust for imbalances in the controls across CG5-complying and non-complying banks. The dependent variable for each column is the average of the listed variable for periods $t+1$ to $t+24$. The dependent variable in (1) is the amount past due, (2) is the max. amount delinquent, (3) is the amount charged off, and (4) is the utilization. Standard errors in parentheses. * $p<0.05$, ** $p<0.01$, *** $p<0.001$. All variables except the probability dependent variables are inverse-hyperbolic-sine-transformed, which preserves all 0 values in dollar variables. Reported number of observations are the effective number of observations due to frequency weighting.

F.3 Lender response results using matched sample

Table F.2 reports estimates of the effect of CG5 on the probability and amount of credit limit increases using a propensity score-matched sample to adjust for imbalances in the controls across CG5-complying and non-complying banks. In these regressions, we do not control for borrower fixed effects because matching occurs on account-month level data and does not guarantee repeated observations of any one borrower. The coefficient on CG5 $\times$ CBP-compliant is consistent with our main findings that banks complying with CG5 surprisingly gave more frequent credit limit increases albeit at small sizes as a result of the policy.

Table F.2: Effects of CG5 on probability and amount of credit limit increases, propensity score-matched sample

	(1) Prob. credit limit increase	(2) Amt. credit limit increase
CBP compliant	-0.00452***	-0.0346***
	(0.0000276)	(0.00268)
CG5 $\times$ CBP compliant	0.00102***	-0.236***
	(0.0000274)	(0.00215)
Credit limit ($)	-0.00555***	0.231***
	(0.00000593)	(0.000592)
Utilization	0.0324***	-0.196***
	(0.0000196)	(0.00141)
Credit score	0.0584***	1.257***
	(0.0000694)	(0.00711)
Age of account	0.00151***	-0.00612***
	(0.00000328)	(0.000555)
Age of consumer	0.00709***	0.446***
	(0.0000514)	(0.00852)
Year FE	Yes	Yes
FSA FE	Yes	Yes
R-squared	0.195	0.826
N	1,732,536,987	22,128,485

Notes: Table F.2 reports estimates of the effect of CG5 on the probability and amount of credit limit increases using a one-to-one propensity score-matched sample to adjust for imbalances in the controls across CG5-complying and non-complying banks. The dependent variable for regressions (1) is the probability of credit limit increase in $t+1$. The dependent variable for regressions (2) is the amount of credit limit increases in $t+1$, conditional on a credit limit increase. Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. All non-indicator variables are inverse-hyperbolic-sine-transformed, which preserves all 0 values in dollar variables. Reported number of observations are the effective number of observations due to frequency weighting.