Adverse Selection and Learning in Consumer Credit Markets*

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Abstract

This paper studies the trade-off between consent-based regulatory safeguards and the informational frictions they can amplify in credit markets. We find that requiring lenders to obtain explicit consent before raising borrower credit limits induces adverse selection. Borrowers who accept are ex post riskier than those whose increases are applied without consent, with higher past-due, delinquent, and charged-off balances. Compliant lenders reduced the size of increases but increased their frequency, which is inconsistent with static models of adverse selection. We use a simple model of credit provision to demonstrate that adverse selection and lender learning are essential to rationalize both empirical patterns.

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 often face adverse selection. While interest rates typically remain unchanged over the life of an account (Ausubel, 1991; Drechsler et al., 2025; Knittel & Stango, 2003), credit limits vary substantially across borrowers and within borrowers over time (Agarwal, Chomsisengphet, Mahoney, & Stroebel, 2018; Aydin, 2022; Fulford, 2015). Credit limits are therefore a primary margin through which lenders manage credit risk and adjust credit supply (Chava et al., 2023; Norden & Weber, 2010). In the U.S., lenders can raise limits unilaterally (111th Congress, 2009; Consumer Financial Protection Bureau, 2024). Other jurisdictions restrict this practice: Canada requires the borrower's express consent for each increase, Australia prohibits unsolicited increases, and the European Union will adopt rules similar to Canada's starting in November 2026 (European Parliament and Council, 2023; Parliament of Australia, 2011). In this paper, we study how requiring consent affects which borrowers get access to additional credit and how lenders provide credit over time.

A consent requirement for credit limit increases provides borrowers with a veto over any lender initiated credit limit increase, as in models of veto bargaining (Ali et al., 2023; Romer & Rosenthal, 1978). Granting the borrower a veto has two effects. First, borrowers can self-select, potentially inducing adverse selection. Under a consent requirement, lenders face adverse selection if the borrowers who are most likely to accept credit limit increases are riskier borrowers. Second, due to the relationships between borrowers and lenders, if different types of borrowers accept differently, borrower decisions can be informative. While lenders already learn about borrowers from repayment and account activity (Agarwal, Chomsisengphet, Liu, et al., 2018; Mester et al., 2007; Norden & Weber, 2010), consenting to higher limits adds a new signal. The borrower's decision to accept gives a lender that cannot commit to future offers an incentive to learn about borrower types over time. Selection discourages lenders from offering increases, while learning potentially encourages more frequent offers. Which force dominates is theoretically ambiguous and affects whether consent regulation leads to under- or over-provision of credit.

We study this trade-off in Canada. We exploit heterogeneous compliance with Canada's *Credit Business Practices Regulations* (CBP) (Government of Canada, 2009a, 2009b) 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. 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 U.S..

We first show that consent requirements induced adverse selection. Borrowers who accepted credit limit increases at compliant lenders were riskier over the subsequent two years than borrowers whose increases were applied without consent. The amount past due was 4.6 percent higher, the amount delinquent 4.4 percent higher, and the amount charged off 1.7 percent higher. We interpret these results as evidence of adverse selection. Whatever drives acceptance, whether liquidity needs, anticipated shocks, plans to revolve balances, or present bias (Kuchler & Pagel, 2021), is private information of the borrowers that is correlated with lender losses.

We then study how lenders respond to the regulation and the presence of adverse selection. Compliant lenders reduced the size of credit limit increases by 19 percent, or $514, consistent with loan-size rationing under adverse selection (Jaffee & Russell, 1976). However, the frequency of accepted credit limit increases, a lower bound on limit offers, rose by 0.17 percentage points per month, roughly 10 percent of the pre-CG5 rate. We find that the increase in the frequency of accepted offers is largest shortly after CG5 for newer accounts, consistent with lender learning. Taken together, credit provision at compliant lenders fell by $53 per account per year. These findings are difficult to reconcile with existing models on asymmetric information. In static models, adverse selection leads lenders to ration credit to fewer borrowers (Stiglitz & Weiss, 1981), and in dynamic models of adverse selection trade does not occur repeatedly between one seller and borrower (Janssen & Roy, 2002). Moreover, the dynamic models in this literature assume bargaining between buyer and seller as a feature of the market, and do not study the impact of granting one party the ability to negotiate. The closest quantitative model of credit limit management, in which lenders do not learn from acceptance decisions, predicts that consent sharply reduces the frequency of increases (Bord et al., 2026).

To interpret these patterns, we develop a three-period model of dynamic adverse selection.

In the model, a lender offers credit limit increases to borrowers whose type is the borrower's private information. Low types are more impatient and value credit more (Chatterjee et al., 2023; Meier & Sprenger, 2010), so they are more likely to accept small offers; high types are more likely to decline and wait for larger increases in the future. Because interest rates are fixed and credit is unsecured, the lender cannot screen with menus that trade off interest rates against loan size or collateral (Bester, 1985; Milde & Riley, 1988). The lender varies only the size and timing of its offers, so delay in credit access plays the role of a price. In our model, consent leads the lender to make a smaller first offer and to condition follow-up offers on the borrower's response, raising the number of completed increases while reducing their size, as in the data. Dynamics and learning are essential to our findings: when the lender can make only one offer, it makes larger offers to induce acceptance but fewer offers are completed, reversing both predictions. The decline in size and the rise in frequency are driven by the repeated interactions between lenders and borrowers. Requiring consent also lowers lender profits and, by delaying borrowers' access to credit, lowers the surplus of both borrower types.

Related Literature: Our paper builds on a long literature on asymmetric information in consumer credit. Karlan and Zinman (2009) randomize loan terms to separate selection from moral hazard. Randomized trials of credit card offers reveal similar selection (Agarwal et al., 2010), switching costs and adverse selection help explain pricing in the credit card market (Calem et al., 2006), and borrowers who expect their credit quality to deteriorate select into credit lines (Agarwal et al., 2006). Lenders screen borrowers through loan size, down payments, and maturity (W. Adams et al., 2009; Einav et al., 2012; Hertzberg et al., 2018), and randomized variation in loan prices shows that asymmetric information distorts prices substantially but generates small welfare losses (DeFusco et al., 2022). As with many of these papers, we find evidence of adverse selection, although in our setting it is induced by regulation. Our finding that acceptors are riskier is also consistent with tests of asymmetric information more broadly (Chiappori & Salanié, 2000). Our source of variation differs: rather than varying the terms of an offer, we compare the same instrument with and without the borrower's right to refuse it. This approach also allows us to study how lenders respond to the presence of adverse selection.

We also contribute to the literature on how lenders learn about borrowers. In relationship lending, lenders acquire private information over the course of a relationship (Petersen & Rajan, 1994; Rajan, 1992; Sharpe, 1990), and loan terms increasingly reflect borrower

quality as they learn (Botsch & Vanasco, 2019), consistent with borrowers gaining access to credit via limit increases. Lenders also learn from borrowers' choices: taking up high-cost debt lowers lenders' assessments of creditworthiness (Liberman et al., 2021), incumbent lenders raise limits when borrowers open cards elsewhere (Kovrijnykh et al., 2024), and card issuers send multiple offers to the same consumers to induce self-selection (Han et al., 2015). Issuers that are better informed about their own borrowers lend smaller amounts to riskier borrowers and raise limits over time (C. F. Foley et al., 2020). More broadly, reputation, information sharing among lenders, credit reports, and information technology shape the supply of consumer credit (Athreya et al., 2012; Blattner et al., 2022; Diamond, 1989; Dobbie et al., 2020; Drozd & Serrano-Padial, 2017; Einav et al., 2013; F. Foley et al., 2020; Pagano & Jappelli, 1993). We show that regulation can create a new opportunity for lenders to learn: the borrower's decision to accept or reject an offer can provide useful information to the lender which provides an additional incentive for lenders to offer limit increases.

Our model relates to theories of dynamic screening with interdependent values, in which an uninformed party that cannot commit learns the informed party's type from its responses to repeated offers (Deneckere & Liang, 2006; Evans, 1989; Fuchs & Skrzypacz, 2015; Krähmer & Strausz, 2015; Vincent, 1989). With a divisible good, trade occurs gradually in small increments (Gerardi et al., 2022), and in veto bargaining, a proposer without commitment screens the vetoer over time (Ali et al., 2023). In revolving credit, an incumbent lender's information advantage over its own customers shapes pricing and switching (Hong et al., 2023), and in mortgage markets the timing of loan sales is informative about loan quality, as dynamic signaling predicts (Adelino et al., 2019). Our model is consistent with these settings. Lenders learn about borrowers' types over time, borrowers' credit limits increase over time as lenders offer increases and borrowers accept, and lenders are unable to commit to future increases. Importantly, the introduction of CG5 grants the borrower a veto, which generates sequential screening. Although there is a large theoretical literature, to our knowledge, there are few empirical studies that document the effect of granting a veto under adverse selection.

Finally, we contribute to work on consumer financial regulation (Campbell, 2006; Campbell et al., 2011) and credit limits. Credit limit increases can lead to increased borrowing and risk (Agarwal, Chomsisengphet, Mahoney, & Stroebel, 2018; Aydin, 2022; Gross & Souleles, 2002a, 2002b; Matcham, 2024; Xu, 2023), and banks transmit funding shocks to consumers by cutting limits (Chava et al., 2023). Studies of the U.S. CARD Act show that regulation

changes how lenders extend credit. Fee restrictions reduced borrowing costs (Agarwal et al., 2015), lenders reduced card offers and card holding among nonprime borrowers (Elliehausen & Hannon, 2018; Han et al., 2018), issuers adjusted account management around the Act's implementation (Jambulapati & Stavins, 2014), and new accounts received lower limits and smaller increases (Santucci, 2015). Repricing restrictions affected selection and consumer surplus (Nelson, 2025), and the Act's ability-to-pay rule can account for more than half of the post-2009 decline in revolving credit (Raveendranathan & Stefanidis, 2025). Minimum-payment rules affect repayment and delinquency (Allen et al., 2024; Keys & Wang, 2019). Closest to our work, Bord et al. (2026) develop a quantitative model of credit provision calibrated to U.S. data. They use it to study the effects of implementing a policy similar to CG5 in the U.S. Relative to that paper, we exploit heterogeneous compliance to directly study its effects driven by adverse selection and lenders' response. Importantly, we find that the frequency of increases rises, rather than declines, following the regulation's introduction.

2 Institutional Details

2.1 Canadian Credit Card Market

The Canadian credit card market is dominated by the "Big Five" banks — 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 had 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, 80 percent of U.S. families held at least one card and U.S. consumers made 31 percent of their payments with credit cards (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.[1]

2.2 Credit Limit Increases, 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 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 CBP Regulations (Government of Canada, 2010).

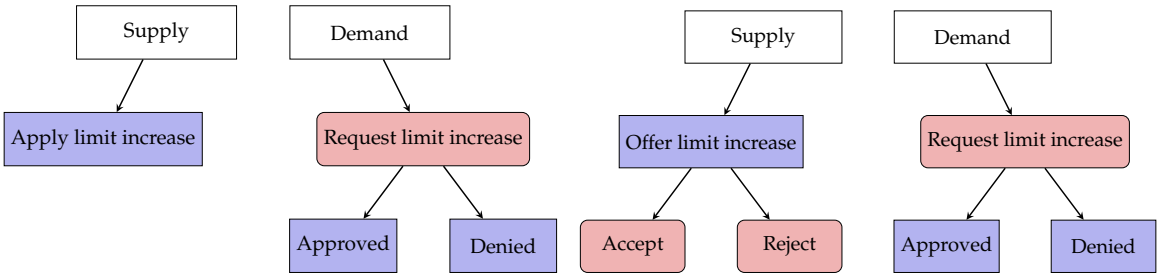
Starting on April 28, 2011, the CG5 guidelines required FRFIs to obtain express consent in *each instance* of a proposed credit limit increase and to do so at the time the increase is offered (Government of Canada, 2010). We define the pre-CG5 period as January 1, 2009 to December 31, 2009 and the post-CG5 period as May 1, 2011 to December 31, 2017 in our data. Due to unclear regulatory guidance from January 2010 to April 2011, we drop that period.

Figure 1 graphically illustrates the changes in borrower decision points after the government published the CG5 guidelines. Prior to CG5, if a bank wished to increase a borrower's

[1] Bord et al. (2026) find that 80 percent of credit card credit limit increases in the U.S. are lender initiated.

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 the borrower's consent before applying it to their account. This change effectively created a new opportunity for borrowers to 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 other borrowers who do not immediately value credit may be more likely to either decline or ignore the request. As a result, borrowers who select into higher credit limits may be riskier than the pool of borrowers who were offered a credit limit increase.

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 Express Consent Regulations in Other Countries

Notably, in the U.S., 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. A number of other jurisdictions have placed more substantial restrictions on credit limit increases. Australia's rules are the most restrictive, prohibiting unsolicited credit limit increase offers altogether (Parliament of Australia, 2011).

Canada's consent requirement lies midway between the more permissive U.S. system and the outright prohibitions on unsolicited offers found in Australia, Singapore, India, Malaysia, and South Africa.[2] By requiring consent without banning unsolicited offers

[2]Singapore bars banks from increasing a borrower's aggregate credit limit unless the borrower has affirma-

altogether, Canada's requirement creates selection concerns that are muted or absent under either the U.S. system, where borrowers do not select into increases, or the stricter regimes, where lenders cannot solicit increases at all.

Other jurisdictions are moving toward similar restrictions: the European Union's recast Consumer Credit Directive prohibits unsolicited granting of credit, including the unilateral increase of a consumer's overdraft, overrunning, or credit card limit, with member states required to transpose the directive by November 2025 and apply it from November 2026 (European Parliament and Council, 2023); Denmark's draft transposing legislation, for instance, was released for public consultation in August 2025 (Plesner, 2025). Since many countries are implementing or actively considering policies restricting unsolicited increases to consumers' credit limits, understanding the effects of these policies on adverse selection and lender behavior is of first-order importance for policymakers weighing similar reforms.

2.4 Violations of CBP and Identification

By notice of violation issued on May 6, 2019, the FCAC alleged that a large Canadian bank committed a violation of the CBP Regulations in relation to credit card limit increases from February 1, 2015 to March 16, 2017. The Agency reviewed the non-compliant bank'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, "[the non-compliant bank]'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).

tively requested the increase in a signed document (Monetary Authority of Singapore, 2013). India's central bank requires card issuers to obtain explicit consent, backed by multi-factor authentication where given digitally, before any credit limit increase (Reserve Bank of India, 2022). Malaysia's central bank likewise prohibits issuers from raising a cardholder's credit limit without consent (Bank Negara Malaysia, 2011), and South Africa's National Credit Act requires written consumer consent in response to a written proposal before a credit limit can be increased, while separately banning negative-option structures under which an increase takes effect automatically unless the consumer declines (Republic of South Africa, 2005).

The FCAC explicitly stated that it did not review materials from the non-compliant bank prior to 2015. In our analysis, we assume that the non-compliant bank only adhered to the full spirit of CG5 starting in 2019, following the FCAC investigation. Whether the non-compliant bank intended to violate CBP or misunderstood the legislation is irrelevant for our analysis. We simply use the fact that the FCAC found it non-compliant with CBP to test the impact of compliance on borrower outcomes and lender behavior.

Given the FCAC's published decision on the non-compliant bank's violations of CBP from February 1, 2015 to March 16, 2017, accounts held at the non-compliant bank were effectively operating as if the express consent provisions of CBP were not in place. As a result, accounts with the non-compliant bank become a natural control group for accounts opened with compliant banks. Using this identification strategy, we study the effects of the express consent provisions of CBP using difference-in-differences regressions in Sections 4 and 5, and conduct robustness checks for our identification strategy in Appendices C, D, and F.

3 Data

3.1 Canadian Consumer Credit Bureau data

We use anonymized TransUnion credit report data[3] 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, any delinquent amount, any amount 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.[4]

We focus on active credit card accounts with credit limits between $250 and $50,000. To compare borrowers at compliant and non-compliant banks, we restrict to accounts from banks in Canada. In total, our sample includes 24,063,547 borrowers and approximately 1.58 billion account-month observations.

[3]To protect the privacy of Canadians, TransUnion did not provide any personal information to the Bank of Canada. The TransUnion dataset was anonymized, meaning it does not include information that identifies individual Canadians, such as names, social insurance numbers or addresses.

[4]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.

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 the consumer. We find that higher existing credit limits and utilization rates increase the probability of receiving a credit limit increase, while account 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.

We study the effect of express consent policies on borrower outcomes, including the amount past due, amount delinquent, amount charged-off, and card utilization. **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 make the minimum payment on a credit card statement by the payment due date.[5] **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 that the lender writes off as a loss on its balance sheets. **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 consider indicators for late payments (positive past-due amount), delinquency (positive delinquent amount), and charge-offs (positive charge-off amount).

3.3 Summary Statistics

3.3.1 Credit Limits vs. New Cards

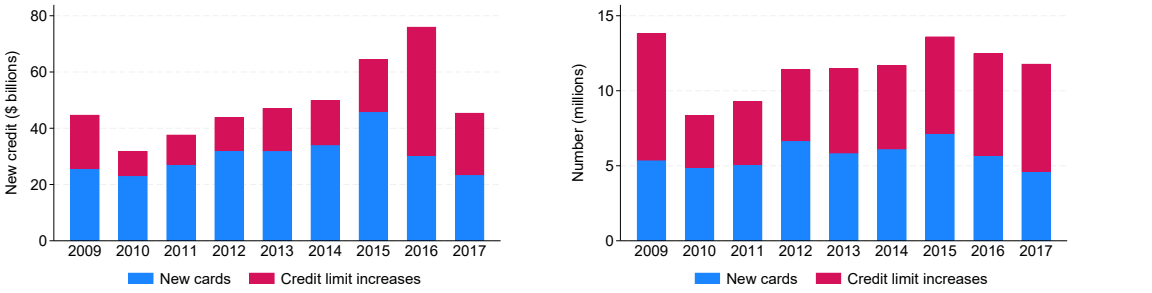
We begin by illustrating the importance of credit limit increases for borrowers' access to credit. In Figure 2, we document the amount of new credit in the Canadian credit market

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

that comes from either new card creation or from credit limit increases on existing cards. From 2009 to 2017, the share of credit derived from credit limit increases is between 30 and 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 there are new credit cards created. Taken together, it is clear that credit limit increases play an important role in borrowers' access to credit.

Figure 2: Extensive and intensive margins of new credit

Notes:



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

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

All graphed series in Figure 2 are computed by the authors using the full credit bureau 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.

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.

In our sample, approximately 21 percent of borrowers have credit cards from both a CBP-compliant and the 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 is similar for both types of institutions, around $3,000 over the whole sample. Utilization is also similar—27 and 24 percent at the 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.[6]

Notably, the non-compliant institution has higher average credit limits, during the pre-CG5

[6]Credit scores in Canada typically range from 300 to 900, as opposed to a maximum of 850 in the U.S.

period than the other institutions. Its average credit limit is around $10,306, whereas CBP-compliant institutions average around $8,113. The median account at the non-compliant institution has a current balance of $2,363, compared to $1,901 at CBP-compliant institutions. Overall, the two 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.

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 the non-compliant bank to test for the presence of increased adverse selection. The key to this test lies in the fact that for compliant lenders, 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 accepted a credit limit increase from compliant lenders, on average, had worse ex post outcomes compared to borrowers who received a credit limit increase without express consent from the non-compliant bank. We take these findings as evidence that the CG5 guidelines increased adverse selection in the Canadian credit market. A primary threat to identification would be if borrowers were selecting cards based on bank compliance; however, given that the results of the FCAC investigation were released after our data period, it is highly unlikely that borrowers were aware of lender compliance or non-compliance when choosing cards.

4.1 Empirical Approach

We examine whether CG5 increased adverse selection for the lenders that complied. We compare several indicators of long-term outcomes: the amount that is past due, the maximum amount that is delinquent, the amount charged-off by the lender, and utilization rate. 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:

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

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 at 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, $\eta_{jy(t)}$ are bank-year fixed effects, and ε_{ijt} are error terms.[7] 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.

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 the non-compliant bank. Further, given that we only use post-CG5 data, the parallel trends assumption requires that 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 lenders', 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 non-compliance from the non-compliant bank throughout May 2011 to the end of our sample, monotonicity, and SUTVA, our estimates can also be interpreted as a local average treatment effect (Imbens & Angrist, 1994).

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

4.2 Results

We focus on borrower outcomes for a 24-month horizon after receiving a credit limit increase. The results for other horizons are similar. Figure **??** 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 in the 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 from periods $t+1$ to $t+24$. 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 a compliant lender is positive and significant. This result is robust across all horizons and to 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 in the amount past due compared to a borrower who receives a credit limit increase from the non-compliant bank. This estimate translates to an average of $6.63 more past due per account, per year, using pre-CG5 statistics.[8]

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 the non-compliant bank. A 4.4 percent increase in the amount delinquent equates to approximately an additional $7.27 delinquent per account, per year, and a 1.7 percent increase in

[8]Summary statistics are reported in Table B.1, Panel B.

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)
Dep. Var Mean	18.77	27.59	26.16	0.258
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.

the amount charged-off is equivalent to approximately an additional $3.20 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 at the non-compliant bank. 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 percentage point increase in their card utilization compared to a borrower who receives a credit limit increase from the non-compliant bank. 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.

Taken together, these results suggest that borrowers who accepted credit limit increases from compliant lenders had worse ex post outcomes compared to borrowers for whom credit limit increases were applied without consent by the non-compliant lender. While credit limit increases can help identify active borrowers and stimulate borrowing activity, they can also lead to larger losses on lender balance sheets. Higher utilization may lead to interest income if a large share of their borrowers are revolvers and *do not default on*

their debt.[9] Thus, we take these results as indicative that CBP-compliant lenders faced increased adverse selection when providing credit limit increases. However, being able to identify which borrowers were active card users that are not likely to default help increase interest income, and this can offset any losses. Financial institutions, therefore, would like to identify which borrowers are profitable (high utilization but with repayment) and which are not (defaulters).

4.3 Adverse Selection vs. Moral Hazard

A natural concern is that the worse outcomes we document reflect moral hazard rather than adverse selection: a credit limit increase might mechanically induce additional borrowing and default regardless of who receives it. Our research design addresses this directly. In both compliance groups, borrowers receive credit limit increases; the groups differ only in whether the increase required express consent. Any causal effect of additional credit on subsequent borrowing and default—the moral hazard channel—is therefore present both for acceptors at compliant lenders and for borrowers who received automatic increases at the non-compliant bank, and is absorbed by the credit-limit-increase main effect β_1. The interaction β_3 isolates the incremental effect of having selected into the increase, holding the receipt of additional credit fixed. A positive β_3 thus reflects the composition of borrowers who opt in, not the behavioral response to increased credit limits.

5 Effect of CG5 Guidelines on Lender Behavior

In this section, we use a difference-in-differences approach to study how lenders responded to CG5. Given increased adverse selection, compliant lenders may choose to provide less credit to borrowers post-CG5 compared to the non-compliant lender. We 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 measure of the size of credit limit increases, respectively. We find that compliant lenders decreased the size of credit limit increases post-CG5, but offered substantially more credit limit increases, leading to an increase in the frequency of received credit limit increases even though some borrowers chose to reject offered increases.

[9] 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 U.S., at around 27 percent of Canadians during 2013 to 2022 (Henry et al., 2024). The Federal Reserve estimates the share of revolvers in the U.S. to be around 45 percent (R. Adams et al., 2022).

5.1 Empirical Approach

We examine whether CG5 increased the frequency and magnitude of credit limit increases given by lenders. We compare two outcome variables across compliant and non-compliant lenders: an indicator of a credit limit increase and the size of the credit limit increase, conditional on having received one. 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. We estimate equations of the following form, controlling for time-varying borrower characteristics at time t:

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

where $Y_{ij,t+1}$ are the outcome variables of interest, an indicator denoting that a borrower i with credit card account j received a credit limit increase in $t+1$ and the amount of a credit limit increase, conditional on receiving a credit limit increase 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 **??** 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 the CG5 guidelines. We see that there is evidence that parallel trends generally hold between compliant and non-compliant lenders, although the probability of a credit limit increase shows that the non-compliant lender appeared to preempt April 2011 by significantly raising its rate of credit limit increases in March 2011.

Table 2 reports the coefficients of interest for each outcome variable. Columns (1) and (2)

report the estimated coefficients of interest using an indicator that a borrower received a credit limit increase 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 controlling for 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 percentage points, per account, per month. Given that these are observed credit limit increases, this estimate serves as a lower bound for lender offers of limit increases. Linearly annualized, this aggregates to approximately a 2.05 percentage points increase in the probability of receiving a credit limit increase every year.

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 $\times$ 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)
Dep. Var Mean	0.012	0.012	3012.52	3012.52
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.

While the probability of a credit limit increase rose for compliant institutions, columns (3) 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 accepted more frequent credit limit increases than borrowers who had cards with the non-compliant bank, who had credit limit increases applied without approval. The average size of credit limit increases, however, decreased in response to CG5. The overall effect is a decrease in credit provision of $53 per year, per account.

We provide additional evidence of the learning channel in Table 3. Appendix D reports Tables D.3 and D.4, which report the full tables of estimated coefficients. In these tables, we run regression (2) with an additional interaction with account age. Columns (1) and (2) report the estimated coefficient using the probability of credit limit increase in $t + 1$ as the dependent variable, and columns (3) and (4) use the amount of the credit limit increase, conditional on receiving a credit limit increase.

Columns (1) and (3) run the regression using the sample from 2009 to 2012, to examine the effects of the CG5 guidelines on lender offers of credit limit increases a year out from the beginning of the policy. We see the learning incentive from the negative coefficient on the interaction term of CG5 $\times$ CBP Compliant $\times$ Age of account, controlling for borrower fixed effects, for the probability of a credit limit increase. There is no statistically significant effect for the size of the credit limit. These effects suggest that, following the implementation of the CG5 guidelines, compliant lenders gave more frequent credit limit increases of a similar size to borrowers with whom they had shorter relationships and about whom they had less information.

Comparing these results to the estimated coefficients in columns (2) and (4), which ran the same regression on a longer sample from 2009 to 2017, we see that the effect on the probability of a credit limit increase flips to a positive coefficient, while the effect on the size of a credit limit increase becomes negative. These results on a longer horizon suggest that the lender sends offers first to the consumers it has the least information about. From these credit limit offers, they observe who accepts, and how they use the additional limits. In the longer horizon, they pivot offers to borrowers with whom they know are good types

and have longer relationships, giving them smaller credit limit increases more frequently. We interpret these results to be consistent with models of dynamic adverse selection, in which uninformed parties learn informed agents' types from their responses to repeated offers (Deneckere & Liang, 2006; Evans, 1989; Fuchs & Skrzypacz, 2015; Vincent, 1989). These models predict that in earlier periods, lower types accept offers, so that the pool of agents who have not yet accepted improves the longer offers continue (Tirole, 2016). With a divisible good such as a credit limit, this screening takes place gradually, through many small increments (Gerardi et al., 2022). These empirical findings appear to be consistent with this story.

Table 3: Effect of CG5 on Credit Limit Increases Given by Firms, Interacted with Account Age: 1-Year vs. 6-Year Effects

	Prob. credit limit increase		Amt. credit limit increase	
	2009–2012	2009–2017	2009–2012	2009–2017
	(1)	(2)	(3)	(4)
CG5 × CBP compliant	0.0102***	-0.00273***	-0.197**	-0.0283*
	(0.000336)	(0.000171)	(0.0765)	(0.0125)
CG5 × CBP compliant × Age of account	-0.000590***	0.000858***	0.0200	-0.0244***
	(0.0000619)	(0.0000328)	(0.0152)	(0.00259)
Dep. Var. Mean	0.012	0.012	3012.52	3012.52
Borrower-level controls	Yes	Yes	Yes	Yes
Account-level controls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
FSA FE	Yes	Yes	Yes	Yes
Borrower FE	Yes	Yes	Yes	Yes
R-squared	0.153	0.0409	0.802	0.731
N	110,810,359	1,087,956,877	427,047	10,114,430

Notes: The dependent variable for columns (1)–(2) is the probability of a credit limit increase in $t+1$. The dependent variable for columns (3)–(4) is the amount of a credit limit increase in $t+1$, conditional on a credit limit increase. Columns (1) and (3) report the effects on lender credit limit offers 1 year after the introduction of the CG5 guidelines. Columns (2) and (4) report effects 6 years after the CG5 guidelines. Standard errors are in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. All non-indicator variables are inverse-hyperbolic-sine-transformed, preserving zero values in dollar variables.

5.3 Potential Sources of Lender Learning

The combination of more frequent but smaller credit limit increases is difficult to reconcile with adverse selection alone. Facing a riskier pool of acceptors, a lender concerned only with selection would shrink its offers, consistent with Jaffee and Russell (1976) and with the decline in size we document. But such a lender would have little reason to offer limit increases *more* often. A worse pool, if anything, should discourage offers. We argue that the rise in frequency reflects a second force: under express consent, borrowers' decisions to accept or reject offers are an informative signal, giving lenders an incentive to make offers in order to learn about their borrowers.

A borrower's willingness to accept a credit limit increase may be informative about how that borrower would behave with additional credit. Borrowers who value liquidity highly—because they are impatient, expect to revolve balances, or anticipate financial pressure—are precisely those most likely to accept an offered increase, and also those who go on to increase utilization and become more delinquent, as the results in Section 4 show. Acceptance therefore bundles information about both the demand for credit and the risk it carries. By offering a small increase and observing whether the borrower takes it up, the lender runs a low-cost experiment that reveals where the borrower sits on this demand-and-risk spectrum before committing to a larger limit. In the language of our model, the acceptance decision is a noisy signal of the borrower's persistent type, which jointly determines the value of credit to the borrower and the profitability of extending it.

6 Stylized Model

To interpret our results and evaluate the effects of the CG5 guidelines on CBP-compliant lenders, we develop a stylized dynamic model of credit card lending with adverse selection and lender learning. There is a single lender that chooses credit limits to maximize profits. The lender faces incomplete information; the type of the borrower — high or low — is private information of the borrower. High-type borrowers are more patient, as reflected by a higher discount factor, and have a lower value of credit limit increases. We assume the lender wants to supply credit to all types and that the lender maximizes profit by giving high-type borrowers large credit limits and low-type borrowers low credit limits. To deal with incomplete information, the lender assigns a type score, as in Chatterjee et al. (2023), which measures the probability the borrower is a high-type. The lender also faces a limited commitment problem — the lender cannot commit to future actions when making choices today. The model has three periods. In the first period, the lender chooses whether to offer a credit limit increase, and if so, how large an increase to offer. The borrower then decides whether to accept or reject the offer. In the second period, the lender observes the borrower's decision to accept or reject, updates their beliefs about the borrower's type based on their decision, and decides again whether to offer another credit limit increase, and if so, how large an increase to offer. Once again, the borrower decides whether to accept or reject an offered credit limit increase. In the final period, payoffs are realized based on the accumulated credit limit.

To quantify the effects of the policy change, we evaluate the model in two settings: one where credit limit increases are applied without consent to borrowers (pre-CG5) and one where borrowers choose to accept or decline a credit limit increase (post-CG5). Adverse selection arises in the post-CG5 period because borrowers who are most likely to accept a credit limit increase are low types, for whom the lender would prefer to provide the lower credit limits. However, this selection is informative for the lender, and so in the second period, the lender can use the information it learned about the borrower's private type when offering another credit limit increase. In the pre-CG5 setting, since credit limits are applied without consent, the lender does not face adverse selection nor can the lender learn about borrowers' types.

The model replicates the empirical findings. We find that, post-CG5, credit limit increases occur more frequently and the average size of credit limit increases declines. We then run a counterfactual to study the role of learning and relationships between borrowers and lenders. In that counterfactual, the model fails to replicate the empirical findings — the frequency of credit limit increases declines while the size of credit limit increases rises. This counterfactual illustrates the importance of repeated interactions between borrowers and lenders in rationalizing the data.

We also use our model to evaluate the effect of CG5 on borrower welfare and lender profits. Our model suggests that the CG5 guidelines decreased lender profit, due to adverse selection. We find that borrower welfare also declines, as borrowers both end up with lower final credit limits and wait longer to get access to credit.

6.1 Model Environment and Timing

There is one lender and a mass of borrowers. The model lasts three periods, indexed $t \in \{1, 2, 3\}$. Borrowers are defined by a persistent type, $\theta \in \{H, L\}$, their credit limit, l, and their credit score, μ. Credit scores denote the probability that a borrower is a high-type (i.e. $\mu = Pr(\theta = H)$). To capture adverse selection concerns, the lender cannot directly observe the borrower's type, but has to learn about this hidden type from the borrower's actions. The lender updates the borrower's type score via Bayes' rule.

Period 1. The borrower begins the period with a private type θ, an initial type score μ_0, and an initial credit limit l_0. The lender makes a take-it-or-leave-it credit limit increase offer of $\delta_1 \geq 0$. Each borrower chooses whether to accept or reject the offer given their Type

I Extreme Value (T1EV) shocks, denoted $\epsilon_{1,A}$ and $\epsilon_{1,R}$. The decision to accept or reject is given by $a_1 \in \{1, 0\}$.

Period 2. The lender observes the period-1 acceptance decision, and updates the borrower's type score $\mu_0 \to \mu_1(a_1)$ via Bayes' rule. The lender then decides whether to make a new credit limit increase offer of $\delta_2(a_1) \geq 0$. Importantly, the lender cannot commit to offers in the second period in the first period. The lender still cannot directly observe the borrower's type, but can condition the offer on the borrower's previous acceptance decision. Borrowers once again receive T1EV shocks to the value of accepting or rejecting the offer, denoted $\epsilon_{2,A}$ and $\epsilon_{2,R}$, and choose whether to accept or reject the limit increase.

Period 3. Terminal payoffs are realized based on the accumulated credit limit.

We solve the model in two settings. In the pre-CG5 setting, all offered credit limit increases are applied without consent. In the post-CG5 setting, borrowers choose whether to accept or reject any offered credit limit increase.

6.2 Borrower's Problem

A borrower begins the first period with an initial credit limit l_0, an initial credit score, μ_0, and a persistent type θ. Borrowers are differentiated in two ways. First, high-type borrowers are more patient, i.e. $\beta_H > \beta_L$. Second, we assume that the value of credit for a borrower of type θ, denoted v_θ, is higher for low-type borrowers, $v_H < v_L$, since high-type borrowers are more patient and hence less likely to borrow. As a result, low types value credit limit increases more.

We can write the borrower's period 1 payoffs as a function of their initial credit limit l_0, their initial type score μ_0, an offered increase, $\delta_1(l_0, \mu_0)$, and their type, θ, as:

$$u_1(l_0, \mu_0, \theta, \epsilon_1, \delta_1, a_1) = \begin{cases} v_\theta\big(l_0 + \delta_1(l_0, \mu_0)\big) + \epsilon_{1,A} - \kappa_c & \text{if } a_1 = 1 \\ v_\theta\, l_0 + \epsilon_{1,R} & \text{if } a_1 = 0 \end{cases}, \tag{3}$$

where $\kappa_c > 0$ is the fixed utility cost of changing credit limits and $\epsilon_{1,A}$ and $\epsilon_{1,R}$ are T1EV shocks.

In period 2, payoffs are:

$$u_2(l_1, \mu_1, \theta, \epsilon_2, \delta_2, a_2) = \begin{cases} v_\theta(l_1 + \delta_2(l_1, \mu_1)) + \epsilon_{2,A} - \kappa_c & \text{if } a_2 = 1 \\ v_\theta l_1 + \epsilon_{2,R} & \text{if } a_2 = 0 \end{cases}. \tag{4}$$

In the final period, payoffs are:

$$u_3(l_2, \theta) = v_\theta l_2. \tag{5}$$

For simplicity, we write the borrower's continuation value after accepting the first period offer as:

$$V^A_{b,2}(l_1, \mu^A_1, \theta, a_2) = u_2(l_1, \mu^A_1, \theta, \epsilon_2, \delta^A_2, a_2(\epsilon_2)) + \beta_\theta u_3(l_1 + \delta^A_2(a_2), \theta). \tag{6}$$

We write the borrower's continuation value after rejecting the first period offer as:

$$V^R_{b,2}(l_1, \mu^R_1, \theta, a_2) = u_2(l_1, \mu^R_1, \theta, \epsilon_2, \delta^R_2, a_2) + \beta_\theta u_3(l_1 + \delta^R_2(a_2), \theta). \tag{7}$$

In period 2, the borrower decides whether to accept or reject based on which option provides higher utility. However, in period 1, the borrower recognizes that their decision may be informative about their type, so they consider how that decision affects future credit limit offers (whether they are offered $\delta^A_2(l_1, \mu^A_1)$ or $\delta^R_2(l_0, \mu^R_1)$). Taken together, the borrower's value function can be written as:

$$V_b(l_0, \mu_0, \theta) = E_{\epsilon_1} \max \Bigg\{ \underbrace{v_\theta(l_0 + \delta_1) - \kappa_c + \epsilon_{1,A} + \beta_\theta E_{\epsilon_2}\left[V^A_{b,2}(l_0 + \delta_1, \mu^A_1, \theta, a_2(\epsilon_2)\right\}\Big]}_{\text{Accept First Offer}},$$

$$\underbrace{v_\theta l_0 + \epsilon_{1,R} + \beta_\theta E_{\epsilon_2}\left[V^R_{b,2}(l_0, \mu^R_1, \theta, a_2(\epsilon_2)\right]}_{\text{Reject First Offer}} \Bigg\}. \tag{8}$$

6.3 Lender's Problem

We assume that there is a single lender. Interest rates are exogenously given, so the only choice for the lender is the borrower's credit limit.[10]

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

We assume a simple quadratic function for the lender's terminal profit, given by:

$$\pi(l, \theta) = \pi_1 \, l - \pi_{2,\theta} \, l^2, \tag{9}$$

with $\pi_1, \pi_{2,\theta} > 0$ so that there is an interior solution. The first term captures the increase in spending induced by an increase in a borrower's credit limit as in Gross and Souleles (2002a) and Aydin (2022). The second term captures the increase in the probability of default induced by an increase in a borrower's credit limit. We assume $\pi_{2,H} < \pi_{2,L}$, to capture that the probability of default rises more rapidly for low-type borrowers as in W. Adams et al. (2009). For a known borrower of type θ, the optimal credit limit is given by: $l^*(\theta) = \frac{\pi_1}{2\pi_{2,\theta}}$. As a result of our assumptions, $l^*(H) > l^*(L)$, so that the lender prefers to provide high limits to high-type borrowers. Because the optimal limits differ for the two types of borrowers, the lender has an incentive to learn about borrowers' types.

The lender first chooses δ_1, given prior belief $\mu_0 = \Pr(\theta = H)$ and initial credit limit l_0. The lender's problem can be written as:

$$\begin{aligned} V_{l,1}(l_0, \mu_0) = \max_{\delta_1 \geq 0} \quad & - \kappa_l \cdot \mathbf{1}[\delta_1 > 0] \\ & + \sum_{\theta} \mu_0(\theta) \left[\alpha_1^*(\theta, \delta_1) \, V_{l,2}^A\left(l_0 + \delta_1, \mu_1^A\right) + \left(1 - \alpha_1^*(\theta, \delta_1)\right) V_{l,2}^R\left(l_0, \mu_1^R\right) \right], \end{aligned} \tag{10}$$

where β_l is the lender discount factor, κ_l is the cost of offering a credit limit increase, $\alpha_1^*(\theta, \delta_1)$ denotes the probability a borrower of type θ accepts the offered credit limit increase of size δ_1, and $V_{l,2}^A(l_0 + \delta_1, \mu_1^A)$ and $V_{l,2}^R(l_0, \mu_1^R)$ denote the value to the lender in period two of a borrower who accepted or rejected a credit limit increase, respectively.

Based on the borrower's decision to accept or reject, the lender's beliefs are updated via Bayes' rule:

$$\mu_1^A = \Pr(\theta = H \mid a_1 = 1) = \frac{\mu_0 \cdot \alpha_1(H, \delta_1)}{\mu_0 \cdot \alpha_1(H, \delta_1) + (1 - \mu_0) \cdot \alpha_1(L, \delta_1)} \tag{11}$$

and

$$\mu_1^R = \Pr(\theta = H \mid a_1 = 0) = \frac{\mu_0(1 - \alpha_1(H, \delta_1))}{\mu_0(1 - \alpha_1(H, \delta_1)) + (1 - \mu_0)(1 - \alpha_1(L, \delta_1))}. \tag{12}$$

In period 2, after observing a_1, the lender chooses $\delta_2(a_1)$ given updated belief $\mu_1(a_1)$:

$$V_{l,2}(l_1, \mu_1) = \max_{\delta_2 \geq 0} \quad -\kappa_l \cdot \mathbf{1}[\delta_2 > 0] + \beta_l \sum_{\theta} \mu_1(\theta) \Big[\alpha_2^*(\theta)\, \pi(l_1 + \delta_2, \theta) + \big(1 - \alpha_2^*(\theta)\big)\, \pi(l_1, \theta) \Big]. \tag{13}$$

In the pre-CG5 setting, increases are applied without consent, hence $\alpha_1(H, \delta_1) = \alpha_1(L, \delta_1) = 1$. As a result, the lender cannot learn from borrowers' decisions, and $\mu_1 = \mu_0$. In the post-CG5 setting, increases require consent, so in a semi-separating equilibrium $\alpha_1(H, \delta_1) \neq \alpha_1(L, \delta_1)$. As a result, the lender can offer credit limit increases to sort borrowers and learn about their type. In our calibration, low types are more likely to accept offered increases because they value higher credit limits more and are more impatient; as a result, they are willing to accept credit limit increases today that more patient high types may reject in hopes of higher limits in the future. Low types accepting more frequently generates adverse selection for the lender when offering credit limit increases, as they prefer to give low credit limits to low types. However, given type persistence and the long-term relationships between the lender and the borrower, the lender may value learning about the borrower's type and may offer credit limit increases to learn despite the presence of adverse selection.

6.4 Equilibrium

A Perfect Bayesian Equilibrium is a set of borrower value functions $\{V_{b,\theta}\}$, a set of lender value functions $\{V_l\}$, borrower policy functions, $\{a_1, a_2\}$, lender policy functions, $\{\delta_1, \delta_2^A, \delta_2^R\}$, and type scoring functions, $\{\mu(a_1), \mu(a_2)\}$, such that:

1. The borrower's value function $V_{b,\theta}$ solves (8).
2. The borrower's policy functions $\{a_1, a_2\}$ solve (8).
3. The lender's value function V_l solves (10).
4. The lender's policy functions $\{\delta_1, \delta_2^A, \delta_2^R\}$ solve (10).
5. The type scoring functions $\{\mu(a_1), \mu(a_2)\}$ are consistent with Bayes' rule as outlined in Equations (11) and (12).

If there are multiple equilibria, we select the lender-preferred equilibrium.

6.5 Model Solution: Period Two

Solving the model via backward induction, we first characterize the optimal borrower and lender choices in the second period.

In the second period, the borrower with an initial limit l_1 decides to accept an offer of δ_2 if

$$(1+\beta_\theta)\, v_\theta\, (l_1+\delta_2) + \epsilon_{2,A} - \kappa_c \;\geq\; (1+\beta_\theta)\, v_\theta\, l_1 + \epsilon_{2,R}, \tag{14}$$

which simplifies to

$$(1+\beta_\theta)\, v_\theta\, \delta_2 + \epsilon_{2,A} \geq \kappa_c + \epsilon_{2,R}. \tag{15}$$

Low types have a higher v_θ, while high types have a higher discount factor β_θ, so it is unclear which type is more likely to accept increases in the second period. Based on the T1EV shocks, the second-period acceptance rate of type θ is given by:

$$\alpha_2(\theta, \delta_2) = \frac{e^{\Delta_2(\theta)/\beta_s}}{1+e^{\Delta_2(\theta)/\beta_s}}, \qquad \Delta_2(\theta) \equiv (1+\beta_\theta)\, v_\theta\, \delta_2 - \kappa_c, \tag{16}$$

where $\beta_s = \sigma\sqrt{6}/\pi$ and σ is the standard deviation of the T1EV shocks.

The lender solves two separate optimization problems — one for each possible period-1 outcome — taking the borrower's probability of acceptance as given. If the borrower accepted in the previous period, $a_1 = 1$, the lender faces belief μ_1^A and a borrower with credit limit $l_1 = l_0 + \delta_1$, and chooses:

$$\begin{aligned}\delta_2^A = \arg\max_{\delta_2^A \geq 0}\; & -\kappa_l \cdot \mathbf{1}[\delta_2^A > 0] \\ & + \sum_\theta \mu_1^A(\theta)\beta_l \left[\alpha_2^*(\theta, \delta_2^A)\; \pi\Big(l_1 + \delta_2^A, \theta\Big) + \big(1 - \alpha_2^*(\theta, \delta_2^A)\big)\; \pi(l_1, \theta)\right].\end{aligned} \tag{17}$$

Analogously, if the borrower rejected in the previous period, $a_1 = 0$, the lender faces belief μ_1^R and a borrower with credit limit l_0, and chooses:

$$\begin{aligned}\delta_2^R = \arg\max_{\delta_2^R \geq 0}\; & -\kappa_l \cdot \mathbf{1}[\delta_2^R > 0] \\ & + \sum_\theta \mu_1^R(\theta)\beta_l \left[\alpha_2^*(\theta, \delta_2^R)\; \pi(l_0 + \delta_2^R, \theta) + \big(1 - \alpha_2^*(\theta, \delta_2^R)\big)\; \pi(l_0, \theta)\right].\end{aligned} \tag{18}$$

In a pooling equilibrium, $\mu_1^A = \mu_1^R$, and the lender does not learn about borrowers' types. In a semi-separating equilibrium, where types accept with different probabilities, $\mu_1^A \neq \mu_1^R$, and the lender may choose different second-period offers depending on the information it learned in the first period.

In the second period, the lender's optimal credit limit increase solves:

$$\sum_{\theta} \mu_1^{a_1}(\theta) \underbrace{[\alpha_2^*(\theta, \delta_2) \frac{\partial \pi(l_1 + \delta_2, \theta)}{\partial \delta_2}}_{\text{Adverse Selection}} + \underbrace{\frac{\partial \alpha_2^*(\theta, \delta_2)}{\partial \delta_2} [\pi(l_1 + \delta_2, \theta) - \pi(l_1, \theta)]]}_{\text{Induce Acceptance}} = 0. \tag{19}$$

In the pre-CG5 case, where consumers always accept credit limit increases, the optimal limit increase is given by:

$$\sum_{\theta} \mu_1^{a_1}(\theta) \frac{\partial \pi(l_1 + \delta_2, \theta)}{\partial \delta_2} = 0. \tag{20}$$

Post-CG5, the lender deviates from that benchmark for two important reasons. First, adverse selection arises because $\alpha_2^*(\theta, \delta_2)$ may differ by θ. If so, then the lender has to account for who may accept, which may lead to an undersupply of credit. If $\alpha_2^*(L, \delta_2) > \alpha_2^*(H, \delta_2)$, then uptake will be primarily done by low types, for whom lower credit limits are optimal. Second, the lender wants to induce borrowers to accept the increase, so it considers how offering a larger increase may lead to greater acceptance rates. This effect depends on how much an increase in offered limits affects both acceptance probability for each type and the change in profit from acceptance. This may lead to an oversupply of credit relative to the pre-CG5 case.

6.6 Model Solution: Period One

A borrower of type θ accepts the period-1 offer δ_1 if and only if the payoff from accepting — which leads to the acceptance branch of the period-2 subgame — exceeds the payoff from rejecting — which leads to the rejection branch:

$$a_1^*(\theta) = \mathbf{1}\Big[u_1(l_0, \mu_0, \theta, \epsilon_1, \delta_1, 1) + \beta_\theta V_{b,2}^A \;\geq\; u_1(l_0, \mu_0, \theta, \epsilon_1, \delta_1, 0) + \beta_\theta V_{b,2}^R\Big], \tag{21}$$

where $V_{b,2}^A$ and $V_{b,2}^R$ are the borrower's continuation values from the period-2 subgame following acceptance and rejection, respectively.

Substituting in the payoff functions, acceptance in period 1 requires:

$$v_\theta(l_0 + \delta_1) + \epsilon_{1,A} - \kappa_c + \beta_\theta V^A_{b,2}(\theta) \;\geq\; v_\theta\, l_0 + \epsilon_{1,R} + \beta_\theta V^R_{b,2}(\theta), \tag{22}$$

which simplifies to:

$$v_\theta\, \delta_1 + \epsilon_{1,A} - \epsilon_{1,R} - \kappa_c \;\geq\; \beta_\theta \Big[V^R_{b,2}(l_0, \mu^R_1, \theta) - V^A_{b,2}(l_1, \mu^A_1, \theta) \Big]. \tag{23}$$

The left-hand side is the *static gain* from accepting. The right-hand side is the *strategic option value of rejection*. The benefit of rejecting is that by rejecting the borrower can signal they are a high type and hence the lender may make a larger subsequent offer.

Two main forces determine which type of borrowers is more likely to accept or reject the initial offer. First, v_θ is large for low types, so low types have a larger static gain from accepting any given δ_1. Second, if $\delta^R_2 > \delta^A_2 + \delta_1$, the borrower can receive a higher limit at the end of the game by rejecting an offer today. Because low types have a smaller discount factor, they value this future benefit less than high types. As a result, high types may strategically reject offered increases to signal their type in order to get even larger increases in the future.

Given the T1EV shocks, the first-period acceptance rate of type θ is given by:

$$\alpha_1(\theta, \delta_1) \;=\; \frac{e^{\Delta(\theta)/\beta_s}}{1 + e^{\Delta(\theta)/\beta_s}}, \qquad \Delta(\theta) \equiv v_\theta\, \delta_1 - \kappa_c - \beta_\theta \Big[V^R_{b,2}(l_0, \mu^R_1, \theta) - V^A_{b,2}(l_1, \mu^A_1, \theta) \Big], \tag{24}$$

where $\beta_s = \sigma\sqrt{6}/\pi$. As σ increases, the standard deviation of shocks increases and the borrower's decision becomes less informative of their type. The acceptance decision also depends on δ_1. Therefore, the posterior beliefs of the lender also depend on δ_1. Hence, lenders can design the initial offer, δ_1, to try to separate borrowers by type. The posterior beliefs are given by:

$$\mu^A_1(\delta_1) = \frac{\mu_0\, \alpha_1(H, \delta_1)}{\mu_0\, \alpha_1(H, \delta_1) + (1 - \mu_0)\, \alpha_1(L, \delta_1)} \tag{25}$$

and

$$\mu_1^R(\delta_1) = \frac{\mu_0 \left(1 - \alpha_1(H, \delta_1)\right)}{\mu_0 \left(1 - \alpha_1(H, \delta_1)\right) + \left(1 - \mu_0\right) \left(1 - \alpha_1(L, \delta_1)\right)}. \tag{26}$$

The full period-1 objective is therefore:

$$\begin{aligned} \mathcal{L}(\delta_1) \equiv & -\kappa_l \cdot \mathbf{1}[\delta_1 > 0] \\ & + \sum_\theta \mu_0(\theta)\, \alpha_1^*(\theta, \delta_1)\, V_{l,2}^A\Big(l_0 + \delta_1, \mu_1^A(\delta_1)\Big) \\ & + \sum_\theta \mu_0(\theta)\, \left(1 - \alpha_1^*(\theta, \delta_1)\right) V_{l,2}^R\Big(l_0, \mu_1^R(\delta_1)\Big). \end{aligned} \tag{27}$$

Taking the derivative with respect to δ_1 and applying the chain rule:

$$\begin{aligned} \frac{\partial \mathcal{L}}{\partial \delta_1} = & \underbrace{\sum_\theta \mu_0(\theta)\, \frac{\partial \alpha_1^*(\theta, \delta_1)}{\partial \delta_1} \left[V_{l,2}^A\Big(l_0 + \delta_1, \mu_1^A\Big) - V_{l,2}^R\Big(l_0, \mu_1^R\Big)\right]}_{\text{(i) Extensive Margin}} \\ & + \underbrace{\sum_\theta \mu_0(\theta) \left[\alpha_1^*(\theta, \delta_1)\, \frac{\partial V_{l,2}^A(l_0 + \delta_1, \mu_1^A(\delta_1))}{\partial \delta_1} + (1 - \alpha_1^*(\theta, \delta_1)) \frac{\partial V_{l,2}^R(l_0, \mu_1^R(\delta_1))}{\partial \delta_1}\right]}_{\text{(ii) Intensive Margin}} = 0. \end{aligned} \tag{28}$$

The first term captures the extensive margin. As the lender increases δ_1, it induces new borrowers to accept the offered increase. The value of increasing acceptance depends on the gap between the lender's continuation value of acceptance compared to rejection. If the lender's valuation of acceptance is lower, due to adverse selection, then the lender will undersupply credit.

The second term captures the intensive margin. As the lender increases δ_1, this alters the continuation value both through how borrowers sort ($\mu_1^{a_1}(\delta_1)$) and the direct effect of a higher credit limit. By designing an offer δ_1 that sorts borrowers by type, the lender can improve separation and thereby offer better target credit limit increases in the subsequent period.

Table 4: Model Parameters

Parameter	Notation	Value
***Panel A**: Calibration pre-solution*		
High Type Annual Discount Factor	β_H	0.95
Low Type Annual Discount Factor	β_L	0.80
High Type Value of Credit Limits	v_H	0.125
Low Type Value of Credit Limits	v_L	0.296
Cost of Changing Credit Limits (Firm)	κ_l	0.01
Cost of Changing Credit Limits (Borrower)	κ_c	0.30
Firm Profit Linear Term	π_1	2.50
Firm Profit Quadratic Term (High Types)	$\pi_{2,H}$	0.05
Firm Profit Quadratic Term (Low Types)	$\pi_{2,L}$	0.50
Signal Quality	σ	1.0
***Panel B**: Initial Conditions*		
Initial Credit Score	μ_0	0.10
Initial Credit Limit	l_0	0.50

Notes: Table 4 presents the model parameters. Parameters in Panel A are the fixed parameters, while those in Panel B are the initial condition for which we present model results.

6.7 Parameterization

Table 4 displays the parameterization. We select discount factors so that $\beta_H > \beta_L$ as in Chatterjee et al. (2023). We select values of credit limits so that $v_H < v_L$. We include costs of offering and accepting credit limit increases, κ_l and κ_c, respectively, to capture both the infrequency of credit limit increases and borrowers' decisions to reject offered increases. We choose $\pi_{2,H} < \pi_{2,L}$ to capture the idea that high-type borrowers are less likely to default than low-type borrowers. The greater the gap between these two, the greater the gap in optimal credit limits by type, which increases the lender's incentive to learn. We choose the standard deviation of T1EV shocks to be relatively large, $\sigma = 1.0$, to capture that borrowers accept or reject offered increases for a variety of reasons not captured by the model. Finally, we focus on a setting with low initial credit limits and a low initial type score, because this is an environment where credit limit increases and lender learning are particularly important.

7 Model Results

7.1 Effects of CG5

To evaluate express consent in the framework of the model, we solve the model both pre- and post-CG5. In the pre-CG5 setting, credit limit increases are applied without consent, whereas in the post-CG5 setting, borrowers can choose whether to accept or reject offers. Table 5 presents the results.

Table 5: Equilibrium Outcomes

	Pre-CG5	Post-CG5	Static Post-CG5
Offers			
δ_1	2.2500	1.9700	2.4900
δ_2^A	0.0000	0.2300	0.0000
δ_2^R	0.0000	2.5800	0.0000
Period-1 Acceptance Probabilities			
α_H	1.0000	0.5394	0.6800
α_L	1.0000	0.6518	0.8726
Expected Number of CLIs			
$\theta = H$	1.0000	1.0454	0.6800
$\theta = L$	1.0000	1.2190	0.8726
Overall	1.0000	1.2017	0.8533
Average CLI Size			
$\theta = H$	2.2500	1.7531	2.4900
$\theta = L$	2.2500	1.6967	2.4900
Overall	2.2500	1.7023	2.4900
Average Final Credit Limit			
$\theta = H$	2.7500	2.3327	2.1933
$\theta = L$	2.7500	2.5683	2.6727
Overall	2.7500	2.5447	2.6248
Surplus			
Lender	3.3897	3.1391	2.9663
High type (det.)	0.6805	0.4295	0.5780
Low type (det.)	1.6881	1.2928	1.6705

Note: Table 5 compares results in the "Pre-CG5" setting with those in the "Post-CG5" setting. In the final column, we present results from the "Post-CG5" setting, where the lender can only make one offer.

Pre-CG5, since credit limit increases are applied without consent, the lender does not update its beliefs, $\mu_1^A = \mu_1^R = \mu_0$. As a result, the lender offers limit increases exclusively in period 1. In the post-CG5 case, the lender offers a smaller initial credit limit increase — δ_1 declines from 2.25 to 1.97. This offer induces greater acceptance from low type borrowers — $\alpha_H < \alpha_L$. The lender then offers a small increase to borrowers who accepted (as those are disproportionately low types) and a much larger increase to those who rejected (as those are disproportionately high types). This leads to 20 percent more credit limit increases, despite some borrowers rejecting offered increases. However, the average size of credit limit increases declines by 23 percent. Taken together, credit provision declines for both types of borrowers. Lender surplus declines due to adverse selection — low type borrowers end up with higher average credit limits than high type borrowers. Borrowers' deterministic surplus declines as borrowers gain access to credit later and end up with lower final credit limits.

7.2 The Role of Learning and Dynamics

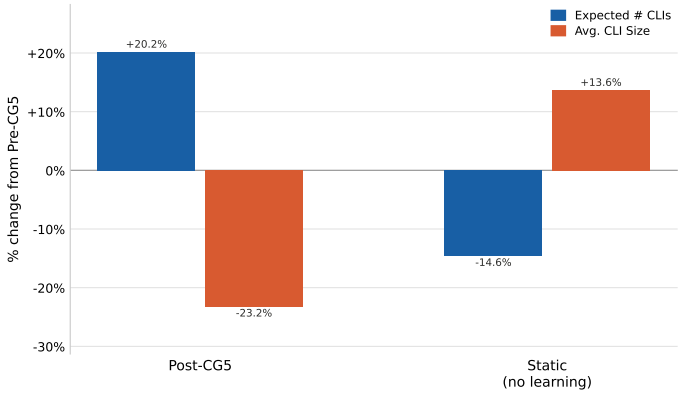
To illustrate the importance of learning and dynamics, we re-solve the model in the post-CG5 setting where the lender can only make one offer to borrowers, rather than making repeated offers. As a result, the lender cannot use the information they gain in the first offer to inform subsequent offers. We present the results of this counterfactual in the final column of Table 5.

This counterfactual leads to higher acceptance probabilities as borrowers have no incentive to strategically reject. Adverse selection remains, as low types accept more frequently than high types. Relative to the post-CG5 baseline, the number of credit limit increases declines, but total credit provision increases slightly due to higher take-up. The lender is worse off because adverse selection cannot be offset by learning in this setting. In fact, low types' credit limits rise compared the post-CG5 baseline, while high type credit limits decline.

Figure 3 summarizes the model-based effect of CG5 on lender behavior. It plots the percent change, relative to the pre-CG5 steady state, the number of credit limit increases and their average size, under both the post-CG5 regime and the no-learning counterfactual. With learning, the post-CG5 regime reproduces our two central empirical findings: more frequent but smaller credit limit increases. Absent learning, the pattern reverses—the lender offers fewer but larger increases, since without the ability to learn from acceptance decisions it can respond to adverse selection only by adjusting the size of offers. Repeated interactions between borrowers and lenders are essential to rationalize the lender behavior we document empirically.

Figure 4 reports the corresponding welfare changes, plotting the percent change relative to the pre-CG5 steady state in lender profits and in high- and low-type borrower surplus. Post-CG5, lender profits fall due to adverse selection and surplus declines for both borrower types because they obtain lower limits and gain access to credit later. Removing learning lowers lender profits further: unable to recoup the cost of adverse selection through sorting, the lender retains less surplus and more accrues to borrowers. Notably, in the static counterfactual the lender offers a higher initial increase than pre-CG5, driven purely by its incentive to induce acceptance rather than to sort.

Figure 3: Model predicted extensive and intensive margins of credit



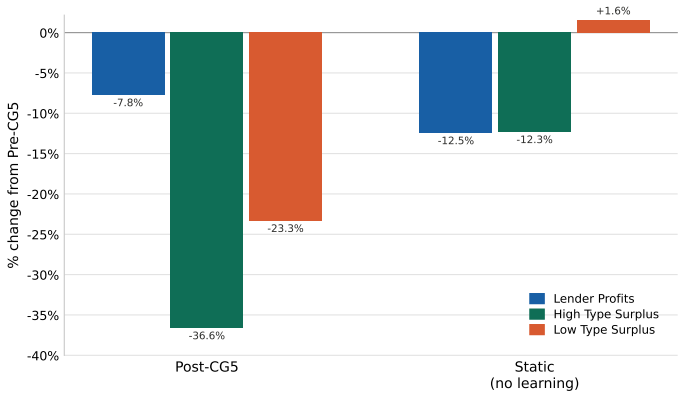
Notes: Figure 3 plots the percent change from the pre-CG5 model-predicted steady state value of the number of credit limit increases (blue) and the average size of credit limit increases (orange), under the post-CG5 regime and under the no-learning regime. With learning, the post-CG5 regime is able to match the empirical facts that the number of credit limit increases are higher while the average size of limit increases are smaller, but the pattern reverses if the lender is unable to learn from borrowers' acceptance/rejection decisions. Learning is important to matching the patterns in our empirical analysis.

7.3 The Role of Signal Quality

Finally, we study how lender and borrower behavior varies with the variance of the Type I EV Shocks. Intuitively, if the shocks are large then the lender cannot learn much about borrower types from their behavior and may choose different ex-ante behavior. However, with large shocks, adverse selection concerns are mitigated as borrowers' decision to accept or reject is driven more by the shocks and less by their type. We present the results graphically in Figure 5.

When σ is small, the decision to accept or reject is informative about type. The lender's beliefs change from $\mu_0 = 0.10$ to $\mu_1^R = 0.30$ for borrowers who reject the initial offer, whereas, when the signal is less informative beliefs only update to $\mu_1^R = 0.12$ if a borrower rejects. As a result, we find that the second period offer conditional on rejection, δ_2^R, declines as the share of low types who reject grows. Importantly, we find lender initial offers, δ_1, are non-monotonic in the signal quality. Initially, as borrower acceptance decisions become less informative, the lender increases the initial offer to induce acceptance of high types. Eventually, the lender reaches a point where the signal is sufficiently uninformative and they reduce the offer substantially to induce sorting of low and high types and offer a small credit limit increase conditional on acceptance as well. We see that when the shocks are small, average credit limits are higher as the lender is better able to identify the high and low types, but when the shocks are large the lender cannot learn about types and borrowers reject offers more frequently, both of which lead to a decline in total credit provision. Finally,

Figure 4: Welfare analysis



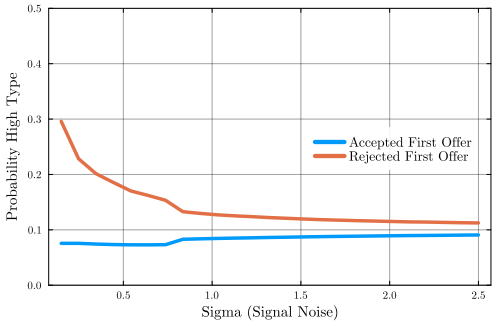
Notes: Figure 4 plots the percent change from the pre-CG5 model-predicted steady state value of lender profits (blue), high-type borrower surplus (green), and low-type borrower surplus (orange), under the post-CG5 regime and under the no-learning regime. Lender profits decrease under the post-CG5 regime due to costs associated with adverse selection. Borrower surplus for both types also decrease due to delayed and/or limited access to credit following the change in policy regimes. Absent learning, lender profits decrease further, to the benefit of the borrowers.

lender surplus is strictly decreasing in the signal noise as the lender values being able to learn about borrower types and unless the signal is incredibly informative, is worse off than in the Pre-CG5 setting.

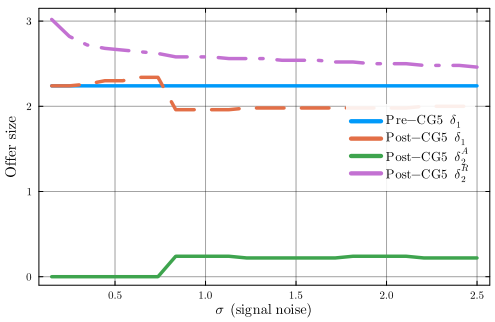
8 Conclusion

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 selection by requiring express consent for credit limit increases. We find the selection was adverse — borrowers who opted into higher limits were riskier than those for whom increases were applied without consent, as measured by higher subsequent past-due amounts, delinquencies, and charge-offs. Yet, compliant lenders' borrowers accepted more frequent credit limit increases, albeit of a 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 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.

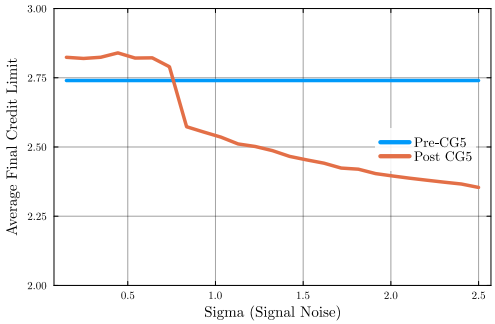
Figure 5: Effects of Varying Signal Quality on Equilibrium Objects



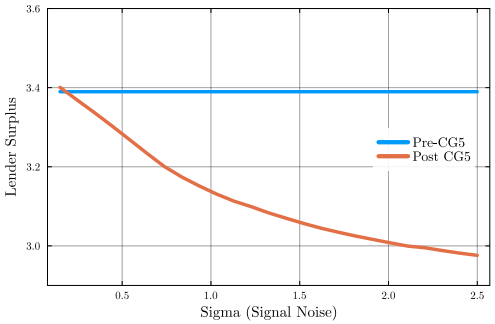
(a) Probability of High Type



(b) Sizes of Credit Limit Increase Offers



(c) Average Final Credit Limit



(d) Lender Surplus

Notes: Figure 5 compares the pre-CG5 baseline to the post-CG5 outcomes, varying the informativeness of the T1EV shocks. Panel (a) plots the probability of being a high type conditional on accepting or rejecting the first period credit limit offer against the informativeness of the signal. Panel (b) plots the changes in the sizes of the offers on the signal informativeness. The blue and orange lines plot the changes in the pre- and post-CG5 regimes on the first period credit limit offer. The green and purple lines plot the changes in the post-CG5 regime on the second period offer, of those who accept and those who reject the first period credit limit offer, respectively. Panel (c) plots the changes in the average credit limit accumulated by the end of the final period in both the pre- and post-CG5 regimes. Panel (d) plots the lender surplus in both the pre- and post-CG5 regimes.

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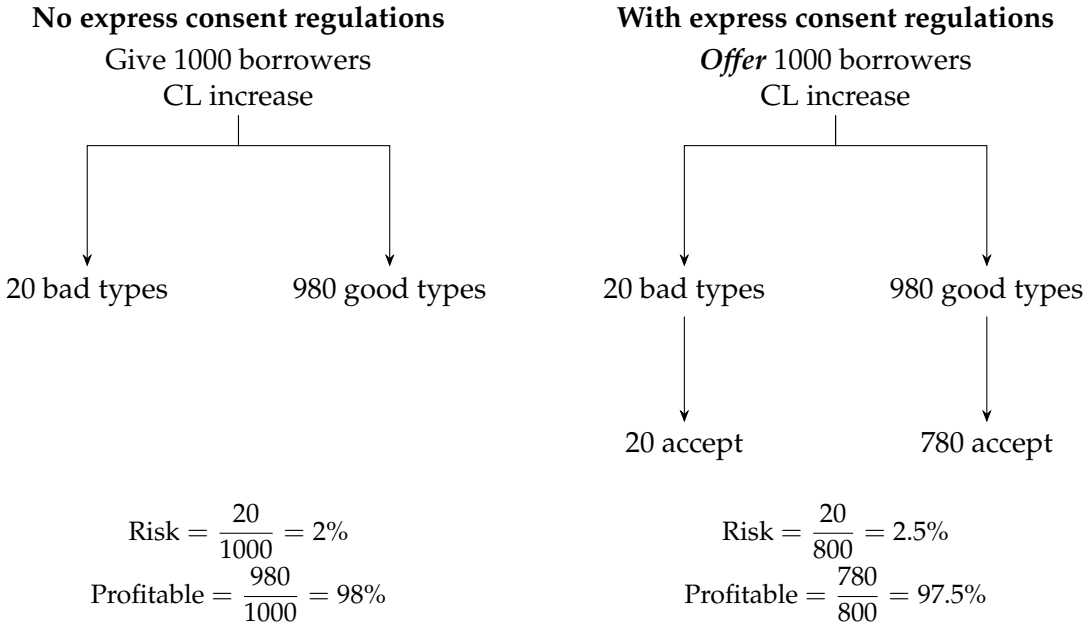
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Appendix A Example of Worsening Risk Profile

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 grant credit limit increases without obtaining consumer consent. Since all consumers who are given credit limit increases have them applied without consent 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 provide 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 the non-compliant bank, 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: *Non-Compliant Bank*							
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: *Compliant Banks*							
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 the non-compliant bank, 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 the non-compliant bank, the institution found by the FCAC to have violated CG5. Panel (b) summarizes the same variables for

CBP-compliant institutions.

Table B.2: Summary statistics by CG5 compliance

	Mean	SD	P1	P25	P50	P75	P99
Panel A: *Non-Compliant Bank*							
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: *Compliant Banks*							
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 the non-compliant bank, 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.

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 average marginal effects, controlling for existing credit limits, utilization rates, credit scores, age of the account, and age of the consumer. We find that higher existing credit limits and utilization rates increase the probability of receiving credit limit increases, while account age and consumer age decrease 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

	Non-compliant bank Pre-CG5		CBP-compliant banks 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 the non-compliant bank. 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 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. 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.2: 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.3: 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.4: 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.5: 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.6: 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.7: 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.8: 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.9: 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.10: 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.11: 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.12: 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 lenders' 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.

Table D.3: Effect of CG5 on credit limit increases given by firms, interacted with account age, 2009-2012

	Prob. credit limit increase		Amt. credit limit increase	
	(1)	(2)	(3)	(4)
CBP compliant	-0.00395***	-0.00196***	0.0723***	0.307***
	(0.000154)	(0.000222)	(0.00585)	(0.0354)
CG5 × CBP compliant	0.00535***	0.0102***	-0.0895***	-0.197**
	(0.000250)	(0.000336)	(0.0219)	(0.0765)
CG5 × Age of account	-0.00127***	-0.000576***	0.0113**	-0.0575***
	(0.0000428)	(0.0000572)	(0.00409)	(0.0137)
CBP compliant × Age of account	0.000181***	-0.000532***	-0.00682***	-0.0697***
	(0.0000297)	(0.0000432)	(0.00117)	(0.00728)
CG5 × CBP compliant × Age of account	0.000211***	-0.000590***	-0.00465	0.0200
	(0.0000465)	(0.0000619)	(0.00467)	(0.0152)
Credit limit ($)	0.00121***	-0.00451***	0.333***	0.195***
	(0.0000119)	(0.0000225)	(0.000816)	(0.00387)
Utilization	0.0308***	0.0355***	-0.397***	-0.194***
	(0.0000548)	(0.0000892)	(0.00233)	(0.00833)
Credit score	0.0498***	0.0385***	0.941***	0.492***
	(0.000126)	(0.000263)	(0.00805)	(0.0323)
Age of account	0.0000215	0.00247***	-0.0545***	0.0663***
	(0.0000279)	(0.0000406)	(0.00104)	(0.00686)
Age of consumer	-0.0118***	0.00900***	0.00417*	0.516***
	(0.0000372)	(0.000254)	(0.00184)	(0.0569)
Dep. Var Mean	0.012	0.012	3012.52	3012.52
Year FE	Yes	Yes	Yes	Yes
FSA FE	Yes	Yes	Yes	Yes
Borrower FE	No	Yes	No	Yes
R-squared	0.00686	0.153	0.200	0.802
N	112,937,745	110,810,359	1,936,482	427,047

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.

Table D.4: Effect of CG5 on credit limit increases given by firms, interacted with account age, 2009-2017

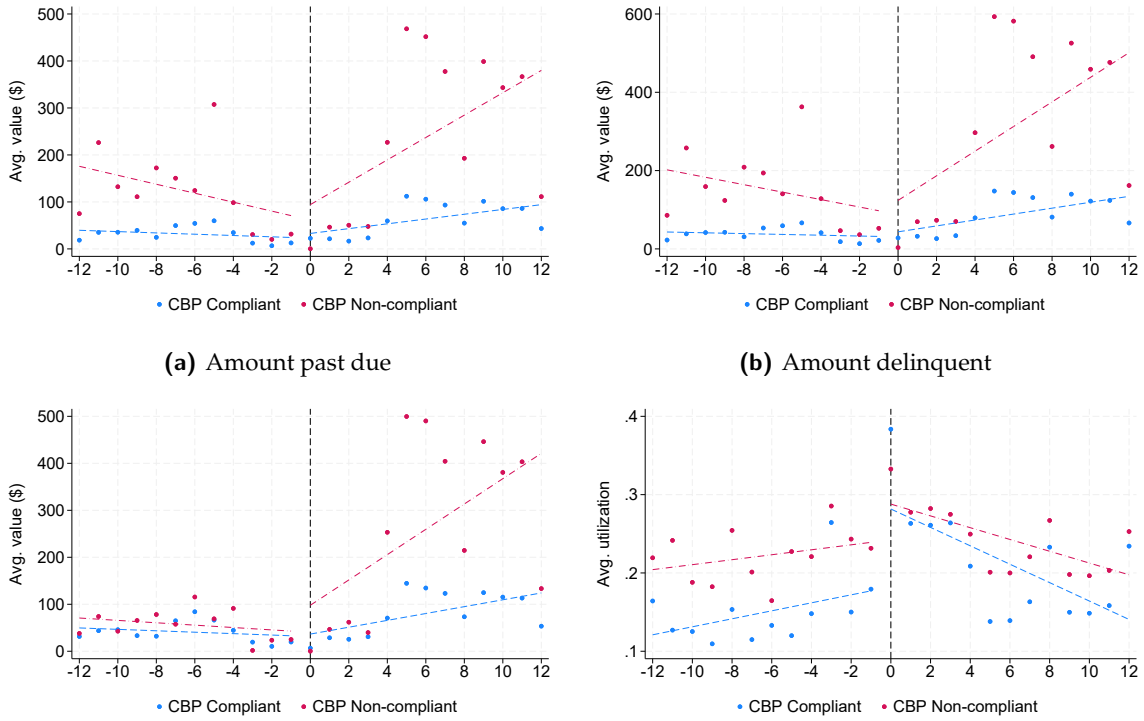
	Prob. credit limit increase		Amt. credit limit increase	
	(1)	(2)	(3)	(4)
CBP compliant	-0.00455***	-0.000661***	0.0683***	0.293***
	(0.000153)	(0.000165)	(0.00622)	(0.0120)
CG5 × CBP compliant	-0.00812***	-0.00273***	-0.158***	-0.0283*
	(0.000158)	(0.000171)	(0.00656)	(0.0125)
CG5 × Age of account	-0.00305***	-0.00166***	0.0652***	0.0288***
	(0.0000283)	(0.0000304)	(0.00109)	(0.00217)
CBP compliant × Age of account	0.000218***	-0.000990***	-0.00589***	-0.0760***
	(0.0000296)	(0.0000319)	(0.00124)	(0.00252)
CG5 × CBP compliant × Age of account	0.00160***	0.000858***	-0.0220***	-0.0244***
	(0.0000305)	(0.0000328)	(0.00132)	(0.00259)
Age of account	0.0000791**	0.00249***	-0.0701***	0.0479***
	(0.0000276)	(0.0000296)	(0.00105)	(0.00214)
Credit limit ($)	0.000412***	-0.00440***	0.292***	0.245***
	(0.00000380)	(0.00000665)	(0.000291)	(0.000600)
Utilization	0.0282***	0.0326***	-0.383***	-0.178***
	(0.0000168)	(0.0000230)	(0.000902)	(0.00143)
Credit score	0.0324***	0.0514***	2.479***	1.241***
	(0.0000449)	(0.0000820)	(0.00391)	(0.00753)
Age of consumer	-0.00748***	0.00502***	-0.0331***	0.444***
	(0.0000107)	(0.0000559)	(0.000689)	(0.00842)
Dep. Var Mean	0.012	0.012	3012.52	3012.52
Year FE	Yes	Yes	Yes	Yes
FSA FE	Yes	Yes	Yes	Yes
Borrower FE	No	Yes	No	Yes
R-squared	0.00638	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.

Appendix E Additional Parallel Trends Analysis

E.1 Adverse Selection Variables

Figure E.1: Trends in adverse selection outcomes



(a) Amount past due

(b) Amount delinquent

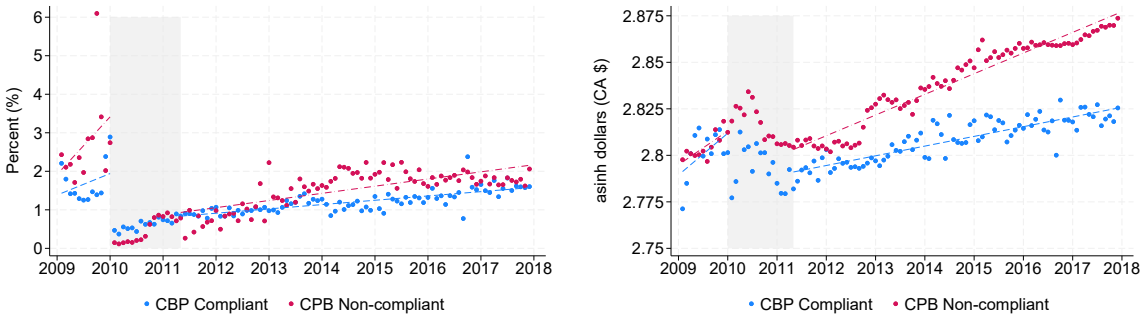
(c) Amount charged-off

(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 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 dashed lines plot the average linear trend across time of the corresponding 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 compliant with CG5 and red series are the non-compliant bank, the institution that was found to have violated CG5. All dashed lines plot the average linear trend across time of the corresponding scatter plots. The gray bars in both panels indicate the period 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

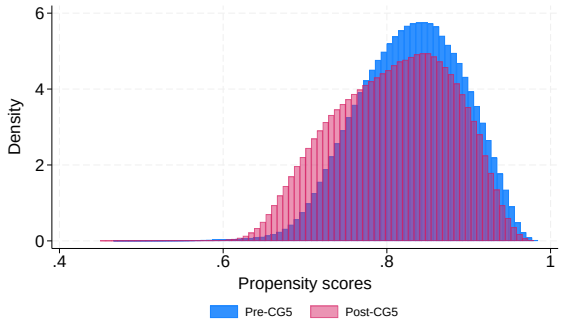
F.1 Matching Methodology

We employ one-to-one propensity-score matching with replacement using a probit model. We match non-compliant bank accounts to similar accounts from CBP-compliant 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, because 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 substantial 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 CBP-compliant and non-compliant 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 × 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 × 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 guidelines on the probability and amount of credit limit increases using a propensity score-matched sample to adjust for imbalances in the controls across CBP-compliant and non-compliant 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 × CBP-compliant is consistent with our main findings that banks compliant with CG5 surprisingly gave more frequent credit limit increases, albeit of smaller size 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 × 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.