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Income and the CARD Act's Ability-to-pay Rule in the US Credit Card Market

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Abstract:
In consumer credit, "ability-to-pay" (ATP) rules require lenders to consider whether the consumer can repay a loan without experiencing undue hardship. ATP rules have recently been implemented or considered in many countries and markets. Using a large panel of credit card accounts, we study the 2009 Credit Card Accountability Responsibility and Disclosure (CARD) Act's ATP rule and its effect, if any, on the US credit card market. We find that the rule appears to have had no effect on bank credit decisions because actual credit limits are almost always substantially lower than reasonable ATP limits. We examine other factors that may explain banks' credit decisions. Nearly 27 percent of consumer accounts that had a change in cardholder income received a credit limit increase of $100 or more in the same month as the income change. Most credit limit increases followed an income increase, although 19 percent of the instances of an income decrease also were followed by a credit limit increase. Most credit limit increases occurred without cardholders providing banks with income updates. The magnitude of the income change coefficient when an income update occurred is estimated to be nearly zero. We conclude that after the origination of an account, the direction and size of the account holder's income updates are largely unimportant for credit limit changes from either a regulatory or bank profitability standpoint.

JEL Classifications: G21, G51, D14, E42
Keywords: ability to pay, CARD Act, credit cards, credit limits

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1. Introduction

The Credit Card Accountability Responsibility and Disclosure (CARD) Act of 2009 requires US lenders to make only loans that credit card borrowers have the "ability to pay" (ATP).[1] ATP rules are also used for other consumer credit markets, including mortgages, and in proposals for payday and other small-dollar lending regulation. Numerous other countries have implemented or considered implementing regulations similar to ATP.[2] As Levitin (2023) argues, consumer credit regulation has shifted broadly from hard caps on interest rates to ATP rules partly because securitization has weakened the connection between originator profitability and loan risk. While researchers have studied ATP in the mortgage market extensively (CFPB 2019), there has been little examination of whether the introduction of ATP has affected the credit card market or lenders' ability to extend credit. Industry practitioners suggest that, in practice, ATP rules rarely bind. (Botella 2022). Yet due to the minimal amount of relevant research, the extent to which these rules have affected lending decisions is unclear. Moreover, while it is often assumed that borrower income plays an important role in credit decisions, understanding how lenders use income information to set or adjust credit limits contributes to a broader comprehension of credit access.

[1] The CARD Act modified the Truth in Lending Act to include the following provision: "A card issuer may not open any credit card account for any consumer under an open-end consumer credit plan, or increase any credit limit applicable to such account, unless the card issuer considers the ability of the consumer to make the required payments under the terms of such account." See Credit Card Accountability Responsibility and Disclosure Act of 2009, Public Law 111-23, 123 Stat. 1734, https://www.govinfo.gov/content/pkg/PLAW-111publ24/pdf/PLAW-111publ24.pdf.

[2] For example, Australia has an ATP requirement for consumer credit (https://asic.gov.au/for-consumers/loans-and-credit-cards/), the United Kingdom's Financial Conduct Authority recently introduced new rules concerning persistent credit card debt (https://www.ukfinance.org.uk/our-expertise/cards/financial-conduct-authority-fca-rules-persistent-credit-card-debt-36-months-actions-frequently), and the European Union has ATP rules for mortgages (https://europa.eu/youreurope/citizens/consumers/financial-products-and-services/mortgages/index_en.htm).

In this paper, we investigate the impact of the CARD Act's ATP rule on the credit card market. In particular, we study whether the rule has affected card issuers' practices involving credit limit increases. Card issuers are required to obtain information about a cardholder's income to calculate ATP,[3] or they can use a "statistically sound model" to estimate income and debt when determining ATP.[4] The exact information necessary and how it can be modeled have been the subject of revision and regulatory clarification since the implementation of the CARD Act. One way that card issuers have been complying is by requesting income information from cardholders, sometimes with the promise of a credit line increase if the cardholder updates their income and the lender determines they are eligible for such an increase.

We study five large banks that consistently report cardholder income updates on a regular basis (not all banks do so). The accounts at these banks comprise about half of the US credit card market.

We first show that the CARD Act's ATP rule has not been a binding factor for credit limit increases because nearly all credit limits are well below the levels that the ATP rule requires. The CARD Act's ATP requirements have constrained lending only to people with very low or no documentable income or assets. We then show that even if cardholder minimum payments increased, ATP requirements would still typically not bind, suggesting there is, in practice, little interaction between minimum payments and ATP. The imposition of ATP could still have indirect effects on credit supply by making it more difficult or costly for card issuers to

[3] Card issuers must consider ATP at origination and when increasing the credit limit. See footnote 3.
[4] See 12 CFR Part 1026.51(a)(1)(i) and the official interpretation at https://www.consumerfinance.gov/rules-policy/regulations/1026/51/#51-a-1-i-Interp-5-i. A banking supervisor placed additional restrictions on using modeled income (CFPB 2015, pp. 113–117).

obtain the necessary income information to comply with the rule or by preventing people without income or assets from obtaining credit in the first place.

If card issuers are not limited by ATP requirements, how do they decide when and how much to change credit limits? We investigate the correlates with credit limit changes in several related regressions. Most credit limit changes are not accompanied by a cardholder income update that is reported in the data,[5] which suggests not only that the ATP rule is not binding, but also that an income update is not required for a credit limit increase. Still, when an account has a change in income, nearly 27 percent of the time the account's credit limit also increases. Yet, conditional on a credit limit increase, the size of the income change does not affect the size of the credit limit change. In fact, we find that even accounts with updates that show a decrease in income might have a credit limit increase, although credit limit increases more frequently follow reported income increases: Thirty-one percent of income increases and 19 percent of income decreases are accompanied by a credit limit increase of $100 or more in the same month as the income update. This result is consistent with income being unimportant for lender decisions in practice, even while income updates are a valuable signal of the cardholder's engagement with that credit card. Consumers who are engaged may be more likely to use their card and less likely to default, even if they report a decrease in income, so their accounts may be more profitable for card issuers.

Lenders appear to place more weight on factors other than cardholder income when deciding whether to raise an account's credit limit. Cardholders who use about half of their available credit are more likely to receive a credit limit increase relative to cardholders who use

[5] Among observations of accounts with a credit limit increase of $100 or more, nearly 20 percent included an income update and nearly 17 percent had an actual change in income in the same month as the credit limit increase.

most or little of their available credit. Similarly, cardholders with higher annual percentage rates (APRs) are slightly less likely to receive credit limit increases (however, conditional on an account receiving such an increase, a higher APR is associated with a larger increase). Credit score increases raise the likelihood of a credit limit increase.

Our results complement the finding by other studies of the credit card market and the CARD Act. While no work has examined the CARD Act's ATP rule directly, researchers have studied the overall effects of the act and some of its provisions extensively (see CFPB 2019 for a detailed review of the literature). Agarwal et al. (2015) compare small-business credit cards, which were not affected by any CARD Act provisions, to consumer credit cards and find, for consumer cards, a reduction in fees and no significant reduction in credit limits. Jambulapati and Stavins (2014) find an increase in credit card account closures that coincided with both the enactment of the CARD Act and the Great Recession. Nelson (2018) examines how restrictions on re-pricing credit card rates affected the competitive equilibrium. Santucci (2015) compares credit accounts originated before the CARD Act and the Great Recession to accounts originated afterward and finds that the latter accounts had lower initial credit lines and received smaller increases. Elliehausen and Hannon (2018) find evidence that credit card lending may have declined for high-risk consumers, who may have substituted other sources of credit.

Understanding how banks set credit limits is also crucial for understanding consumer debt decisions. Fulford (2015) documents that consumers face substantial credit limit volatility, which affects their desire for other liquidity. Gross and Souleles (2002) and Fulford and Schuh (2023) show that when credit limits change, most of the change passes through to a change in debt. Aydin (2022) uses an experiment to show that this relationship between credit limit changes and debt changes is causal. Dettling and Hsu (2021) find that higher minimum wages

lead to higher credit limits among lower-income cardholders. Understanding differences in credit access and credit limits among consumer groups remains important: Black and Hispanic consumers are less likely to receive credit card offers (Firestone 2014; Goodstein et al. 2021), while most differences in credit limits between male and female cardholders are explained by observable differences in, for example, income and employment (Blascak and Tranfaglia 2023).

Of course, lender profitability depends on profitable lending decisions. Banks' internal decision making is a mostly private process, which in some recent cases has taken the form of large-scale experiments within banks (Botella 2022). Some academic work examines banks' line-management decisions (Dey and Elwood 2009; Leippold, Vanini, and Ebnoether 2006; Alfonso-Sánchez et al. 2024).

Credit cards are widely available in the United States and used as both a payment mechanism and as a source of revolving consumer credit. Because consumers react to credit limit changes, an understanding of how credit limits are set and of credit availability and cost can help to inform macroeconomic and monetary policy (Musto and Souleles 2006). Agarwal et al. (2017) study the extent to which banks pass through credit expansions to consumers. Fulford and Schuh (2017) study aggregate declines in credit and show that they can cause aggregate changes in consumption.

2. Data

Our main data source is the Y-14M credit card account data. The Board of Governors of the Federal Reserve System collects Y-14M data monthly from bank holding companies that have total consolidated assets of $100 billion or more and uses that information for supervisory capital assessments and stress-test models. Bank holding companies are required to report information

on every credit card account they have on file. The accounts reported in the Y-14M data represent about three-quarters of the total bank card balances in the United States.[6] While the Board attempts to standardize the data, the underlying data come from internal bank systems that are distinct. Therefore, combining data across multiple banks requires care, and not all variables of interest are comparable. For benchmarking purposes only, we compare our main sample with data from the Federal Reserve Bank of New York Consumer Credit Panel (CCP)/Equifax sample for December 2019.

For our main panel analysis, we use a sample of accounts from five large banks that comprises more than half of the credit card accounts in the Y-14M data set and about half of the overall US credit card market. We are intentionally inexact for data disclosure reasons. Together, the banks cover a diverse geography and customer base. These banks' business practices are largely representative of the industry. As noted earlier, each bank's internal reporting is distinct, but we are confident that we can compare these five banks and that they report cardholder income updates. The data quality for many other banks is lower. For example, several banks whose data we do not use do not report cardholder income updates in the standard field, and we are unable to determine whether they do not collect this information or do not report it.[7]

[6] For more information about the Federal Reserve Y-14M data-collection process, see the Board of Governors website, Reporting Forms, https://www.federalreserve.gov/apps/ReportingForms/.

[7] In the instructions for Y-14M, reporting income at the origination of accounts is mandatory, but reporting cardholder income updates is optional. The instructions specify that optional variables should be reported if used and collected: "Optional variables should be provided when available, or when not directly available they should be provided on a best effort basis. All mandatory variables must be completed for each reported credit. Variables designated 'optional' must be reported if the reporter uses the requested information in the course of the reporter's risk management practices or otherwise generates or stores the requested information. If the reporter does not use or generate the information requested in the variable, the reporter is not required to generate the information for this schedule, in which case the variable should be reported as blank." (Y-14M instructions for December 2016, available at https://www.federalreserve.gov/apps/reportingforms/Report/Index/FR_Y-14M, accessed January 26, 2024). As we discuss below, card issuers must comply with the CARD Act's ability-to-repay requirements by collecting cardholder income information or maintaining a model of it, and national banks had to seek actual income during this period, so only banks that did not collect any income information after the origination of accounts could have reasonably not reported income updates.

According to the Y-14M reporting instructions, those banks should have reported cardholder income updates if they collected income information after the origination of the accounts. One possible inference is that many banks collected no income information after origination, which implies that the banks did not collect or use income updates as part of their credit-limit decision making or CARD Act compliance. However, in practice, the banks may have not reported updated income information even though they were collecting it. Our sample of banks therefore represents the segment of the market for which income updates were the most influential.[8]

For each of the five banks we use, we take a 10 percent random sample of credit card accounts originated in January 2015, excluding corporate and business cards. For each bank, we follow these accounts from January 2015 to December 2019 (to avoid the COVID-19 pandemic period and due to data limitations—banks stopped reporting cardholder income updates in 2020). We use a single-cohort balanced panel to focus on how these banks make decisions, holding the age of the account fixed. We focus on 2015 so that we can study several years before the pandemic disrupted the economy and several years after the Great Recession, the CARD Act, and regulatory clarifications changed lending procedures. Using an unbalanced panel of accounts that were created from 2015 to 2019 produces similar results but makes it more difficult to distinguish between age and cohort effects. For confidentiality reasons, we produce all results for only the pooled sample from all five banks. Again, bank practices and internal scoring differ, and pooling banks might obscure some of those differences. It is also worth noting that despite the differences in bank practices, our panel regression findings are very similar to the results obtained from analyzing banks individually. To measure credit risk, we use credit scores from

[8] Approximately one-fifth of income updates were recorded a few months after the actual dates reported by the banks. To correct for that, we assigned the income update flag and the new income to the correct month.

credit bureaus, which are comparable across banks.[9] Additionally, we exclude from the panel accounts that report a near-zero income during any month in our sample period, and we top-code incomes that are greater than $1 million.[10]

Table 1 shows descriptive statistics for the relevant credit limit and income variables for our balanced panel from the five banks combined. Tables A-3 and A-4 in the appendix show the same descriptive statistics for a combined sample from the five banks for account months in which there was a credit limit increase and account months with a decrease.[11] The average credit limit was $7,763, and credit limit changes were relatively rare; changes of more than $100 dollars occurred in only 2.25 percent of account months for these banks.[12] The average change in credit limit among the larger increases (more than $100) was $2,413, and the median was $1,960. Mean household income among cardholders, as collected at account origination or if subsequently updated, was just over $80,000. For comparison, US mean family income was $92,600, and US median household income was $56,520 in 2015.[13] Although mean income and mean credit score vary slightly across banks, the income and score distributions substantially overlap, and each bank in the sample has customers across the credit-score and income distributions. Notably, income changes are relatively rare on a monthly basis at all banks, although income updates are more common overall and are more common at some banks than at

[9] Credit scores are an ordinal ranking of likelihood of default on a particular product within a time frame and fall into a 350–850 range. To ensure that scores are comparable across banks, we use credit scores provided by a credit bureau. In some cases, the provided credit scores were not FICO-equivalent scores and were mapped onto this score range.
[10] Here, near-zero refers to annual income of less than $1,000. The top-coding of income affects only a negligible number of observations (less than one-quarter of 1 percent) in the final balanced panel.
[11] A unit of observation is a single account in a single month. The total number of observations is the number of accounts times the number of months those accounts are in the sample.
[12] We consider changes of less than $100 minor adjustments and therefore exclude them from our analysis.
[13] See FRED series MAFAINUSA646N and MEHOINUSA646N, both originally from Census Bureau Income and Poverty calculations. Note that the mean in our data is the mean of reported household income for new credit card accounts (not the mean over households). People opening accounts may be different from the average credit cardholder, who in turn are not representative of the whole population.

others because banks use different systems for asking consumers about their income. The fraction of accounts with a reported income update in any given month is 4.54 percent, but the fraction for which a change in income was observed is only 1.43 percent. In other words, income updates are sometimes flagged without a change in income. This could happen, for example, if a cardholder updated (confirmed) their income without changing the amount. The fraction of accounts that had at least one income update in 2015 was 23.1 percent (with or without an actual change in income, excluding the account origination month); in 2016, the share rose to 27.3 percent before falling to 25.5 percent in 2017, 20.0 percent in 2018, and 17.9 percent in 2019.[14]

We do not consider income changes as an indication of underlying income volatility. Instead, they represent banks' information about individual cardholder income collected through their own efforts and individuals' willingness to submit it, sometimes while asking for a credit limit change. Household income at account origination or when updated is likely to be a reasonable measure of actual income, at least as understood by the cardholder, because it would be an act of fraud to knowingly misreport income. But cardholders with increasing income or who want more credit may be more likely to update their income, and banks are more likely to seek income updates from cardholders whose credit limits they want to change.

Tables 1 and 2 show how income updates and actual income changes are related to credit limit increases. While 2.25 percent of all account months report a credit limit increase of $100 or more, an increase occurs in only 1.87 percent of account months for which there is no income update. By contrast, 30.59 percent of account months in which income increased also include a credit limit increase of $100 or more. Even in 19.06 percent of account months with a reported

[14] The fraction of accounts with an actual change in income each year showed a similar pattern, rising from 11.2 percent in 2015 to 17.9 percent in 2016 before dropping to 15.7 percent in 2017, 14.1 percent in 2018, and 12.2 percent in 2019.

decrease in income, there was an increase in credit limit of $100 or more. Thus, any actual change in reported income is likely to trigger an increase in credit limit. However, among account months when an income update is recorded but income does not change, only 2.68 percent include a credit limit increase of $100 or more. Table A1 in the appendix includes additional statistics for credit scores, credit card utilization, and account characteristics broken down into shares of account months with a credit limit increase of $100 or more, account months with a credit-limit decrease of $100 or more, and account months in which the credit limit change falls between a $100 decrease and a $100 increase, which we characterize as no change.

For benchmarking purposes, Table A2 in the appendix shows summary statistics for several variables in our data that are also available in the New York Fed CCP/Equifax data, measured at the end of our sample period in December 2019. The New York Fed CCP/Equifax data set provides information on credit card accounts held by a random sample of the US population and therefore can show whether accounts at the five banks in our sample are representative of the broader credit card market.[15] Compared with our sample, the New York Fed CCP/Equifax accounts have slightly lower credit limits and credit scores and slightly higher balances and minimum payments. However, the divergences are small. We therefore conclude that the five major banks in our sample are representative of the US credit card market.

[15] The match is limited by the fact that the New York Fed CCP/Equifax data do not provide income, so we are not able to remove accounts with near-zero income as we do with our Y-14M panel.

Table 1. Statistics for Credit Limits and Income for Credit Card Accounts at Five Major Banks

	Mean credit limit ($)	7762.67
	% of observations with any increase in credit limit	2.71
	% of observations with Δcredit limit ≥ $100	2.25
	Mean Δ Credit Limit ($) (obs. with any credit limit increase)	2008.08
	Median Δ Credit Limit ($) (obs. with any credit limit increase)	1400.00
	Mean Δ Credit Limit ($) (obs. with Δcredit limit ≥ $100)	2413.05
	Median Δ Credit Limit ($) (obs. with Δcredit limit ≥ $100)	1960.35
	Mean Δ Credit Limit ($) (all obs.)	47.60
	Mean % change in credit limit (percentage points) (all obs.)	1.48
	Mean # months since last CL increase ≥$100	21.28
	Mean income ($ thousands)	82.21
	Mean Δ income ($ thousands)	0.12
	Mean % change in income (percentage points)	0.46
	% of obs. with Income change (any magnitude) observed	1.43
	% of obs with income increase of at least $1000 observed	0.89
	% of obs. With income update reported (with or without change)	4.54
% of obs. with income…	*<$25,000*	12.61
	$25,000–$49,999	27.90
	$50,000–$74,999	20.17
	$75,000–$99,999	16.06
	$100,000–$124,999	8.24
	$125,000–$149,999	3.51
	$150,000–$174,999	4.50
	$175,000–$199,999	1.72
	≥$200,000	5.29

Note: The sample is a balanced panel constructed using a 10 percent sample of all non-business/corporate accounts created at five major banks in the Y-14M credit card data in January 2015 and still active through December 2019.
Source: Authors' calculations based on the Y-14M data.

Table 2: Income Updates and Credit Limit Increases

Monthly Income Status:	% of accounts reporting credit limit increase of at least $100
All accounts	2.25
No income update	1.87
Income increase of $1000 or more	31.81
Income increase of any magnitude	30.59
Income decrease of 20% or more	19.01
Income decrease of any magnitude	19.06
Income change observed	26.66
Income updated in current month	10.65
Income updated in current month with no change	2.68
Income updated in past 12 months (excluding first month)	5.16

Note: The sample is a balanced panel constructed using a 10 percent sample of all non-business/corporate accounts created at five major banks in the Y-14M credit card data in January 2015 and still active through December 2019.
Source: Authors' calculations based on the Y-14M data.

3. Is ability to pay a constraint for lenders?

The CARD Act's ATP rule states that card issuers must comply with the requirement to "establish and maintain reasonable written policies and procedures to consider the consumer's ability to make the required minimum payments under the terms of the account based on a consumer's income or assets and a consumer's current obligations."[16] Determining ATP requires two calculations. The first involves the consumer's income after they pay their mortgage and meet other financial obligations. Card issuers are required to collect this information at the origination of the account or maintain a model to estimate it.

The second calculation involves the required minimum payments. Card issuers have a "safe harbor" for calculating minimum payments that comply with the ATP rule. If card issuers meet the requirements of the safe harbor, they are presumed to be in compliance.

The card issuer is presumed to be in the safe harbor "if it estimates required minimum periodic payments using the following method:

> (A) The card issuer assumes utilization, from the first day of the billing cycle, of the full credit line that the issuer is considering offering to the consumer; and
>
> (B) The card issuer uses a minimum payment formula employed by the issuer for the product the issuer is considering offering to the consumer or, in the case of an existing account, the minimum payment formula that currently applies to that account, provided that:
>
> (1) If the applicable minimum payment formula includes interest charges, the card issuer estimates those charges using an interest rate that the issuer is considering offering to the consumer for purchases or, in the case of an existing account, the interest rate that currently applies to purchases; and
>
> (2) If the applicable minimum payment formula includes mandatory fees, the card issuer must assume that such fees have been charged to the account."[17]

[16] Comment 51(a)(1)(ii) https://www.consumerfinance.gov/rules-policy/regulations/1026/51/#a
[17] 1026.51(a)(2)(ii) https://www.consumerfinance.gov/rules-policy/regulations/1026/51/#a-2

To see how these calculations work in practice, consider a $5,000 credit limit with a 14 percent APR.[18] A typical minimum payment requirement is 1 percent of the balance and all interest charges and fees. The required minimum payment on the $5,000 debt would be $50 plus the $58.33 interest. (APR is non-compounding, so the interest charged starting from the first day of the month is 14 percent divided by 12 months for an average month.) Therefore, the card issuer would be within the safe harbor and presumed in compliance with the ATP rule if the consumer had the ability to pay $108.33 a month based on their "income and other obligations."

Card issuer practices vary widely in calculating whether a consumer's minimum payment meets the ATP rule (CFPB 2015, section 5.5). A common approach is to calculate a residual or discretionary income based on how much the consumer has available after taking into account monthly housing and other debt payments.

How frequently does the ATP rule bind actual credit limits? We calculate the actual credit limits and the implied safe harbor for minimum payments using our income data. We calculate how much a consumer could pay if 50 percent of their reported income is discretionary income—income not required to meet "other obligations"—and make the same calculation if 25 percent of their income was discretionary. We then use these available incomes to calculate the largest credit limit they could receive while remaining under the thresholds. While the actual obligations matter for meeting the ATP requirements, these thresholds nevertheless provide useful evidence of the extent to which the ATP rule is binding. For example, it is common to define a household that spends more than 30 percent of its income on housing (including mortgage or rent, taxes, insurance, utilities, and fees) to be housing-cost burdened and

[18] The average APR on credit cards was approximately 14 percent throughout our sample period, so the rate is representative for that time period. However, an APR reflective of today's higher interest rates would not meaningfully affect our conclusions based on the example's calculations.

households that spend more than 50 percent to be severely housing-cost burdened. The average household spent about 25 percent of its pre-tax income on housing in 2022, so these thresholds are conservative. [19]

Table 3 shows that the ATP rule binds the credit limit on only a minimal number of accounts. While the actual average credit limit is approximately $7,763, the average maximum limit assuming 50 percent discretionary income is $144,000, and the average limit assuming 25 percent discretionary income is $72,000. On average, current credit limits are only 7.1 percent of the maximum limit for 50 percent discretionary income and 14 percent assuming 25 percent discretionary income.

Table 3 shows that ATP calculations are not a binding factor in banks' credit-limit decisions. Even with a much more restrictive threshold that assumes only 25 percent of income is discretionary, just 0.4 percent of account months appear to be above the safe harbor limit. Of course, the "facts and circumstances" of some consumers' obligations may make even a 25 percent threshold unreasonable, and bank practices vary, but the analysis suggests that the ATP rule does not directly affect most credit-limit decisions.

We caution that this result holds for the post-CARD Act enactment period, in which banks have been required to consider ATP. Before the CARD Act, banks sometimes originated accounts for consumers with no current source of income, such as college students. Indeed, the CARD Act's ATP rule says, "It would be unreasonable for a card issuer not to review any information about a consumer's income or assets and current obligations, or to issue a credit card

[19] Based on 2022 US Bureau of Labor Statistics data, consumers spend about 25 percent of their pre-tax household income on housing on average; the average annual housing expenditure was $24,298, while the average pre-tax income was $94,003 (https://www.bls.gov/news.release/cesan.nr0.htm).

to a consumer who does not have any income or assets."[20] A consumer with no income or assets has no ability to pay, so card issuers cannot issue credit cards to them. Thus, the ATP rule may still have had an effect by preventing more credit card lending to people without any income, even if it has not been binding for accounts with positive self-reported income. Moreover, as we discuss below, the Office of the Comptroller of the Currency (OCC), which oversees national banks, restricted the use of modeled income in the ATP calculations for prudential reasons (CFPB 2015, p. 114). Obtaining updated income information is distinct from the CARD Act's ATP requirement, and not all banks need to meet the requirement, but it may still constrain credit limit changes. In the next section, we look at the ATP rule in the context of a broader examination of income changes and credit limit changes.

The last panel of Table 3 shows the impact of increasing the minimum payment from 1 percent of the balance to 5 percent, implying a much faster debt amortization. Mechanically, a higher minimum payment reduces the maximum ATP limit because the consumer has to be able to afford to pay the minimum each month if they borrowed the full limit. Practically, however, actual credit limits are so far below the ATP limits, even with the higher minimum payment, that raising the minimum would not directly affect access to credit by pushing cardholders against a CARD Act ATP maximum. Raising minimums might have other effects on, for example, persistent debt by increasing debt or on financial distress by pushing cardholders to pay more than they would otherwise each month.

[20] See, § 1026.51 Ability to Pay, at https://www.consumerfinance.gov/rules-policy/regulations/1026/51/. Note that income could include income that the consumer reasonably has access to, such as the income of the working spouse for a stay-at-home parent.

Table 3. Ability-to-pay Constraint

	All Observations	Δ Credit Limit ≥ $100	-$100 < Δ Credit Limit < $100	Δ Credit Limit ≤ -$100
Current Credit Limit	7,762.67	9,027.42	7,760.90	7,248.14
Assuming 50% of income is discretionary:				
Maximum credit limit given ATP requirement	143,523.77	148,940.16	142,809.87	168,037.22
Maximum limit given ATP / Current limit	44.2115	30.6268	43.9470	45.5113
Current limit / Max limit given ATP	0.0711	0.0918	0.0711	0.0586
Current limit > Max limit given ATP	0.0012	0.0018	0.0012	0.0005
Current limit < Max limit given ATP	0.9988	0.9982	0.9988	0.9995
Assuming 25% of income is discretionary:				
Maximum credit limit given ATP requirement	71,761.89	74,470.08	71,404.93	84,018.61
Maximum limit given ATP / Current limit	22.1057	15.3134	21.9735	22.7557
Current limit / Max limit given ATP	0.1421	0.1837	0.1421	0.1173
Current limit > Max limit given ATP	0.0041	0.0084	0.0041	0.0021
Current limit < Max limit given ATP	0.9959	0.9916	0.9959	0.9979
Assuming 50% of income is discretionary and 5% minimum payment per month:				
Maximum credit limit given ATP requirement	52,773.51	52,989.69	52,718.93	61,871.31
Maximum limit given ATP / Current limit	16.9245	10.7169	16.9382	17.1279
Current limit / Max limit given ATP	0.1854	0.2401	0.1852	0.1531
Current limit > Max limit given ATP	0.0070	0.0155	0.0069	0.0027
Current limit < Max limit given ATP	0.9930	0.9845	0.9931	0.9973
Percent of Observations	100.00	2.25	97.39	0.36

Notes: The ATP requirement is calculated using the following method: We assume the minimum monthly payment at the credit card limit should be 1 percent of the balance plus all of the interest if the full limit was utilized at the stated APR. Assuming X% of income is discretionary, then X% of most recent income should equal 0.01*(Max credit limit given ATP) + (APR/12)*(Max credit limit given ATP). The third panel shows an alternate specification in which we assume use a 5 percent minimum, rather than 1 percent, such that X% of the most recent income should equal 0.05*(Max credit limit given ATP) + (APR/12)*(Max credit limit given ATP). The sample is a balanced panel constructed using a 10 percent sample of all non-business/corporate accounts created at five major banks in the Y-14M credit card data in January 2015 and still active through December 2019.
Source: Authors' calculations based on the Y-14M data.

4. Are income changes accompanied by credit limit changes?

The previous section showed that ATP limits are not constraining; however, banks may still use income changes to determine credit limits. Banks might still consider income for several reasons: (1) higher income might make default less likely; (2) higher income might mean a higher

demand for spending, making the account more profitable; and (3) because the OCC restricts the use of modeled income to meet the ATP requirement, national banks need to obtain fresh income information, which many have found difficult (CFPB 2015, p. 115). While the ATP requirement may not bind, the OCC's updated income requirement may, because many credit limit increases may be possible only with updated income.[21] Bank marketing sometimes suggests that by updating income, cardholders could receive a higher credit limit, so banks may be using the implied credit limit increase as a way of obtaining income information. (4) Updating income may be a valuable signal about the cardholder. Any update to income is a sign of the cardholder's engagement with that credit card and possibly of their general conscientiousness. Therefore, that cardholder's account is likely to be more profitable, whatever the change in income is. In addition, an income update indicates to the issuer that the cardholder is still employed, although Braxton, et al. (2023) find that credit limits do not decline within five years after cardholder job loss.

4.1 Two-stage regressions

We examine the factors that lead to a credit limit increase and affect the size of the increase in a two-stage Heckman (1979) regression framework. Credit limit changes are infrequent, although most underlying variables change from month to month. This relationship suggests there must be some cost to changing a limit. The cost could be an implementation cost or a concern that frequent decreases or increases in their credit limit might be poorly received by cardholders. We therefore model the decision to change the limit as separate from the size of the change and

[21] In 2016, the banks surveyed by the CFPB for its biennial CARD Act report said that when they did review an account for a credit line increase not specifically requested by a cardholder, 90 percent of the rejections were due to a lack of consumer-reported updated income (CFPB 2017).

adjust the second stage to include only observed limit changes for select accounts. While we choose a specific modeling framework to present results, our primary interest is identifying the variables that are associated with credit limit changes, rather than the particular model. We obtain similar results when using an ordinary least squares regression without the Heckman (1979) correction, as shown in the appendix.

In the first stage, we estimate a probit regression to determine which variables make a credit limit increase more likely. We estimate variations of

$$\Pr(\Delta \text{ Credit Limit } \geq \$100) = \Phi(\alpha_t + \alpha_b + X_{it}\beta),$$

where α_t are common month effects, α_b are bank fixed effects for each of the five banks, and the X_{it} are individual variables, including cardholder's income and income change or update indicators, credit score, whether there was a change in credit score, whether the cardholder revolved on the account, and the average utilization rate during the previous three months.[22] The dependent variable is equal to one if there is a credit limit increase of $100 or more to remove small changes that might result from reporting issues.[23]

In the second stage, we restrict the sample to month observations in which there was an increase in credit limit of at least $100 and estimate variations of

$$\%\text{ Change } Credit\ Limit = \alpha_t + \alpha_b + X_{it}\beta + Correction_{it} + \epsilon_{it,}$$

[22] We included state fixed effects (α_s) in initial regressions but found that in the nonlinear probit, the state effects were nearly colinear with other variables, which made the maximum likelihood fail to converge in smaller samples. Near colinearity can also produce unstable estimates, so we prefer the estimates without state effects. For samples where we achieved convergence, our results are nearly identical.

[23] Less than 0.5 percent of observations in the sample include a credit limit increase of less than $100, and almost all of these were from a single bank. Outside of these idiosyncratic increases, most of which are close to zero dollars, the credit limit increases in our sample tend to be in increments of $100.

where $Correction_{it}$ is the Heckman correction term. We generally exclude the income updated in the current month indicator and the change in credit score of 25 or more indicator from the second-stage regressions to aid numerical identification (see table notes for the exact specification). An indicator that income or credit score was updated in the current month might affect the likelihood of a credit limit change but is unlikely to affect the size of the change after we include the magnitude of the change in income or credit score.

Table 4 shows probit regression results for when a credit limit change occurs for our sample of all five banks combined. An income change is always accompanied by an income update, but not the other way round. A change in income is much more likely to lead to an increase in credit limit compared with an update that includes no change in income. Having had an income update at any point in the past 12 months (regardless of whether income changed, and not counting January 2015, when the accounts were created) is associated with a 2.6 percent higher probability of an account receiving a credit limit increase of $100 for a given account month. However, the effect of an income update that includes an income change is estimated to be much larger: An account for which a change in income was recorded had a roughly 13 percent higher probability of a credit limit increase of $100 or more. The size of the income change, while statistically significant, is not economically significant. After controlling for whether there was an income change or update (regardless of magnitude), we find that, when evaluating the marginal effect at the mean, a 100 percent increase in income raises the probability of a credit limit increase by only 0.2 percent.

Table 4. Heckman Stage 1, Probit Regression for Probability of a Credit Limit Increase of $100 or More in the Current Month

		Stage 1: Probit Δ Credit Limit ≥ $100			
		(1)	(2)	(3)	(4)
Income	*<$25,000*			0.003058***	0.003822***
	$25,000 - $49,999			0.001842***	0.002391***
	$50,000 - $ 74,999			0.000747***	0.001116***
	$75,000 - $99,999			-0.000204	-0.00002
	$100,000 - $124,999			--	--
	$125,000 - $149,999			-0.000594	-0.000733*
	$150,000 - $174,999			-0.000894**	-0.001096***
	$175,000 - $199,999			-0.000955*	-0.001614***
	≥ $200,000			-0.001385***	-0.002373***
% Δ Income		0.00002***	0.00002***	0.00002***	0.00002***
Income update recorded in current month		-0.001703***	-0.001072***	-0.001375***	-0.000817**
Inc. update in past 12 months, omitting first month		0.026332***	0.026103***	0.025892***	0.025642***
Income change observed in current month		0.135556***	0.131489***	0.13212***	0.128171***
Credit Score	*<580*			-0.011204***	-0.011182***
	580 - 669			-0.007768***	-0.007493***
	670 - 739			--	--
	740 - 799			0.00143***	0.000382
	≥ 800			-0.002617***	-0.004123***
Δ Credit score		-0.000059***	-0.000058***	-0.000083***	-0.000075***
Δ Credit score ≥ 25 (indicator)		0.005372***	0.005328***	0.005894***	0.005743***
Mos since last CredLim increase		-0.000204***	-0.0002***	-0.000177***	-0.000171***
Revolver Indicator		-0.006486***	-0.00611***	-0.006312***	-0.006249***
Minimum payment due ($)		0.00002***	-0.000026***	0.000017***	-0.000028***
Retail APR			-0.000247***		-0.000234***
Finance charge ($)			0.000016***		0.000014***
Total balance ($)			0.000836***		0.0009***
Total fees ($)			0.000001		0.000006**
Average Utilization (past three months)	*< 0.1*	-0.02413***	-0.023266***	-0.023325***	-0.022019***
	[0.1, 0.2)	-0.015022***	-0.014599***	-0.014896***	-0.013799***
	[0.2 , 0.3)	-0.00606***	-0.006113***	-0.006421***	-0.005822***
	[0.3, 0.4)	-0.004045***	-0.004087***	-0.00428***	-0.003979***
	[0.4, 0.5)	--	--	--	--
	[0.5, 0.6)	0.00296***	0.003272***	0.003764***	0.003644***
	[0.6, 0.7)	0.003928***	0.004356***	0.005796***	0.005436***
	[0.7, 0.8)	0.0007	0.001289*	0.003664***	0.003309***
	[0.8, 0.9)	-0.002203***	-0.001601**	0.002332***	0.001784**
	≥ 0.9	-0.010794***	-0.009781***	-0.004253***	-0.0044***
Bank FE?		Yes	Yes	Yes	Yes
Month FE?		Yes	Yes	Yes	Yes
pseudo R-squared		0.1465	0.1488	0.1527	0.155
Observations		2,091,075	2,091,056	2,091,075	2,091,056

Note: Results are reported as marginal effects at means, * p<0.10, ** p<0.05, *** p<0.01. "--" denotes the reference group. The sample is a balanced panel constructed using a 10 percent sample of all non-business/corporate accounts created at five major banks in the Y-14M credit card data in January 2015 and still active through December 2019.
Source: Authors' calculations based on the Y-14M data.

The probability of a credit limit change has an inverse-U relationship with card utilization. As utilization increases, so does the probability of a credit limit increase, until peaking when utilization reaches 0.6 to 0.7. When utilization exceeds that level, the probability of a credit limit increase declines. These mid-level-utilization accounts may be the most profitable: The issuer earns more from either interest or transaction charges, but the account is not close to its credit limit, which might suggest a default is possible. Perhaps surprisingly, although revolving debt reduces the likelihood of credit limit increase, it does so by an economically insignificant amount. Utilization is highly predictive of revolving (Fulford and Schuh 2023). When we drop utilization from our regression analysis but keep revolving (not shown separately), we find that revolving has a positive effect on the probability of a credit limit increase.

Table 5 shows stage 2 Heckman OLS regressions of the percentage change in credit limit, conditional on an account's credit limit changing, with the coefficients adjusted for selection. Depending on the specification, even with many included variables, the regressions explain only a small fraction of the variance. The % Δ Income variable is economically insignificant, suggesting that *how much* income changed was typically not an important factor for the card issuer in deciding the size of the credit limit change.

Cardholders' income levels and their credit scores and credit score changes are economically significant with respect to credit limit changes. Percentage changes in credit limits are larger for accounts of lower-income cardholders. For accounts of cardholders with incomes of more than $100,000, the point estimate is not statistically different from zero. A 100-point increase in an account holder's credit score is associated with a 15 percent increase in their credit limit when we control for the credit score. Together, these two estimates suggest that while

Table 5. Heckman Regression Stage 2, Percentage Change in Credit Limit among Accounts with an Increase of $100 or More

		Stage 2: % change in credit limit			
		(1)	(2)	(3)	(4)
Income	*<$25,000*			20.293007***	18.289286***
	$25,000 - $49,999			11.04475***	9.621377***
	$50,000 - $ 74,999			4.428738**	3.509077*
	$75,000 - $99,999			1.425796	1.165688
	$100,000 - $124,999			--	--
	$125,000 - $149,999			0.015262	0.18732
	$150,000 - $174,999			-2.11037	-1.032558
	$175,000 - $199,999			-1.1054	1.319612
	≥ $200,000			-3.796554	-0.142374
% Δ Income		0.003669	0.001205	0.004078	
Credit Score	*<580*			3.431316	-0.059577
	580 - 669			18.251406***	15.703739***
	670 - 739			--	--
	740 - 799			-13.974868***	-11.545102***
	≥ 800			-14.984614***	-10.844074***
Δ Credit Score		0.048775**	0.049108**	0.150337***	
Mos since last CredLim increase			0.937239***	0.960697***	0.945379***
Revolver Indicator		-13.639222***	-13.637413***	-15.775608***	-15.566667***
Minimum payment due ($)		-0.145358***	0.064702***	-0.089045***	0.06138***
Retail APR			0.541261***		0.348198***
Finance charge ($)			-0.071895***		-0.080487***
Total balance ($ thousands)			-3.327066***		-2.588836***
Average Utilization (past three months)	*< 0.1*	-5.585108***	-7.801192***	-1.345343	-4.176956**
	[0.1, 0.2)	-15.499197***	-16.608925***	-11.312325***	-13.432586***
	[0.2 , 0.3)	-13.627557***	-14.218993***	-10.524641***	-11.886076***
	[0.3, 0.4)	-6.119678***	-6.588499***	-4.894553**	-5.516204***
	[0.4, 0.5)	--	--	--	--
	[0.5, 0.6)	0.08843	-0.448231	-2.729162	-2.599027
	[0.6, 0.7)	4.156997**	3.226655	-0.543587	0.028951
	[0.7, 0.8)	4.068256*	2.025694	-3.014731	-2.608808
	[0.8, 0.9)	0.931933	-1.868955	-8.67636***	-7.928004***
	≥ 0.9	-9.520033***	-12.462005***	-21.50691***	-20.946669***
Bank FE?		Yes	Yes	Yes	Yes
Month FE?		Yes	Yes	Yes	Yes
Mills ratio^{-1}		-14.479***	-15.471***	-16.947***	-16.613***
adjusted R-squared		0.120	0.135	0.142	0.143
Selected observations		48,148	48,148	48,148	48,148

Note: The regressors in stage 2 must be a strict subset of those in stage 1. For column (1), we omit the income update in the current month indicator, the change in credit score of 25 or more indicator, and the months since last credit limit increase. For column (2), we omit the income updated in the current month indicator, the change in credit score of 25 or more indicator, months since last credit limit increase, and total fees charged. For column (3), we omit the income updated in the current month indicator and the change in credit score of 25 or more indicator. For column (4), we omit the income updated in the current month indicator, the change in credit score of 25 or more indicator, percentage change in income, change in income, change in credit score, and total fees charged. The sample is a balanced panel constructed using a 10 percent sample of all non-business/corporate accounts created at five major banks in the Y-14M credit card data in January 2015 and still active through December 2019 . * p<0.10, ** p<0.05, *** p<0.01. "--" denotes the reference group.
Source: Authors' calculations based on the Y-14M data.

income level matters for accounts of low-income cardholders, when a cardholder's income is $75,000 or more, only their credit score matters for setting credit limits.

4.2 Income or income updates: Which one matters more?

A surprising result presented in Tables 4 and 5 is that the size of a cardholder's income change seems to have little effect on their credit limit. One potential hypothesis is that any income update is a valuable positive signal about the profitability of the cardholder's account. If so, banks might raise credit limits even when income decreases or an update does not change income. Because banks are not constrained by ATP requirements, the only factor important for their decision about increasing a cardholder's credit limit is whether doing so would be profitable. We investigate this mechanism by dividing the income updates into meaningful increases, no changes or slight decreases, and substantial decreases.

Table 2 shows the unconditional distributions of credit limit increases by different kinds of income updates. Conditional on an income increase greater than $1,000, 32 percent of account months included a credit limit increase. Yet when we include observations with any income update—an increase, no change, or even a decrease—the update is followed by a credit limit increase about 11 percent of the time.

The evidence in Table 2 suggests that income changes themselves are valuable signals of the cardholder's engagement with the account and that the size of the income change is mostly uninformative. One possible interpretation is that cardholders who are willing to update their income respond to requests from the issuer and are more likely to use that card and less likely to default. To investigate this hypothesis, we divide the sample into three groups: cardholders who made the minimum payment in the last month, those who paid more than the minimum but less

than the full balance, and those who paid the full balance. Table A-6 in the appendix shows statistics for these three groups. Full-balance-payment accounts have significantly higher credit limits, but they are the least likely to have income updates or credit limit increases. Instead, consistent with Table 4, accounts of revolvers are more likely to have credit limit increases. Minimum-payment accounts are more likely to have income updates and are somewhat more likely than full-balance accounts to have credit limit increases. We conclude that payment behavior and account engagement in the form of income updates seem to be important for banks' credit-limit decision making, but the size of income changes seems relatively unimportant.

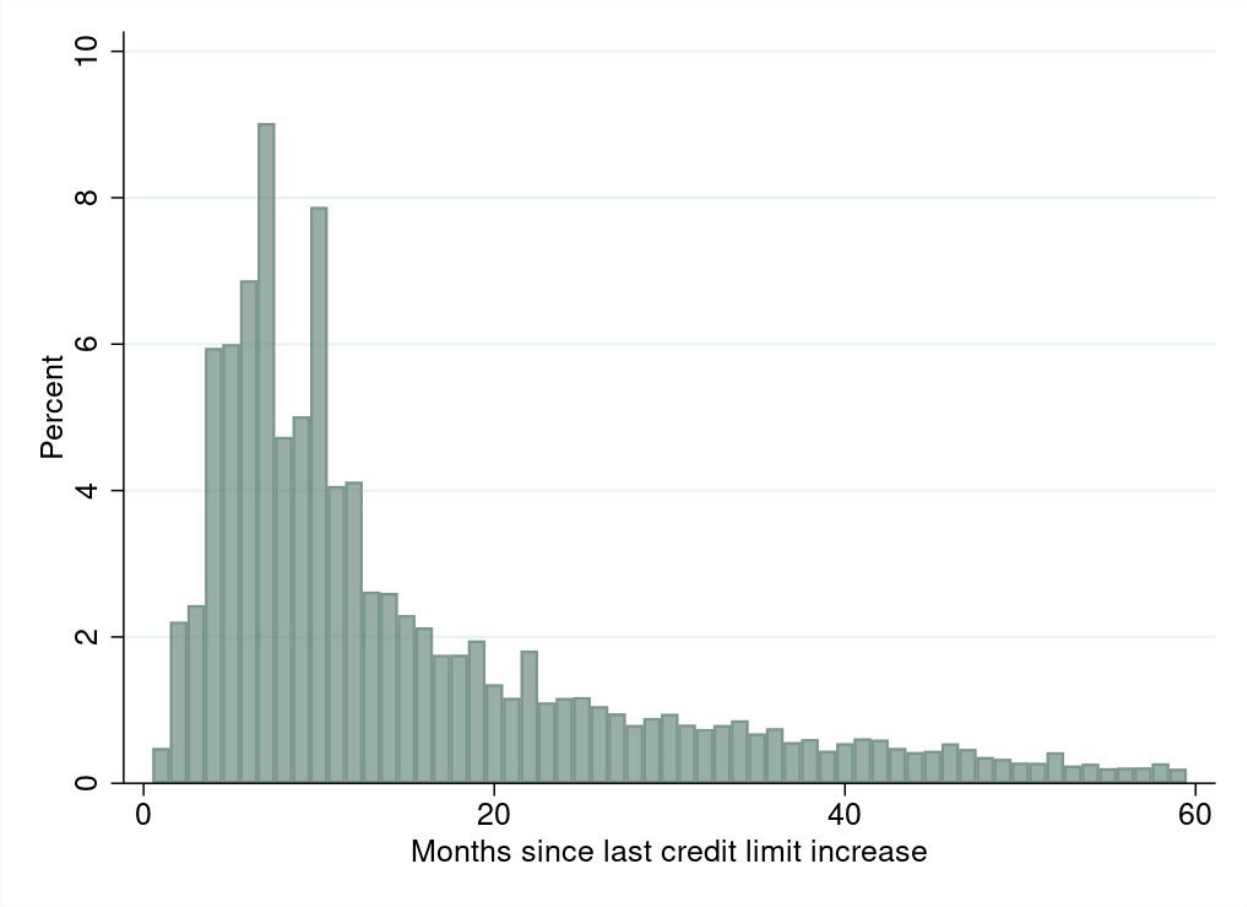
4.3 Months since last credit limit change

It is possible that banks decide to raise credit limits based on periodic evaluations of accounts. We investigate the likelihood that banks employ this approach by examining the months since accounts' last credit-limit change to see if such changes are more likely to occur at specific intervals. Figure 1 shows a histogram of the months since the last change for accounts with a credit limit increase of $100 or more.

While the intervals between credit limit increases vary across banks, the combined sample of five banks (Figure 1) shows that accounts are most likely to receive a credit limit increase 7 or 10 months after the previous increase. Most credit limit increases occur before 12 months have passed, and there are a notable number of increases at 7 months and 10 months.

Regressions using individual bank data show some similarity in how the five banks in our sample react to underlying consumer characteristics (not shown in the paper), but banks may approach credit-line increases very differently from each other based on their customer bases and risk modeling.

Figure 1. Months Since Last Credit Limit Increase for Observations with a Credit Limit Increase of $100 or More



Source: Authors' calculations based on the Y-14M data.

Among all accounts in the Y-14M data at the five banks we study (not limited to the cohort opened in 2015), the share reporting at least one income update in a calendar year decreased over time, although the rate of income changes remained nearly constant. Underlying these overall changes, however, is substantial heterogeneity. Some banks in our sample have relatively constant income-update shares, others have decreasing shares, and some have increasing shares over time. Due to the underlying heterogeneity, our results may not generalize to all accounts beyond these banks. However, given that our sample represents approximately half of all credit card accounts, and that many banks outside our sample did not report income

updates and so, by the terms of reporting, did not rely on the updates for risk management, it is unlikely that income updates have become more common over time.

5. Conclusion

We study how banks use income updates when changing credit card limits. We show that the CARD Act's ability-to-pay (ATP) rule is generally not binding for credit-limit increases. Banks are more likely to increase credit limits on the accounts of cardholders who update their income, but whether income increases, decreases, or stays the same does not matter with respect to banks' decisions to increase credit card limits, and the size of the change in income is practically unrelated to the change in credit limit.

Instead of consumers' income being a primary explanatory variable for credit limits, other variables matter more and are likely more directly linked to bank profits. Accounts with more engagement, as shown by income updates, may be more profitable, for example. Similarly, accounts using 40 to 50 percent of their available credit and those with higher APRs may be more profitable because the holders of these accounts are actively using their credit cards in ways that are profitable for the bank, but they are not using so much credit as to indicate liquidity constraints that might lead to delinquency. While consumer income at the time of credit card application may be useful for setting the initial profit-maximizing credit limit, as banks observe repayment behavior and card use, other variables seem to become more important.

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Appendix

Table A1. Statistics for Credit Scores, Utilization, and Account Characteristics

		Sample: All Observations	Obs. with Δcredit limit ≥ $100	Obs. Without increase or decrease of $100 or more	Obs. with Δcredit limit≤ -$100
% with credit score…	*<580*	2.93	1.54	2.97	7.15
	580–669	19.52	18.19	19.42	38.58
	670–739	26.51	38.40	26.14	34.15
	740–799	25.58	27.68	25.61	13.83
	≥800	25.45	14.19	25.86	6.29
	Mean credit score	735.05	725.28	735.59	681.19
	% with Δ credit score ≥ 25	5.33	7.16	5.28	5.58
	Average Δ credit score	0.35	-0.04	0.39	-8.19
	Average utilization (last three months)	0.34	0.46	0.34	0.74
% with three-month average utilization rate of…	*<0.1*	37.44	13.53	38.11	8.77
	[0.1,0.2)	12.47	11.80	12.52	3.04
	[0.2,0.3)	8.15	11.88	8.08	2.36
	[0.3,0.4)	6.17	9.84	6.10	3.63
	[0.4,0.5)	4.96	8.94	4.87	4.18
	[0.5,0.6)	4.46	8.63	4.36	4.94
	[0.6,0.7)	4.36	8.48	4.26	6.45
	[0.7,0.8)	4.37	7.37	4.28	7.77
	[0.8,0.9)	5.49	8.07	5.41	9.99
	≥ 0.9	12.14	11.46	12.02	48.88
	Average revolving balance (among all accounts, $ thousands)	1.23	1.81	1.21	4.57
	Average total balance ($ thousands)	1.88	3.17	1.86	5.59
	Average minimum payment due ($)	46.51	67.20	46.29	144.62
	Average finance charges ($)	18.27	28.78	18.11	77.71
	Average total fees ($)	3.92	4.72	3.79	8.49
	% with positive revolving balance	53.96	62.01	53.68	78.86
	% with positive total balance	84.51	94.17	84.45	94.87
	% paying any fees	9.54	10.15	9.48	19.63
	Average retail APR	18.96	18.16	19.05	18.44
	Percent of All Observations:	100.00	2.25	97.39	0.36

Note: The sample is a balanced panel constructed using a 10 percent sample of all non-business/corporate accounts created at five major banks in the Y-14M credit card data in January 2015 and still active through December 2019.
Source: Authors' calculations based on the Y-14M data.

Table A2: Comparison of Sample with NY Fed Consumer Credit Panel/Equifax (Values in December 2019)

	Y-14M Credit Card Schedule	Equifax Consumer Credit Panel
Mean Credit Limit ($)	9,101.66	8,236.16
Mean Credit Score	745.90	721.32
Mean Balance ($)	2,189.91	2,338.83
Mean Minimum Payment ($)	58.42	76.89

Note: The Federal Reserve Bank of New York Consumer Credit Panel (CCP)/Equifax data set contains data from a 5 percent sample of US adults with a Social Security number and a credit report. For the account-level data on credit cards owned by these individuals, we do not always have access to a unique identifier and thus are not able to balance the entire panel of accounts over time. However, because we observe the month when each account was created, we focus on credit card accounts in the 2019:Q4 data that were created in January 2015, all of which would be included in a hypothetical balanced panel. For the sake of comparison, the statistics shown for the Y-14M data are calculated from the December 2019 component of our balanced panel. The match is limited by the fact that the CCP/Equifax data do not provide any income data, so we are not able to remove accounts with near-zero income, as we do with our Y-14M panel.
Source: Y-14M and New York Fed CCP/Equifax, December 2019 values.

Table A3. Statistics for Credit Limits and Income for Observations with a Credit Limit Increase of $100 or More

	Mean credit limit ($)	9027.42
	% of observations with any increase in credit limit	100.00
	% of observations with Δcredit limit ≥ $100	100.00
	Mean Δ Credit Limit ($) (obs. with any credit limit increase)	2413.05
	Median Δ Credit Limit ($) (obs. with any credit limit increase)	1960.35
	Mean Δ Credit Limit ($) (obs. with Δcredit limit ≥ $100)	2413.05
	Median Δ Credit Limit ($) (obs. with Δcredit limit ≥ $100)	1960.35
	Mean Δ Credit Limit ($) (all obs.)	2413.05
	Mean % change in credit limit (percentage points) (all obs.)	69.11
	Mean # months since last CL increase ≥$100	15.39
	Mean income ($ thousands)	81.90
	Mean Δ income ($ thousands)	3.29
	Mean % change in income (percentage points)	9.88
	% of obs. with Income change (any magnitude) observed	16.99
	% of obs with income increase of at least $1000 observed	12.56
	% of obs. With income update reported (with or without change)	20.42
% of obs. with income…	*<$25,000*	13.94
	$25,000–$49,999	28.54
	$50,000–$74,999	19.71
	$75,000–$99,999	14.84
	$100,000–$124,999	7.95
	$125,000–$149,999	3.48
	$150,000–$174,999	4.04
	$175,000–$199,999	1.80
	≥$200,000	5.69

Note: The sample is a balanced panel constructed using a 10 percent sample of all non-business/corporate accounts created at five major banks in the Y-14M credit card data in January 2015 and still active through December 2019.
Source: Authors' calculations based on the Y-14M data.

Table A4. Statistics for Credit Limits and Income for Observations with a Credit Limit Decrease of $100 or More

	Mean credit limit ($)	7248.14
	% of observations with any increase in credit limit	0.00
	% of observations with Δcredit limit ≥ $100	0.00
	Mean Δ Credit Limit ($) (obs. with any credit limit increase)	0.00
	Median Δ Credit Limit ($) (obs. with any credit limit increase)	0.00
	Mean Δ Credit Limit ($) (obs. with Δcredit limit ≥ $100)	0.00
	Median Δ Credit Limit ($) (obs. with Δcredit limit ≥ $100)	0.00
	Mean Δ Credit Limit ($) (all obs.)	-1873.94
	Mean % change in credit limit (percentage points) (all obs.)	-20.74
	Mean # months since last CL increase ≥$100	9.51
	Mean income ($ thousands)	96.12
	Mean Δ income ($ thousands)	0.09
	Mean % change in income (percentage points)	0.37
	% of obs. with Income change (any magnitude) observed	1.41
	% of obs with income increase of at least $1000 observed	0.89
	% of obs. With income update reported (with or without change)	2.01
% of obs. with income…	*<$25,000*	10.00
	$25,000–$49,999	23.74
	$50,000–$74,999	17.89
	$75,000–$99,999	19.47
	$100,000–$124,999	8.98
	$125,000–$149,999	4.04
	$150,000–$174,999	6.77
	$175,000–$199,999	2.76
	≥$200,000	6.36

Note: The sample is a balanced panel constructed using a 10 percent sample of all non-business/corporate accounts created at five major banks in the Y-14M credit card data in January 2015 and still active through December 2019.
Source: Authors' calculations based on the Y-14M data.

Table A5. Ordinary Least Squares Estimates, among Accounts with a Credit Limit Increase of $100 or More in the Current Month

		Ordinary Least Squares Estimates: % change in credit limit				
		(1)	(2)	(3)	(4)	(5)
Income	*<$25,000*			18.347506***	16.37295***	16.714172***
	$25,000 - $49,999			10.247892***	8.95869***	9.02875***
	$50,000 - $ 74,999			4.020002**	3.262428*	3.22579*
	$75,000 - $99,999			1.160163	1.014364	0.893738
	$100,000 - $124,999			--	--	--
	$125,000 - $149,999			0.320114	0.49831	0.492599
	$150,000 - $174,999			-2.162376	-1.069802	-1.212674
	$175,000 - $199,999			-0.354973	1.911351	1.770747
	≥ $200,000			-2.917202	0.757462	-0.026811
% Δ Income		0.01563***	0.014014***	0.017517***		0.016654***
Credit Score	*<580*			-5.486545	-8.585686**	-6.775163*
	580 - 669			14.878368***	12.525147***	13.770467***
	670 - 739			--	--	--
	740 - 799			-14.203094***	-12.119068***	-12.792504***
	≥ 800			-17.463215***	-13.936462***	-14.986205***
Δ Credit score		0.039977*	0.040047*	0.133619***		0.121723***
Mos since last CredLim increase			0.902992***	0.93044***	0.920049***	0.918591***
Revolver Indicator		-16.656206***	-16.756807***	-19.225307***	-19.031111***	-18.610752***
Minimum payment due ($)		-0.139539***	0.059465***	-0.087875***	0.05486***	0.056176***
Retail APR			0.515641***		0.321638***	0.291311***
Finance charge ($)			-0.077493***		-0.088546***	-0.088464***
Total balance ($ thousands)			-3.007302***		-2.296667***	-2.240276***
Average Utilization (past three months)	*< 0.1*	-13.673224***	-16.189152***	-10.886124***	-13.320824***	-12.547293***
	[0.1, 0.2)	-19.678045***	-21.041204***	-16.175188***	-18.255106***	-17.509251***
	[0.2 , 0.3)	-15.47285***	-16.242899***	-12.67487***	-14.140562***	-13.682331***
	[0.3, 0.4)	-7.029037***	-7.590628***	-5.978184***	-6.781733***	-6.440541***
	[0.4, 0.5)	--	--	--	--	--
	[0.5, 0.6)	0.976638	0.516313	-1.551643	-1.575038	-1.810376
	[0.6, 0.7)	5.062274**	4.256545**	0.879164	1.201244	0.854079
	[0.7, 0.8)	4.446859**	2.566085	-1.980224	-1.789777	-2.143738
	[0.8, 0.9)	0.615884	-2.022547	-8.037406***	-7.538593***	-7.981369***
	≥ 0.9	-12.646287***	-15.507091***	-23.330614***	-22.854237***	-23.592363***
Bank FE?		Yes	Yes	Yes	Yes	Yes
Month FE?		Yes	Yes	Yes	Yes	Yes
adjusted R-squared		0.116	0.130	0.137	0.138	0.139
Observations		48,148	48,148	48,148	48,187	48,148

Note: * p<0.10, ** p<0.05, *** p<0.01. "--" denotes the reference group. The sample is a balanced panel constructed using a 10 percent sample of all non-business/corporate accounts created at five major banks in the Y-14M credit card data in January 2015 and still active through December 2019.
Source: Authors' calculations based on the Y-14M data.

Table A6. Credit Limits and Income for Credit Card Accounts at Five Major Banks, Splitting Sample by Whether the Consumer Paid the Minimum Payment, More Than the Minimum, or the Full Balance

		Full Sample	Minimum payment	More than minimum	Full balance
	Mean credit limit ($)	7762.67	4180.01	7314.88	10248.39
	% of observations with any increase in credit limit	2.71	3.36	3.27	2.38
	% of observations with Δcredit limit ≥ $100	2.25	2.02	2.82	2.34
	Mean Δ Credit Limit ($) (obs. with any credit limit increase)	2008.08	890.40	1986.43	2866.50
	Median Δ Credit Limit ($) (obs. with any credit limit increase)	1400.00	350.00	1500.00	2000.00
	Mean Δ Credit Limit ($) (obs. with Δcredit limit ≥ $100)	2413.05	1464.20	2302.94	2911.39
	Median Δ Credit Limit ($) (obs. with Δcredit limit ≥ $100)	1960.35	1000.00	1900.00	2000.00
	Mean Δ Credit Limit ($) (all obs.)	47.60	26.02	57.35	61.52
	Mean % change in credit limit (percentage points) (all obs.)	1.48	1.34	1.66	1.67
	Mean # months since last CL increase ≥$100	21.28	22.53	19.74	21.47
	Mean income ($ thousands)	82.21	66.60	77.82	94.77
	Mean Δ income ($ thousands)	0.12	0.07	0.11	0.18
	Mean % change in income (percentage points)	0.46	0.42	0.47	0.58
	% of obs. with Income change (any magnitude) observed	1.43	1.97	1.64	1.36
	% of obs with income increase of at least $1000 observed	0.89	1.17	0.99	0.88
	% of obs. With income update reported (with or without change)	4.54	5.45	3.81	3.69
% of obs. with income…	*<$25,000*	12.61	15.70	12.68	11.44
	$25,000–$49,999	27.90	32.92	29.82	23.47
	$50,000–$74,999	20.17	20.76	20.39	19.15
	$75,000–$99,999	16.06	14.80	15.90	16.54
	$100,000–$124,999	8.24	6.50	7.80	9.48
	$125,000–$149,999	3.51	2.93	3.30	4.19
	$150,000–$174,999	4.50	2.97	4.18	5.62
	$175,000–$199,999	1.72	0.94	1.74	2.14
	≥$200,000	5.29	2.49	4.18	7.98

Note: The sample is a balanced panel constructed using a 10 percent sample of all non-business/non-corporate accounts created at five major banks in the Y-14M credit card data in January 2015 and still active through December 2019. The "full sample" column summarizes all observations from our balanced panel, reproducing the statistics in Table 1. The remaining three columns are restricted to observations that had a balance of more than $0 in the previous period. The "minimum payment" column shows the subset that paid the minimum balance due on their account for the current period. The "full balance" column shows the subset that made a payment of the full balance amount. The "more than minimum" column shows that subset paying more than the minimum but less than the full balance. For a set of observations, the minimum payment due was the entire balance; these are assigned to the "full balance" column and excluded from the "minimum payment" and "more than minimum" columns.
Source: Authors' calculations based on the Y-14M data.