



Responses to an anticipated increase in cash on hand: Evidence from term loan repayments

Philippe D'astous

► To cite this version:

Philippe D'astous. Responses to an anticipated increase in cash on hand: Evidence from term loan repayments. *Journal of banking & finance* = *Journal of banking and finance*, 2019, 108, pp.105649 -. [10.1016/j.jbankfin.2019.105649](https://doi.org/10.1016/j.jbankfin.2019.105649). <hal-03487295>

HAL Id: hal-03487295

<https://hal.science/hal-03487295v1>

Submitted on 20 Jul 2022

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Distributed under a Creative Commons CC BY-NC 4.0 - Attribution - Non-commercial use - International License

Responses to an Anticipated Increase in Cash on Hand: Evidence from Term Loan Repayments*

Philippe d'Astous[†]

September 16, 2019

Abstract

I use account-level credit card and term loan data to analyze consumers' responses to anticipated increases in cash on hand following term loan run-offs. Financial constraints are elicited using past credit card payment behavior and can explain the response of credit card but not term loan expenditure: unconstrained consumers are 23% more likely to finance new durable goods with term loans after the run-off. The results provide evidence of consumers engaging in sequential term loan borrowing.

JEL Classification: D12, D14, E21, G21.

*I am grateful to three referees, the Editor, Stephen Shore, Sumit Agarwal, Ron Balvers, Conrad Cicotello, Georges Dionne, Glenn Harrison, Jimmy Martinez, and Pierre-Carl Michaud for helpful comments. I also thank seminar participants at the CFP Colloquium 2018, the CIRANO Applied Microeconomics Workshop 2016, Copenhagen Business School, the IFID Conference on Household Debt, the Federal Reserve Bank of Richmond, Florida International University, Georgia State University, HEC Montréal, Laval University, Queen's University, and Utah State University for their valuable suggestions.

[†]HEC Montréal, 3000 Chemin de la Côte-Sainte-Catherine, Montréal, QC H3T 2B1, Canada.
Email: philippe.dastous@hec.ca. Tel: +1-514-340-7120.

Responses to an Anticipated Increase in Cash on Hand: Evidence from Term Loan Repayments

Abstract

I use account-level credit card and term loan data to analyze consumers' responses to anticipated increases in cash on hand following term loan run-offs. Financial constraints are elicited using past credit card payment behavior and can explain the response of credit card but not term loan expenditure: unconstrained consumers are 23% more likely to finance new durable goods with term loans after the run-off. The results provide evidence of consumers engaging in sequential term loan borrowing.

JEL Classification: D12, D14, E21, G21.

1 Introduction

Term loans are used by consumers to borrow a fixed amount of money that is typically repaid in a predetermined number of equal periodic installments. They run off when borrowers complete their required payment schedule on time, after which their disposable income increases by the periodic payment amount. Borrowers can then use the freed-up resources to increase savings, repay other debts, or increase consumption. In particular, there is growing concern that financially vulnerable individuals might engage in extended sequences of installment borrowing, which can be especially problematic in the case of predatory high-cost loans (Consumer Financial Protection Bureau, 2017).

In this paper, I analyze the response of consumers to term loan run-offs by using account-level data from 2009 to 2013 provided by a large North American bank. This bank is particular in allowing consumers to borrow using term loans on their credit card account. The term loans are contracted either at selected retail stores (i.e. *store-originated*), or directly at the bank (i.e. *bank-originated*). Prospective borrowers apply for term loans using their credit card, and an automated system using credit bureau checks and the bank's internal information accepts or rejects the request within a few minutes. The term loans observed in the data are on average for \$2,300, repaid over 24 months at a rate of 4% and have monthly payments of about \$100.¹ The borrowers at the institution are in large part prime borrowers, with an average external credit score of 915 (out of 1000).

Because the data include both credit card and term loan expenditure, they provide an ideal laboratory to study the consumption response to a term loan run-off and sequential term loan borrowing. Measuring the responses to term loan run-offs can be interpreted as a test of the permanent income hypothesis (PIH) (Modigliani and Brumberg, 1954, Friedman, 1957). The PIH predicts that unconstrained consumers adjust consumption when future changes in disposable income are anticipated, not when they are realized. This implication

¹The 95th percentile of loan sizes is about \$7,000. There is variation in the term loan APRs, and some retail stores have promotions for 0% APR loans. The credit card account is a revolving loan with an average APR of 18%, and standard contract terms.

of the PIH has been tested empirically in response to different types of changes in disposable income.² The empirical failure of this prediction is often attributed to the presence of financial constraints: constrained consumers who are unable to borrow to adjust consumption when disposable income is expected to rise respond by increasing consumption when the increase in cash on hand is realized (Deaton, 1991, Carroll, 1997).

One definition of liquidity constraint refers to the inability to borrow against future wealth: a credit quantity constraint. Empirically, net wealth (Zeldes, 1989), survey responses from borrowers who have been refused loans (Jappelli, 1990), and the percentage of the maximum authorized credit limit drawn down on credit cards (Agarwal et al., 2007) have been used as proxies for liquidity constraint. However, as noted by Gross and Souleles (2002), a weaker definition of a financial constraint refers to the cost of funds used to finance consumption: a higher interest rate paid on the funds used to finance consumption represents a tighter financial constraint. Under this definition, borrowers who are unconstrained in terms of the quantity of credit available can still differ substantially in terms of the cost of funds used to finance consumption. Kreiner et al. (2018) model liquidity constraints similarly in the case of a Danish fiscal policy that transformed illiquid pension wealth into liquid wealth. This distinction is especially important in the credit card market, where there is substantial heterogeneity in APRs (Stango and Zinman, 2016).

I use borrowers' credit card payment history to identify financial constraints. Consumers choose how much of their end-of-month balance to pay back, subject to a minimum payment imposed by the bank. Any amount that is not repaid by the end of the billing cycle is revolved and charged at the card's annual percentage rate (APR). I classify borrowers into three levels of financial constraints depending on past payment behavior, as described below and summarized in Table 1.³

²See, for example, Zeldes (1989), Souleles (1999), Browning and Collado (2001), Hsieh (2003), Shapiro and Slemrod (2003), Johnson et al. (2006), Agarwal et al. (2007), Parker et al. (2013), and Agarwal and Qian (2014). Jappelli and Pistaferri (2010) survey theoretical results on the consumption response to income shocks, and Attanasio and Weber (2010) and Fuchs-Schuendeln and Hassan (2015) survey empirical finding

³Table A1 shows the interaction between a commonly used measure of quantity constraints (in terms of the utilization rate of the credit card limit) and this measure in terms of payment behavior. Virtually

Table 1: Financial Constraints and Credit Card Payment Behavior

	Outside	Empirical Predictions		
	Cost of Funds	C.C. Purchases	Term Purchases	C.C. Debt
Full Payer	$R < APR$	No Changes	No Changes	No Changes
Partial Payer	$R = APR$	No Changes	No Changes	Decrease
Minimum Payer	$R > APR$	Increase	Increase	Increase

Full Payer — Consumers paying their balance in full are charged no interest on their purchases. Before the run-off, they could pay off a smaller fraction of their balance and use the freed-up liquidity to increase consumption, but they choose not to do so. These consumers are not financially constrained, and their marginal cost of funds is lower than their card’s APR. After the run-off, these consumers should not increase consumption, but should instead save the resources freed up by the run-off.

Partial Payer — Consumers who are partially repaying their credit card balance are at an interior solution. Before the run-off, they are indifferent between paying off a marginally smaller fraction of their balance (and increasing consumption by that amount) and paying off a marginally larger fraction of their balance (and reducing interest paid). These consumers are not financially constrained, but their marginal cost of funds is equal to the APR on the card. After the run-off, these consumers should not increase consumption, but should instead use the freed-up resources to pay down their credit card balance.

Minimum Payer — Consumers making minimum payments are at a corner solution and are charged interest on almost their entire credit card balance. Before the run-off, they would like to increase the amount revolved on the card, but are constrained by the minimum

every consumer who pays either part of or the full balance is also considered unconstrained in terms of the quantity of funds available to draw down. Consumers identified as paying the minimum amount fall into two groups: one group is constrained in terms of both quantity and the cost of funds, while the other is only constrained in terms of the cost of funds. The framework proposed in this analysis should therefore be seen as augmenting the traditional view of liquidity constraints as either binding or otherwise by separating the behavior of consumers for whom quantity constraints do not bind in terms of their outside cost of funds.

payment. These borrowers have a marginal cost of funds that is higher than the card’s APR. After the run-off, they should increase consumption, potentially financed by increasing credit card debt.⁴

I test these predictions and validate them for credit card but not term loans expenditures: After the run-off, full payers are the least responsive in terms of credit card expenditure, minimum payers increase their credit card expenditure and their revolving balance, and partial payers decrease their revolving balance.⁵ However, term loan expenditure increases discontinuously in the months following the term loan run-off for all consumers, regardless of whether they are constrained. There is a transitory increase in new *bank-originated* term loans that can be explained by a group of consumers who use term loans each year to contribute to tax-sheltered retirement savings. There is also an increase in new *store-originated* term loans of 23% (0.3 percentage points on a monthly baseline of 1.3%) for unconstrained consumers. These results provide evidence of consumers engaging in sequential term loan borrowing. Because borrowers could also respond by increasing consumption through other accounts (for example at another bank), the results provide a lower bound for the consumption response.

The results have a natural interpretation in light of “planner-doer” models pioneered by O’Donoghue and Rabin (1999) that have been used in the household finance literature. For example, Laibson et al. (2003) model individuals as their current- and future-selves to explain seemingly time inconsistent behavior, while Bertaut et al. (2009) model individuals as their accountant- and shopper-selves to explain the simultaneous holding of liquid assets

⁴Previous research shows that in response to an increase in minimum credit card payments, affected consumers fail to fully comply, resulting in increased financial delinquency (d’Astous and Shore, 2017). An alternative view is that behavioral factors, not liquidity constraints, affect consumers’ choice to only pay the minimum required amount on their credit card (Agarwal et al., 2015, Keys and Wang, 2016). However, this explanation cannot distinguish the behavior of consumers paying their balance either partially or in full, as both of these groups of consumers pay more than the minimum payment.

⁵These results are in line with those of Mian et al. (2013), Di Maggio et al. (2015), and Keys et al. (2014), who find that the most indebted households choose to deleverage instead of increasing consumption in response to increased liquidity and are in accordance with a PIH-style model in which the marginal cost of funds is informative about financial constraints (see Kreiner et al. (2018) for a recent application of such model).

and high cost credit card debt. Analogously, one could explain the different behavior on credit cards and term loans by two different individual-selves controlling the credit card and term loan accounts. This naturally hints to the possibility of mental accounting (Thaler, 1990): consumers have a higher propensity to roll over in a new term loan when one is finished paying off than increasing credit card spending. It therefore seems like consumers have more self-control on credit cards than on term loans. Although the term loans in the sample studied in this paper are no predatory like the ones in recent debates on consumers rolling over payday loans, the results nonetheless speak to this propensity to roll over term loans.

The main analysis uses two different identification strategies, both intended to reveal the causal effect of the run-off on the outcomes of interest. The first strategy compares borrowers before and after the term loan run-offs. The second identification strategy allows a weaker assumption about the exogenous timing of run-offs by comparing the before- and after-run-off patterns in the outcomes of interest for those with small and large term loan payments. Importantly for the validity of the identification strategy, term loan maturities are offered in six-month blocks by the bank (i.e., consumers can choose maturities of 6, 12, 18, and 24 months, and so on, up to a maximum of 60 months), so consumers do not choose the exact maturity of their loan. However, because the term loans can be prepaid without penalty, unobservable variables could correlate with the decision to *prepay* the term loan and the outcomes studied in the analysis. For this reason, the main analysis uses the anticipated date of final payment—predicted 12 months before its realization—as the event leading to an increase in cash on hand.⁶ As an additional test for the validity of the identification strategy, I estimate a Heckman (1979) selection model in Section 4, and verify that the results hold when instrumenting for the timing of the run-off.

This is not the first study to analyze the responses to final loan payments, although

⁶In this intention-to-treat (ITT) approach (e.g. Imbens and Rubin, 2015), random assignment into the treatment is assumed to hold for the predicted final payment date, not its actual realization. This mitigates concerns about unobservable variables correlating with the final term loan payment and subsequent behavior, while still capturing a discontinuous decrease in monthly debt payments.

existing studies do not jointly analyze the consumption response in terms of credit card expenditures and sequential term loan borrowing. Coulibaly and Li (2006) and Stephens (2008) use the Consumer Expenditure Survey (CEX) to measure the response to 286 mortgage run-offs and 200⁷ auto loan run-offs, respectively. The nature of the CEX allows them to analyze different categories of expenditures. Coulibaly and Li (2006) find a marginal propensity to consume of 20% and 4% in home furnishing and entertainment, respectively, while Stephens (2008) finds that a 10% increase in after-tax income increases nondurable consumption by 2.8%. Scholnick (2013) uses administrative data from a Canadian bank to measure the response of credit card expenditure to 147 mortgage run-off events. He finds evidence that the magnitude of an income change affects consumption smoothing. Andersen et al. (2017) use administrative data from Denmark to analyze the response of earnings, savings, and non-mortgage debt to 15,895 mortgage run-offs. They find that individuals use 39% of the resources previously devoted to mortgage payments to decrease labor income and 53% to pay down other debts.

2 Data and Research Design

I use account-level data provided by a large North American bank that allows borrowers to use their account to make purchases using either a credit card or term loans. The original data consist of monthly observations on the universe of the bank’s credit card accounts (close to five million unique accounts) over the period from December 2009 to May 2013. All accounts are linked to a credit card and any term loan contracted through the bank is added to the borrower’s account. There is no penalty for prepaying either type of loan and neither type of loan is secured by any collateral. The credit card is a typical revolving loan: borrowers use it to make purchases and pay interest only on the portion of the balance that is unpaid after a billing cycle. There is no fixed repayment schedule other than a small

⁷About 4% of a sample of 5,000 households according to Table 1 presented in the paper.

minimum monthly payment.⁸

Term loans are repaid in equal monthly installments over maturities ranging between 6 and 60 months selected from a coarse menu of six-month increment bins. Two types of term loans are offered by the bank: *bank-originated* term loans are contracted at the bank, and *store-originated* term loans are contracted at selected retail stores as a way of financing consumer goods by monthly installments. Over 10,500 retail stores participate in the program throughout the region in which the bank operates. Accounts have separate borrowing limits for term and revolving loans. The bank advertises explicitly that taking out a term loan does not affect the available credit on the credit card account, and vice versa.⁹ This is an important features of the institutional setting as it rules out credit supply effects between credit card and term loans at this bank.

The data include monthly information typically found on the front page of credit card statements such as total spending on the credit card and on each type of term loans, total payments posted on the account, balance outstanding on the credit card and on each type of term loans, interest rate on the credit card, and financial delinquency. Data also include demographics such as sex, age, credit score, and partial information about zip code.¹⁰

⁸The bank increased the minimum revolving payment from 3% to 5% of the monthly credit card balance during the time frame analyzed in this study (see d’Astous and Shore, 2017). However, because the date of the final term loan payment varies across borrowers and because I control for time fixed effects, this does not affect the results.

⁹The revolving (credit card) account limit states the maximum balance that the borrower can carry on his credit card, while the term loan account limit states the maximum amount of term loan a borrower is pre-approved for. For a term loan amount under this limit, the borrower will automatically be approved. For a term loan amount above this limit, the bank will run an automated credit check (potentially at both the credit bureau and using the banks internal information) and will provide an accept/reject decision within a few minutes. Borrowing more on the credit card does not reduce the headroom available on the term loan account and vice versa. Furthermore, as the term loan is gradually repaid, the credit limit available on the term loan account increases by the amount of capital repaid on the loan.

¹⁰The data do not distinguish between payments made on term and revolving loans. However, unless otherwise specified, all payments posted to the account above minimum monthly payments are processed towards the highest interest-bearing debt which, in virtually every cases, is the revolving debt. I therefore back out payments made towards revolving and term loans using total payments, the evolution of the balances, and spending. Further, the interest rate and amortization schedule are missing for the term loans. Thus, I calculate this information using the monthly installment, which is given, and the evolution of the term balances. Specifically, I first use the variation in the balance of the term loan to back out the interest charged on the account as $i = \frac{Installment_t - \Delta Balance_t}{Balance_{t-1}}$. Using this rate, I calculate the number of months left before the term loan is repaid as $n = \frac{\log\left(\frac{Installment}{(Installment - \Delta Balance_t) \times i}\right)}{\log(1+i)}$. I winsorize these variables at the 1st and

Figure 1: Account Statement Example

Account Statement																									
Statement Date: 02-12-2014		Due Date: 03-10-2014																							
Account Number: XXXX-XXXX-XXXX-XXXX																									
<div style="border: 1px solid black; padding: 5px;"> John Smith 123 Street Townsville North America </div>	<div style="border: 1px solid black; padding: 5px;"> Total Minimum Payment Due: <div style="text-align: center; font-weight: bold; font-size: 1.2em;">\$ 81.49</div> </div>	<div style="border: 1px solid black; padding: 5px;"> Amount Paid: <div style="text-align: center; font-size: 1.5em;">\$</div> <div style="border-bottom: 1px solid black; width: 100%; height: 1.2em; margin: 5px 0;"></div> <div style="text-align: center; font-size: 0.8em;">(this amount will be applied to you current balance)</div> </div>																							
Account Summary:																									
<div style="border: 1px solid black; padding: 5px;"> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 60%;">Previous Balance</td> <td style="text-align: right;">\$1,500</td> </tr> <tr> <td>Purchases and Adjustments</td> <td style="text-align: right;">+ \$1,000</td> </tr> <tr> <td>Cash Advances</td> <td style="text-align: right;">+ \$0</td> </tr> <tr> <td>Interest Charges</td> <td style="text-align: right;">+ \$0</td> </tr> <tr> <td>Monthly Term loan Installment</td> <td style="text-align: right;">+ \$31.49</td> </tr> <tr> <td>Payments and other Credits</td> <td style="text-align: right;">- \$1,500</td> </tr> <tr> <td style="border-top: 1px solid black;">Current Balance</td> <td style="text-align: right; border-top: 1px solid black;">= \$1,031.49</td> </tr> </table> </div>		Previous Balance	\$1,500	Purchases and Adjustments	+ \$1,000	Cash Advances	+ \$0	Interest Charges	+ \$0	Monthly Term loan Installment	+ \$31.49	Payments and other Credits	- \$1,500	Current Balance	= \$1,031.49	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Credit Card Limit:</td> <td style="text-align: right;">5,000</td> </tr> <tr> <td>Credit Card Available:</td> <td style="text-align: right;">4,000</td> </tr> <tr> <td colspan="2" style="padding-top: 10px;">Annual Percentage Rate (APR):</td> </tr> <tr> <td></td> <td style="text-align: right;">19.90%</td> </tr> </table>		Credit Card Limit:	5,000	Credit Card Available:	4,000	Annual Percentage Rate (APR):			19.90%
Previous Balance	\$1,500																								
Purchases and Adjustments	+ \$1,000																								
Cash Advances	+ \$0																								
Interest Charges	+ \$0																								
Monthly Term loan Installment	+ \$31.49																								
Payments and other Credits	- \$1,500																								
Current Balance	= \$1,031.49																								
Credit Card Limit:	5,000																								
Credit Card Available:	4,000																								
Annual Percentage Rate (APR):																									
	19.90%																								
<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20%;"></td> <td style="width: 15%; text-align: center; font-size: 0.8em;">Minimum Payment on Revolving Balance</td> <td style="width: 15%; text-align: center; font-size: 0.8em;">Monthly Payment on the Term Loan</td> <td style="width: 15%; text-align: center; font-size: 0.8em;">Overdue Amount</td> <td style="width: 15%; text-align: center; font-size: 0.8em;">Total Minimum Payment Due</td> </tr> <tr> <td style="vertical-align: top;">Total Minimum Payment Due:</td> <td style="text-align: center; border: 1px solid black; padding: 5px;">\$ 50</td> <td style="text-align: center; border: 1px solid black; padding: 5px;">\$ 31.49</td> <td style="text-align: center; border: 1px solid black; padding: 5px;">\$ 0</td> <td style="text-align: center; border: 1px solid black; padding: 5px;">\$ 81.49</td> </tr> </table>					Minimum Payment on Revolving Balance	Monthly Payment on the Term Loan	Overdue Amount	Total Minimum Payment Due	Total Minimum Payment Due:	\$ 50	\$ 31.49	\$ 0	\$ 81.49												
	Minimum Payment on Revolving Balance	Monthly Payment on the Term Loan	Overdue Amount	Total Minimum Payment Due																					
Total Minimum Payment Due:	\$ 50	\$ 31.49	\$ 0	\$ 81.49																					
<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 40%;"></td> <td style="width: 20%; text-align: center; font-size: 0.8em;">Current Balance</td> <td style="width: 20%; text-align: center; font-size: 0.8em;">Term Loan Balance</td> <td style="width: 20%; text-align: center; font-size: 0.8em;">Total Account Balance</td> </tr> <tr> <td style="vertical-align: top;">Information concerning total account balance:</td> <td style="text-align: center; border: 1px solid black; padding: 5px;">\$ 1,031.49</td> <td style="text-align: center; border: 1px solid black; padding: 5px;">\$ 552.36</td> <td style="text-align: center; border: 1px solid black; padding: 5px;">\$1,583.85</td> </tr> </table>					Current Balance	Term Loan Balance	Total Account Balance	Information concerning total account balance:	\$ 1,031.49	\$ 552.36	\$1,583.85														
	Current Balance	Term Loan Balance	Total Account Balance																						
Information concerning total account balance:	\$ 1,031.49	\$ 552.36	\$1,583.85																						

Term loan information <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; padding: 5px;"> <div style="border: 1px solid black; padding: 5px;"> Previous Balance on the Term Loan <div style="text-align: center; font-weight: bold; font-size: 1.2em;">\$ 580.44</div> </div> </td> <td style="width: 50%; padding: 5px;"> <div style="border: 1px solid black; padding: 5px;"> Variation in the Principal Amount <div style="text-align: center; font-weight: bold; font-size: 1.2em;">\$ 0</div> </div> </td> </tr> </table>		<div style="border: 1px solid black; padding: 5px;"> Previous Balance on the Term Loan <div style="text-align: center; font-weight: bold; font-size: 1.2em;">\$ 580.44</div> </div>	<div style="border: 1px solid black; padding: 5px;"> Variation in the Principal Amount <div style="text-align: center; font-weight: bold; font-size: 1.2em;">\$ 0</div> </div>	<table style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="3" style="font-size: 0.8em;">Detailed Current Payment</th> </tr> <tr> <th style="width: 33%; font-size: 0.7em;">Principal</th> <th style="width: 33%; font-size: 0.7em;">Interest</th> <th style="width: 33%; font-size: 0.7em;">Total</th> </tr> <tr> <td style="text-align: center; border: 1px solid black; padding: 5px;">\$ 28.08</td> <td style="text-align: center; border: 1px solid black; padding: 5px;">\$ 3.41</td> <td style="text-align: center; border: 1px solid black; padding: 5px;">\$ 31.49</td> </tr> <tr> <td colspan="3" style="text-align: center; border: 1px solid black; padding: 5px; font-weight: bold; font-size: 1.2em;">\$ 31.49</td> </tr> </table>	Detailed Current Payment			Principal	Interest	Total	\$ 28.08	\$ 3.41	\$ 31.49	\$ 31.49			<table style="width: 100%; border-collapse: collapse;"> <tr> <th style="font-size: 0.8em;">New Balance on the Term Loan</th> </tr> <tr> <td style="text-align: center; border: 1px solid black; padding: 5px; font-weight: bold; font-size: 1.2em;">\$ 3.41</td> </tr> <tr> <td style="text-align: center; border: 1px solid black; padding: 5px; font-weight: bold; font-size: 1.2em;">+ \$ 548.95</td> </tr> <tr> <td style="text-align: center; border: 1px solid black; padding: 5px; font-weight: bold; font-size: 1.2em;">= \$ 552.36</td> </tr> </table>	New Balance on the Term Loan	\$ 3.41	+ \$ 548.95	= \$ 552.36
<div style="border: 1px solid black; padding: 5px;"> Previous Balance on the Term Loan <div style="text-align: center; font-weight: bold; font-size: 1.2em;">\$ 580.44</div> </div>	<div style="border: 1px solid black; padding: 5px;"> Variation in the Principal Amount <div style="text-align: center; font-weight: bold; font-size: 1.2em;">\$ 0</div> </div>																				
Detailed Current Payment																					
Principal	Interest	Total																			
\$ 28.08	\$ 3.41	\$ 31.49																			
\$ 31.49																					
New Balance on the Term Loan																					
\$ 3.41																					
+ \$ 548.95																					
= \$ 552.36																					

Note: This figure shows a typical account statement for a borrower at the bank. The monthly statement presents information about the revolving and term loans on the account. The total minimum payment due consists of the minimum payment on the credit card balance, the monthly term loan payment, and the overdue amount. The monthly payment on the term loan consists of the installment due on the term loan in the current month. The overdue amount consists of the cumulative amount that arises from paying less than the total minimum payment due on previous statements.

Figure 1 presents a typical monthly statement. The total account balance is the sum of the term and revolving balances, and purchases and payments can either be analyzed on each type of loan or aggregated at the account level. The total minimum payment due is the sum of the minimum credit card payment, the monthly payment on the term loan balance, and any overdue amount on the account. Accounts can be either current or up to five cycles delinquent. Accounts that are six cycles delinquent are considered to be in default and must be written off. The bank also writes off loans when the consumer files for bankruptcy. There is no distinction between delinquency on the revolving and term loans; delinquency is recorded at the account level.

2.1 Sample Construction

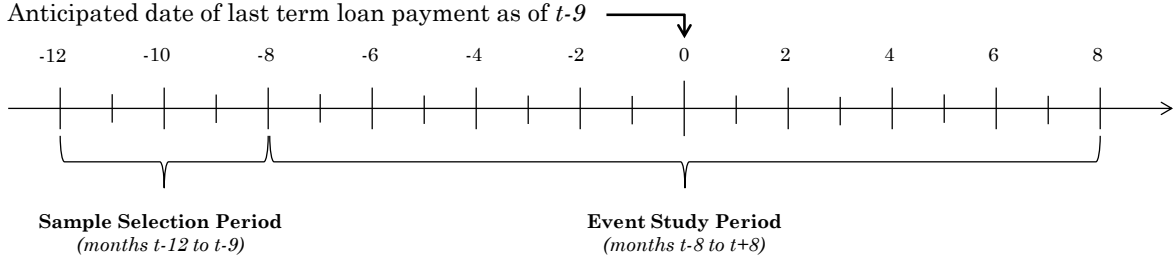
Figure 2 shows the timeline of the study. I select borrowers that are on track to repaying a term loan during the period 12 months to 9 months before its anticipated final payment. Borrowers must have only one type of active term loan during this selection period (*bank-originated* or *store-originated*) to rule out the possibility that a consumer is identified as paying off a term loan even though a second loan is still active on the account.¹¹ Time 0 corresponds to the first month in which a borrower is predicted to have paid down the term loan, as measured one year in advance. Measures of financial constraints are calculated during the sample selection period, before the study starts, to avoid confounding the impact of term loan repayment with any of the outcomes studied.

A total of 2,649,863 accounts have an active term loan at some point in the time frame and 1,225,965 term loan repayment events are observed. To be included in the sample, accounts must have an anticipated term loan repayment event and have observations over the full event-study period, which restricts the number of accounts that are included in the final sample. Accounts that are written-off prior to the end of the sample period are nevertheless

99th percentile to avoid aberrant values.

¹¹However, during the analysis period, borrowers can have two types of term loans (*store-* and *bank-originated* loans) simultaneously, in which case I analyze the total term loan balance.

Figure 2: Event Study Timeline

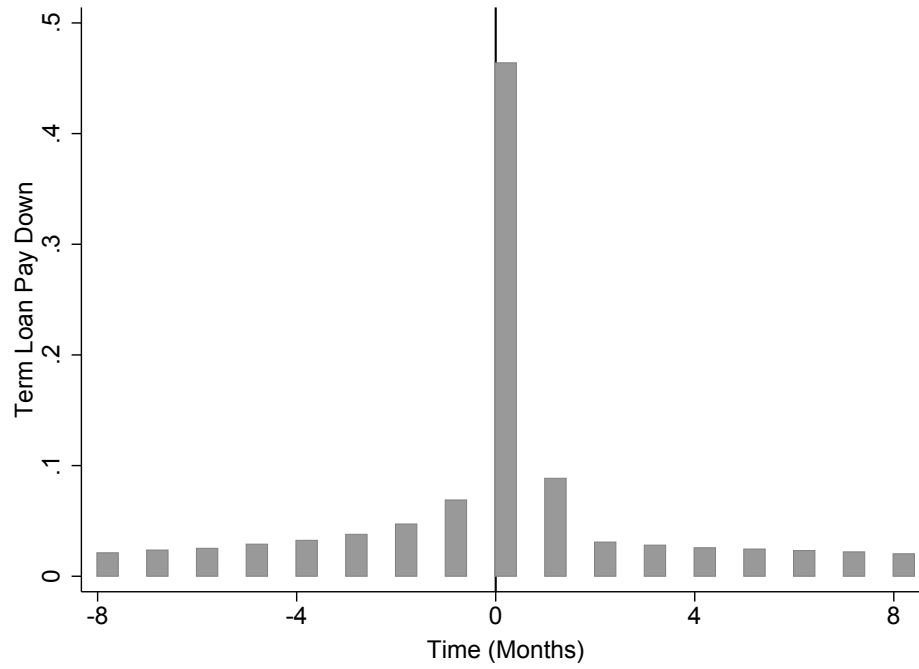


included in the sample. This sample selection process yields 291,777 unique accounts and 4,803,365 account-month observations.

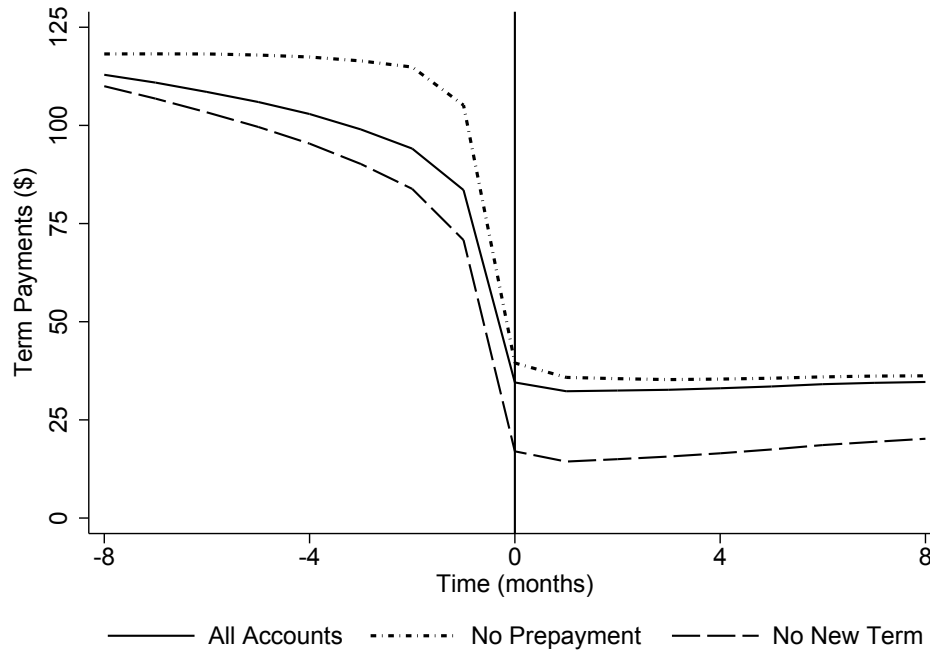
2.2 Compliance with the Predicted Last Payment Date

Because of the nature of the research design, I provide evidence of compliance with the predicted date of the final term loan payment. Panel (a) of Figure 3 shows the fraction of borrowers for whom the sum of all active term loan balances goes from a positive amount to zero in each month. Forty-six percent of account holders pay off their term loan in month 0 of the event-study, exactly as predicted one year earlier. Note that consumers taking up a new term loan prior to the final payment on the original loan will not drive their total term loan balance down to zero, although the repayment of the original term loan will still induce a decrease in monthly installments. Panel (b) shows the monthly term loan installment for the full sample and for groups of borrowers who do not prepay and who do not take out new term loans before the original loan is repaid. There is a discontinuous decrease in term loan installments in the month of the predicted final payment, although average installments do not fall to zero because some borrowers take out new term loans before the original loan is repaid, or had another active term loan before the run-off is identified.

Figure 3: Compliance with Predicted Last Payment



(a) Actual Term Loan Paydown



(b) Monthly Term Installment

Note: Panel (a) shows the fraction of borrowers paying off their term loan (i.e. bringing the term balance to zero) each month. Panel (b) shows the monthly term loan installment for the full sample and for groups of borrowers who do not prepay and who do not take out new term loans before the original one is repaid. Time 0 corresponds to the first month in which the borrower is predicted to have paid down the term loan.

2.3 Identification Strategy

I analyze the consumers’ responses using an event-study methodology using two different specifications, both intended to reveal the causal effect of the run-off on the outcomes of interest. Because borrowers finish repaying their term loans in different months, the variation in the timing of the final term loan payment averages out seasonal effects. The first (and simplest) specification exploits this variation in an equation of the form

$$Y_{i,\tau} = \beta \text{After}_{\tau} + \alpha_i + \lambda_t + f(\tau) + \varepsilon_{i,\tau}. \quad (1)$$

τ represents event-study time and t represents calendar year-months. $Y_{i,\tau}$ represents outcomes such as spending (using either the credit card or term loans), debt payments, changes in debt levels, or delinquency events. $\text{After}_{i,\tau}$ is a dummy variable equal to 1 if the observation is after the anticipated final term loan payment date, and 0 otherwise. Year-month fixed effects λ_t and a quadratic trend in event-study time $f(\tau)$ are included in all specifications. An account-level dummy variable α_i , which absorbs all time-invariant effects at the individual level, is also included in all specifications, except when binary outcomes are modeled, in which case I use a set of control variables.¹² This first identification strategy compares borrowers before and after the term loan run-off. For this to accurately measure the causal effect of the run-off, the timing of the term loan repayment must be uncorrelated with the error term.

A second identification strategy allows for a weaker assumption about the endogenous timing of run-offs by comparing the before and after run-off patterns for borrowers with small and large term loans. In this second specification, I augment the baseline specification by interacting the dummy variable indicating the predicted final payment date with the dollar

¹²For binary outcomes, I estimate probit models in which I control for the following variables averaged over the four-month period prior to the start of the study: monthly term loan installment, external credit score, revolving limit on the account, APR on the revolving loan, age of the account, age of the account holder, average credit card and term loan balances, and average monthly purchases. When modeling delinquency outcomes, I also add a dummy variable indicating the delinquency cycle in the previous month and a dummy variable for the length of the current delinquency state. In unreported results available from the author, I show that the results are unchanged when modeling binary outcomes in a Linear Probability Model with accounts fixed effects.

amount of monthly term loan installments. I estimate a regression equation of the form

$$Y_{i,\tau} = \beta_1 \text{After}_\tau \times \text{Installment}_i + \beta_2 \text{After}_\tau + \lambda_t + f(\tau) + \alpha_i + \varepsilon_{i,\tau}, \quad (2)$$

where Installment_i is the monthly installment on the term loan calculated in the selection period, before the analysis period. β_1 gives the average monthly response in dollars to a \$1 reduction in the term loan installment. This equation is equivalent to the main specification used in Agarwal and Qian (2014). This identification strategy will be unbiased as long as there are no differences between large and small loans in the degree to which run-off timing is potentially endogenous.

In Section 4, I further refine the model of run-off timing by estimating a Heckman (1979) selection model in which I instrument for the timing of the term loan run-offs. I show that the results from both identification strategy hold up once the timing of the run-offs are modeled in a selection equation.

Finally, I estimate the heterogeneous effects of the payment behaviors outlined in the introduction by interacting a dummy variable indicating the consumer's type with the dummy variable indicating the predicted final payment date. In this case, I estimate a model of the form

$$\begin{aligned} Y_{i,\tau} = & \beta_1 \text{After}_\tau \times \text{Min Payer}_i + \beta_2 \text{After}_\tau \times \text{Partial Payer}_i \\ & + \beta_3 \text{After}_\tau \times \text{Full Payer}_i + \lambda_t + f(\tau) + \alpha_i + \varepsilon_{i,\tau}, \end{aligned} \quad (3)$$

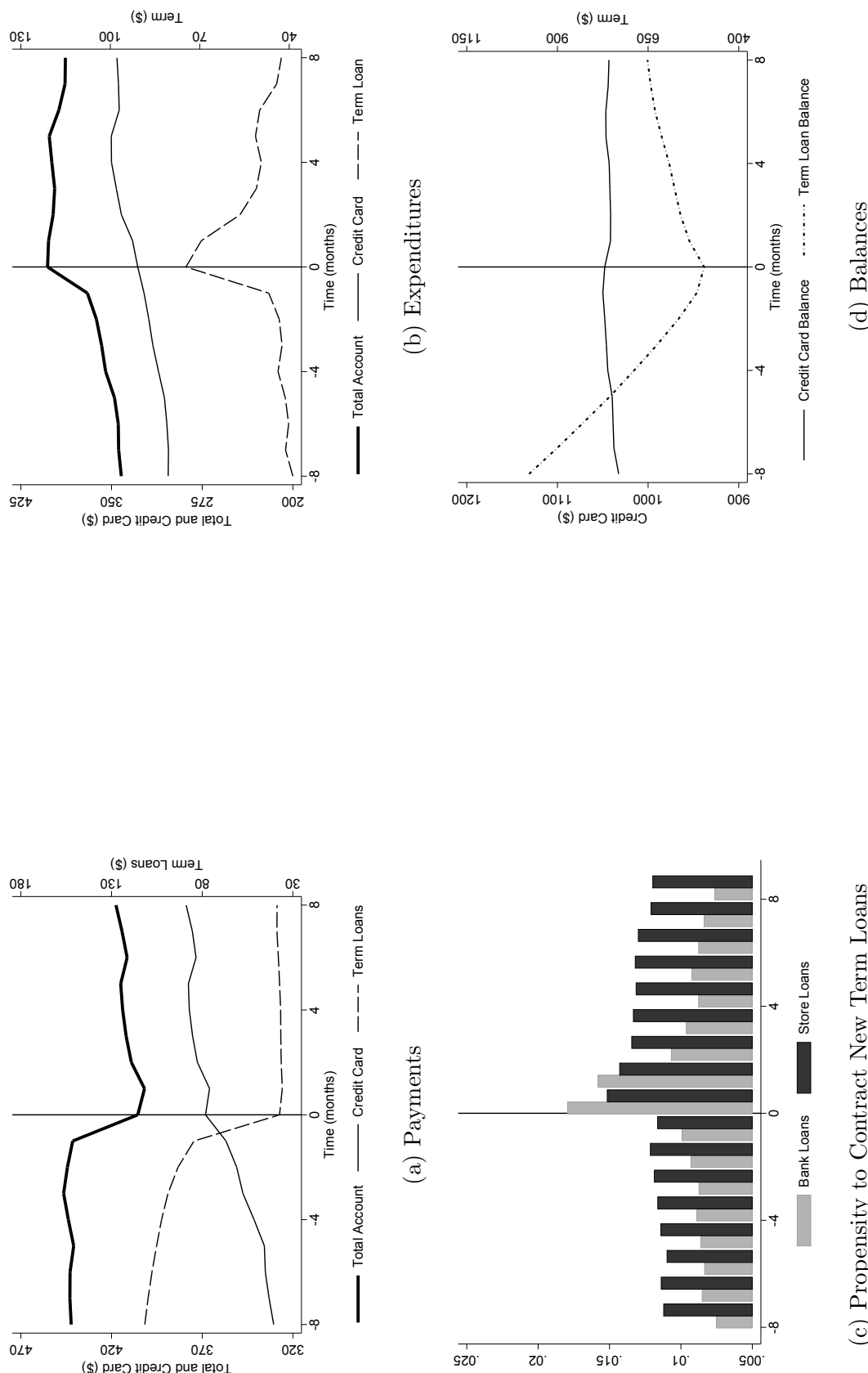
where the constant is omitted from the regression model and “Min Payer”, “Partial Payer”, and “Full Payer” are dummy variables identifying borrowers by their payment behavior in the four months prior to the start of the study. This equation is also augmented by interacting the dollar amount of monthly installments, as is the case in equation (2).

Table 2: Descriptive Statistics

	Full Sample					Before		After		Diff
	Mean/(Std. Dev.)	p5	p50	p95	Obs.	Mean/(Std. Dev.)	Obs.	Mean/(Std. Dev.)	Obs.	Mean/(Std. Error)
<i>A. Borrower Characteristics</i>										
Age	46 (15)	24	46	71	4,803,365	-	-	-	-	-
Male	0.51	-	-	-	4,803,365	-	-	-	-	-
Account age (in years)	9 (7)	1	7	24	4,803,365	-	-	-	-	-
External Credit Score	915 (140)	601	963	976	4,803,365	911 (147)	2,296,214	920 (133)	2,507,151	9.26*** (0.13)
<i>B. Total Account</i>										
Monthly Purchases	376 (1,164)	0	0	1,967	4,803,365	353 (1,125)	2,296,214	397 (1,199)	2,507,151	44.01*** (1.06)
Payments	426 (1,102)	0	110	1,946	4,803,365	443 (1,077)	2,296,214	411 (1,124)	2,507,151	-32.00*** (1.01)
Balance	1,701 (2,942)	0	689	6,994	4,803,365	1,776 (2,720)	2,296,214	1,632 (3,131)	2,507,151	-143.42*** (2.69)
<i>C. Credit Card</i>										
Monthly Purchases	327 (995)	0	0	1,754	4,803,365	311 (970)	2,296,214	342 (1,018)	2,507,151	31.82*** (0.91)
Payments	358 (1,079)	0	20	1,820	4,803,365	341 (1,050)	2,296,214	374 (1,105)	2,507,151	32.47*** (0.99)
Balance	1043 (2,189)	0	129	5,033	4,803,365	1042 (2,172)	2,296,214	1044 (2,205)	2,507,151	1.98 (2.00)
Limit	3,598 (4,636)	400	1,500	15,000	4,803,365	3,488 (4,531)	2,296,214	3,698 (4,727)	2,507,151	209.95*** (4.23)
% Limit Used	0.27 (0.36)	0	0	1	4,803,365	0.29 (0.37)	2,296,214	0.26 (0.35)	2,507,151	-0.03*** (0.00)
% Balance Paid	0.40 (0.45)	0	0.09	1	4,803,365	0.44 (0.46)	2,296,214	0.36 (0.44)	2,507,151	-0.08*** (0.00)
APR	18.05 (3.16)	10	19	19.40	4,803,365	18.07 (3.14)	2,296,214	18.03 (3.17)	2,507,151	-0.04*** (0.00)
Has Reduced APR	0.07 (0.26)	0	0	1	4,803,365	0.07 (0.26)	2,296,214	0.07 (0.26)	2,507,151	0.00*** (0.00)
<i>D. Term Loan</i>										
Monthly Purchases	49 (578)	0	0	0	4,803,365	42 (546)	2,296,214	54 (607)	2,507,151	12.19*** (0.53)
Monthly Purchases Purchases > 0	2,198 (3,228)	345	1,200	7,291	106,158	2,097 (3,241)	46,217	2,275 (3,216)	59,941	178.10*** (19.97)
Payments	68 (147)	0	23	265	4,803,365	102 (150)	2,296,214	37 (137)	2,507,151	-64.46*** (0.13)
Balance	658 (1,774)	0	145	2,738	4,803,365	734 (1,469)	2,296,214	588 (2,011)	2,507,151	-145.40*** (1.62)
Limit	3,042 (2,934)	0	2,500	8,000	4,803,365	3,033 (2,853)	2,296,214	3,050 (3,005)	2,507,151	17.36*** (2.68)
Monthly Installment	66 (107)	0	32	255	4,803,365	102 (115)	2,296,214	34 (87)	2,507,151	-68.79*** (0.09)
Rate	4.07 (5.62)	0	0	13.58	4,803,365	-	-	-	-	-

Note: All statistics are presented for the full sample, and broken down by periods before and after the predicted final term loan payment. See Section 2.1 for the sample selection details.

Figure 4: Average Payments, Expenditures, and Balances



Note: Panel (a) presents average payments made towards the credit card and the term loan over the event-study. Panel (b) shows average purchases made with the credit card or new term loans. Panel (c) shows the propensity to take out a new term loan each month, segmented by the type of term loan taken out. Panel (d) shows the evolution of credit card and term loan balances.

3 Main Results

3.1 Descriptive Statistics

Table 2 presents summary statistics for the variables used in the analysis. All statistics are presented for the full sample, and are divided into periods before and after the predicted final term loan payment.¹³ Panel A shows borrower demographics; Panel B shows purchases, payments and balances aggregated at the total account level; and Panels C and D show the activity on the credit card and term loans separately.

Panel D shows that the monthly installment due on the term loan falls by \$64 from an initial amount of \$102 after the anticipated final payment date. The reduction in the term loan installment drives the total account payments down by \$32 and the revolving payments increase by the difference: $\$64 - \$32 = \$32$. Total purchases on the account rise by \$44, of which \$32 comes from an increase in revolving purchases and \$12 comes from an increase in term loans. The size of new term loans is similar before and after the event date, which suggests that the increase in term loan purchases is driven by an increase in the extensive margin (i.e., the propensity to take out a new term loan, not its size).

The average APR on the credit card is 18%, while it is 4% for term loans. This lower interest rate on term loans is driven by some of the loans taken out at retail stores being offered at an APR of 0%; the average term loan APR for those with a non-zero rate is 9.6%. The external credit score is a bankruptcy prediction score that varies from 1 to 1,000 and increases by about 1% after the term loan is repaid.¹⁴

¹³Online-Appendix Tables ?? and ?? compare summary statistics for the group of individuals with and without a term loan, and for the group of individuals with store- and bank-originated term.

¹⁴Unlike FICO scores, which predict the probability of missing a loan payment, this type of measure predicts the probability of filing for bankruptcy over the next two years and is typically higher than average FICO scores.

3.2 Average Effects

Figure 4 shows the response to the anticipated final term loan payment over the course of the study. Panel (a) shows total payments made on the account and how they are allocated between the credit card and term loans. There is evidence of substitution of payments: as the term loans are paid off, borrowers increase payments on the credit card. Panel (b) shows total expenditure on the account, as well as separate expenditure on the credit card and new term loans. New term loan expenditure exhibits a large transitory increase around the month of the final payment, followed by a smaller permanent increase. Panel (c) shows the fraction of borrowers taking out new store- and bank-originated term loans each month. Transitory and permanent increases in new term loan expenditure are confined to new bank loans and new store loans, respectively. These patterns are further explored in Section 3.4. Finally, Panel (d) shows the evolution of the credit card and term loan balances. The credit card balance is relatively stable over the study, while the term loan balance is the sum of all active term loans on the account. It decreases in the months prior to the final payment and then increases as some consumers take out new term loans.

Table 3 quantifies these effects by estimating equation (1). The results show that payments made on the term loan account fall by \$51 after the final term loan payment, while payments made on the revolving account increase by \$8, driving the total payments made on the account down by \$42. Thus, part of the reduction in monthly term loan payments is passed on to an increase in credit card payments. Total purchases on the account increase by \$31, and can be traced back to an increase in revolving expenditure of \$6 and an increase in term loan expenditure of \$25. The size of the average term loan taken out does not change: the increase in term loan expenditure is driven solely by an increase of 0.84 percentage points in the probability of taking out a new term loan (a 35% increase on a baseline of 2.4%). The simultaneous increase in spending and payments made with the credit card leaves the revolving balance almost unchanged, while term loan balances increase as borrowers take out new term loans.

Table 3: Average Effects

	Expenditures			Payments	Δ Balance
	(1)	(2)	(3)	(3)	(5)
	In Dollars	$\mathbb{P}(\text{New Purchases})$	$\text{Purchases} \mid > 0$	In Dollars	In Dollars
<i>A. Total Account</i>					
After?	30.8*** (1.69)	0.015*** (0.00060)	47.7*** (3.97)	-42.4*** (1.47)	62.5*** (2.13)
R^2	0.505	0.308	0.468	0.561	0.023
Observations	4,803,365	4,803,365	2,053,541	4,803,365	4,787,607
<i>B. Revolving Loan</i>					
After?	6.24*** (1.19)	0.011*** (0.00057)	8.15*** (2.90)	8.22*** (1.45)	-3.71*** (1.32)
R^2	0.666	0.319	0.617	0.553	0.015
Observations	4,803,365	4,803,365	2,008,154	4,803,365	4,787,607
<i>C. Term Loan</i>					
After?	24.6*** (1.19)	0.0084*** (0.00028)	-196.4 (135.5)	-50.7*** (0.28)	66.2*** (1.74)
R^2	0.005	0.013	0.366	0.344	0.031
Observations	4,803,365	4,803,365	106,158	4,803,365	4,787,607
Year-Month F.E.	YES	YES	YES	YES	YES
Quadratic Trend	YES	YES	YES	YES	YES
Account F.E.	YES	NO	YES	YES	YES
Controls	NO	YES	NO	NO	NO

Note: This table shows the results of estimating equation (1) by OLS for all columns except for column (2) which is estimated using a Probit model and for which I report the average partial effects. The control variables are taken in the four months period prior to the start of the event study and consist of monthly term loan installment, external credit score, revolving limit on the account, age of the account, age of the account-holder, average credit card and term loan balances, average monthly purchases and a dummy variable indicating if the borrower pays for a reduced APR on the credit card. Standard errors corrected for within-account heteroscedasticity are presented in parentheses. ***, **, and * represent significance at the 1, 5 and 10 percent level, respectively.

Panel A. of Table 4 shows the credit card response as a fraction of the reduction in the monthly installment obtained by estimating equation (2). The average consumption response through the credit card is 9% of the original term loan payments. This is in line with previous research using credit card expenditure to measure consumption responses.¹⁵ An increase in payments almost perfectly offsets the increase in new expenditure, leading to a decrease in the average credit card balance of 2% of the monthly installment each month.

¹⁵For example, Gross and Souleles (2002) estimate a marginal propensity to consume of 10-14%, based on increases in credit card limits.

Table 4: Credit Card Response: Expenditures, Payments, and Balance

	Expenditures	Payments	Δ Balance
	(1)	(2)	(3)
<i>A. Overall Effect</i>			
After? \times Installment	0.091*** (0.014)	0.094*** (0.014)	-0.017** (0.0078)
R^2	0.666	0.553	0.015
Observations	4,803,365	4,803,365	4,787,607
<i>B. Liquidity Constraints</i>			
After? \times Installment \times Full Payer	0.064*** (0.022)	0.059*** (0.022)	-0.0067 (0.0092)
After? \times Installment \times Med. Payer	0.088*** (0.028)	0.12*** (0.026)	-0.040** (0.016)
After? \times Installment \times Min. Payer	0.14*** (0.024)	0.13*** (0.033)	-0.0077 (0.023)
R^2	0.662	0.547	0.015
Observations	4,248,783	4,248,783	4,233,301
Year-Month F.E.	YES	YES	YES
Quadratic Trend	YES	YES	YES
Account F.E.	YES	YES	YES

Note: This table shows the results of estimating equation (2). Panel A uses the linear monthly installment on the term loan, and Panel B segments it categories of financial constraints. Standard errors corrected for within-account heteroscedasticity are presented in parentheses. ***, **, and * represent significance at the 1, 5 and 10 percent level, respectively.

3.3 Financial Constraints

In this section, I test the empirical predictions derived from the borrowers' repayment behavior on the credit card. Consumers paying their credit card balance in full are not constrained and should not increase consumption in response to the final payment on the term loan. Consumers paying their balance partially use their credit card as their marginal source of funds and are expected to reduce their revolving balance using the freed up liquidity. Finally, consumers paying the minimum monthly amount are constrained and are expected to increase consumption once the term loan is repaid.

Appendix Figures A1, A2, and A3 show the response of payments, expenditure, and debt levels segmented by groups of constrained borrowers. Table 5 presents these effects estimated

Table 5: Effect of Financial Constraints

	Expenditures			Payments	Δ Balance
	(1)	(2)	(3)	(4)	(5)
	In Dollars	$\mathbb{P}(\text{New Purchases})$	Purchases $ > 0$	In Dollars	In Dollars
<i>A. Total Account</i>					
After? \times Full Payer	23.5*** (2.14)	-0.0032*** (0.00076)	42.9*** (4.89)	-52.6*** (1.88)	63.7*** (2.43)
After? \times Med. Payer	15.4*** (2.76)	-0.0012 (0.0010)	21.3*** (5.11)	-26.8*** (2.39)	30.9*** (3.10)
After? \times Min. Payer	60.8*** (2.46)	0.052*** (0.00098)	78.3*** (4.96)	-33.0*** (2.17)	80.4*** (3.04)
R^2	0.504	0.296	0.468	0.555	0.023
Observations	4,248,783	4,248,783	2,030,437	4,248,783	4,233,301
<i>B. Revolving Loan</i>					
After? \times Full Payer	-2.17 (1.64)	-0.0076*** (0.00074)	3.87 (3.98)	2.99 (1.85)	-5.44*** (1.48)
After? \times Med. Payer	-4.74** (2.05)	-0.0041*** (0.00100)	-12.2*** (3.84)	13.9*** (2.35)	-21.2*** (1.84)
After? \times Min. Payer	31.3*** (1.63)	0.048*** (0.00097)	34.2*** (3.34)	15.3*** (2.14)	13.3*** (1.99)
R^2	0.662	0.305	0.618	0.547	0.015
Observations	4,248,783	4,248,783	1,993,042	4,248,783	4,233,301
<i>C. Term Loan</i>					
After? \times Full Payer	25.7*** (1.35)	0.0089*** (0.00035)	-252.6* (152.3)	-55.6*** (0.40)	69.1*** (1.98)
After? \times Med. Payer	20.2*** (1.77)	0.0066*** (0.00038)	-278.4 (176.9)	-40.7*** (0.52)	52.1*** (2.57)
After? \times Min. Payer	29.6*** (1.81)	0.0097*** (0.00037)	-103.9 (179.9)	-48.4*** (0.47)	67.1*** (2.47)
R^2	0.005	0.013	0.374	0.334	0.031
Observations	4,248,783	4,248,783	97,441	4,248,783	4,233,301
Year-Month F.E.	YES	YES	YES	YES	YES
Quadratic Trend	YES	YES	YES	YES	YES
Account F.E.	YES	NO	YES	YES	YES
Controls	NO	YES	NO	NO	NO

Note: This table shows the results of estimating equation (2) by OLS for all columns except for column (2) which is estimated using a Probit model and for which I report the average partial effects. The control variables are taken in the four months period prior to the start of the event study and consist of monthly term loan installment, external credit score, revolving limit on the account, age of the account, age of the account-holder, average credit card and term loan balances, average monthly purchases and a dummy variable indicating if the borrower pays for a reduced APR on the credit card. Standard errors corrected for within-account heteroscedasticity are presented in parentheses. ***, **, and * represent significance at the 1, 5 and 10 percent level, respectively.

using equation (3). Panel A. shows that, aggregated to the total account, minimum payers respond the most in terms of increased monthly expenditures. Once disaggregated to each account, Panel B. shows that unconstrained borrowers do not change their spending behavior in relation to the credit card, nor their payments. Conversely, minimum payers increase their credit card expenditure by \$31, with a corresponding increase in payments of only \$15. This leads to a monthly increase in credit card balances of \$13. Consumers who were partially repaying their balance do not change their credit card expenditure significantly (a decrease of \$4 every month), but they use part of the reduction in monthly installments to increase the payments made toward the credit card balance by \$13, reducing their credit card balance by about \$21 each month.

These results are in line with the predictions of a PIH-style model in which some borrowers have financial constraints as measured by their outside cost of funds. Importantly, in terms of quantity constraints, the groups of borrowers paying either their full balance or part thereof are not considered constrained. Thus, the results highlight the fact that even within groups of consumers who are not quantity constrained, the outside cost of funds affects consumption/saving behavior: borrowers with a higher cost of funds choose to pay down their debt.

Surprisingly, Panel C. of Table 5 shows that the term loan response is similar across groups of constrained borrowers. All groups of borrowers see an increase in term loan expenditure, ranging from \$20 to \$30, with the most constrained borrowers instituting the largest increase. This increase in term loan expenditure is driven by an increase in the propensity to take out new term loans, not by the size of the loan taken out. This is investigated in detail in Section 3.4.

Panel B. of Table 4 shows the credit card response as a fraction of the reduction in the monthly installment across categories of financial constraints. The results are in line with the responses in dollar amounts presented in Table 5. Borrowers who pay in full spend about 6% of the term loan installment on new credit card expenditure, which is offset by an equivalent

increase in payments, leaving their revolving balance mostly unchanged. Minimum payers spend about 14% of the installment, with a similar increase in payments, such that their balance as a fraction of the monthly installment does not change. Finally, consumers for whom the credit card provides their marginal source of funds increase their expenditure as much as those who pay the full balance, but they increase their payments substantially, which leads to a reduction in their credit card balance.

3.4 Term Loans

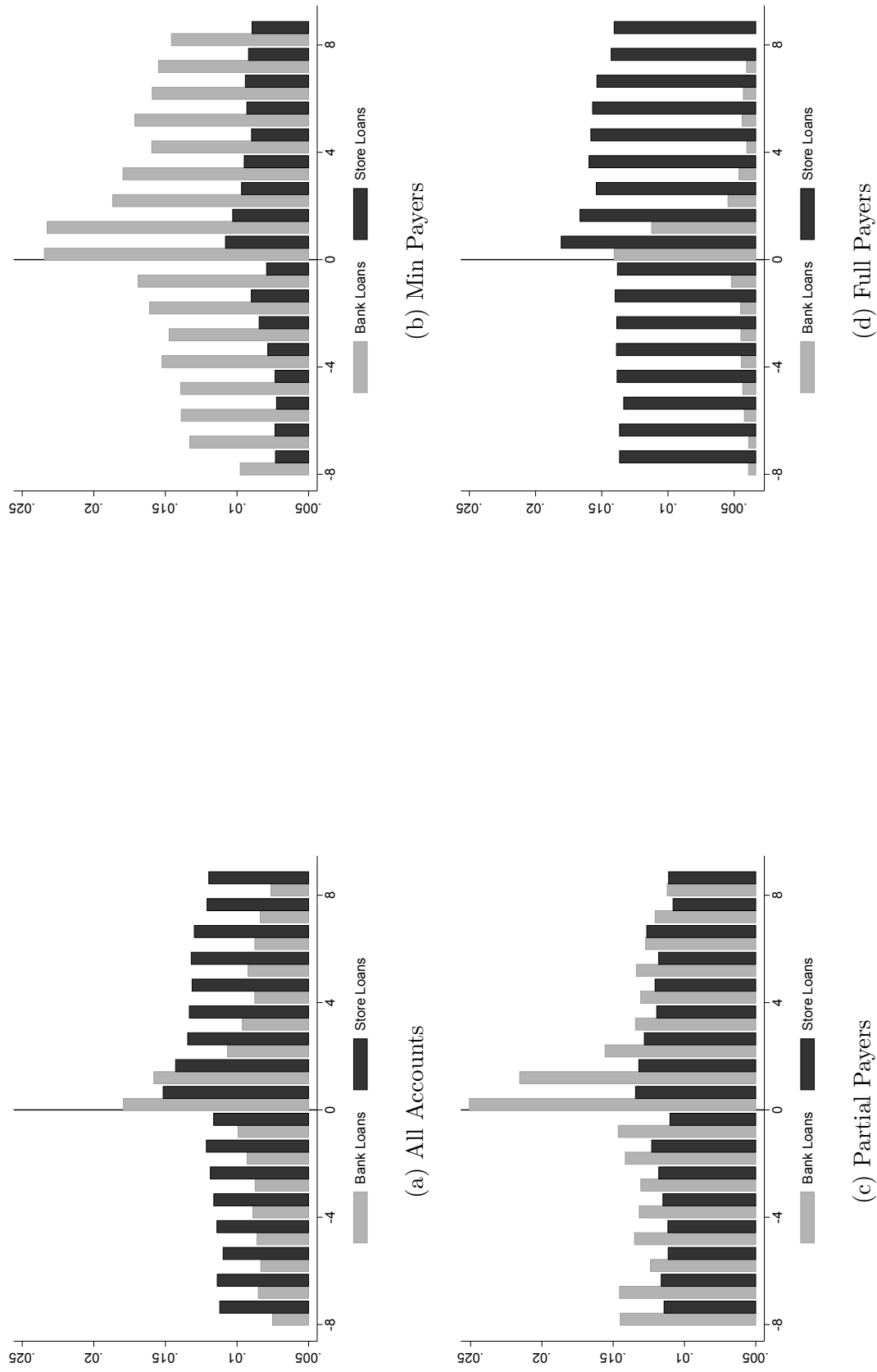
Figure 5 shows the propensity to take out a new term loan, segmented across new bank- and store-originated loans, for each category of financial constraints. Two facts should be noted. First, new term loans are taken out similarly across all groups. Second, the patterns differ across new store- and new bank-originated loans. There is a transitory increase in the propensity to take out a new bank-originated loan in the month in which the original term loan ends, while there is a permanent increase in the propensity to take out a new store-originated loan that seems persistent over the period studied.

Just as new term loan expenditure can be segmented across store- and bank-originated loans, it is possible to segment the sample according to the type of loan used as a term loan run-off.¹⁶ Appendix Figures A4 and A5 show the propensity to take out new term loans for the subsamples of bank- and store-originated run-offs, respectively. These figures show two patterns: both the bank- and store-originated run-offs show a permanent increase in the propensity to take out new store-originated loans, but only the bank-originated run-offs show a transitory increase in the propensity to take out new bank-originated loans.

Table 6 quantifies the average response for store- and bank-originated run-offs. The variable “During?” is a dummy variable indicating whether the event-study month is 0 or 1, and the “After” variable is re-defined as the event-study month being strictly greater

¹⁶Online-appendix Tables ?? and ?? show that the results previously presented in relation to the credit card response are robust to the type of term loan generating the run-off. In both cases, minimum payers increase their expenditure, full payers do not respond to the increase in cash on hand, and partial payers reduce their revolving balance.

Figure 5: New Term Loan Propensity



Note: This figure shows the propensity to take out new store and bank loans each month, segmented by financial constraints.

than 1. This allows to separate the transitory and permanent effects noted in new term loan expenditure. Panel (A) shows that both store-originated and bank-originated run-offs produce increased expenditure on new store-originated loans, although the effect is greater for store-originated loans because the baseline take-out rate is larger for this subsample. Panel (B) shows that the increase in new bank-originated loan expenditure is limited to the subsample of bank-originated run-offs.¹⁷

3.4.1 Explaining the Increase in Term Loan Expenditures

Bank-Originated Term Loans— There is a rational explanation for the transitory increase in new bank-originated term loans being confined to the subsample of bank-originated term loan run-offs. At the end of the year, consumers who qualify can contribute to their retirement savings and reduce their gross income by the amount of the contribution. This has the advantage of reducing the amount of income tax that must be paid to the tax authority. As a marketing strategy, the bank offers term loans with a one-year maturity date to cover the contribution. Consumers might want to use term loans to make their contributions if the reduction in income tax is greater than the interest paid on the loan. Many consumers make this contribution financed by a term loan in the same month each year. Thus, the response in terms of new bank-originated loan expenditure for the subsample of bank-originated run-off will exhibit a transitory effect.¹⁸ Such behavior could be rational, and therefore should not be interpreted as a failure of the PIH.

Store-Originated Term Loans — Store-originated term loans do not exhibit seasonal patterns (see Appendix Figure A6). Accordingly, for the subsample of store-originated run-offs, Appendix Figure A5 shows no change in the propensity to take out new bank-originated term loans. However, there is still a permanent increase in the propensity to take out a new

¹⁷Online-appendix Table ?? further decomposes these results in terms of financial constraints and in terms of the propensity to take out new loans. The results are in line with graphical evidence, and the average effects are presented in Table 6.

¹⁸This is verified by data showing that the increase in bank-originated loans coincides with the last month in which consumers are allowed to make a contribution to their retirement account (see Appendix Figure A6). It is also verified by talking with bank representatives.

Table 6: New Term Loans Response

Sample:	Store-Originated Runoffs	Bank-Originated Runoffs
	(1)	(2)
<i>A. New Store Loan Originations</i>		
During?	8.38*** (0.61)	0.65*** (0.19)
After?	7.11*** (0.77)	0.95*** (0.30)
R^2	0.003	0.002
Observations	3,369,400	1,433,954
<i>B. New Bank Loan Originations</i>		
During?	-0.85 (0.95)	73.1*** (3.29)
After?	-0.60 (1.17)	26.6*** (3.68)
R^2	0.004	0.005
Observations	3,369,402	1,433,963
Year-Month F.E.	YES	YES
Quadratic Trend	YES	YES
Account F.E.	YES	YES

Note: This table shows the average new term and bank loan expenditures, as segmented by the type of term loan originally held by the borrower. Standard errors corrected for within-account heteroscedasticity are presented in parentheses. ***, ***, and * represent significance at the 1, 5 and 10 percent level, respectively.

store-originated term loan that is present in borrowers with either store- or bank-originated term loans. This behavior holds for all groups of financial constraints. In particular, full payers increase their propensity to obtain a new store-originated term loan by 23% each month (an increase of 0.3 percentage points on a monthly baseline of 1.3%), while for partial payers the increase is 16.7% (0.2 percentage points on a monthly baseline of 1.2%). This translates to 4% of the sample of unconstrained consumers behaving contrary to theoretical predictions over the eight-month period after the first term loan is repaid.

4 Extensions

The intention-to-treat research design used in this study implies that some accounts do not comply with the anticipated month of final payment. Non-compliance occurs when a borrower takes out a new term loan prior to paying off the original loan or when a borrower prepays the original term loan. Borrowers taking out a new term loan before the predicted date of final payment of the original loan still have a discontinuous decline in their monthly debt payments, although the required payments do not fall to zero. However, borrowers who prepay their term loan do not experience such a decline at the anticipated payoff date. More importantly, prepayment of the term loan could bias the results if unobservable variables correlate with both the term loan prepayment and the outcomes studied. In this section, I consider these issues and show that the main results hold under different extensions.

4.1 Selection into Prepayment

The most important threat to identification comes from unobservable variables that could potentially correlate with prepayment and subsequent consumption, debt repayment, or delinquency patterns. This would violate the identifying assumption of orthogonality between the final term loan payment and other outcomes of interest. Fortunately, prepayment events can be identified in the sample. A Heckman selection model (Heckman, 1979) is used to correct for the potential sample selection problem induced by term loan prepayment. In such a model, the decision to prepay the term loan is first modeled in a probit equation for which the dependent variable is a dummy variable indicating whether the term loan is prepaid or not. A sample correction variable is then created; the Inverse-Mills Ratio (IMR). This variable is used in the second-stage estimation to correct for sample selection in the outcome equations.

The Heckman selection model requires an exclusion restriction, in this case a variable that influences the decision to prepay the term loan but that does not influence the other

Table 7: Heckman Selection: Decision to Prepay

	Expenditures	Payments	Δ Balance
	(1)	(2)	(3)
<i>A. Outcome Equations</i>			
After? \times Installment	0.0828*** (0.0064)	0.0847*** (0.0073)	-0.0413*** (0.0071)
Installment	-1.6795*** (0.0163)	-1.6275*** (0.0187)	-0.0145 (0.0181)
After?	-0.5996 (1.6920)	3.1666 (1.9371)	-2.8179 (1.8891)
IMR	-190.0604*** (7.1221)	-82.3137*** (8.1559)	60.0101*** (7.8616)
<i>B. Selection Equation</i>			
Zero i Term	0.2397*** (0.0014)		
After? \times Installment	0.0000** (0.0000)		
Installment	-0.0016*** (0.0000)		
After?	0.0015 (0.0029)		
All Observations	4,803,365		
Censored Observations	1,167,300		
Month F.E.	YES		
Quadratic Trend	YES		
Account Controls	YES		

Note: This table shows the result of estimating equation (2) using a Heckman selection model. The decision to prepay is first modeled in a selection equation. The outcome equation then includes the Inverse-Mills Ratio. A binary variable equal to 1 if the term loan is financed at 0% APR serves as the exclusion restriction.

outcomes studied. Such an exclusion restriction is analogous to an instrumental variable in the case of an endogenous regressor. The institutional setting of the bank providing the data provides an ideal candidate for such an exclusion restriction. Because some of the term loans contracted at retail stores are offered with an APR of 0%, there is essentially no incentive for the borrower to prepay them. Having a cost of capital equal to zero should negatively affect the probability of prepaying the term loan, although there is no obvious reason why it would affect subsequent consumption decisions. Therefore, this variable is an ideal candidate for an exclusion restriction in modeling the prepayment decision.

The results of estimating the selection equation are presented in Panel B of Table 7. The dummy variable indicating whether the original term loan is financed under a contract with an APR of 0% is strongly significant and increases the probability that the term loan is *not* prepaid by 24%. Given that about 75% of the term loans are not prepaid, this variable has a strong predictive power.

The IMR is then constructed and added to the outcome equations. This corrects the conditional expectation function for potential bias induced by borrowers self-selecting into term loan prepayment. Panels A of Table 7 shows the results. The marginal propensity to consume following a reduction in debt payments is still around 9% on the credit card, in line with the results presented in the main analysis.¹⁹ This provides evidence that the inclusion of borrowers that prepay the term loan in the intention-to-treat framework does not introduce a sample-selection bias; the results hold even after considering the potential sample selection problem induced by borrowers repaying their term loans before the final payment date.

4.2 Analysis of Compliers

The second extension looks at the effect of reduced debt installments on the subsample of “compliers” and is presented in the first set of results in Table 8. The analysis involves estimating the baseline model only for the subsample of borrowers who finish repaying their term loan in the month that was predicted one year earlier. This is also called a “perfect-compliance” analysis (Imbens and Rubin, 2015). It has the disadvantage of introducing a bias toward more constrained borrowers that might be unable to increase their payments on the term loan and prepay, and therefore potentially overestimates the effects. Panel A of Table 8 shows that the consumption response on the credit card is higher than that in the results presented in the main analysis, and is estimated to be 13% of the term loan

¹⁹Online-appendix Table ?? shows the results augmented with the interactions of financial constraints. Again, the results are both qualitatively and quantitatively in line with the baseline analysis: full payers do not respond, minimum payers increase credit card expenditure the most, and partial payers reduce their credit card balance.

Table 8: Perfect Compliance and As-Treated Analyses: Expenditures and Financial Constraints

	Compliers Only			As-Treated		
	(1) Expenditures	(2) Payments	(3) Δ Balance	(4) Expenditures	(5) Payments	(6) Δ Balance
<i>A. Marginal Propensity to Consume</i>						
After? \times Installment	0.13*** (0.024)	0.13*** (0.024)	-0.037*** (0.011)	0.092*** (0.013)	0.087*** (0.015)	0.029** (0.012)
R^2	0.698	0.619	0.013	0.666	0.553	0.015
Observations	1,955,633	1,955,633	1,952,956	4,803,365	4,803,365	4,787,607
<i>B. Liquidity Constraints</i>						
After? \times Full Payer	5.92** (2.55)	3.24 (2.79)	-1.26 (2.28)	3.81** (1.51)	0.042 (1.62)	10.3*** (1.01)
After? \times Med. Payer	11.8*** (3.30)	22.6*** (3.79)	-21.8*** (2.97)	9.67*** (1.76)	7.89*** (2.03)	7.26*** (1.41)
After? \times Min. Payer	34.7*** (2.43)	33.2*** (3.08)	-7.71*** (2.85)	35.6*** (1.29)	-10.5*** (1.94)	52.2*** (1.66)
R^2	0.694	0.613	0.013	0.662	0.547	0.015
Observations	1,673,554	1,673,554	1,670,950	4,248,783	4,248,783	4,233,301
Year-Month F.E.	YES	YES	YES	YES	YES	YES
Quadratic Trend	YES	YES	YES	YES	YES	YES
Account F.E.	YES	YES	YES	YES	YES	YES

Note: This table first shows the results of estimating equation (2) on the subsample of accounts that exactly comply with the anticipated date of final term loan payment in the first group of results. The second group of results uses the *actual* date of final term loan installment instead of the anticipated date.

installment. However, Panel B shows that the group of constrained consumers behaves in the same way qualitatively as in the baseline analysis; partial payers reduce their credit card balances the most.

4.3 Analysis of As-Treated Observations

The third extension involves analyzing each account in terms of the way in which they have been treated, that is, measuring the term loan payoff date as the *actual* month in which the term loan balance first decreases to zero, rather than using the *predicted* final payment date. This is called an “as-treated” analysis (Imbens and Rubin, 2015). Although this provides the exact timeline for debt repayment, it has the disadvantage of allowing unobservable windfall gains to correlate with both the term loan repayment and the outcomes studied. The results are presented in the second set of results in Table 8 and show that the fraction of the term loan installment charged as credit card expenditure is similar to that in the main analysis, around 9%. Qualitatively, the different groups of borrowers also respond similarly to the baseline analysis; although their credit card balances increase on average, the most constrained consumers are the ones with the largest responses.

5 Conclusion

This study contributes to our understanding of the responses to an anticipated increase in cash on hand. I use term loan run-offs as events that generate a predictable increase in cash on hand, to which unconstrained consumers should not respond. Relative to previous work, I introduce a new framework to consider financial constraints in terms of the outside cost of funds faced by borrowers, as measured by past credit card payment behavior. This allows me to segment borrowers who we typically think of as unconstrained into borrowers who are paying high interest charges on their credit card balance and borrowers who are paying their balance in full, and are therefore charged no interest. The data also allow me to measure the

consumption response on store-originated term loans, which are used to finance “big-ticket” items over monthly installments, thereby providing a measure of durable consumption.

Full payers are the least responsive in terms of credit card expenditure. Partial payers, who use their credit card as a marginal source of funds, reduce their credit card balance. Minimum payers, who are more likely to be constrained, increase their credit card expenditure and their revolving balance. Because full and partial payers are both unconstrained in terms of the quantity of credit they have available, these results suggest that the cost of funds used to finance consumption influences the debt repayment response.

Surprisingly, the propensity to take out term loans increases for all consumers, whether constrained or not. Contrary to predictions, unconstrained consumers increase their likelihood of financing durable goods with term loans by 23%, which translates to about 4% of unconstrained consumers who delay taking out a new term loan until the original loan is repaid. It is hard to rationalize such results with the PIH because unconstrained consumers should not delay consumption until they receive an increase in cash on hand. Although it is usually hard to distinguish between financial constraints and self-control mechanisms, the fact that borrowers behave in accordance with a liquidity-constraints model in relation to their credit card but not their term loans suggests that some consumers are forcing themselves to finish repaying their original term loan before allowing themselves to purchase a new “big-ticket” item via installment financing; a case of sequential installment borrowing.

These results can be interpreted in light of “planner-doer” models (Laibson et al., 2003, Bertaut et al., 2009, for example), in which one individual-half (or one person within a household) controls the credit card account and the other controls the term loan account. The results suggest that individuals treat the credit card and term loan accounts separately (akin to theories of mental accounting as in Thaler (1990)), and have better self-control on their credit card accounts than on their term loan accounts. Although the term loans analyzed in this sample are not predatory, this can provide an explanation for why some individuals engage in extended sequences of high-cost installment borrowing (Consumer Financial

Protection Bureau, 2017).

References

- AGARWAL, S., S. CHOMSISENGPHET, N. MAHONEY, AND J. STROEBEL (2015): “Regulating Consumer Financial Products: Evidence from Credit Cards,” *Quarterly Journal of Economics*, 130.
- AGARWAL, S., C. LIU, AND N. S. SOULELES (2007): “The Reaction of Consumer Spending and Debt to Tax Rebates: Evidence from Consumer Credit Data,” *Journal of Political Economy*, 115, 986–1019.
- AGARWAL, S. AND W. QIAN (2014): “Consumption and Debt Response to Unanticipated Income Shocks: Evidence from a Natural Experiment in Singapore,” *American Economic Review*, 104, 4205–4230.
- ANDERSEN, S., P. D’ASTOUS, J. MARTINEZ-CORREA, AND S. SHORE (2017): “Responses to Saving Commitments: Evidence from Mortgage Run-offs,” *Working Paper*.
- ATTANASIO, O. P. AND G. WEBER (2010): “Consumption and Saving: Models of Intertemporal Allocation and Their Implications for Public Policy,” *Journal of Economic Literature*, 48, 693–751.
- BERTAUT, C. C., M. HALIASSOS, AND M. REITER (2009): “Credit Card Debt Puzzles and Debt Revolvers for Self Control,” *Review of Finance*, 13.
- BROWNING, M. AND M. D. COLLADO (2001): “The Response of Expenditures to Anticipated Income Changes: Panel Data Estimates,” *American Economic Review*, 91, 681–692.
- CARROLL, C. D. (1997): “Buffer-Stock Saving and the Life Cycle/Permanent Income Hypothesis,” *Quarterly Journal of Economics*, 112, 1–55.
- CONSUMER FINANCIAL PROTECTION BUREAU (2017): “Payday, Vehicle Title, and Certain High-Cost Installment Loans,” *Federal Register*, 82.
- COULIBALY, B. AND G. LI (2006): “Do Homeowners Increase Consumption After the Last Mortgage Payment? An Alternative Test of the Permanent Income Hypothesis,” *Review of Economics and Statistics*, 88, 10–19.
- D’ASTOUS, P. AND S. H. SHORE (2017): “Liquidity Constraints and Credit Card Delinquency: Evidence from Raising Minimum Payments,” *Journal of Financial and Quantitative Analysis*, 52, 1705–1730.
- DEATON, A. (1991): “Saving and Liquidity Constraints,” *Econometrica*, 59, 1221–1248.
- DI MAGGIO, M., A. KERMANI, AND R. RAMCHARAN (2015): “Monetary Policy Pass-Through: Household Consumption and Voluntary Deleveraging,” *Working Paper*.
- FRIEDMAN, M. (1957): *A Theory of the Consumption Function*, Princeton University Press.
- FUCHS-SCHUENDELN, N. AND T. A. HASSAN (2015): “Natural Experiments in Macroeconomics,” *NBER Working Paper*.

- GROSS, D. B. AND N. SOULELES (2002): “Do Liquidity Constraints and Interest Rates Matter for Consumer Behavior? Evidence from Credit Card Data,” *Quarterly Journal of Economics*, 117, 149–185.
- HECKMAN, J. J. (1979): “Sample Selection Bias as a Specification Error,” *Econometrica*, 47, 153–161.
- HSIEH, C.-T. (2003): “Do Consumers React to Anticipated Income Changes? Evidence from the Alaska Permanent Fund,” *American Economic Review*, 93, 397–405.
- IMBENS, G. W. AND D. B. RUBIN (2015): *Causal Inference for Statistics, Social, and Biomedical Sciences*, Cambridge University Press.
- JAPPELLI, T. (1990): “Who is Credit Constrained in the U.S. Economy?” *Quarterly Journal of Economics*, 105, 219–234.
- JAPPELLI, T. AND L. PISTAFERRI (2010): “The Consumption Response to Income Changes,” *Annual Review of Economics*, 2, 479–506.
- JOHNSON, D. S., J. A. PARKER, AND N. S. SOULELES (2006): “Household Expenditure and the Income Tax Rebates of 2001,” *American Economic Review*, 96, 1589–1610.
- KEYS, B. J., T. PISKORSKI, A. SERU, AND V. YAO (2014): “Mortgage Rates, Household Balance Sheets, and the Real Economy,” *NBER Working Paper*.
- KEYS, B. J. AND J. WANG (2016): “Minimum Payments and Debt Paydown in Consumer Credit Cards,” *NBER Working Paper No. 22742*.
- KREINER, C. T., D. D. LASSEN, AND S. LETH-PETERSEN (2018): “Liquidity Constraint Tightness and Consumer Responses to Fiscal Stimulus Policy,” *Forthcoming, American Economic Journal: Economic Policy*.
- LAIBSON, D., A. REPETTO, AND J. TOBACMAN (2003): “A Debt Puzzle,” *In: Knowledge, Information, and Expectations in Modern Economics: In Honor of Edmund S. Phelps*, Princeton University Press.
- MIAN, A., K. RAO, AND A. SUFI (2013): “Household Balance Sheets, Consumption and the Economic Slump,” *Quarterly Journal of Economics*, 128, 1687–1726.
- MODIGLIANI, F. AND R. BRUMBERG (1954): “Utility Analysis and the Consumption Function: An Interpretation of Cross-Section Data,” in *Post-Keynesians Economics*, ed. by K. Kurihara.
- O’DONOGHUE, T. AND M. RABIN (1999): “Doing It Now or Later,” *American Economic Review*, 89.
- PARKER, J. A., N. S. SOULELES, D. S. JOHNSON, AND R. MCCLELLAND (2013): “Consumer Spending and the Economic Stimulus Payments of 2008,” *American Economic Review*, 103.

- SCHOLNICK, B. (2013): “Consumption Smoothing After the Final Mortgage Payment: Testing the Magnitude Hypothesis,” *Review of Economics and Statistics*, 95, 1444–1449.
- SHAPIRO, M. D. AND J. SLEMROD (2003): “Consumer Response to Tax Rebates,” *American Economic Review*, 93, 381–396.
- SOULELES, N. S. (1999): “The Response of Household Consumption to Income Tax Refunds,” *American Economic Review*, 89, 947–958.
- STANGO, V. AND J. ZINMAN (2016): “Borrowing High versus Borrowing Higher: Price Dispersion and Shopping Behavior in the U.S. Credit Card Market,” *Review of Financial Studies*, 29, 976–1006.
- STEPHENS, M. J. (2008): “The Consumption Response to Predictable Changes in Discretionary Income: Evidence from the Repayment of Vehicle Loans,” *Review of Economics and Statistics*, 90, 241–252.
- THALER, R. H. (1990): “Saving, Fungibility, and Mental Accounts,” *Journal of Economic Perspectives*, 4, 193–205.
- ZELDES, S. P. (1989): “Consumption and Liquidity Constraints: An Empirical Investigation,” *Journal of Political Economy*, 97, 305–346.

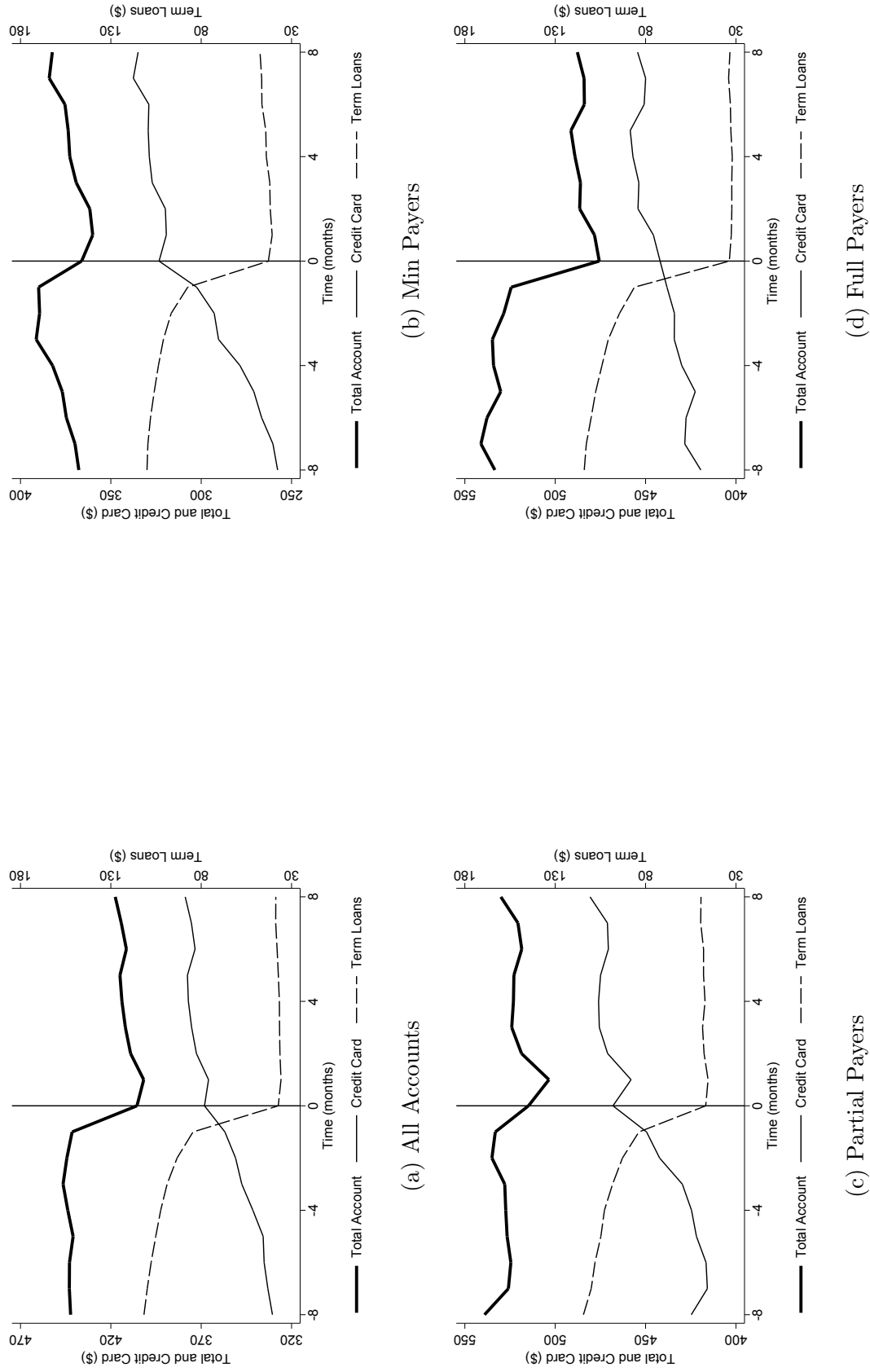
A Appendix

Table A1: Financial Constraints and Quantity Constraints

	Low utilization (0%-80%)	High utilization (80%-100%)	Total
Full Payer	115,225	208	115,433
Partial Payer	57,892	6,522	64,414
Minimum Payer	38,657	40,519	79,176
Total	216,774	47,249	259,023

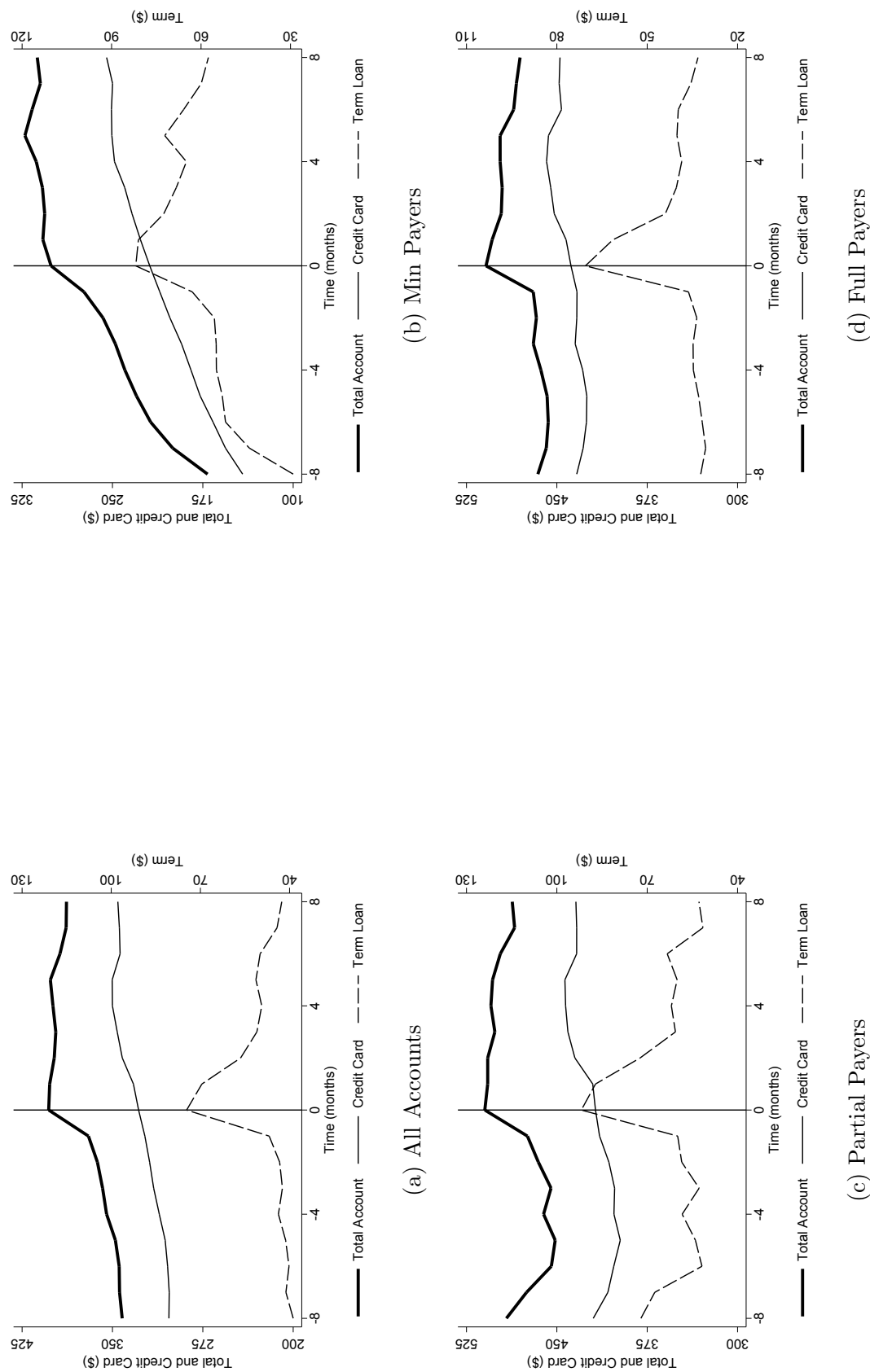
Note: This table shows the number of accounts in each category of payment behavior and financial constraints (in the quantity sense), as well as their interactions.

Figure A1: Payments by Financial Constraints



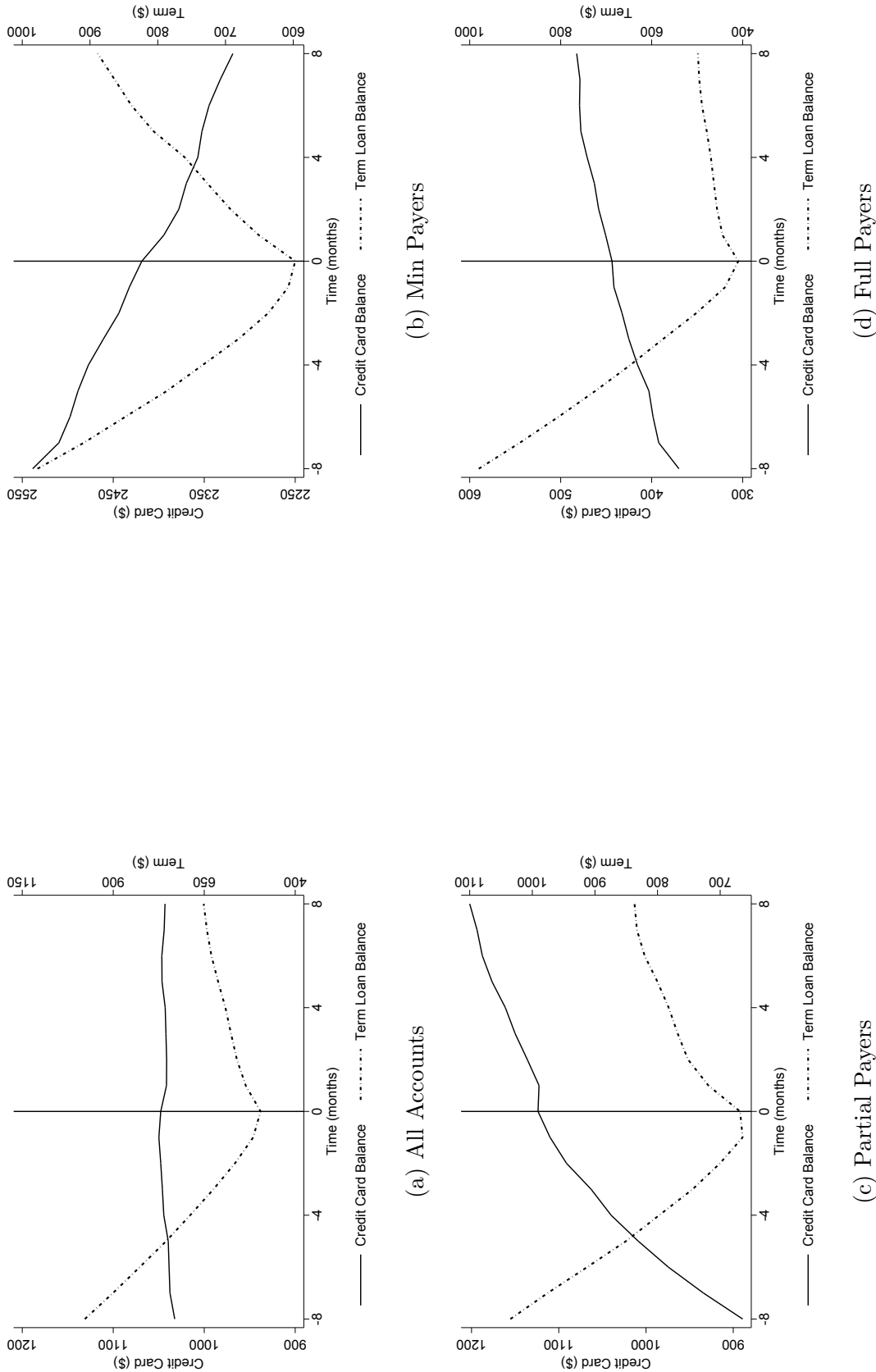
Note: This figure shows average payments segmented by groups of financial constraints.

Figure A2: Expenditures by Financial Constraints



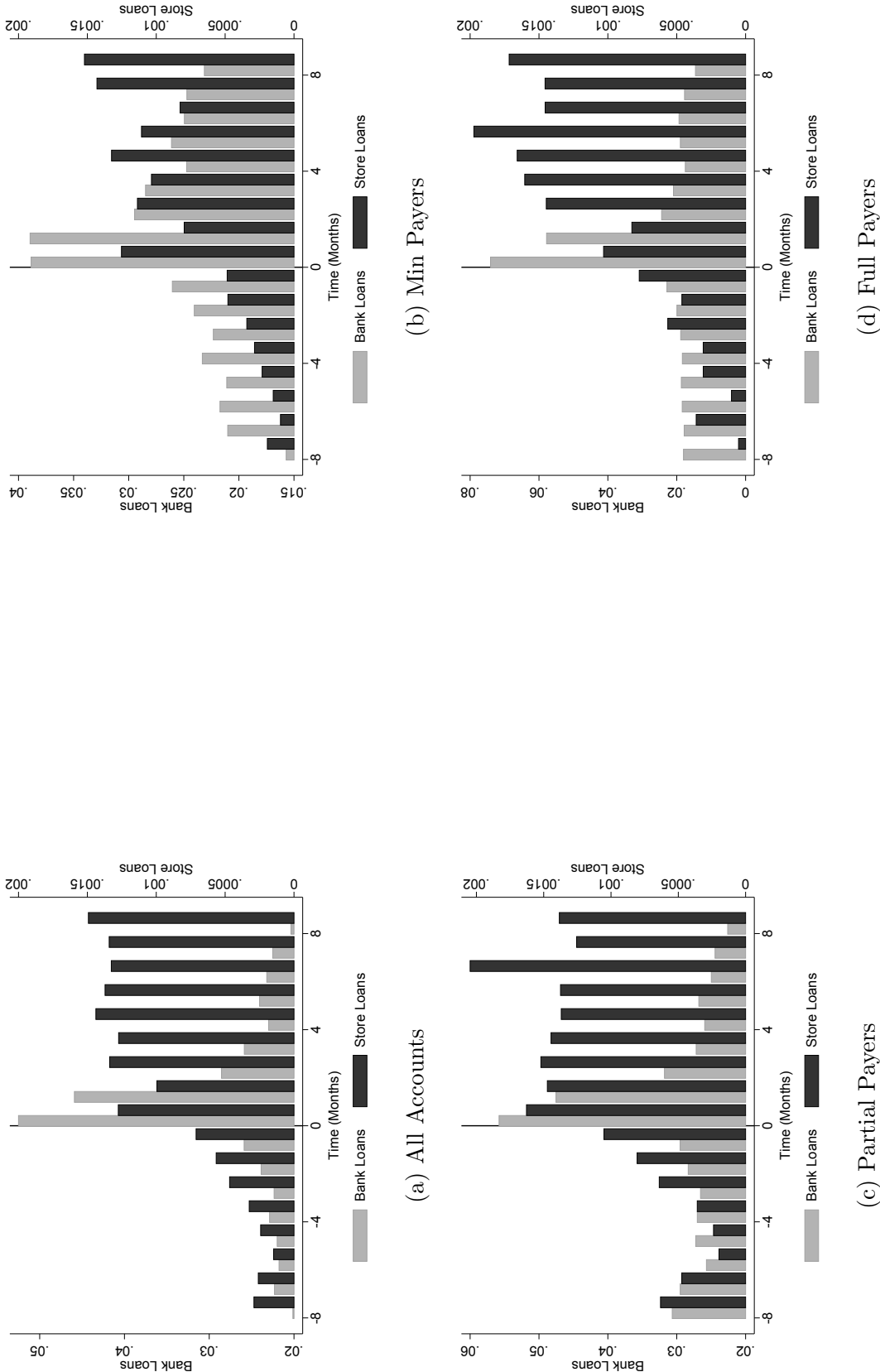
Note: This figure shows average expenditures segmented by groups of financial constraints.

Figure A3: Balances by Financial Constraints



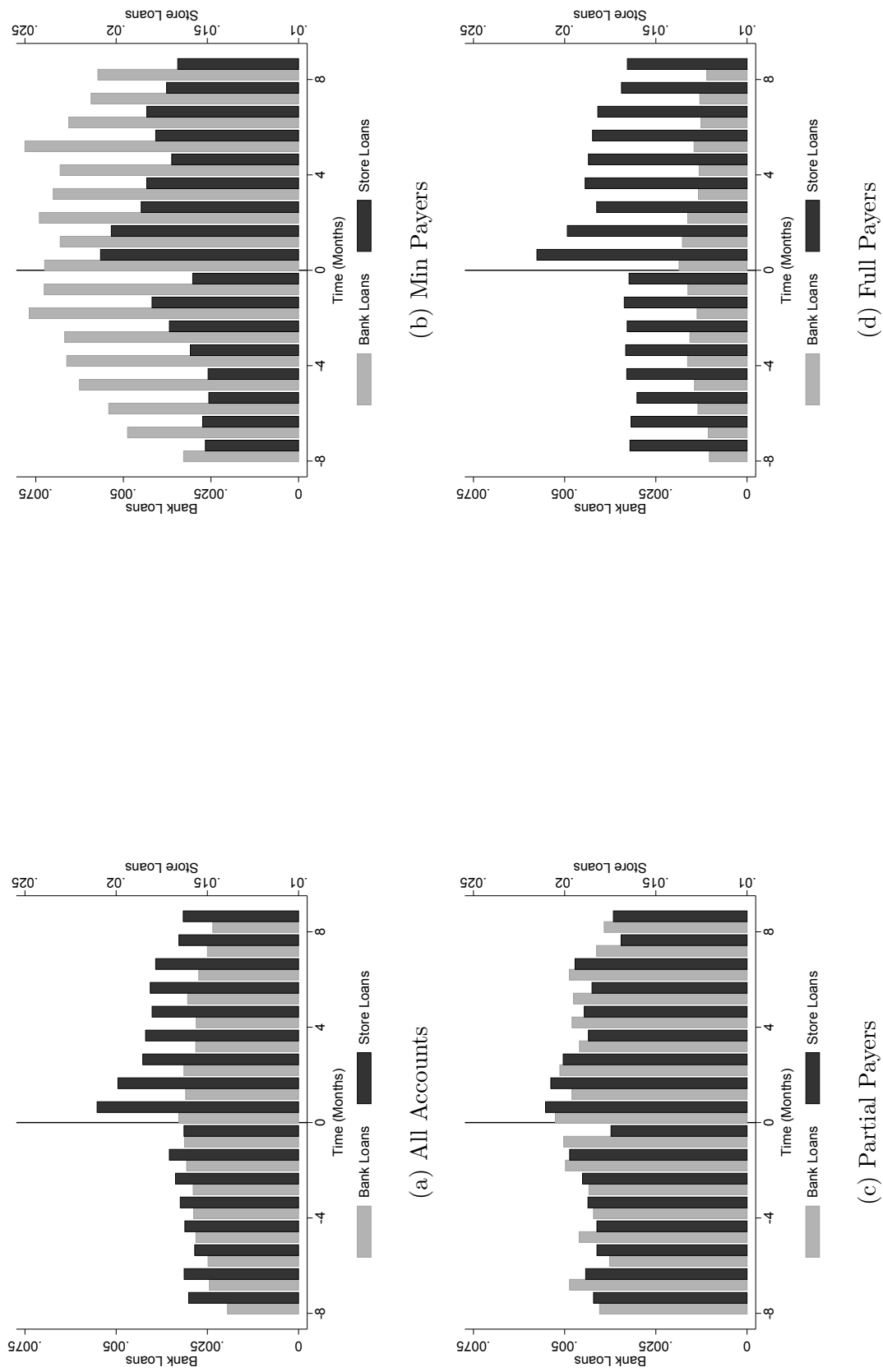
Note: This figure shows average balances segmented by groups of financial constraints.

Figure A4: New Term Loan Propensity
(Subsample of Bank-Originated Loans)



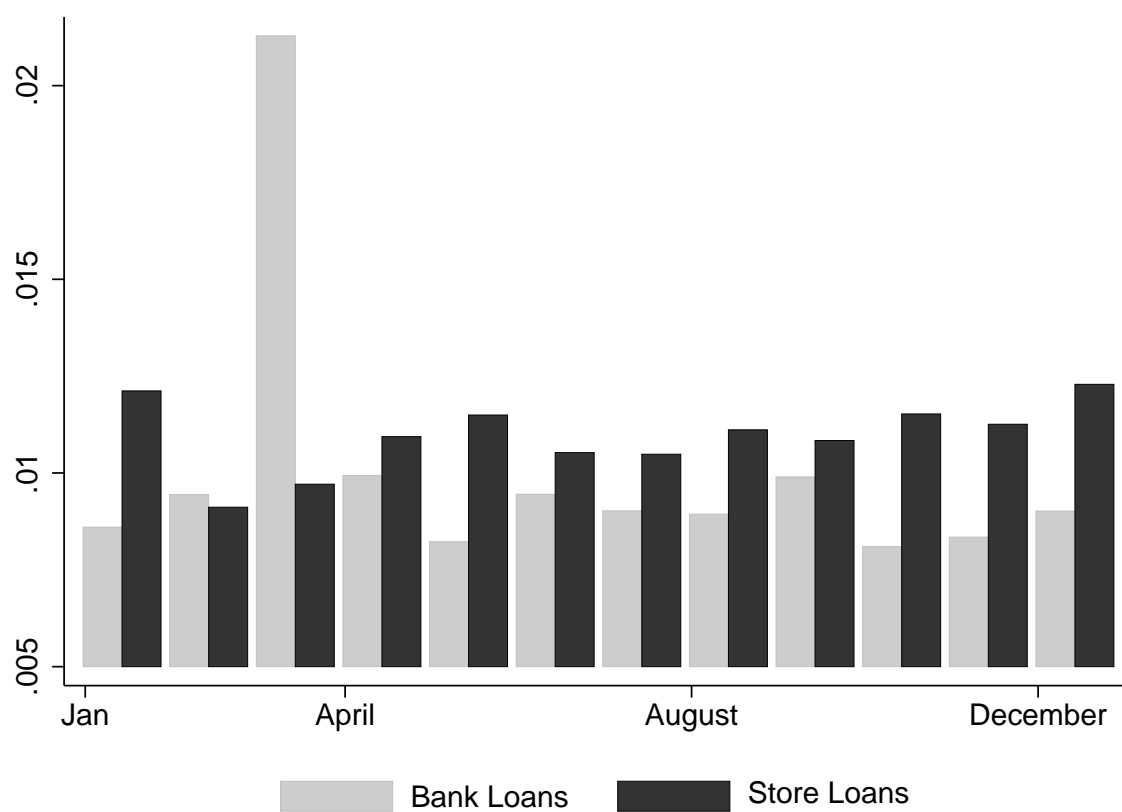
Note: This figure shows the propensity to take out new bank and store term loans segmented by groups of financial constraints, for the subsample of bank-originated term loans.

Figure A5: New Term Loan Propensity
(Subsample of Store-Originated Loans)



Note: This figure shows the propensity to take out new bank and store term loans segmented by groups of financial constraints, for the subsample of store-originated term loans.

Figure A6: New Term Loan Propensity
(Seasonal Patterns)



Note: This figure shows the propensity to take out new bank and store term loans across calendar months.