Winners and Losers of Marketplace Lending: Evidence from Borrower Credit Dynamics

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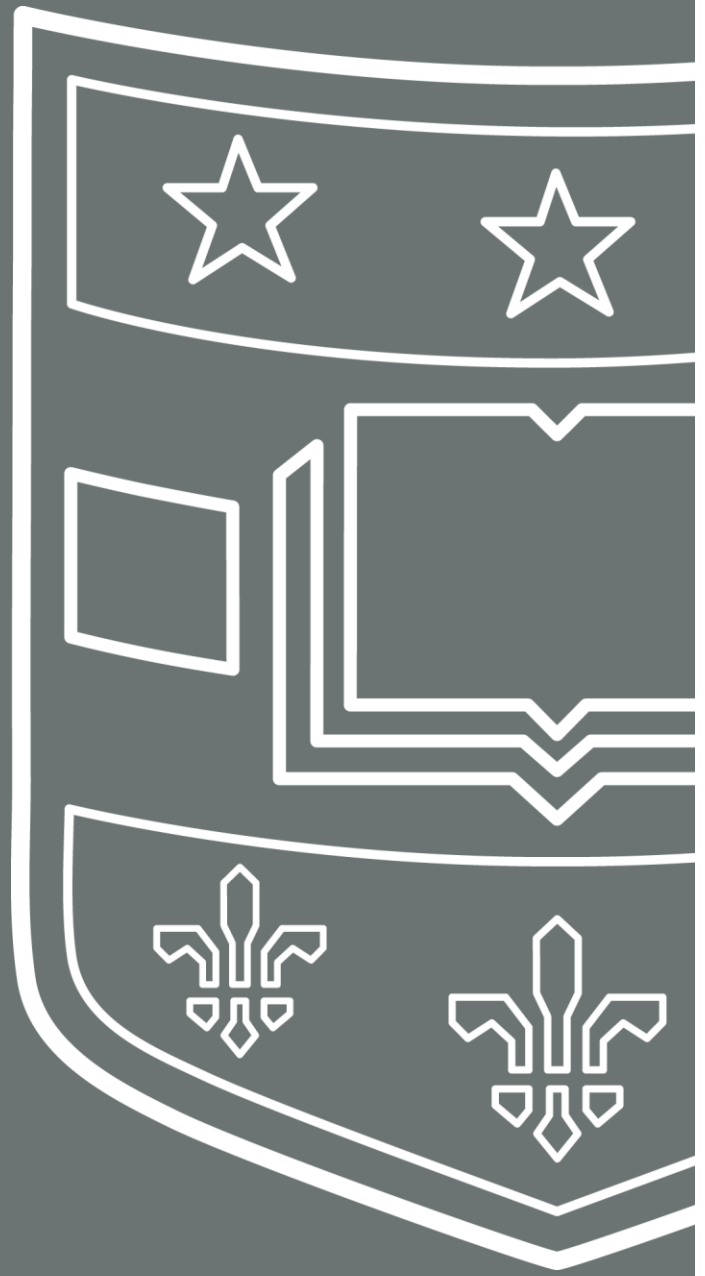

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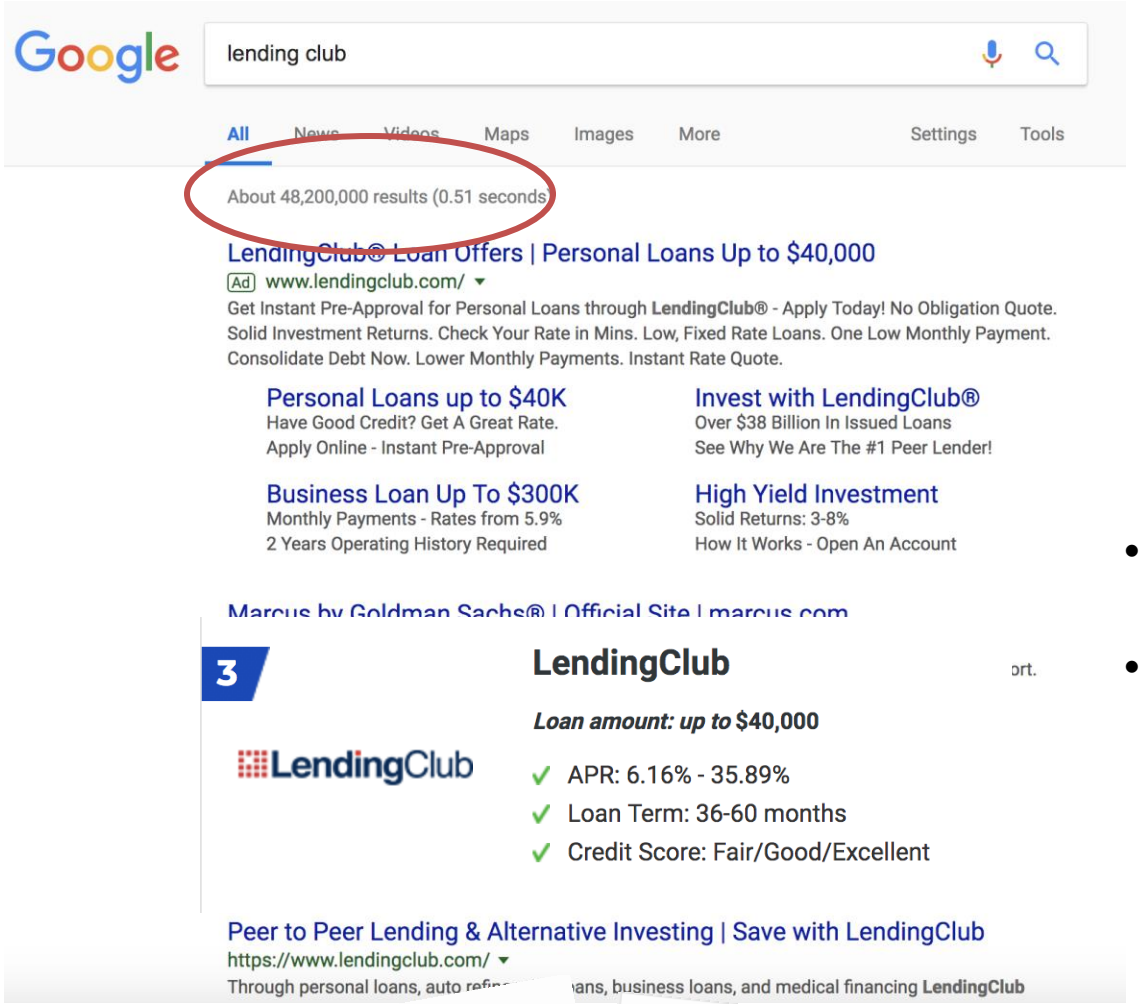

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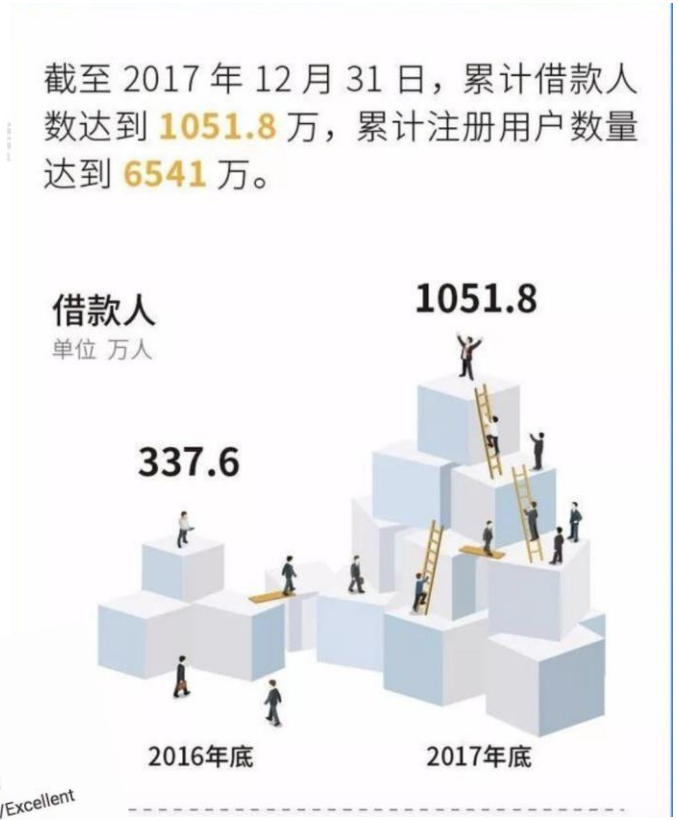
- over 10 million borrowers
- 65.41 million registered users



I. Institutional Background and Introduction

Marketplace Lending (MPL) / Peer-to-Peer lending (P2P lending)

- Alternative investment: directly connect individual borrowers and lenders
- Reduce information asymmetry and systematic risk
- Completely online: no fixed investment costs

Loan Application Process

- MPL borrower: loan amount, annual income, employment status, intended purpose
- MPL platform: make a soft credit check and pull out credit history
- MPL lender: provide unsecured loans for successful loan applications

Does marketplace lending (MPL) benefit all its borrowers?

Profile Comparison: MPL borrowers vs. average American population

Empirical Methodology: Credit profiles of MPL borrowers

- Pre-MPL Loan Origination Trends vs. Post-MPL Loan Origination Trends

Robustness Check:

- Dependent Variable: job/income loss
- Region- and Individual-Specific Factors: non-MPL borrowing neighbors (using KNN)

Cross-Sectional Heterogeneity: Subsection Analysis

- Credit Score Range
- Interest Rates Charged
- Loan Amounts

II. Data Sources and Profile Comparison

Trades File	Attributes File	Scores File	Demographics File	Performance File
Mortage	Inquires	Vantage 3.0	Monthly income	Indicator variable
Student loans	Balances	highly positively correlated with all three FICO scores	Occupation	"default" as being 90 days past due
Credit cards	Utilization ratios		Homeownership	
Personal loans	Credit limits		Location	

*Data all from credit bureau

All MPL borrowers (one-time) at the time of peer-financed loan origination to a 5% random sample of the total U.S. population and to a 33% random sample of homeowners

MPL borrowers are / have

- more open trades
- over twice as indebted in credit card debt
- High credit utilization ratios
- debt-to-income (DTI) ratios: lower income and higher non-mortgage debt

	MPL Platform Borrowers	National Average	Homeowners Average
	(I)	(II)	(III)
Panel A: Credit Characteristics			
# Open Trades	10.49	4.68	7.58
# Auto Trades	1.02	0.66	0.84
# Mortgage Trades	0.86	0.79	1.07
# Student Loan Trades	2.23	1.66	1.49
# Credit Card Trades	3.84	1.97	2.74
Vantage Score	656.44	675.47	733.84
Total Balance	$232,463	$208,195	$310,142
Auto Balance	$20,659	$17,038	$20,648
Mortgage Balance	$189,597	$186,237	$274,244
Student Loan Balance	$24,425	$19,122	$20,210
Credit Card Balance	$9,821	$4,197	$5,994
Credit Card Utilization	69.42%	30.89%	28.55%
Panel B: Income Characteristics			
Monthly Income	$3,602	$3,437	$5,232
Debt-to-Income	41.03%	27.82%	45.39%

III. Empirical Methodology-Base Specification

$$ln(Y_{i,t}) = \sum_{\tau \neq -1} \beta_\tau Quarter_{i,\tau} + \gamma \mathbf{X}_{i,t} + \alpha_i + \delta_{yq} + \epsilon_{i,t}$$

*Observations are at the individual level at a monthly frequency

Outcome variables: balances along four broad trade lines

- auto, mortgage, student debt, and credit card

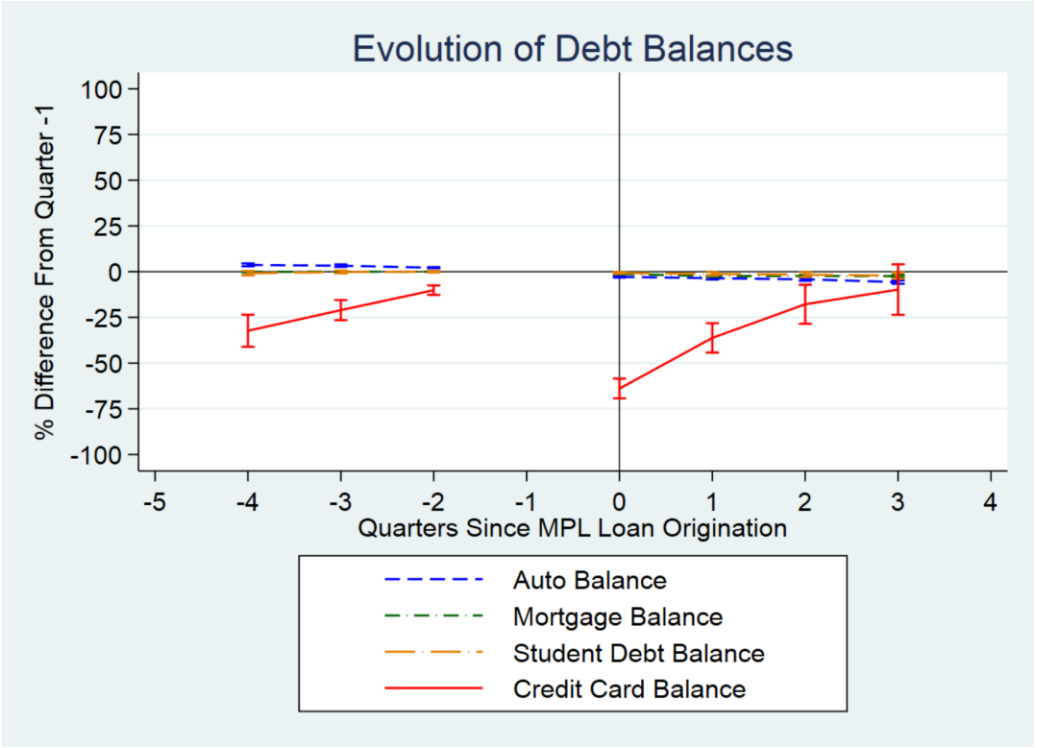
Independent variables:

- *T*: quarters relative to the quarter of MPL loan origination ([-4, 3], two-year window)
- *Quarter*: indicators, Quarter0 as months [0,+3] in relation to the month of MPL loan origination; Quarter-1 as baseline period (omitted category)
- α_i: a vector of individual fixed effects
- δ_{yq}: indicates a vector of year- quarter fixed effects.
- $X_{i,t}$: a vector of individual-level time-varying controls (monthly income, educational attainment, occupation, and homeownership status)

Coefficient interpretation: differences from the quarter prior to MPL loan origination

Main Results – Debt balances

	Auto Balance	Mortgage Balance	Student Debt Balance	Credit Card Balance
	(I)	(II)	(III)	(IV)
Pre-MPL Loan Origination Trends				
$Quarter_{-4}$	3.72***	-0.03	-0.82	-32.30***
	(0.41)	(0.21)	(0.62)	(4.47)
$Quarter_{-3}$	3.29***	-0.004	-0.17	-21.00***
	(0.33)	(0.14)	(0.40)	(2.80)
$Quarter_{-2}$	2.18***	0.01	0.04	-10.10***
	(0.16)	(0.08)	(0.24)	(1.32)
Post-MPL Loan Origination Trends				
$Quarter_{0}$	-2.83***	-1.21***	-0.65***	-63.90***
	(0.20)	(0.11)	(0.24)	(2.76)
$Quarter_{+1}$	-3.55***	-2.42***	-1.19**	-36.20***
	(0.38)	(0.18)	(0.49)	(4.10)
$Quarter_{+2}$	-4.16***	-2.36***	-1.60**	-17.80***
	(0.42)	(0.27)	(0.68)	(5.45)
$Quarter_{+3}$	-5.68***	-2.40***	-2.13**	-9.77
	(0.47)	(0.33)	(0.85)	(7.04)
Observations	5,753,781	3,529,229	3,218,142	10,499,164
Adjusted R^2	0.82	0.96	0.98	0.59
Controls	✓	✓	✓	✓
Fixed Effects	*I, Y-Q*	*I, Y-Q*	*I, Y-Q*	*I, Y-Q*

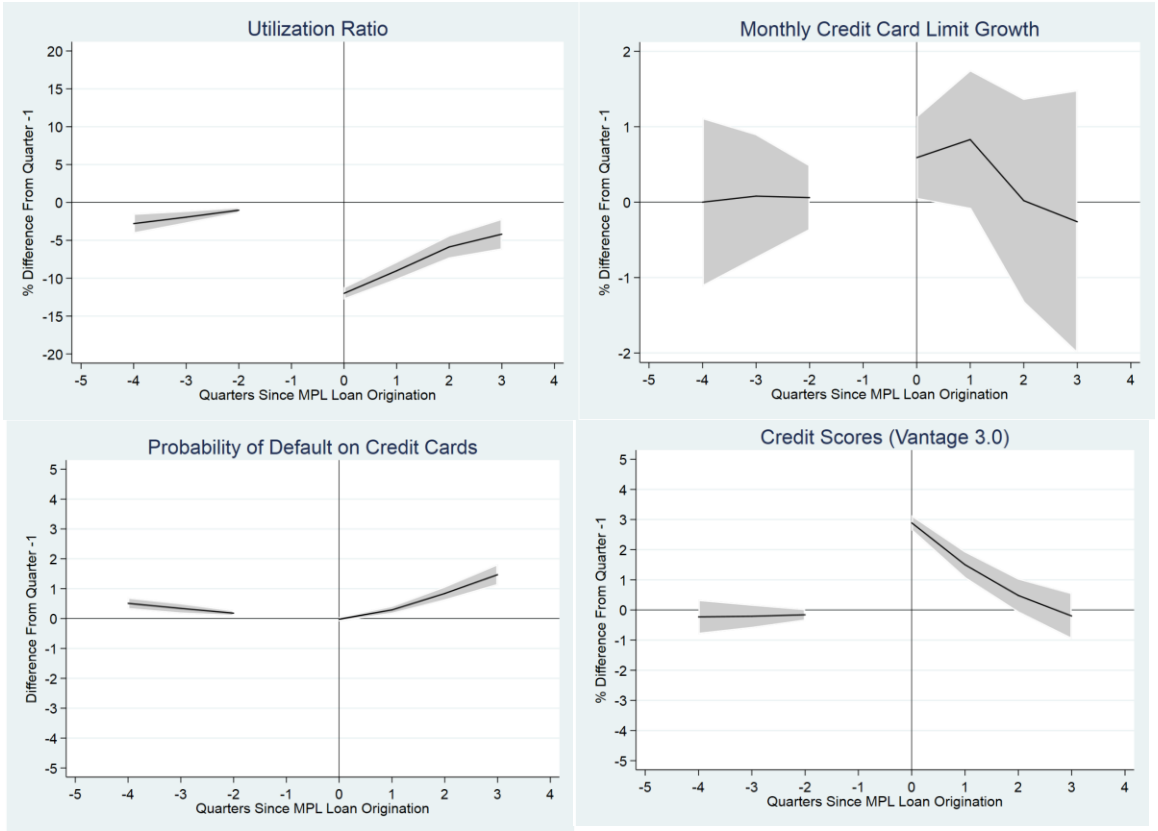


(IV):

- No significant misreporting intended purpose of MPL loan **?**
- Focus on consolidating the most expensive debt
- short-livedness of debt consolidation & reduction activity

Main Results – Credit Profile

	Credit Card Utilization	Credit Card Limit Growth	Credit Card Default Rates	Credit Score (Vantage 3.0)
	(I)	(II)	(III)	(IV)
Pre-MPL Loan Origination Trends				
$Quarter_{-4}$	-2.79***	0.00	0.51***	-0.23
	(0.67)	(0.57)	(0.10)	(0.29)
$Quarter_{-3}$	-1.94***	0.08	0.34***	-0.21
	(0.43)	(0.42)	(0.09)	(0.20)
$Quarter_{-2}$	-1.02***	0.06	0.18***	-0.16
	(0.21)	(0.22)	(0.05)	(0.10)
Post-MPL Loan Origination Trends				
$Quarter_{0}$	-12.00***	0.59**	-0.02	2.89***
	(0.42)	(0.28)	(0.04)	(0.13)
$Quarter_{+1}$	-9.02***	0.83*	0.29***	1.50***
	(0.62)	(0.47)	(0.07)	(0.23)
$Quarter_{+2}$	-5.87***	0.02	0.84***	0.48*
	(0.79)	(0.69)	(0.12)	(0.29)
$Quarter_{+3}$	-4.18***	-0.26	1.47***	-0.20
	(1.04)	(0.89)	(0.18)	(0.39)
Observations	11,146,916	9,986,676	10,128,710	11,147,416
Adjusted R^2	0.60	0.01	0.15	0.67
Controls	✓	✓	✓	✓
Fixed Effects	*I, Y-Q*	*I, Y-Q*	*I, Y-Q*	*I, Y-Q*



*the shaded area represents the associated 95% confidence interval

Traditional banking intermediaries over-extrapolate the temporary downturn in credit card debt facilitated by MPL-induced debt consolidation

IV. Robustness Check - Dependent Variable

Does the origination of MPL loans affect the job profiles of borrowers?

$$ln(Y_{i,t}) = \sum_{\tau \neq -1} \beta_\tau Quarter_{i,\tau} + \gamma \mathbf{X}_{i,t} + \alpha_i + \delta_{yq} + \epsilon_{i,t}$$

"Job / Income loss" indicator: Equals 1 if the individual's income in a given month differs from their income in the previous month, and 0 otherwise; the same thing for job changes

Results: In the 12-month period prior to, and the 12-month period following the origination of MPL loans, the probability of income / job change remains stable

MPL loan origination does not alter the job and income profiles of borrowers.

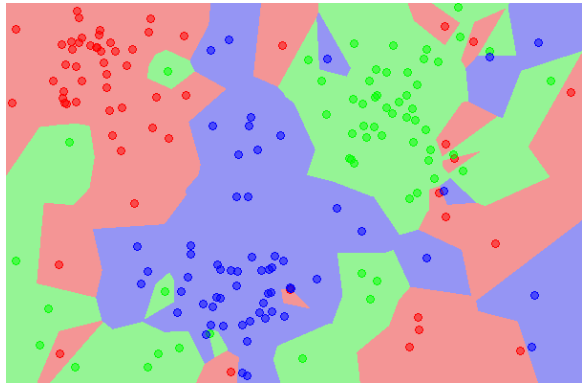
IV. Robustness Check - Region- and Individual-Specific Factors

- **Problem**: individuals of certain specific characteristics self-selecting into borrowing from such online peer-based platforms
- **Solution**: Create a matched control sample of non-MPL borrowers
- **Method**: a. Modified k-nearest neighbors (k-NN) algorithm

  b. Fixed effects cross-sectional regression

$$\overline{ln\left(\frac{Y_{i,t}}{Y_{i,t-1}}\right)} = MPL\_Borrower_i + \gamma\overline{\mathbf{X}}_{i,t} + \alpha_c + \epsilon_{i,t}$$

k-nearest neighbors (k-NN) algorithm



Baseline:

- Step 01: For each MPL borrower, identify all neighbors living in the same 5-digit ZIP code in the month of MPL loan origination (~7,500 people)
- Step 02: further subset into ones have hard credit check in the quarter prior to the MPL loan origination
- Step 03: make use of cohort-level, calendar-time approach (credit profile x a quarter prior)
- Step 04: identify the nearest (top 1) neighbor using KNN including eight dimensions (e.g. Credit profile, monthly income)

Bank-unsatisfied: filter by failing to received additional bank credit

Near neighborhood: filter by 9-digit ZIP code (<10 people)

Fixed effects cross-sectional regression

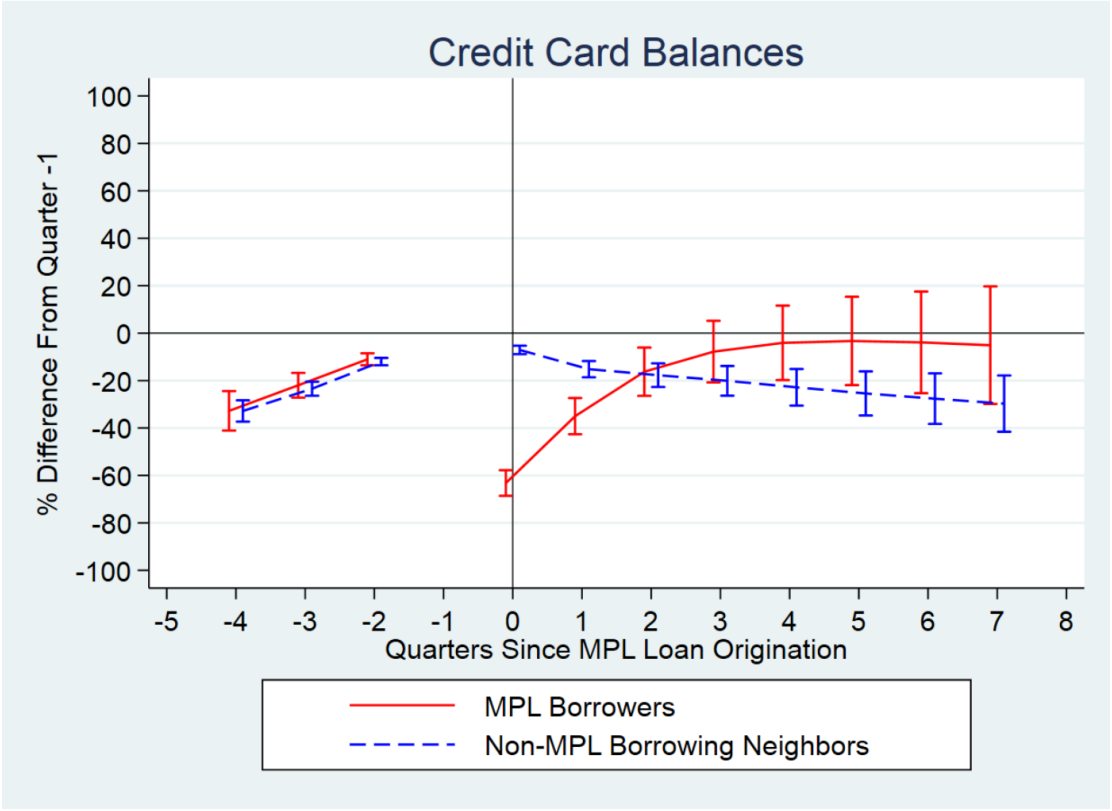
$$\overline{ln\left(\frac{Y_{i,t}}{Y_{i,t-1}}\right)} = MPL\_Borrower_i + \gamma\overline{\mathbf{X}}_{i,t} + \alpha_c + \epsilon_{i,t}$$

- MPL Borrower: indicator variable that is 1 for individuals borrowing on the MPL platform, and 0 otherwise
- c: separate cohorts of matched MPL borrowers and their closest non-MPL borrowing neighbors
- Dependent variables: changes in credit profile

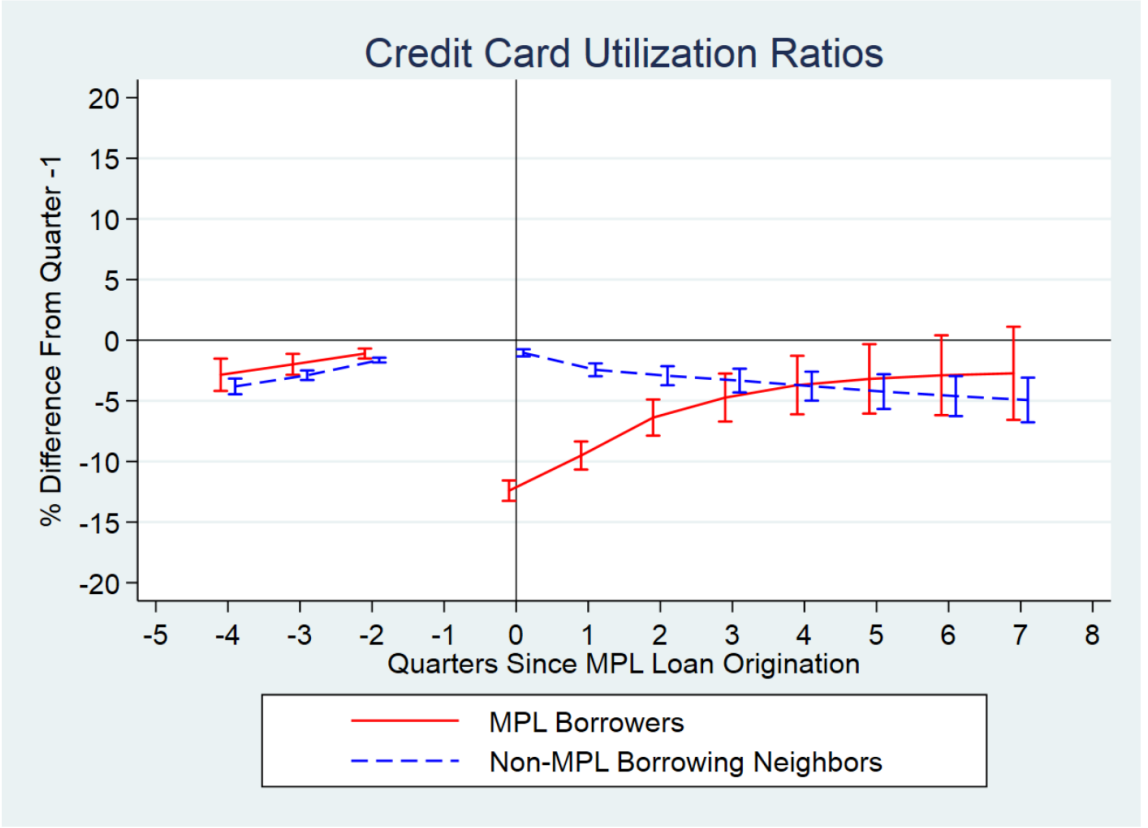
Panel A: Δ(Monthly Credit Card Balance)

	$Quarter_0$	$Quarter_{+1}$	$Quarter_{+2}$	$Quarter_{+3}$	$Quarter_{+4}$	$Quarter_{+5}$	$Quarter_{+6}$	$Quarter_{+7}$
	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)
MPL Borrower	-13.20***	13.37***	6.21***	3.36***	1.56***	0.72***	0.13	-0.13
	(0.10)	(0.12)	(0.12)	(0.13)	(0.15)	(0.17)	(0.19)	(0.23)
Observations	1392677	1307373	1246310	1191416	1095271	941331	787385	619054

Empirical Methodology- $ln(Y_{i,t}) = \sum_{\tau \neq -1} \beta_\tau Quarter_{i,\tau} + \gamma \mathbf{X}_{i,t} + \alpha_i + \delta_{yq} + \epsilon_{i,t}$

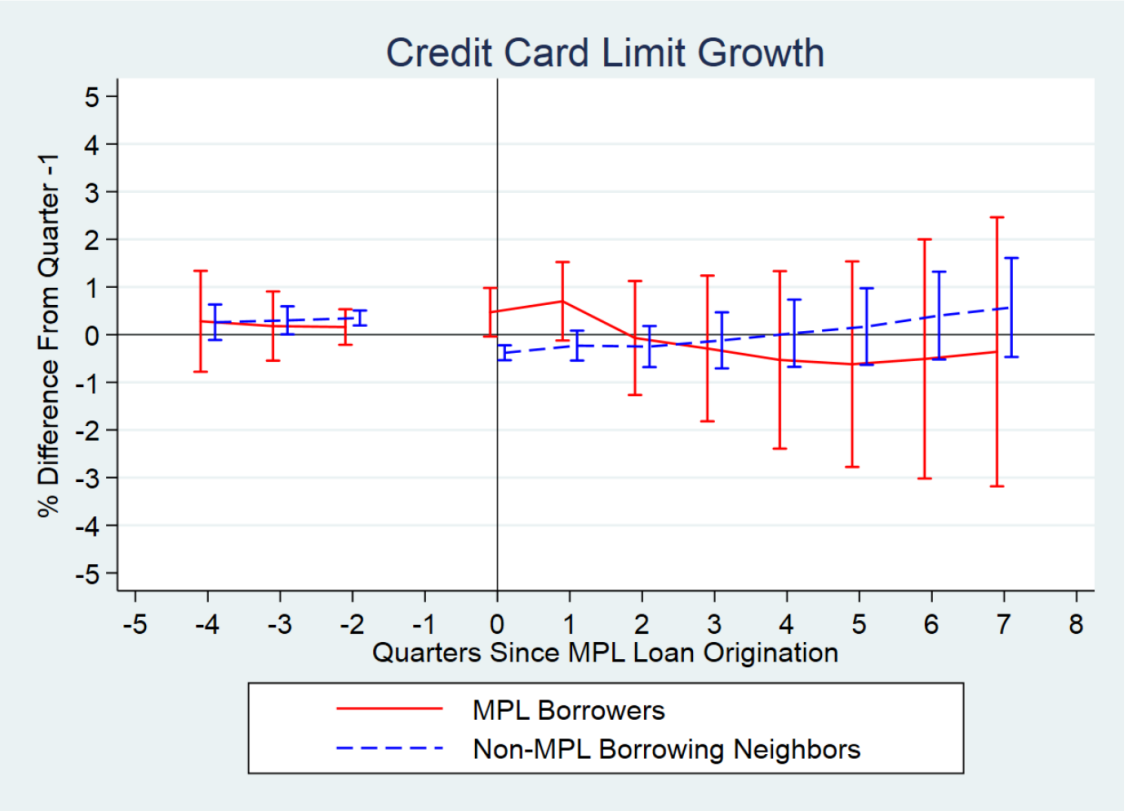


(a) *Credit Card Balances*

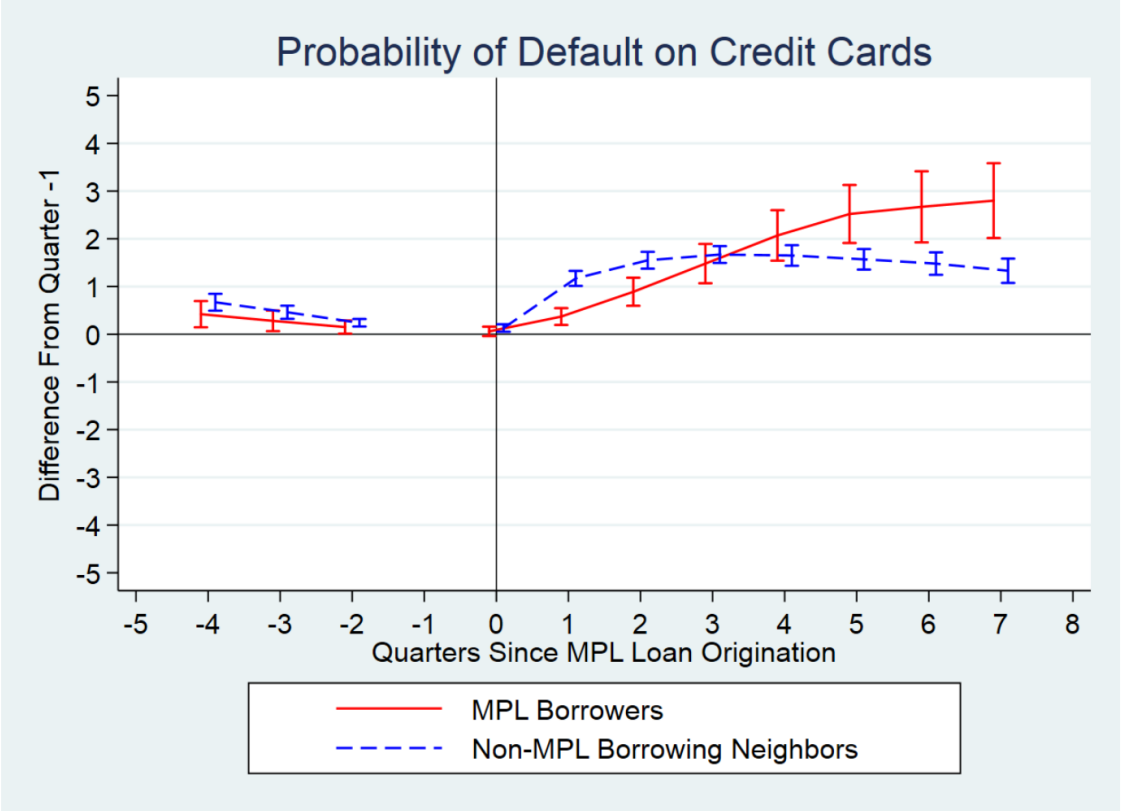


(b) *Credit Card Utilization*

Empirical Methodology- $ln(Y_{i,t}) = \sum_{\tau \neq -1} \beta_\tau Quarter_{i,\tau} + \gamma \mathbf{X}_{i,t} + \alpha_i + \delta_{yq} + \epsilon_{i,t}$

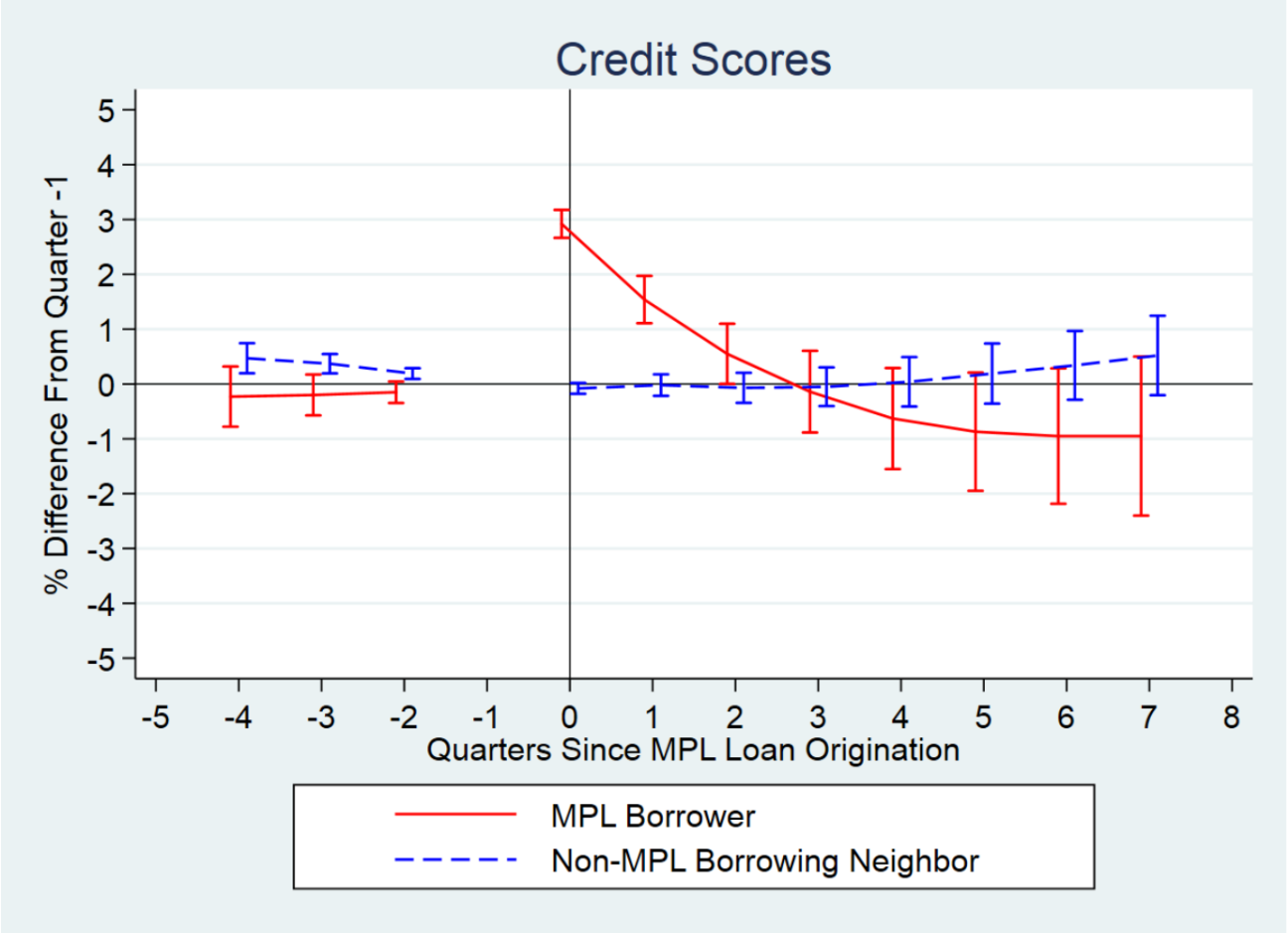


(c) *Credit Card Limits*



(d) $\mathbb{P}$*(Credit Card Defaults)*

Empirical Methodology- $ln(Y_{i,t}) = \sum_{\tau \neq -1} \beta_\tau Quarter_{i,\tau} + \gamma \mathbf{X}_{i,t} + \alpha_i + \delta_{yq} + \epsilon_{i,t}$



(e) *Credit Scores*

V. Cross-Sectional Heterogeneity

a. Credit Quality

Subsection: Vantage 3.0 score (>620; 620~680; >680)

Results: same pattern for all subsections;

subprime borrowers are as indebted in credit card debt as they were pre-origination

b. Interest Rates Charged

Subsection: sort interest rate into terciles

Result: the negative aspects of MPL funds are concentrated in loans originated at high interest rates

c. Loan Amounts

Subsection: sort interest rate into terciles

Result: the negative (positive) aspects of MPL funds are concentrated in the portfolio of loans with low (medium- or high-) origination amounts

VII. Conclusions and Implications

- Incidences of misreporting appear to be rare
- Traditional lenders incorrectly interpret the temporary financial relief of MPL borrowers
- MPL borrowers have increased overall indebtedness results
- Subprime borrowers are most negatively affected

For individuals:

- How long MPL loan benefits last depends on the actions of the borrowing individual in the post-origination period

For banking intermediaries:

- make credit limit increase decisions on a longer, sustained history of consumer activity

Further Thoughts

- Data Selection: one-time vs. multiple-times
- Opposite behavior of one-time MPL borrowers: after the repayment on MPL platforms, trun to bank loans with higher credit score
- One-time MPL borrowers may have greater probability of default than two-times MPL borrowers according to previous research