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

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Consumer Lending in the United States

- Consumer lending constitutes significant share of U.S. economy
  - Accounts for $3.6 trillion as of 2017
- Banking intermediaries serve as primary providers of credit to most consumers
  - Specialize in screening and monitoring, and enjoy economies of scale in reducing information asymmetry (Diamond, 1984; Ramakrishnan and Thakor, 1984)
- Consumer lending market rife with inefficiencies
  - Over-reliance on crude, formulaic methods to determine creditworthiness
  - Significant informational frictions
  - High interest rates on loans, even for high credit quality applicants (Stango and Zinman, 2009)
  - Post-crisis capital requirements and regulatory restrictions further limiting credit access
Rise of FinTech in Consumer Credit Markets

- Banking inefficiencies creating entry avenues for innovators
  - Changes in consumer attitudes and technological improvements also possible contributors

- Marketplace lending (MPL) platforms specializing in peer-to-peer ("P2P") lending in the consumer credit market

- Reliant on online marketing and underwriting platforms
  - Traditional banks not involved in loan origination process

- Alternative loan pricing schemes
Features of MPL Platforms

- Process relies on matching individual borrowers to prospective investor-lenders
  - Information asymmetry reduced through credit-bureau generated borrower reports made available by MPL
  - Aids in possibly overcoming the principal-agent problem (Jensen and Meckling, 1976)
- Disbursed MPL funds are unsecured
  - MPL platform plays role of broker; lenders bear full risk of borrower defaults
- MPL loans used primarily for debt consolidation
  - Over 70% of loan applicants on MPL platforms in US state “expensive debt consolidation” as primary reason for requiring MPL funds (source: Prosper and Lending Club)
- No mechanism in place to ensure that borrowed MPL funds are used towards reasons stated on loan applications
Research Questions

▶ **Question 1**: Is stated aim of debt consolidation misreported on MPL loan applications?
  ▶ MPLs lack enforcement mechanisms

▶ **Question 2**: Does borrowing from MPLs alter credit profile characteristics?
  ▶ Default rates, credit card utilization, credit scores, etc.

▶ **Question 3**: Identify winners and losers of MPLs
  ▶ Cross-sectional analysis
  ▶ Identify mechanisms that determine benefits or costs imposed on MPL borrowers
  ▶ Facilitated by cohort-level analysis comparing borrowers to non-borrowers
Preview of Findings

- Credit card balances decline 47% in the quarter of MPL loan origination, before reversing trend
- Average credit score jumps by approximately 19 points in the quarter of MPL loan origination
- Findings suggest that credit card limits increase in months following MPL loan origination, especially for subprime borrowers
- Credit card default rates spike, especially for subprime MPL borrowers
- Evidence suggests that bank lending actions are triggered by MPL-induced improvement in borrowers’ credit scores
Related Literature

- Lending decisions within online platforms:

- Determinants of interest rates on MPL loans:
  - Race and age (Pope and Sydnor, 2011); gender (Barasinska, 2011; Pope and Sydnor, 2011); beauty (Ravina, 2012); stereotypes (Hasan et al., 2018); non-verifiable disclosures (Michels, 2012); group leader bids (Hildebrand et al., 2016)

- Credit expansion vs. credit substitution?
  - Jagtiani and Lemieux (2017), Wolfe and Yoo (2018), Buchak et al. (2017)

- Impact of MPL credit on consumers:
  - Balyuk (2018), Demyanyk et al. (2017)

- Importance of credit scores in bank-lending relationships:
  - Keys et al. (2010), Rajan et al. (2015), Agarwal et al. (2018), Liberman et al. (2017)
Data Sources

▸ Credit bureau trades file:
  ▸ Information on the various trades opened by an individual (auto, mortgage, student loans, bankcard, etc.)
  ▸ Used to identify individuals who have borrowed through fintech lenders

▸ Credit bureau credit file:
  ▸ Balance information at monthly frequency for various kinds of trade lines
  ▸ Monthly utilization ratios
  ▸ Monthly credit scores

▸ Demographic file:
  ▸ Occupation
  ▸ Education status
  ▸ Income
# MPL Borrowers v. Average U.S. Population

## Panel A: Credit Characteristics

<table>
<thead>
<tr>
<th></th>
<th>MPL Borrowers</th>
<th>National</th>
<th>Homeowners</th>
</tr>
</thead>
<tbody>
<tr>
<td># Open Trades</td>
<td>10.49</td>
<td>4.68</td>
<td>7.58</td>
</tr>
<tr>
<td># Auto Trades</td>
<td>1.02</td>
<td>0.66</td>
<td>0.84</td>
</tr>
<tr>
<td># Mortgage Trades</td>
<td>0.86</td>
<td>0.79</td>
<td>1.07</td>
</tr>
<tr>
<td># Student Loan Trades</td>
<td>2.23</td>
<td>1.66</td>
<td>1.49</td>
</tr>
<tr>
<td># Credit Card Trades</td>
<td>3.84</td>
<td>1.97</td>
<td>2.74</td>
</tr>
<tr>
<td>Vantage Score</td>
<td>656.44</td>
<td>675.47</td>
<td>733.84</td>
</tr>
<tr>
<td>Total Balance</td>
<td>$232,463</td>
<td>$208,195</td>
<td>$310,142</td>
</tr>
<tr>
<td>Auto Balance</td>
<td>$20,659</td>
<td>$17,038</td>
<td>$20,648</td>
</tr>
<tr>
<td>Mortgage Balance</td>
<td>$189,597</td>
<td>$186,237</td>
<td>$274,244</td>
</tr>
<tr>
<td>Student Loan Balance</td>
<td>$24,425</td>
<td>$19,122</td>
<td>$20,210</td>
</tr>
<tr>
<td>Credit Card Balance</td>
<td>$9,821</td>
<td>$4,197</td>
<td>$5,994</td>
</tr>
<tr>
<td>Credit Card Utilization</td>
<td>69.42%</td>
<td>30.89%</td>
<td>28.55%</td>
</tr>
</tbody>
</table>

## Panel B: Income Characteristics

<table>
<thead>
<tr>
<th></th>
<th>MPL Borrowers</th>
<th>National</th>
<th>Homeowners</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monthly Income</td>
<td>$3,602</td>
<td>$3,437</td>
<td>$5,232</td>
</tr>
<tr>
<td>Debt-to-Income</td>
<td>41.03%</td>
<td>27.82%</td>
<td>45.39%</td>
</tr>
</tbody>
</table>

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Empirical Approach

- Examine how MPL loans change credit profiles of borrowers
- Utilize event study methodology similar to Agarwal et al. (2016), and Agarwal et al. (2017):

\[ \ln(Y_{i,t}) = \sum_{\tau \neq -1} \beta_{\tau} \text{Quarter}_{i,\tau} + \gamma X_{i,t} + \alpha_i + \delta_t + \epsilon_{i,t} \]  

(1)

- Definitions:
  - \( \text{Quarter}_{-1} (\text{Quarter}_{+1}) \) refers to months [-3,-1] (months [+4,+6]) in relation to month of MPL loan origination
  - \( \tau \) varies from -4 to +3, with \( \tau = -1 \) omitted
  - Individual- and year-quarter fixed effects
  - SEs double clustered at individual- and year-quarter levels
  - \( X_{i,t} \): Monthly income, educational attainment, occupation, and homeownership status
Question #1: What type of debt is consolidated?

- Possible strategic misreporting due to non-verifiable nature of reasons stated on MPL loan applications
  - Moreover, non-verifiable reasons affect loan pricing on MPL platforms (Michels, 2012)

- What kind of debt is consolidated?
  - Comparison of average interest rates:
    - Auto (4.21% on 60 month loans)
    - Mortgage (4.125% for 15-year FRM, 3.875% on 5/1 ARM)
    - Student loans (4.5–7%)
    - Credit cards (15–20%)
  - Inefficient consolidation can leave borrowers worse off
Evolution of Debt Balances

- Auto Balance
- Mortgage Balance
- Student Debt Balance
- Credit Card Balance

Question #2: Long-run effects on credit profile?

▶ Are other credit profile characteristics affected by MPL loan-induced credit card debt consolidation?

▶ How long do these credit profile changes persist?
Credit Card Utilization

Utilization Ratio

% Difference From Quarter -1

Quarters Since MPL Loan Origination

Determinants of Utilization

\[ Utilization = \frac{Balance}{Limit} \]

- Our findings indicate that at the 1-year mark following MPL loan origination:
  - Balance $\approx$
  - Utilization $\downarrow$
  - Suggests that: Limits $\uparrow$
Long-Run Effects on Credit Profile

$\Delta$ (Monthly Credit Card Limits)

Monthly Credit Card Limit Growth

% Difference From Quarter -1

Quarters Since MPL Loan Origination

Long-Run Effects on Credit Profile

\[ P(\text{Credit Card Default}) \]

Chava and Paradkar (2018) - Winners and Losers of Marketplace Lending
Credit Scores

Chava and Paradkar (2018) - Winners and Losers of Marketplace Lending
Alternative Channels?

- Job/Income loss
  - Results cannot be explained by change in employment or income of the MPL borrower

- Regional economic factors
  - Pattern of findings not driven by region-specific shocks exogenous to the MPL borrowers
  - Robust to 5-digit ZIP × Year-Quarter fixed effects
Identification – Matched-Sample Analysis

- Creating cohorts of borrowers and non-borrowers:
  - Identify non-MPL borrowers from same 5-digit (or 9-digit) ZIP as MPL borrower
  - Identify subset of non-MPL borrowing neighbors with need for credit
  - Identify neighbors with identical ex-ante credit and income profile trends in calendar time
  - Use kNN algorithm to identify most similar neighbor to MPL borrower

- Successful in identifying cohorts of borrowers and neighbors with similar dynamics in credit scores, utilization, debt balances, etc.

- Results robust to matched-sample analysis

- Lingering concerns of selection on observables
Robustness

Identification – Natural Experiments

- Identifying ‘shocks’ to geographic regions that could affect MPL share:
  - Changes in broadband access
  - Rollout of Google Fiber (used in Fuster et al. (2018))
  - Bank branch closures

- Currently ongoing
Who wins or loses from borrowing from MPLs?

Differential Patterns based on Credit Status

- Analysis thus far assumes that all MPL borrowers are of equal sophistication
- MPL borrowers differ on financial sophistication, however
- Sophistication proxied through credit score in the month prior to MPL loan origination:

<table>
<thead>
<tr>
<th>Sophistication Level</th>
<th>Score Range Pre-MPL Origination</th>
<th>Percentage of Total Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subprime</td>
<td>[300, 620)</td>
<td>23%</td>
</tr>
<tr>
<td>Near-Prime</td>
<td>[620, 680)</td>
<td>50%</td>
</tr>
<tr>
<td>Prime</td>
<td>[680, 850]</td>
<td>27%</td>
</tr>
</tbody>
</table>

Who wins or loses from borrowing from MPLs?

Credit Status Cuts – Credit Card Balances

Chava and Paradkar (2018) - Winners and Losers of Marketplace Lending
Who wins or loses from borrowing from MPLs?

Credit Status Cuts – $\Delta$(Credit Card Limits)

Monthly Credit Card Limit Growth

Chava and Paradkar (2018)  
Winners and Losers of Marketplace Lending
Who wins or loses from borrowing from MPLs?

Credit Status Cuts – $P(\text{Credit Card Default})$

Probability of Default on Credit Cards

Difference From Quarter -1

Quarters Since MPL Loan Origination

-5 -4 -3 -2 -1 0 1 2 3 4

Sub-Prime

Near-Prime

Prime

Do MPLs alter the perceived creditworthiness of borrowers?

Improvement in MPL Borrower Creditworthiness?

- Earlier findings suggest that MPL borrowers experience an increase in average credit scores in quarter of MPL loan origination
  - Scores increase by 2.89% (∼ 19 points) for entire sample

- Findings also show that MPL borrowers experience stronger credit card limit growth immediately following origination

- Are increases in credit card limits caused by MPL-induced improvement in credit scores?
  - Studied through cohort-level analysis

Do MPLs alter the perceived creditworthiness of borrowers?

**Empirical Specification**

- Use kNN algorithm to match MPL borrowers to non-borrowing neighbors in same 5-digit (or 9-digit) ZIP with identical ex ante credit and income dynamics.

- Specification relies on comparing borrowers to non-borrowers within cohort:

  $$
  \log \left( \frac{\text{AvgScore}_{[+1,+3]}}{\text{AvgScore}_{[-3,-1]}} \right) = \text{MPL-Borrower}_{i,c} + \gamma X_{i,c} + \alpha_c + \epsilon_{i,c}
  $$

  (2)

- Instrumental variables setup:

  $$
  \log \left( \frac{\text{AvgCCLimits}_{[+1,+3]}}{\text{AvgCCLimits}_{[-3,-1]}} \right) = \log \left( \frac{\text{AvgScore}_{[+1,+3]}}{\text{AvgScore}_{[-3,-1]}} \right) + \gamma X_{i,c} + \alpha_c + \epsilon_{i,c}
  $$

  (3)

**Impact of MPL Loans on Subprime Borrower Creditworthiness**

<table>
<thead>
<tr>
<th></th>
<th>1st Stage</th>
<th>IV</th>
<th>OLS</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>$\Delta (\text{Score})$</td>
<td>$\Delta (\text{CC Limits})$</td>
<td>$\Delta (\text{CC Limits})$</td>
</tr>
<tr>
<td>MPL Borrower</td>
<td>5.43*** (0.09)</td>
<td>0.89*** (0.05)</td>
<td>0.32*** (0.03)</td>
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<td>$\Delta (\text{Score})$</td>
<td>34.80*** (0.27)</td>
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<tr>
<td>Observations</td>
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<td>228051</td>
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<tr>
<td>Adjusted $R^2$</td>
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<tr>
<td>Controls</td>
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<tr>
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<td>7140</td>
<td></td>
</tr>
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</table>

Chava and Paradkar (2018) **Winners and Losers of Marketplace Lending**
Conclusion

* Using credit bureau data, we analyze the credit profile evolution of borrowers on a major U.S. MPL
* Borrowers use funds to consolidate expensive credit card debt
  * Lowers credit utilization ratios, elevates credit scores
  * Consolidation phase is short-lived
  * Induces increased credit card limits from traditional banks
  * Significant increases in credit card default rates, especially for subprime MPL borrowers
* Results indicate that MPL-induced improvements in credit scores trigger bank lending actions
* Paper highlights how cascading of information between MPL platforms and banks through credit scores can leave some borrowers worse off
Matched Sample Comparison – Credit Card Balances

Credit Card Balances

% Difference From Quarter -1 vs. Quarters Since MPL Loan Origination

- MPL Borrowers
- Non-MPL Borrowing Neighbors

Tables: 5-Digit ZIP, 9-Digit ZIP, Back

Chava and Paradkar (2018) - Winners and Losers of Marketplace Lending
Matched Sample Comparison – Credit Card Utilization

Credit Card Utilization Ratios

% Difference From Quarter -1

Quarters Since MPL Loan Origination

-5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8

-20 -15 -10 -5 0 5 10 15 20

MPL Borrowers
Non-MPL Borrowing Neighbors

Tables: 5-Digit ZIP, 9-Digit ZIP, Back

Matched Sample Comparison – Credit Card Limit Growth

Credit Card Limit Growth

% Difference From Quarter -1

Quarters Since MPL Loan Origination

-5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8

MPL Borrower
Non-MPL Borrowing Neighbor

Tables: 5-Digit ZIP, 9-Digit ZIP, Back: Back

Matched Sample Comparison – $P$(Credit Card Default)

Probability of Default on Credit Cards

- MPL Borrowers
- Non-MPL Borrowing Neighbors

Tables: 5-Digit ZIP, 9-Digit ZIP
Matched Sample Comparison – Credit Scores

Credit Scores

% Difference From Quarter -1

Quarters Since MPL Loan Origination

-5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8

-5 -4 -3 -2 -1 0 1 2 3 4 5

MPL Borrower
Non-MPL Borrowing Neighbor

Tables:  5-Digit ZIP  9-Digit ZIP  Back:  Back

### Impact of MPL Loans on Near-Prime Borrower Creditworthiness

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<thead>
<tr>
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<th>1st Stage</th>
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<tbody>
<tr>
<td></td>
<td>Δ(Score)</td>
<td>Δ(CC Limits)</td>
<td>Δ(CC Limits)</td>
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<tr>
<td>MPL Borrower</td>
<td>4.25***</td>
<td>0.11***</td>
<td>0.05***</td>
</tr>
<tr>
<td></td>
<td>(0.04)</td>
<td>(0.01)</td>
<td>(0.02)</td>
</tr>
<tr>
<td>Δ(Score)</td>
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<td></td>
<td></td>
</tr>
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<td>Observations</td>
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<td>0.03</td>
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<td>Fixed Effects</td>
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<td>Controls</td>
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*Back to Chava and Paradkar (2018) Winners and Losers of Marketplace Lending*