

Marketplace Lending and Consumer Credit Outcomes: Evidence from Prosper

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Federal Reserve Board¹

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¹Views expressed as those of the authors and not the Board of Governors or its staff.

Motivation

- In 2016, marketplace lenders originated more than \$21 billion in consumer loans, up from \$7.6 billion in 2014
 - 176% growth
 - Total consumer debt only grew by 10% over the same period
- In 2005, Prosper launched first marketplace lending website in the US
 - Prosper originated \$2b in 2016 and \$10b since inception
- Little is known about the effects of this new source of credit on individuals or the financial system as a whole

Motivation

- We match application data from one lender - Prosper - to credit bureau data
- We then ask
 - What is the credit profile of consumers who apply for marketplace loans?
 - How does taking out one of these loans affect subsequent credit outcomes?

Results

- Relative to general population, applicants have moderate credit scores and low delinquency rates but high and increasing debt levels
- Following loan origination, borrowers pay down revolving debt, credit scores increase, total debt increases due to increase in mortgage debt, and delinquency rates decrease

Related Literature

- Marketplace Lending and Consumer Outcomes
 - Balyuk (2017), Demyanyk, Loutskina, and Kollinger (2017)
- Credit Access and Consumer Outcomes
 - Campbell (2006), Melzer (2011), Morse (2011)
- Marketplace Lending Investment Decisions
 - Iyer et al. (2009), Lin et al. (2013), Paravisini et al. (2017)

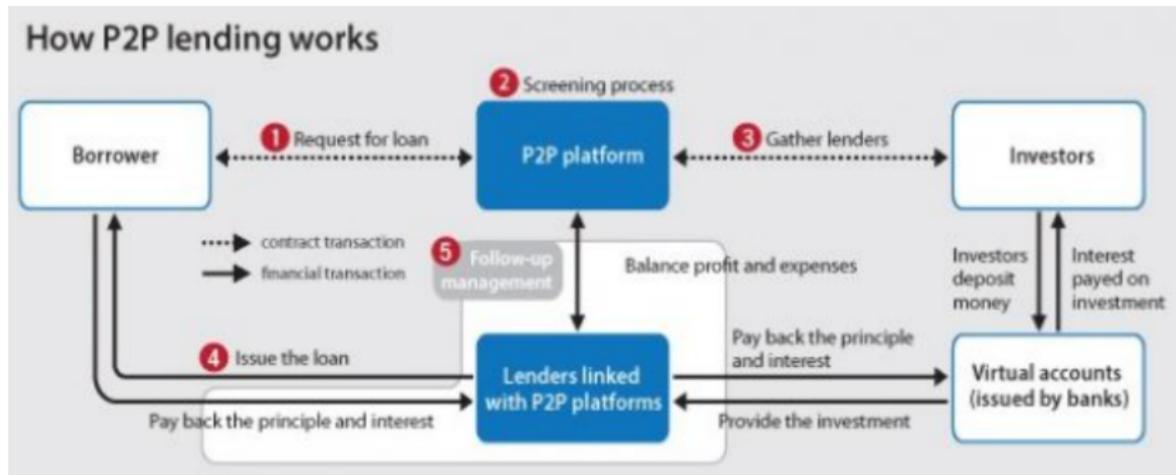
Outline

- Introduction
- Marketplace Lending Background
- Data
- Characteristics of Borrowers Results
- Credit Outcome Results
- Conclusion

Marketplace Lending Background

- Marketplace lending (MPL) is a new form of disintermediated lending that matches borrowers and lenders through online platforms
- Marketplaces also score loans and set the terms of loans and collect an origination and servicing fee
- Lenders can be institutional investors or retail investors
- Most common type of loan is an unsecured consumer loan
- Perceived benefits are faster decision times and potentially lower rates

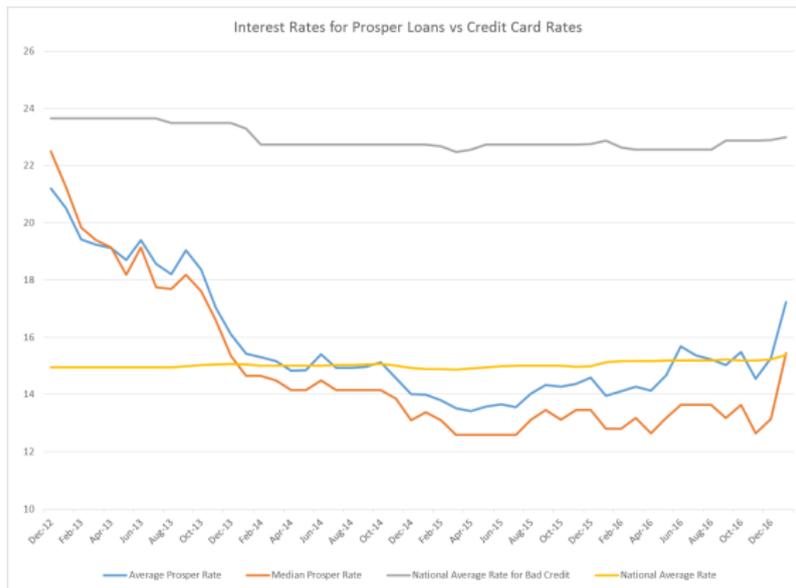
Marketplace Lending Overview



Prosper Loan Application Process

- Individual submits application for \$2,000-\$35,000 unsecured loan
- Prosper verifies identity and pulls credit report
- Assuming requirements are met, Prosper scores the loan and posts the application on marketplace for funding
 - Rates are 6%-36% and origination fees are 1%-5%
- Lenders choose to fund application or not and, if funded, loan is originated unless borrower or Prosper cancel application
 - For a subset of applications, Prosper verifies income/employment of applicant prior to origination

How Do Rates of Prosper Borrowers Compare to Rates Available on Credit Cards?



Prosper Loan Offerings

Rating	Listing ID	Loan Category	Amount	Yield	% Funded	Time Left-	Select
B	7596381	Debt Consolidation	\$15,000	9.39%	54% \$12,953 left	13d 12h 29m	<input type="checkbox"/>
B	7594407	Debt Consolidation	\$35,000	11.59%	39% \$22,299 left	13d 12h 29m	<input type="checkbox"/>
C	7581982	Debt Consolidation	\$10,500	14.45%	74% \$2,889 left	13d 12h 29m	<input type="checkbox"/>
A	7580359	Auto / Motorcycle / RV / Boat	\$25,000	7.69%	46% \$13,529 left	13d 12h 29m	<input type="checkbox"/>
A	7380692	Debt Consolidation	\$20,000	8.85%	85% \$2,940 left	13d 12h 29m	<input type="checkbox"/>
B	7591898	Debt Consolidation	\$15,000	10.99%	63% \$5,569 left	11d 15h 29m	<input type="checkbox"/>
A	7591385	Debt Consolidation	\$18,000	6.69%	32% \$12,199 left	11d 15h 29m	<input type="checkbox"/>
B	7590042	Debt Consolidation	\$20,000	9.39%	17% \$16,658 left	11d 15h 29m	<input type="checkbox"/>
AA	7377227	Debt Consolidation	\$30,000	4.31%	19% \$26,170 left	11d 15h 29m	<input type="checkbox"/>
A	7573792	Debt Consolidation	\$21,000	8.29%	16% \$17,818 left	10d 15h 29m	<input type="checkbox"/>
B	7365328	Other	\$35,000	10.99%	24% \$26,603 left	10d 15h 29m	<input type="checkbox"/>
A	7583574	Debt Consolidation	\$25,000	7.39%	16% \$21,299 left	9d 18h 29m	<input type="checkbox"/>

Prosper Loan Offerings: Details

Debt Consolidation

Listing #7596381

Verification Stage: 3 Borrower State: PA Borrower Rate: 10.39% Monthly Payment: \$486.76 Lender Servicing Fee: 1% Initial Status: F	<table><tr><td>\$15,000</td><td>3</td><td>9.39%</td></tr><tr><td>Amount</td><td>Years</td><td>Yield</td></tr></table> <table><tr><td>14% Funded</td><td>\$12,952.61 Left</td></tr></table> <p>Listing Start Date: Tue, Jan 02, 2016 Expire: Tue, Jan 16, 2016 Note: loan will fund at 70% or higher.</p>	\$15,000	3	9.39%	Amount	Years	Yield	14% Funded	\$12,952.61 Left	Effective Yield*: 9.3% Estimated Loss*: 4.49% Estimated Return*: 4.81% <p>\$ Between \$25 and \$12952.61</p> <p>Add to Cart</p> <p>Available Balance: \$0.00</p>
\$15,000	3	9.39%								
Amount	Years	Yield								
14% Funded	\$12,952.61 Left									

Borrower's Credit Profile

Prosper Rating: B Prosper Score(1-11): 9 TU FICO Range: 720-739 Current Delinquencies: 0 Amount Delinquent: \$0.00 Public Records Last 24m / 10y: Not available / 0 Delinquencies in Last -7y: 0	Inquiries Last 6 Months: 0 First Credit Line: Jul-2006 Current/Open Credit Lines: 10 / 10 Total Credit Lines: 11 Revolving Credit Balance: \$10,099.00 Bankcard Utilization: 93% Has Mortgage: No	Debt/Income Ratio: 36% Employment Status: Self-employed Length of Status: 1y 6m Stated Income: \$25,000-49,999 Occupation: Other
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The borrower's credit and mortgage information displayed above has been obtained from their credit report.
Please note: This information is awaiting verification. "Not available" indicates the information could not be obtained by the credit bureau.

The employment and income information displayed above has been provided by the borrower. This information may not be verified by Prosper, or may be awaiting verification.

Data

- All Prosper listings for 2013-2016
 - Data on borrower at time of listing: FICO bins, income, employment status, debt to income ratio, Experian credit data
 - Data on listing: listing outcome, listing amount, borrower rate, loan purpose, expected return
- Consumer Credit Panel
 - 5% random sample of population who have a credit report and SSN plus other individuals in household
 - Longitudinal, individual-level Equifax credit data on balances, limits, and payments for several loan types

Matching Procedure

- We match on:
 - county
 - age of oldest and newest accounts
 - bankruptcies
 - public records
 - real estate balances and payments
 - revolver limits
 - installment loan amounts
 - auto payments
 - delinquencies
- We match 49,981 applications, a match rate of 6.56%

Results of Matching Procedure

	Non-Matched Applicants	Matched Applicants	Diff	
Observations	712,460	49,981		
Loan Originated	0.74	0.75	0.01	***
Percent Funded	0.99	0.99	0.00	
Percent Fully Funded	0.98	0.98	0.00	
Listing Amount	13,592.16	13,589.86	(2.30)	
Monthly Payment	411.90	412.22	0.32	
Listing Term = 36 Months	0.69	0.70	0.01	
Borrower APR	0.18	0.17	(0.00)	
Estimated Return	0.07	0.07	(0.00)	
FICO: < 700	0.54	0.53	(0.01)	***
FICO: 700-739	0.30	0.31	0.01	***
FICO: 740+	0.16	0.16	0.00	***
Annual Income	80,036.30	75,275.95	(4,760.35)	**
Home Owner	0.47	0.47	(0.00)	
Total Balance	139,938.90	139,228.20	(710.70)	
Monthly Debt	1,060.43	1,068.71	8.28	
Revolver Balance	20,175.93	19,986.70	(189.23)	

Summary Statistics

	All	Origination	No Origination	Diff	
Loan Originated	0.75	1.00	0.00	1.00	***
Percent Funded	0.99	1.00	0.97	0.03	***
Percent Fully Funded	1.00	1.00	0.94	0.06	***
Listing Amount	13,589.86	13,349.96	14,304.61	-954.65	***
Monthly Payment	412.22	404.14	436.30	-32.16	***
Listing Term = 36 Months	0.70	0.71	0.69	0.01	***
Borrower APR	0.17	0.17	0.18	0.00	***
Estimated Return	0.07	0.07	0.07	0.00	***
FICO: < 700	0.53	0.53	0.52	0.01	***
FICO: 700-739	0.31	0.31	0.31	0.00	
FICO: 740+	0.16	0.16	0.17	-0.02	***
Annual Income	75,275.95	73,211.72	81,426.07	-8,214.35	***
Home Owner	0.47	0.48	0.44	0.04	***
Total Balance	13,9228.20	143341.90	126970.70	16,371.20	***
Monthly Debt	1,068.71	1,093.87	993.73	100.14	***
Revolver Balance	19,986.70	20,117.26	19,597.65	519.61	*
Observations	49,981	37,421	12,560		

Credit Scores of Borrowers versus National Population

- We then match applicants to CCP population by county, age, and previous quarter's credit score
- Credit score distribution:

Credit Score	CCP Sample	All	Prosper Applicants	
			Orig.	No Orig.
280-599	0.12	0.02	0.01	0.02
600-659	0.23	0.19	0.18	0.23
660-699	0.12	0.28	0.28	0.28
700-759	0.19	0.37	0.37	0.34
760-850	0.35	0.15	0.16	0.12

- Prosper applicants are much less likely to have very high or low credit scores

Age of Borrowers versus National Population

- Age distribution:

Age	CCP Sample	All	Prosper Applicants	
			Orig.	No Orig.
18-24	0.10	0.01	0.01	0.01
25-30	0.14	0.08	0.08	0.07
31-40	0.21	0.24	0.25	0.21
41-50	0.21	0.28	0.28	0.25
51-60	0.24	0.30	0.28	0.34
61-63	0.10	0.10	0.09	0.13

- Prosper applicants are more likely to be prime-aged

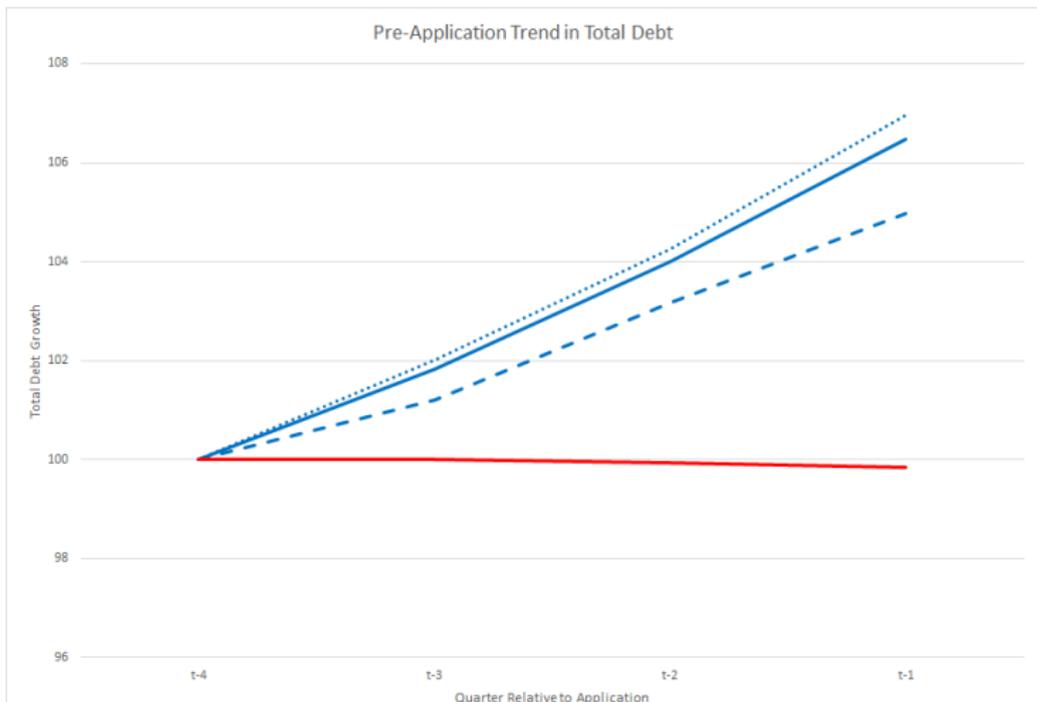
Characteristics of Borrowers versus Population

- By county, age, and previous quarter's credit score:

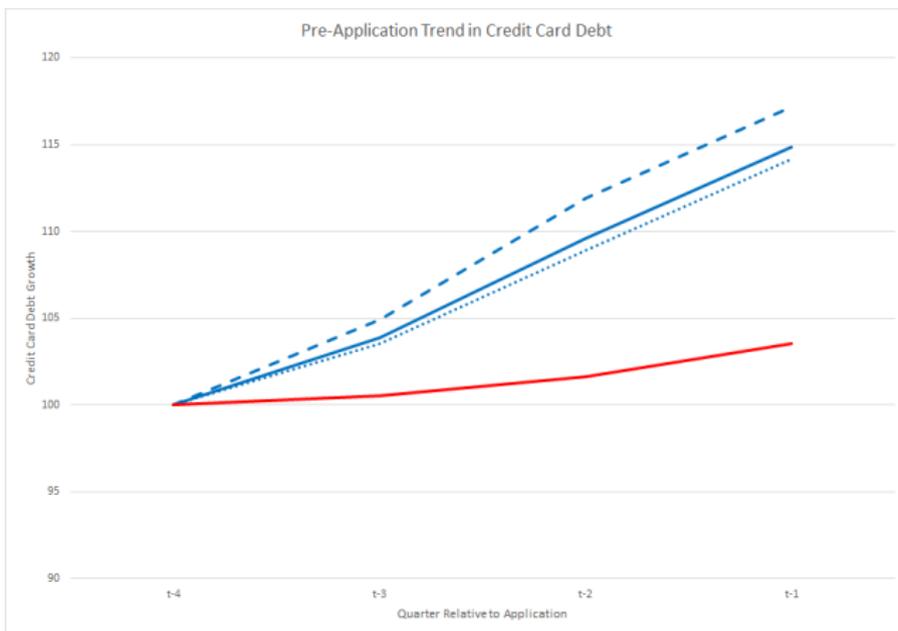
	Prosper Applicants			Population Matched by:		
	All	Orig.	No Orig.	Cty	Cty, Age	Cty, Age, CS
Credit Score	689.87	689.09	692.21	701.08	694.94	694.87
Total Debt	139,354.40	142,715.40	129,237.20	81,945.09	94,090.45	88,075.26
Credit Card Debt	12,558.71	12,678.99	12,196.63	3,586.89	3,954.56	5,088.43
Any Mortgage Debt	0.49	0.50	0.46	0.30	0.34	0.33
Mortgage Debt	99,093.13	101,821.20	90,881.00	55,509.94	66,355.81	64,184.42
Non-Mortgage Debt	40,261.27	40,894.20	38,356.20	26,435.15	27,734.64	23,890.84
Delinquency Rate	0.10	0.10	0.09	0.16	0.18	0.13

- Applicants have higher debt levels, are more likely to have home debt, lower delinquency rate

Characteristics of Borrowers: Trend in Total Debt Balances



Characteristics of Borrowers: Trend in Revolving Debt Balances



Empirical Specification

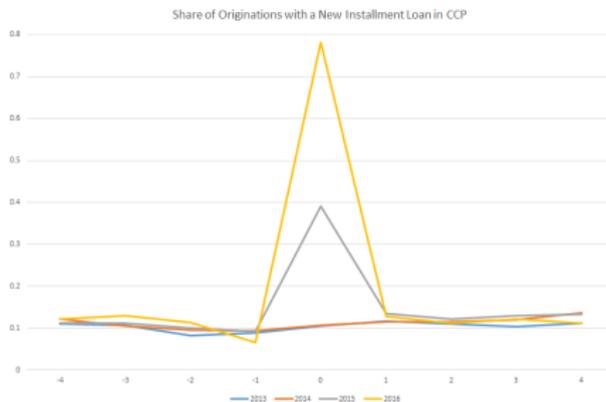
- We next test the effect of loans on credit outcomes
- We estimate:

$$\begin{aligned} Y_{i,t+k} &= \alpha + \beta \text{LoanOriginated}_{it} \\ &+ \gamma X_{it} + \sum_{l=1}^4 \delta_l Z_{i,t-l} \\ &+ \tau_t + \nu_{i,t+k} \end{aligned}$$

- Dependent variables:
 - Revolver balance, monthly non-home debt payments, credit score, total debt balances, delinquency rates, home debt balances, new mortgage origination

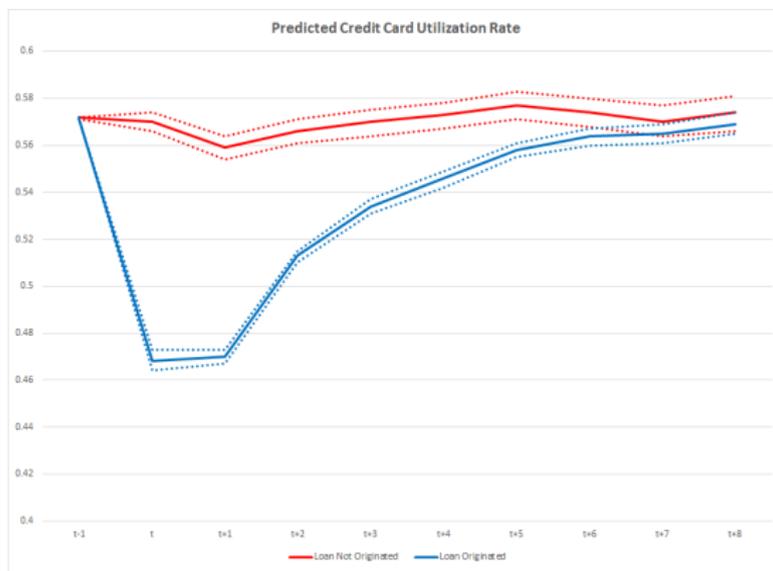
Do our Data include the Prosper Loan?

- Marketplace lenders have not always reported loans to credit bureaus

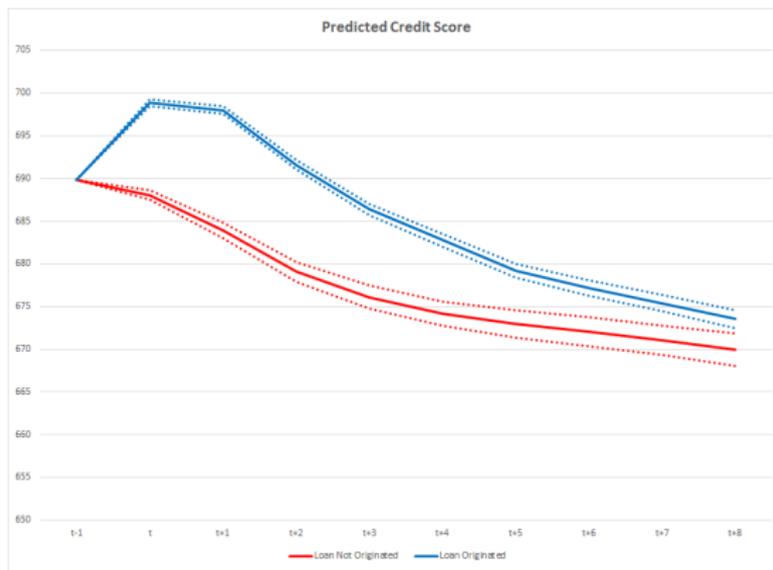


- Results are qualitatively similar for full sample and for borrowers with reported loan

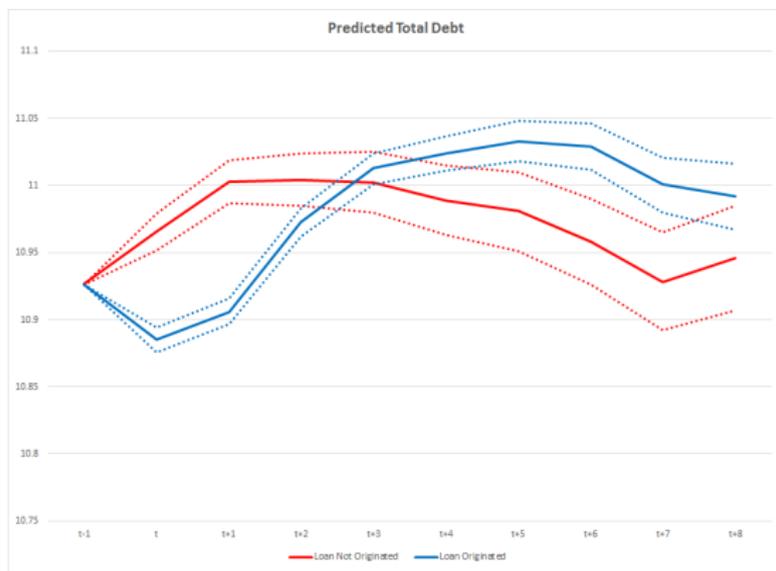
Outcome: Credit Card Utilization



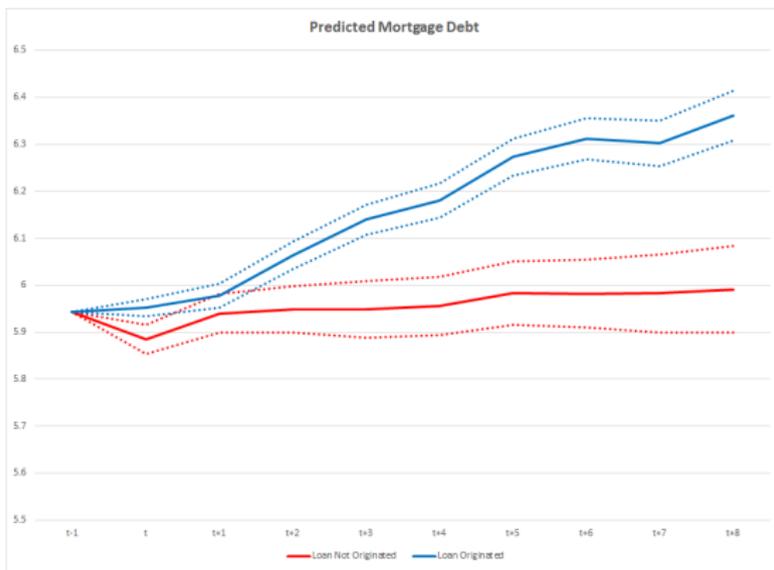
Outcome: Credit Score



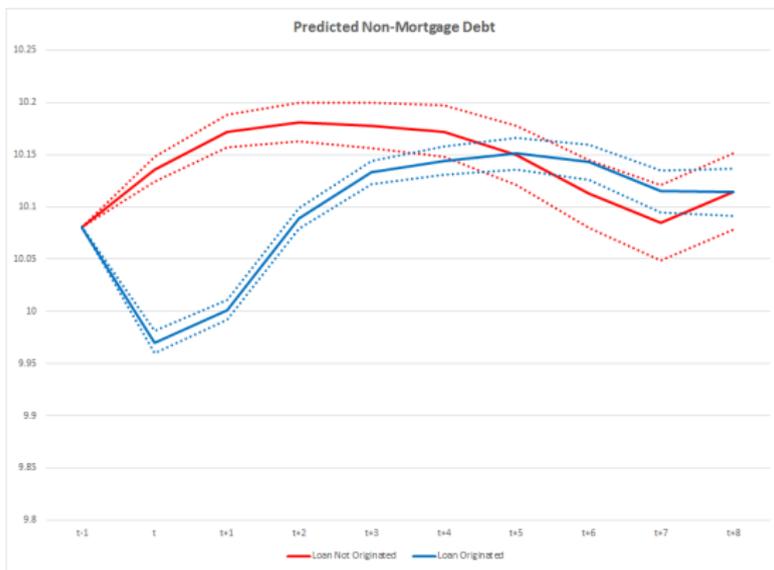
Outcome: Total Debt



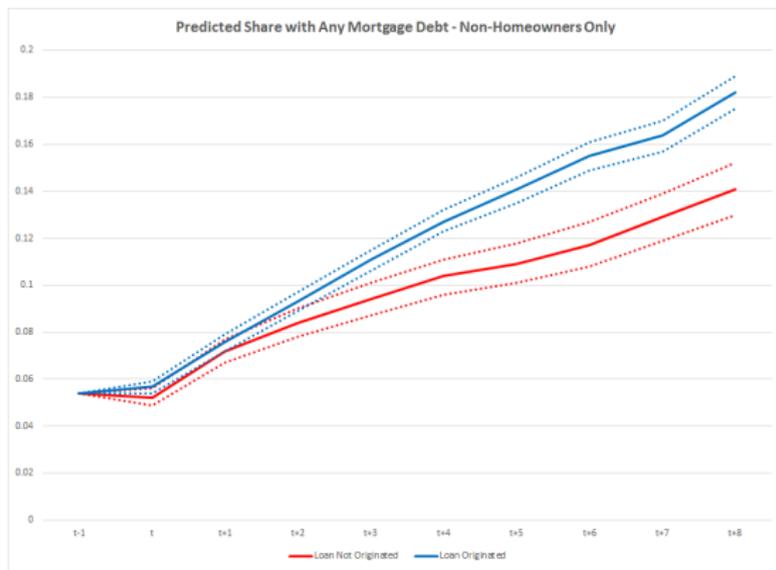
Outcome: Mortgage Debt



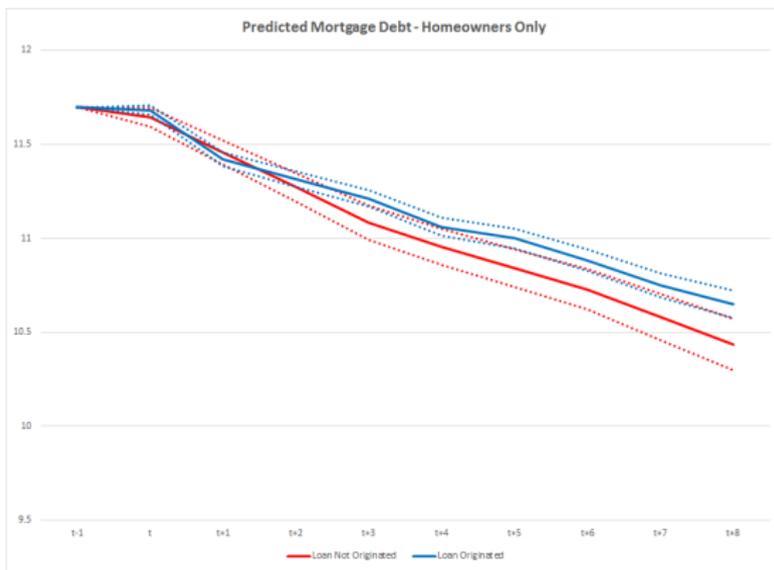
Outcome: Non-Mortgage Debt



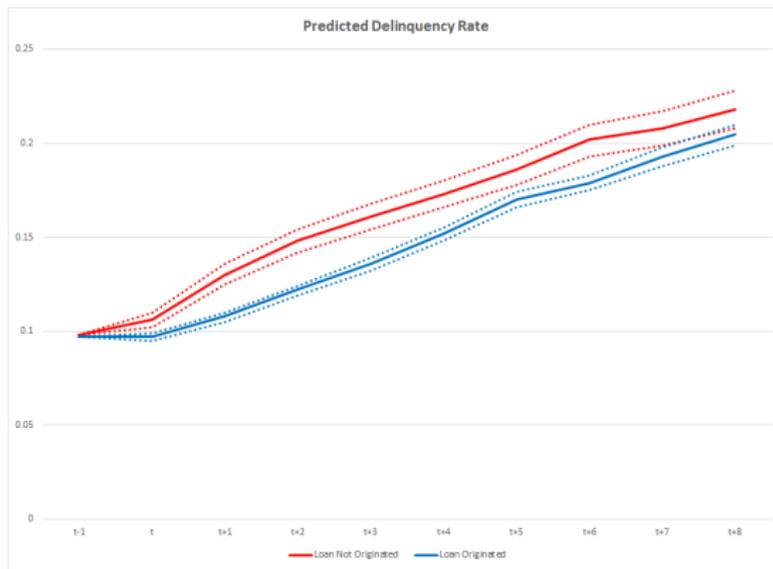
Outcome: Any Mortgage Debt, Non-Homeowners Only



Outcome: Mortgage Debt, Homeowners Only



Outcome: Delinquency Rate



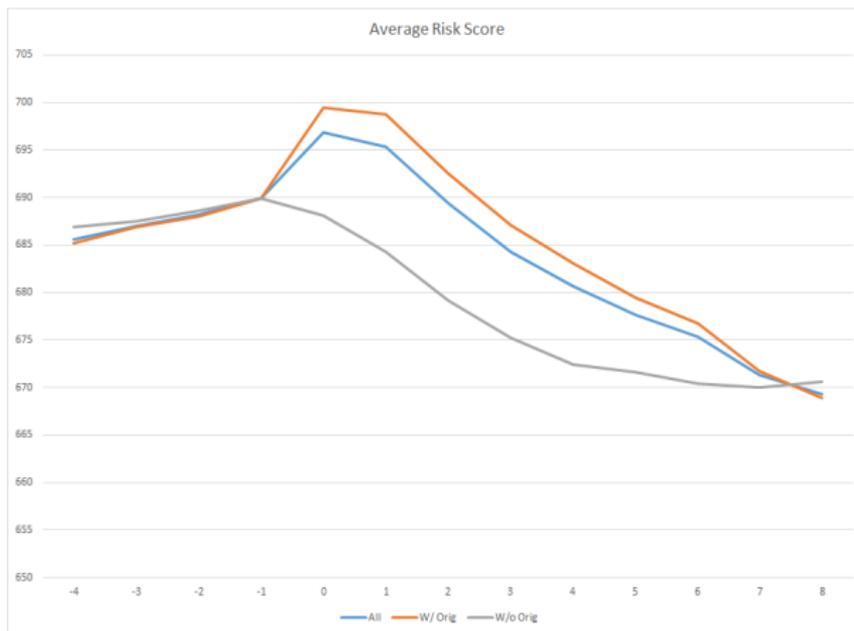
Endogeneity

- Is endogeneity a concern?
 - 94% of applications without origination are fully funded
 - Borrowers have higher levels of debt and lower income but similar FICO scores and loan terms
 - Pre-application trends are broadly similar
- ⇒ Non-borrowers likely have cheaper sources of financing
- ⇒ Our estimates likely underestimate effects of MPL
- We're exploring possible instruments that exploit pricing changes and discontinuities

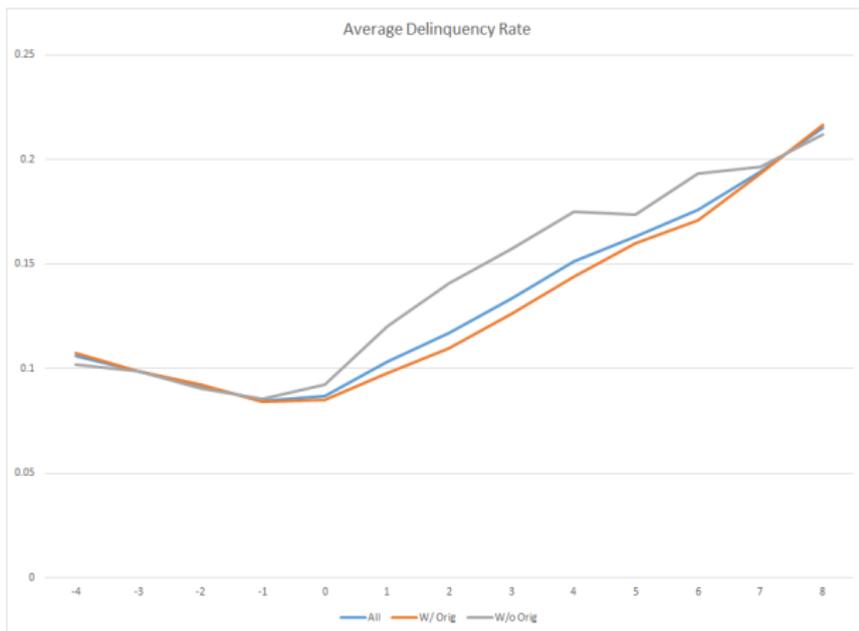
Conclusion

- We match data on marketplace lending applicants to credit bureau data and study applicant credit profiles pre- and post-application
- Applicants have relatively strong credit profiles but with high and increasing debt levels
- Relative to applicants without an origination, borrowers see increases in their credit scores, increases in total debt, and decreases in delinquency rates
- MPL doesn't appear to lead to deterioration in household financial well-being but their increased leverage does expose these borrowers to significant risk to economic downturns

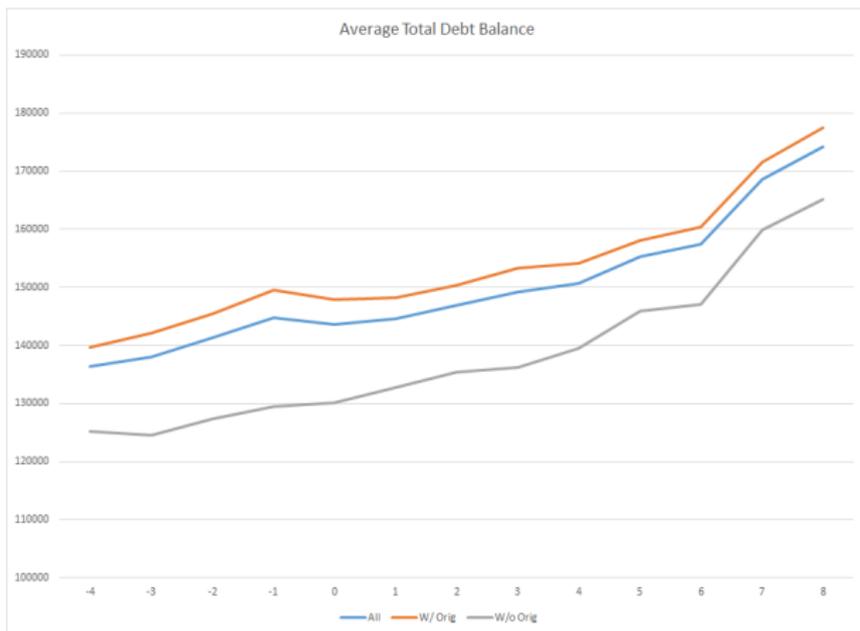
Additional Results



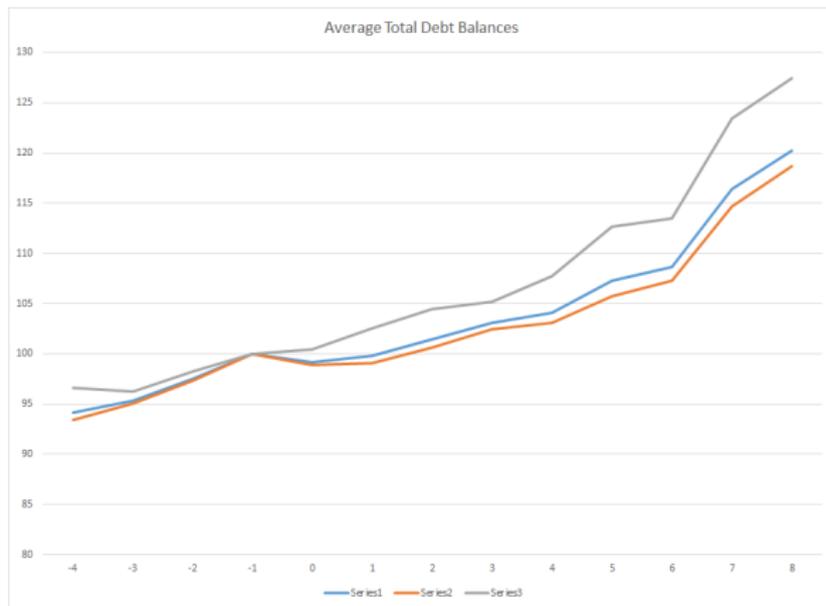
Additional Results



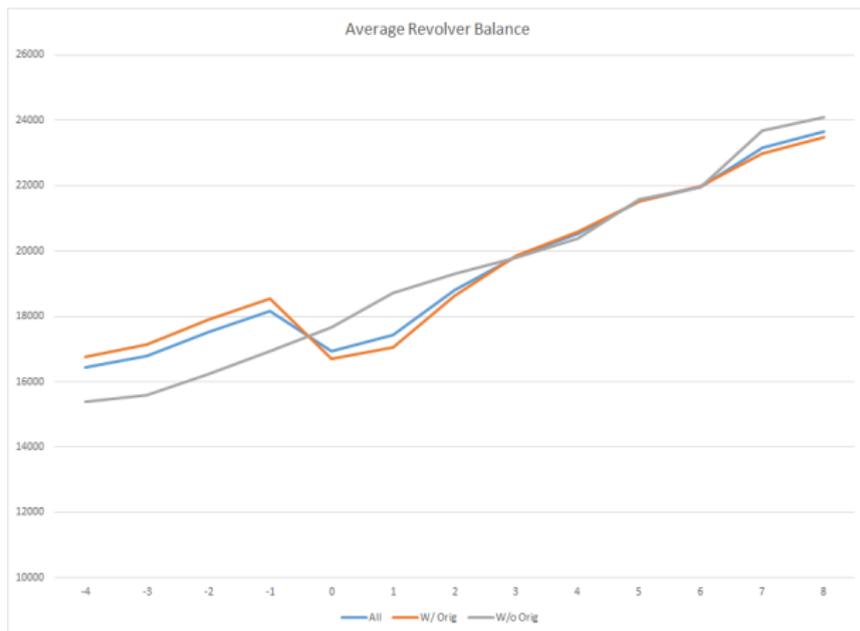
Additional Results



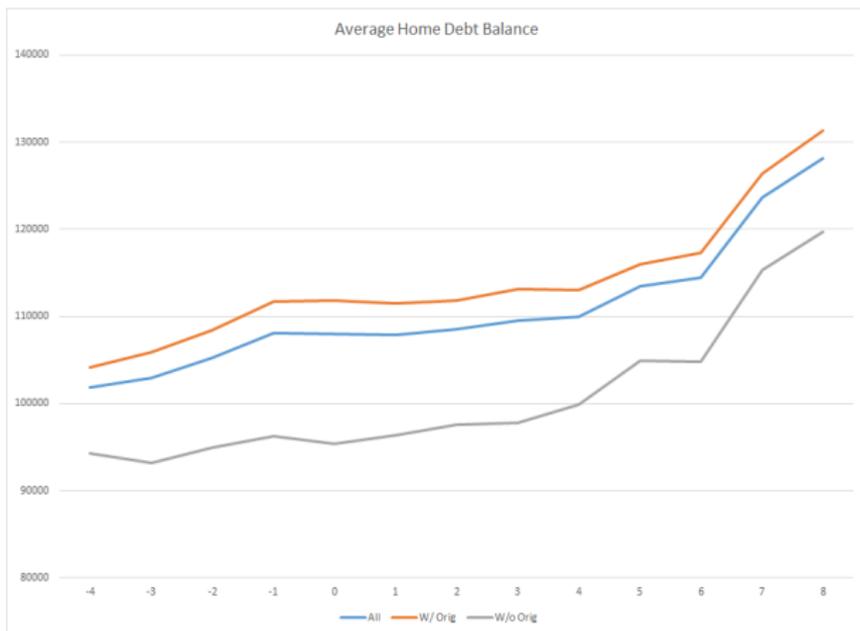
Additional Results



Additional Results



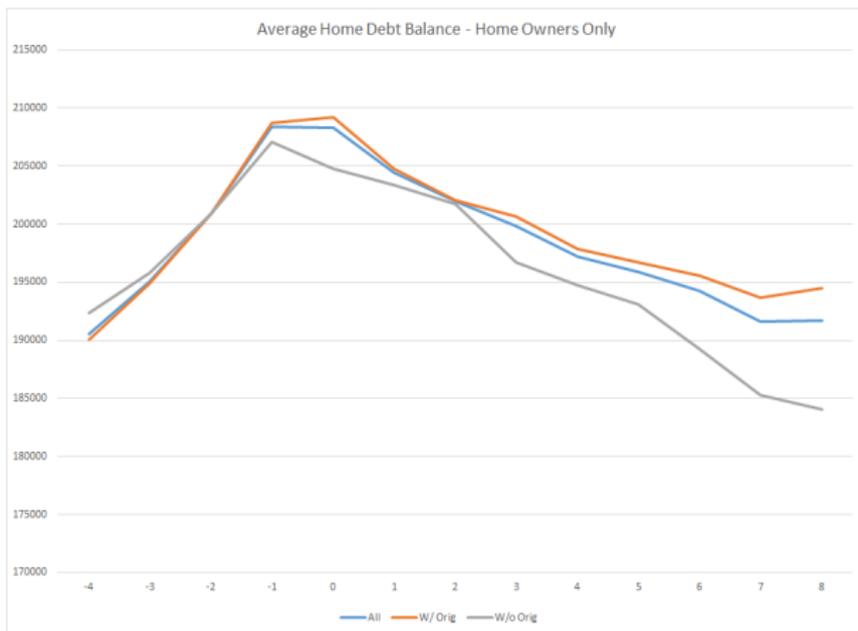
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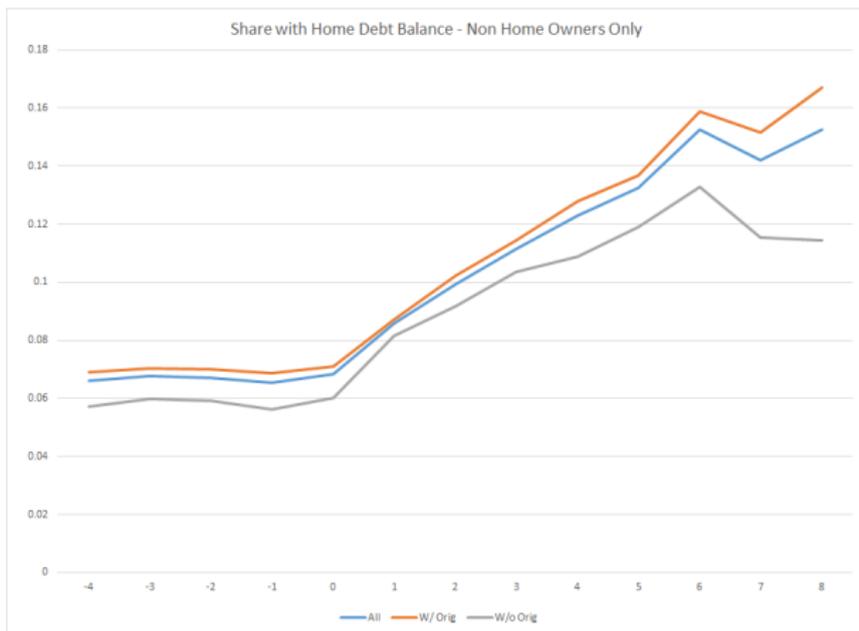
Additional Results



Additional Results



Additional Results



Outcome: Installment Balance

