

“Funding Decisions in Online Marketplace Lending” by Eric Lam

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Overview of the Paper

- ❖ **Goals:** To explore factors that determine the likelihood of a loan application being funded (on the LendingClub consumer platform)
- ❖ **The Data:**
 - LendingClub loan applications – both accepted and rejected – during January 2014 to December 2018
 - Of the 28 million applications, only 2 million loans originated – examine both funded and rejected loans together
- ❖ **Empirical Approach:** Machine Learning – simple decision tree algorithm – to allow for nonlinearity. Risk scores are excluded.
- ❖ **Findings:** Number of years employed is most important (88% relative importance) – compared to amount (6%) and DTI (5%). Loan grades are important in determining APR.



Impact of Length of Employment

What Happened to People with Thin Credit Files?

Can LendingClub identify the Invisible Prime?

Impact on Price of Credit Consumers Pay?

Years	<1	1	2	3	4	5	6	7	8	9	10+
% Funded	.008	.362	.526	.521	.548	.052	.614	.649	.598	.641	.660
% Amount	.009	.448	.570	.571	.590	.067	.662	.643	.608	.669	.659
Average Rate	.114	.115	.114	.114	.114	.114	.114	.115	.115	.114	.113

Source: Eric Lam (2019) and LendingClub data from LendingClub website



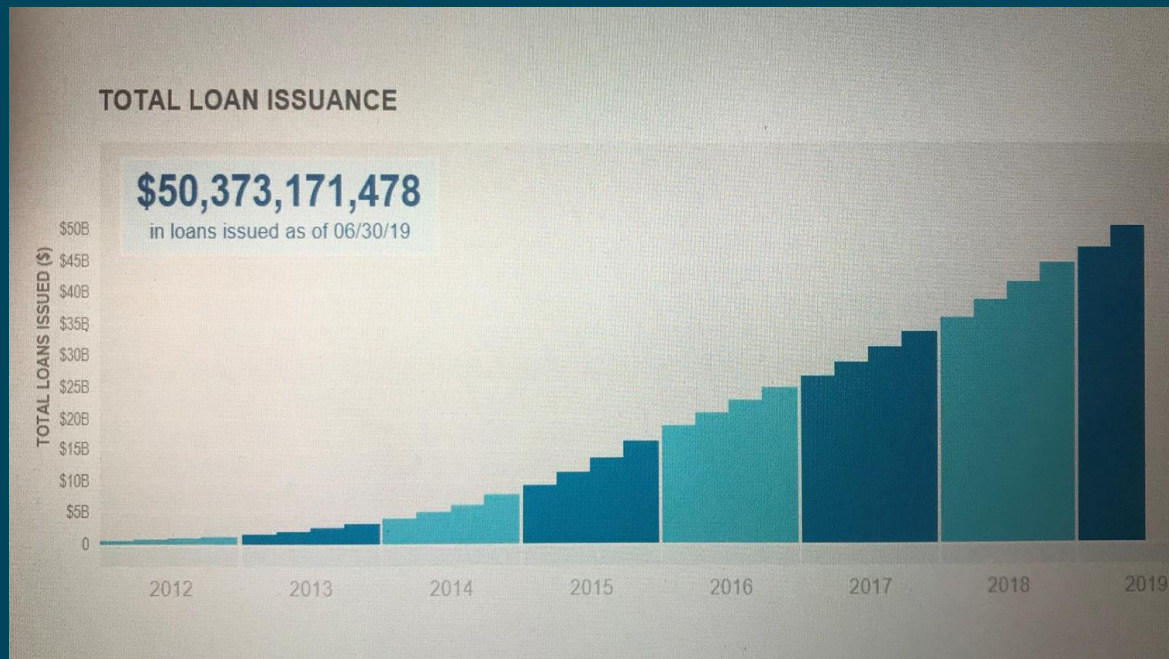
Data Limitations

- ❖ **Only loans that are available for small public investors are listed on the LendingClub website – SEC requirements**
- ❖ **Limited knowledge on other loans that were originated off the platform – with institutional investors or other programs**
- ❖ **Limited information on loan applications that were denied**
- ❖ **Limited information on location of the borrowers -- 3-digit zip may not be granular enough to identify military, gov't, IRS, etc.**
- ❖ **There are a few concerns around the following predictions:**
 - **Funding Outcome**
 - **Funding Amount**
 - **Credit Pricing**

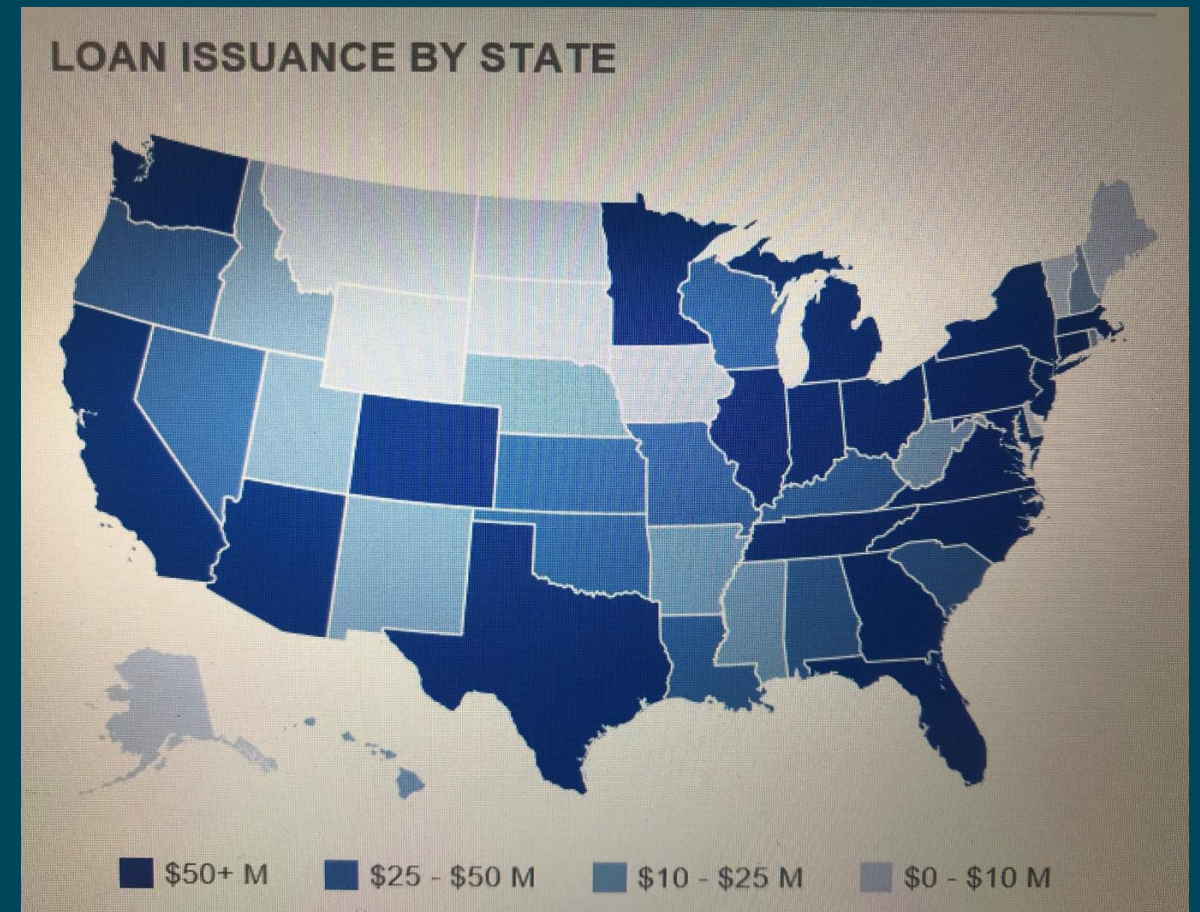


LendingClub Consumer Loan Volume

Total Volume \$50 Billion (as of June 2019)



Source: LendingClub website



Total Consumer Loans Reported \$38 Billion (2007:Q1 to 2019:Q2)

A B C D E F G All

Loan Grade	TOTAL ISSUED	FULLY PAID	CURRENT	LATE	CHARGED OFF (NET)	PRINCIPAL PAYMENTS RECEIVED	INTEREST PAYMENTS RECEIVED	AVG. INTEREST RATE	ADJ. NET ANNUALIZED RETURN ¹
A	\$7,635,190,975	\$3,592,720,072	\$2,559,911,063	\$23,083,746	\$124,846,874	\$4,927,349,290	\$549,414,163	7.18%	4.60%
B	\$10,626,851,925	\$5,162,801,811	\$2,979,968,786	\$63,539,113	\$471,939,712	\$7,111,404,300	\$1,320,277,156	10.78%	5.71%
C	\$10,735,270,425	\$4,789,346,293	\$2,851,283,193	\$107,602,007	\$895,077,294	\$6,881,307,923	\$1,903,638,722	14.29%	5.98%
D	\$5,647,643,925	\$2,401,198,818	\$1,413,498,182	\$82,801,853	\$718,095,145	\$3,433,248,739	\$1,256,717,653	18.43%	5.68%
E	\$2,415,367,925	\$1,105,612,523	\$331,973,709	\$31,523,064	\$484,391,875	\$1,567,479,274	\$724,419,757	21.87%	5.05%
FG	\$1,046,611,750	\$457,356,924	\$100,760,515	\$12,452,157	\$291,990,851	\$641,408,226	\$366,576,074	26.10%	3.04%
All	\$38,106,936,925	\$17,509,036,441	\$10,237,395,448	\$321,001,940	\$2,986,341,751	\$24,562,197,753	\$6,121,043,526	13.31%	5.46%

Source: LendingClub website



Sample Data 2014:Q1 to 2018:Q4

2 Million Accounts (\$30.8 Billion)

A B C D E F G All

Loan Grade	TOTAL ACCOUNTS	FULLY PAID	CURRENT	LATE	TOTAL \$ AMOUNT
A	394,264	217,960	160,230	1,880	\$5,843,814,525
B	588,545	320,034	211,362	5,668	\$8,452,369,325
C	591,304	288,283	207,672	8,860	\$8,960,008,950
D	290,516	131,702	92,404	5,767	\$4,628,559,150
E	120,001	52,856	29,930	2,426	\$2,085,808,175
FG	45,322	18,536	8,502	866	\$872,650,150
All	2,029,952	1,029,371	710,100	25,467	\$30,843,210,275

Source: LendingClub website



Limitation on Reported Loan Data

- ❖ In addition to the private program and those with institutional investors, LendingClub also sends out credit offers to individual consumers with pre-approved credit offers.
- ❖ We assume that the sample loan-level data listed on the website is a random sample and representative of the population

Lender Name	Freq	Percent	Cum Freq	Cum Percent
Avant	523	1.43	523	1.43
Best Egg	6361	17.36	6884	18.78
Big Picture Loans	1504	4.10	8388	22.89
GreenSky	2	0.01	8390	22.89
LendingClub	11739	32.03	20129	54.92
OneMain Financial	6087	16.61	26216	71.53
Prosper	7319	19.97	33535	91.50
SoFi	2323	6.34	35858	97.83
Upstart	794	2.17	36652	100.00

Source: Mintel Comprimedia, Inc.
Direct Mail Monitor Data



LendingClub also started its loan securitization in 2017

Loan-level data are not reported for these non-P2P loans ?

Class	Size (\$)	Rating (Kroll)	Coupon (%)
A	\$162,415,650.00	A-	2.39%
B	\$41,235,062.00	BBB	3.17%
C	\$75,737,868.00	BB	5.13%
Total	\$279,388,588.00		4.01%

**Non-P2P Loans from LendingClub
(not listed in loan-level data
download)**

June 22, 2017	\$279.4 Mill
September 28, 2017	\$323.1 Mill
December 6, 2017	\$330 Mill
December 20, 2017	\$265.8 Mill
March 21, 2018	\$301.7 Mill
June 21, 2018	\$294.4 Mill

Source: LendingClub website



Limited Information on Rejected Loans

- ❖ LendingClub loan grades are not used in predicting funding outcome and funding amount – used for credit pricing only
- ❖ What about Risk Score (**FICO** and *VantageScore*) which are available for both funded and rejected loans?

Rejected Loan

Only 10 Variables Reported by LendingClub (compared with over 100 variables for Funded Loans)

Amount Requested

Application Date

Loan Title

Risk Score (FICO, *VantageScore* scores)

Debt-To-Income Ratio

Zip Code (3-digit zip)

State

Employment Length

Policy Code

3-Digit Zips in NYC Manhattan

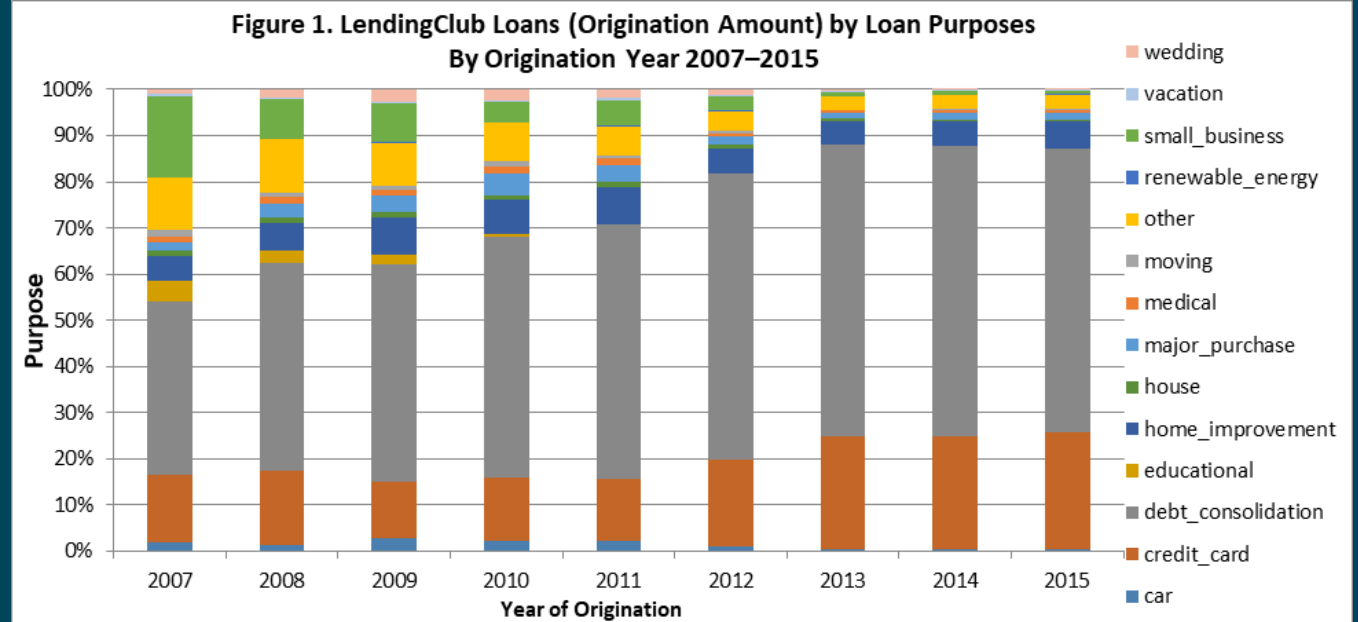
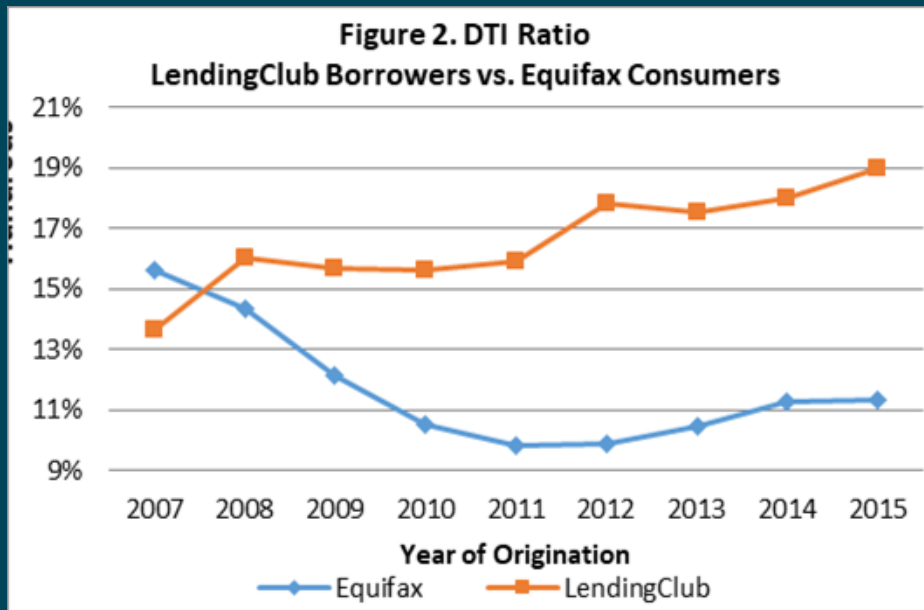
Zip 100 include diverse communities in NYC

Central Harlem	10026, 10027, 10030, 10037, 10039
Chelsea and Clinton	10001, 10011, 10018, 10019, 10020, 10036
East Harlem	10029, 10035
Gramercy Park and Murray Hill	10010, 10016, 10017, 10022
Greenwich Village and Soho	10012, 10013, 10014
Lower Manhattan	10004, 10005, 10006, 10007, 10038, 10280
Lower East Side	10002, 10003, 10009
Upper East Side	10021, 10028, 10044, 10065, 10075, 10128
Upper West Side	10023, 10024, 10025
Inwood and Washington Heights	10031, 10032, 10033, 10034, 10040



Results on Funding Outcome

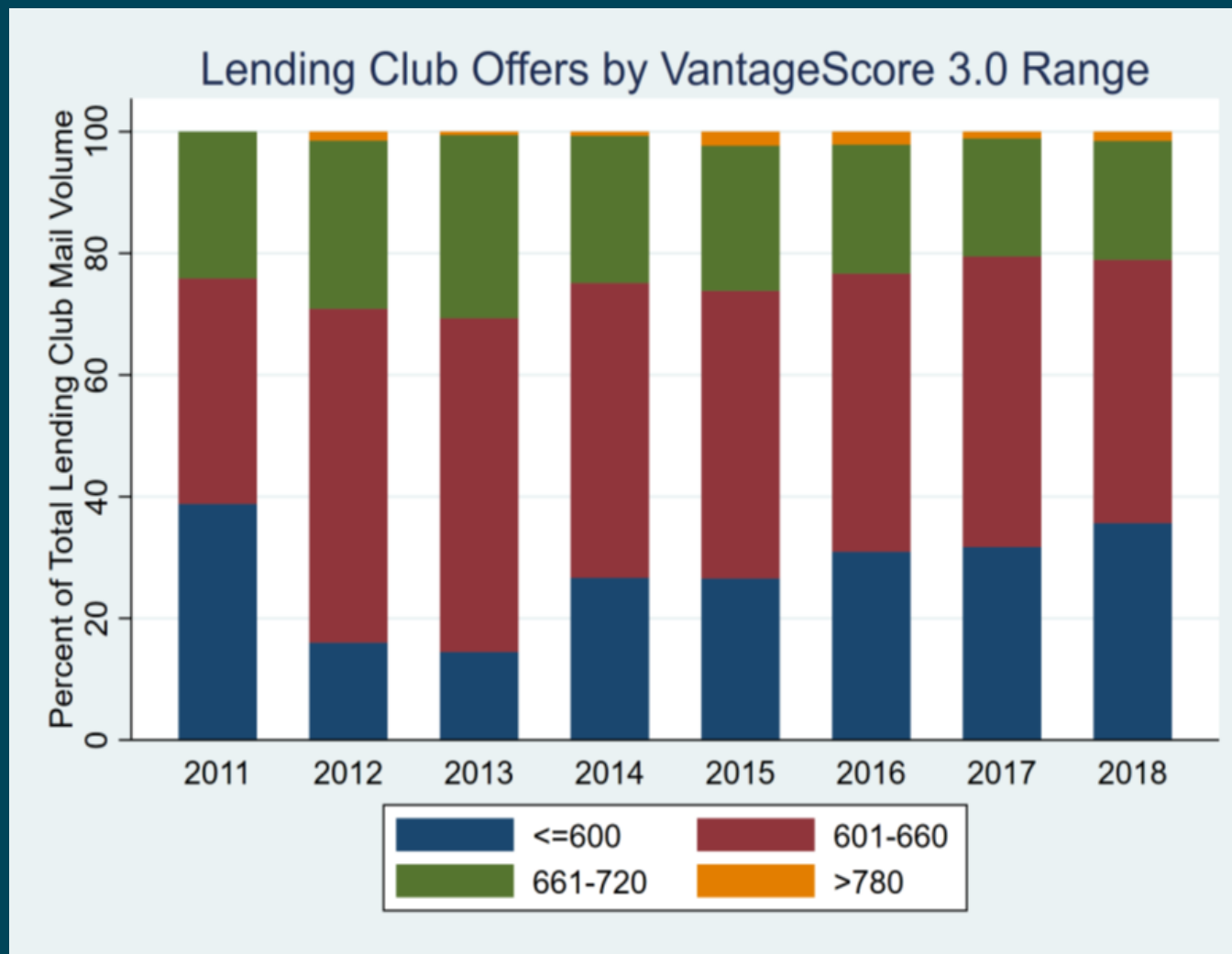
- ❖ Funded loans are mostly for debt consolidation purposes
- ❖ Low leverage borrowers (smaller DTI ratio) are more likely to receive funding
- ❖ People with less than 1 year of employment rarely gets funding
- ❖ These results are consistent with other research studies:



Source: Jagtiani and Lemieux (2018); FRBNY CCP/Equifax; loan-level data from LendingClub

Other Related Findings from Existing Research

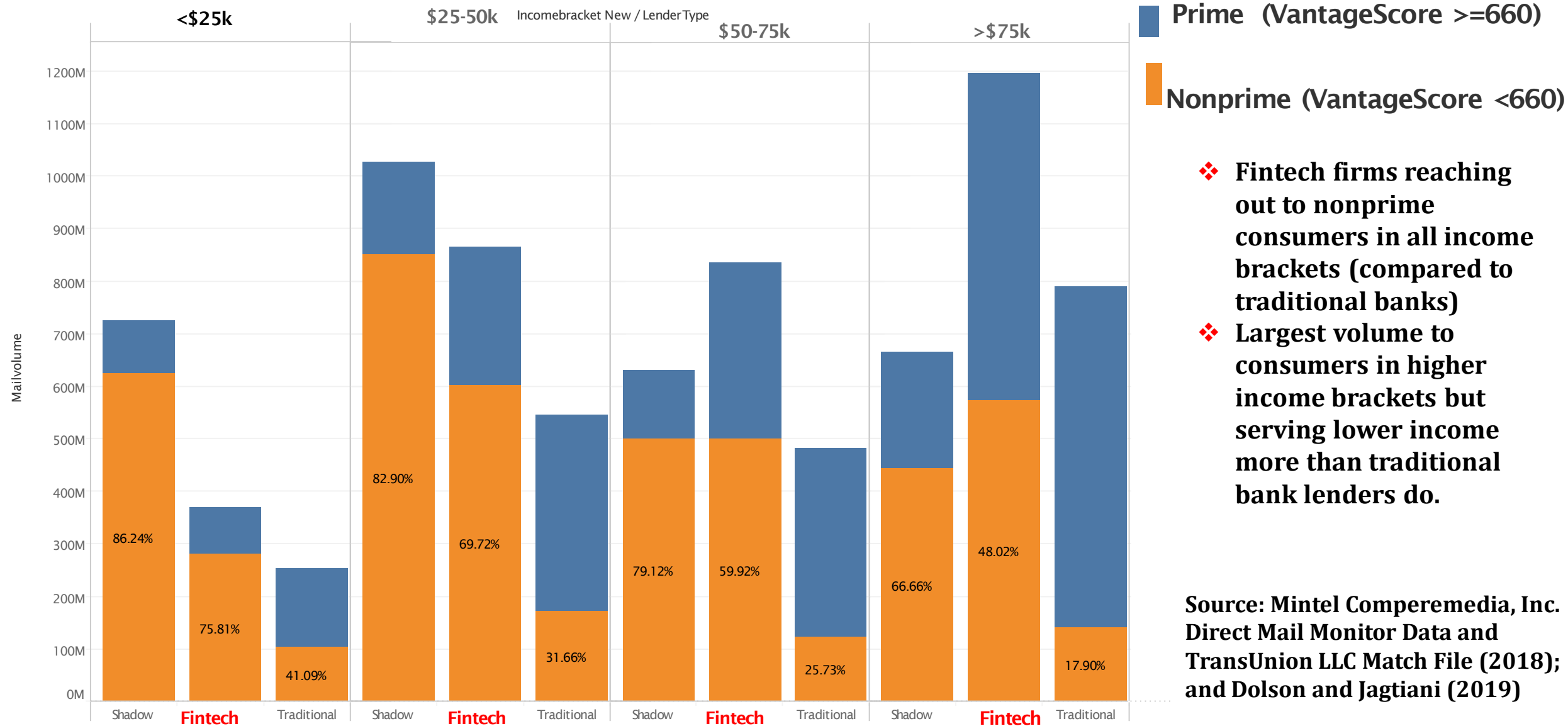
LendingClub offers credit to below-prime consumers



Source: Mintel Comprimedia, Inc. Direct Mail Monitor Data and TransUnion LLC Match File (Mintel-TransUnion)



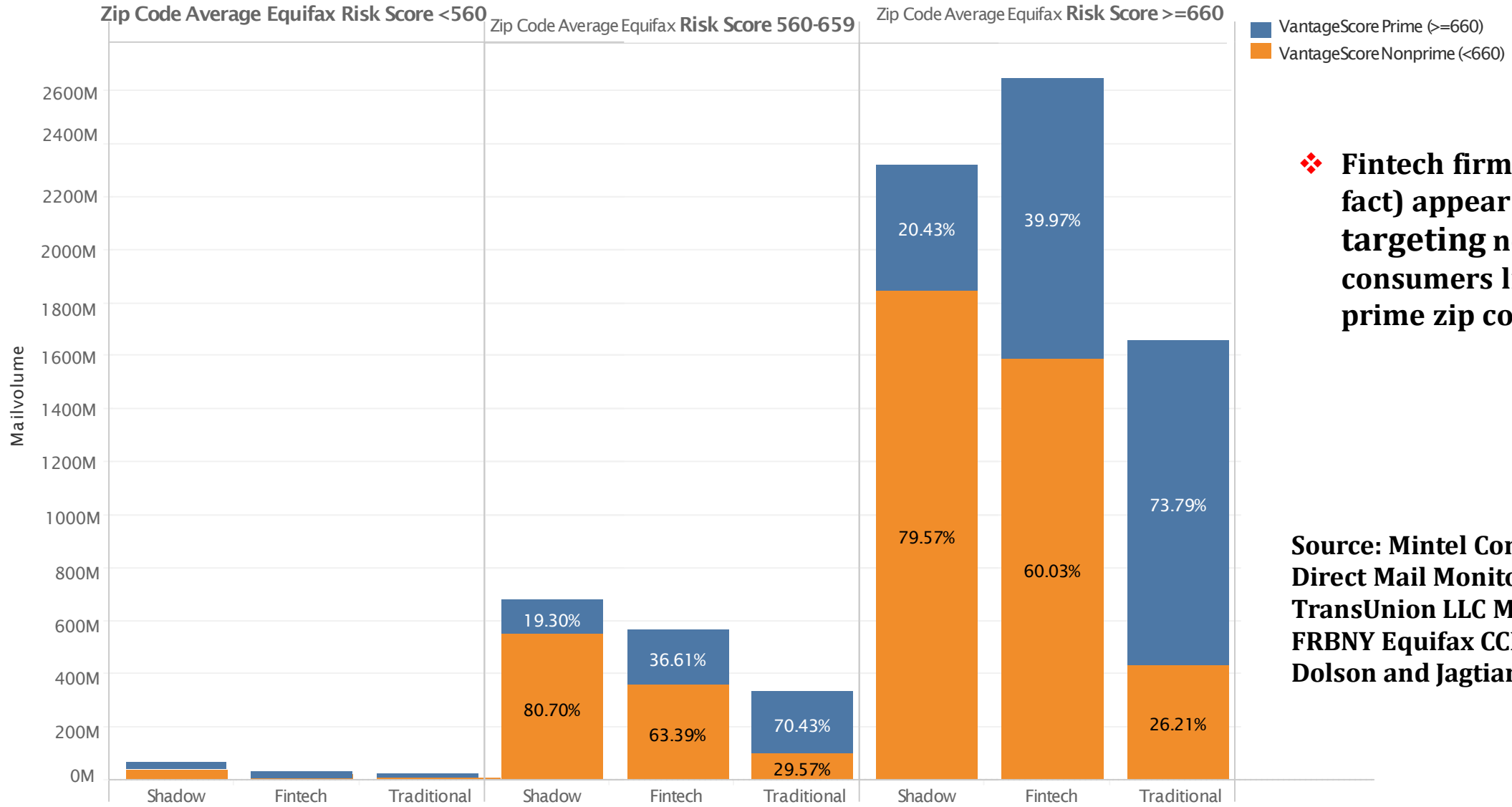
Personal Loan Mail Volume by Income Brackets (2015-2018)



- ❖ Fintech firms reaching out to nonprime consumers in all income brackets (compared to traditional banks)
- ❖ Largest volume to consumers in higher income brackets but serving lower income more than traditional bank lenders do.

Source: Mintel Comperemedia, Inc. Direct Mail Monitor Data and TransUnion LLC Match File (2018); and Dolson and Jagtiani (2019)

Personal Loan Mail Volume by VantageScore and Zip-Level Average Equifax Risk Score (2015-18)

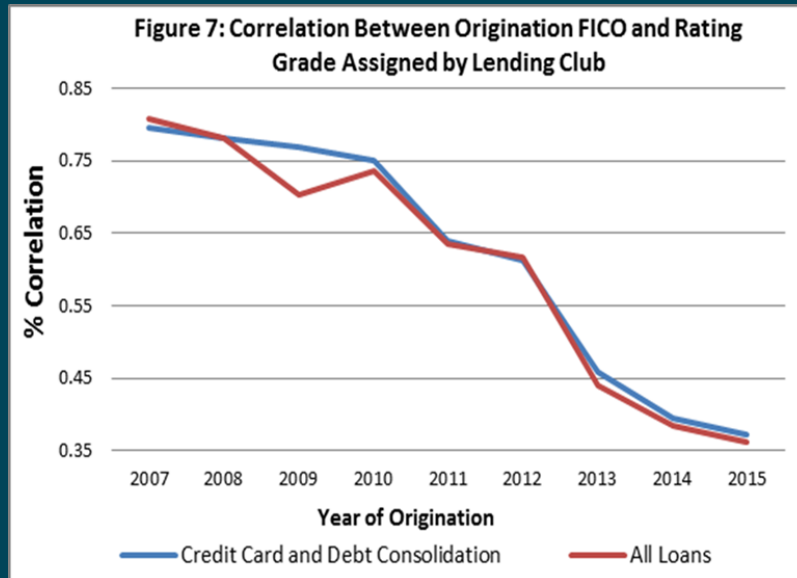


❖ **Fintech firms (all firms, in fact) appear to be targeting nonprime consumers living in prime zip codes**

Source: Intel Comperemedia, Inc. Direct Mail Monitor Data and TransUnion LLC Match File (2018); FRBNY Equifax CCP (2018); and Dolson and Jagtiani (2019)

Credit Pricing?

- ❖ Credit pricing – should incorporate up-front fees deducted from loan amount (one time fee 2% to 6% of origination amount)
- ❖ Loan grades (assigned by LendingClub) determines the price of credit – with maximum APR (including fees) being set at 36%
- ❖ The factors that determine rating grades and APR include nontraditional data not related to traditional rating (e.g. FICO)

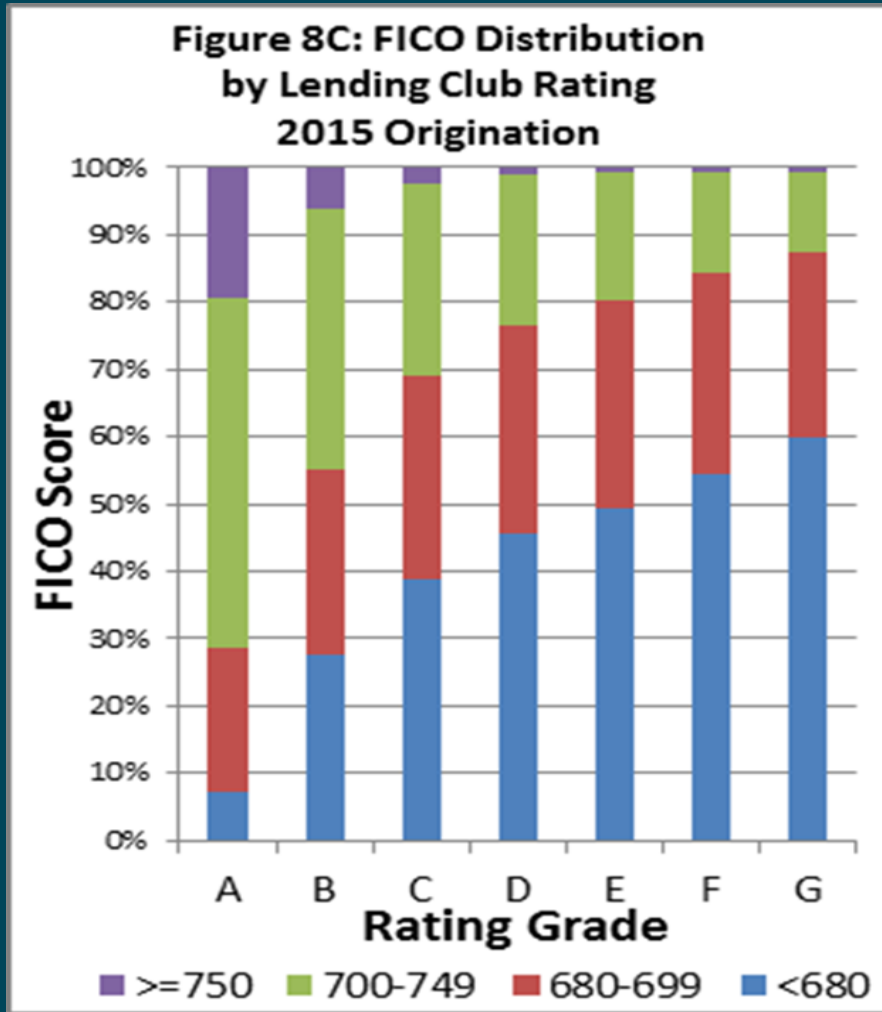


A1	6.46%	B1	10.33%	C1	14.30%	D1	18.62%
A2	7.02%	B2	11.02%	C2	15.24%	D2	20.55%
A3	7.56%	B3	11.71%	C3	16.12%	D3	23.05%
A4	8.19%	B4	12.40%	C4	16.95%	D4	25.65%
A5	8.81%	B5	13.08%	C5	17.74%	D5	28.80%

Source: Jagtiani and Lemieux (2019) and loan-level data from LendingClub website

Source: LendingClub website

Credit Pricing: APR by FICO Segments



Source: Jagtiani and Lemieux (2019) and loan-level data from LendingClub

FICO Segment at Origination	% Average APR Spread LendingClub (Include Origination Fees)		% Average Spread Bank Y-14M (Revolvers Only)
	3-Year Maturity	5-Year Maturity	
660–679	15.336 N=139,337	18.113 N=64,359	20.1923 N=6,812
680–699	13.756 N=100,033	16.764 N=54,030	19.8465 N=7,067
700–719	12.013 N=64,271	15.351 N=36,313	19.1418 N=6,637
720–739	10.432 N=32,512	14.033 N=17,071	18.4180 N=5,930
740–759	9.125 N=15,403	12.818 N=6,823	17.6569 N=5,383
760–779	8.236 N=8,081	11.972 N=3,015	16.8312 N=4,701
780–799	7.604 N=4,458	11.338 N=1,436	16.1820 N=4,586
800+	6.9519 N=2,509	10.699 N=837	16.1668 N=12,070

Conclusions

- ❖ This is a nice paper – exploring important research questions
- ❖ Years of employment is most important in this study (88%) – may serve as a proxy for alternative data. LendingClub claims that the self-reported length of employment is not considered in their credit decision (and the data is not collected until a prequalified offer is made to loan applicants).
- ❖ Loan grades are important in determining APR -- by designed. It would be interesting to explore the relationship between loan grades and loan performance – risk pricing accuracy.
- ❖ Credit scores should be included in the analysis overall.
- ❖ Future research may focus on applying similar ML techniques to maximize accuracy in credit risk pricing – to expand credit access to consumers and improved risk/return trade-off for investors.





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