

Are Borrowers Paid to Repay? Payday Effect in FinTech Lending

Jianfeng Hu, *Singapore Management University*

Changcheng Song, *Singapore Management University*

Gloria Yang Yu, *Singapore Management University*

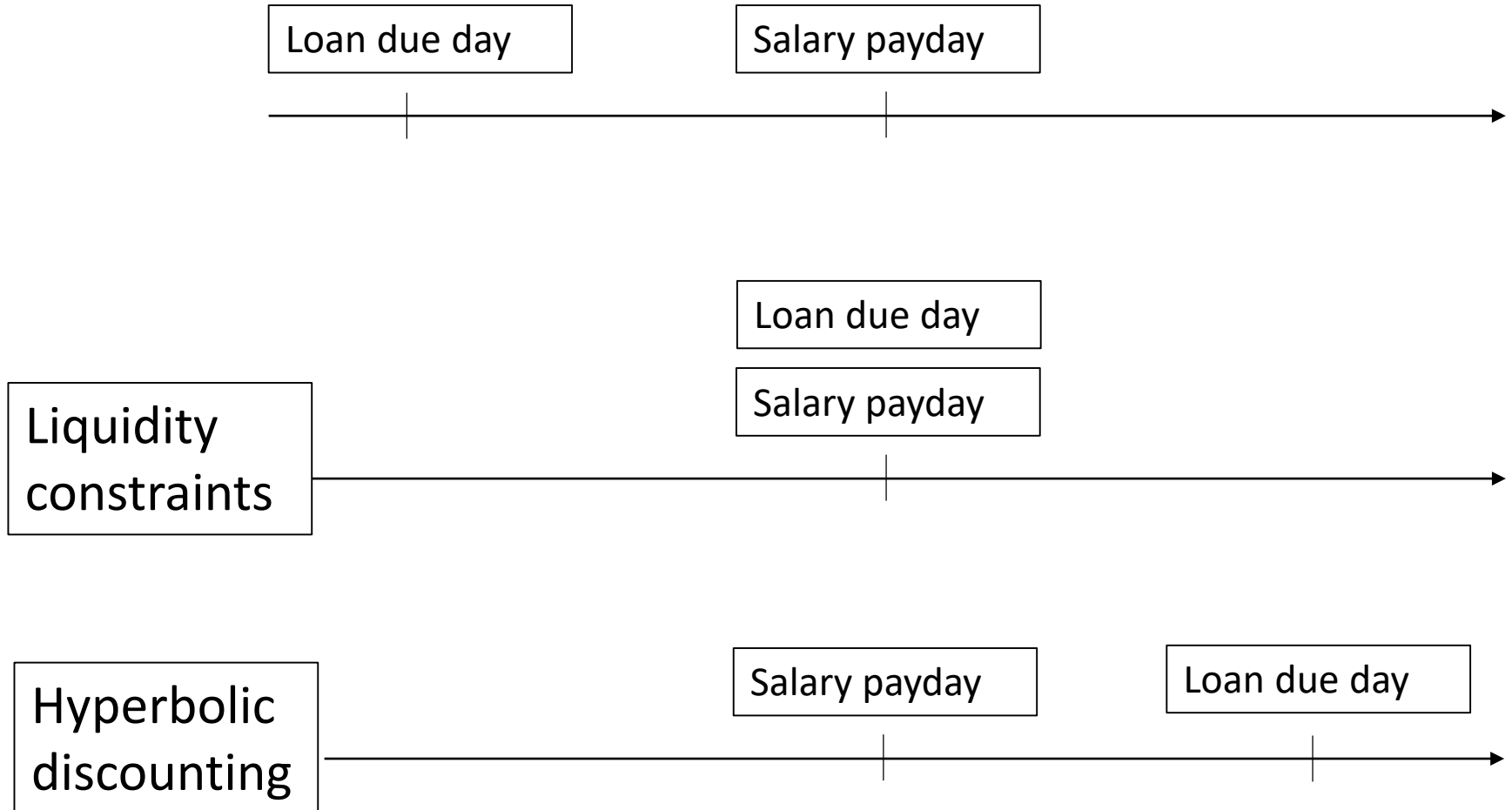
Motivation

- Fintech lending has the potential to improve financial inclusion for the unbanked population.
- Challenge: the relative high default rate
 - Existing literature largely focuses on adverse selection and moral hazard (Karlan and Zinman 2009).
- Possible solutions:
 - A better contract design
- Difficult to study the causal impact of contract designs: institutional constraints
 - High costs to conduct randomized control trials
 - Lack of digitalization to record data

This Paper

- Research Question
 - How fintech loan contract flexibility affects loan outcomes?
- What we do
 - Collaboration with a large fintech firm to conduct a low-cost randomized control trial.
 - Randomly extend the loan term by one/two days to align the loan due date with the salary payday
 - Treatment group with a new due date that is the same as their salary payday.

Hypothesis



Findings

- Extension postponing the due date after borrowers' salary payday increases the repayment likelihood by 27%
- Such loan extension does not affect loan repayment when the due date is far away from the salary payday.
 - Consistent with liquidity constraints
- The effect is larger for smaller loan sizes, borrowers with low credit ratings, and borrowers with more past overdue.
 - Implication: flexible contract design improve the loan performance for low-credit borrowers

Roadmap

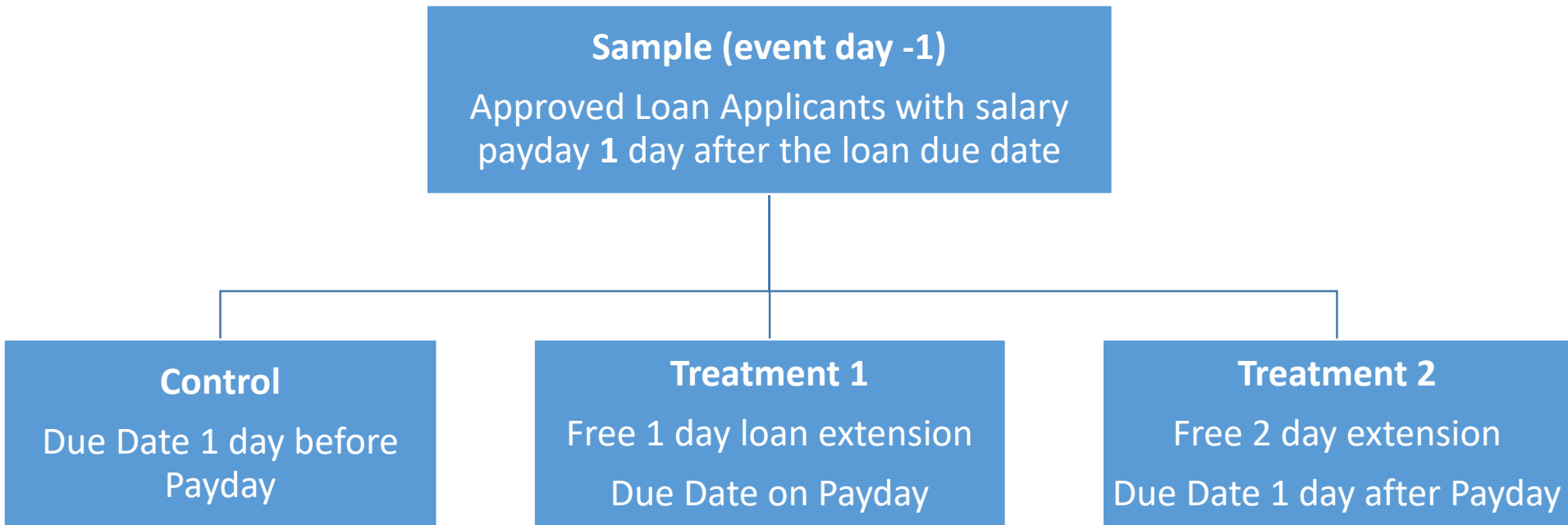
- Experiment design
 - Balance of treatment
- Empirical Results
 - Overdue
 - Repayment
 - Heterogeneous results
- Conclusion

Experiment Design

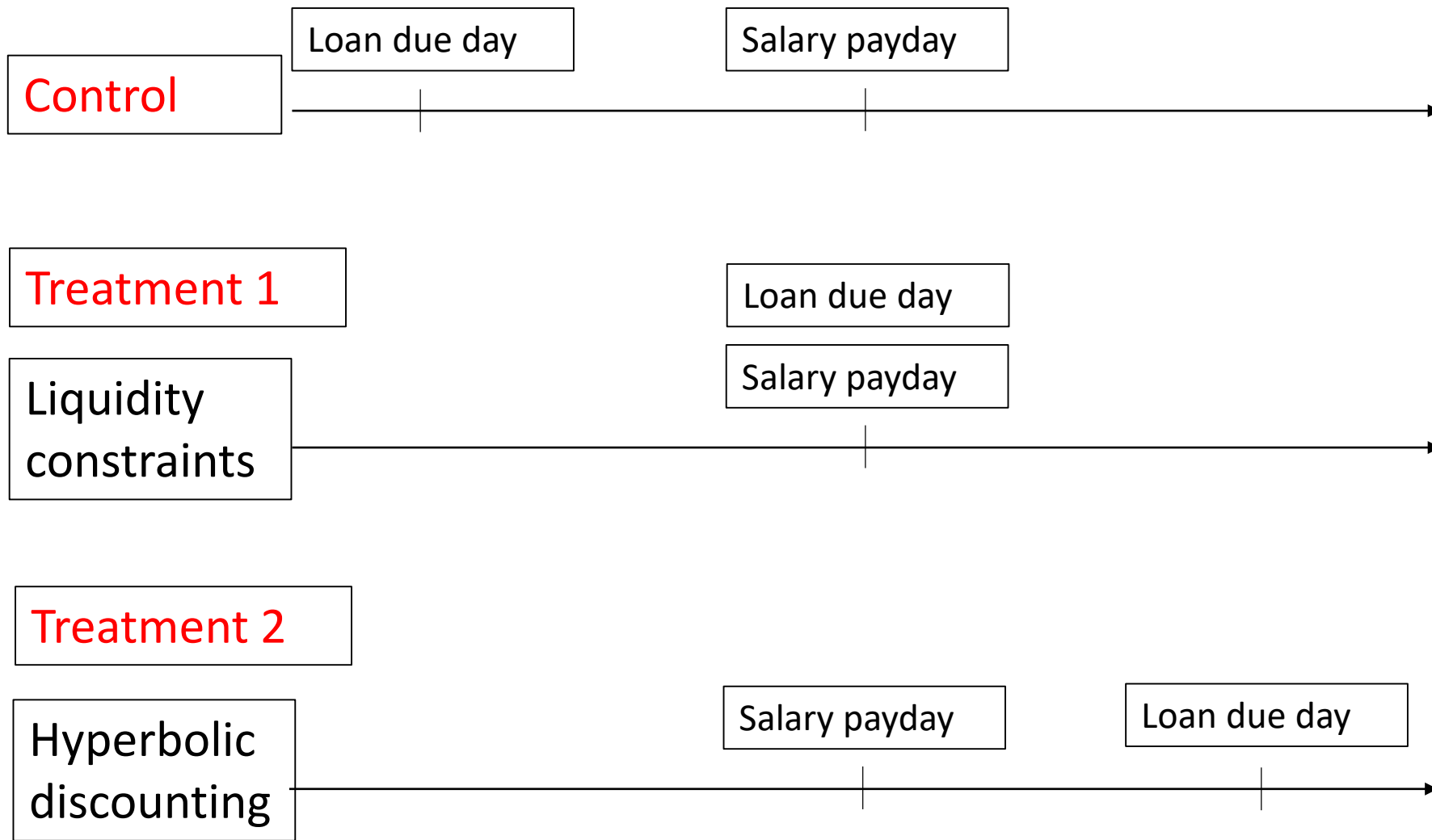
Collaborated Company

- Kredit Pintar (KP) is the Indonesia based digital lending business of Atome Financial (Atome) which is the digital financing arm of Advance Intelligence Group (AIG).
- Currently, KP has an active loan book of 1.2 trillion rupiah, with over 700,000 active users.
- KP's loans are non-collateralized and have fixed maturities of 2-4 weeks, three months, and six months with annual percentage rate between 100% and 300%.
- Without external credit histories to screen customers, KP faces a greater risk of fraud and losses from defaults.

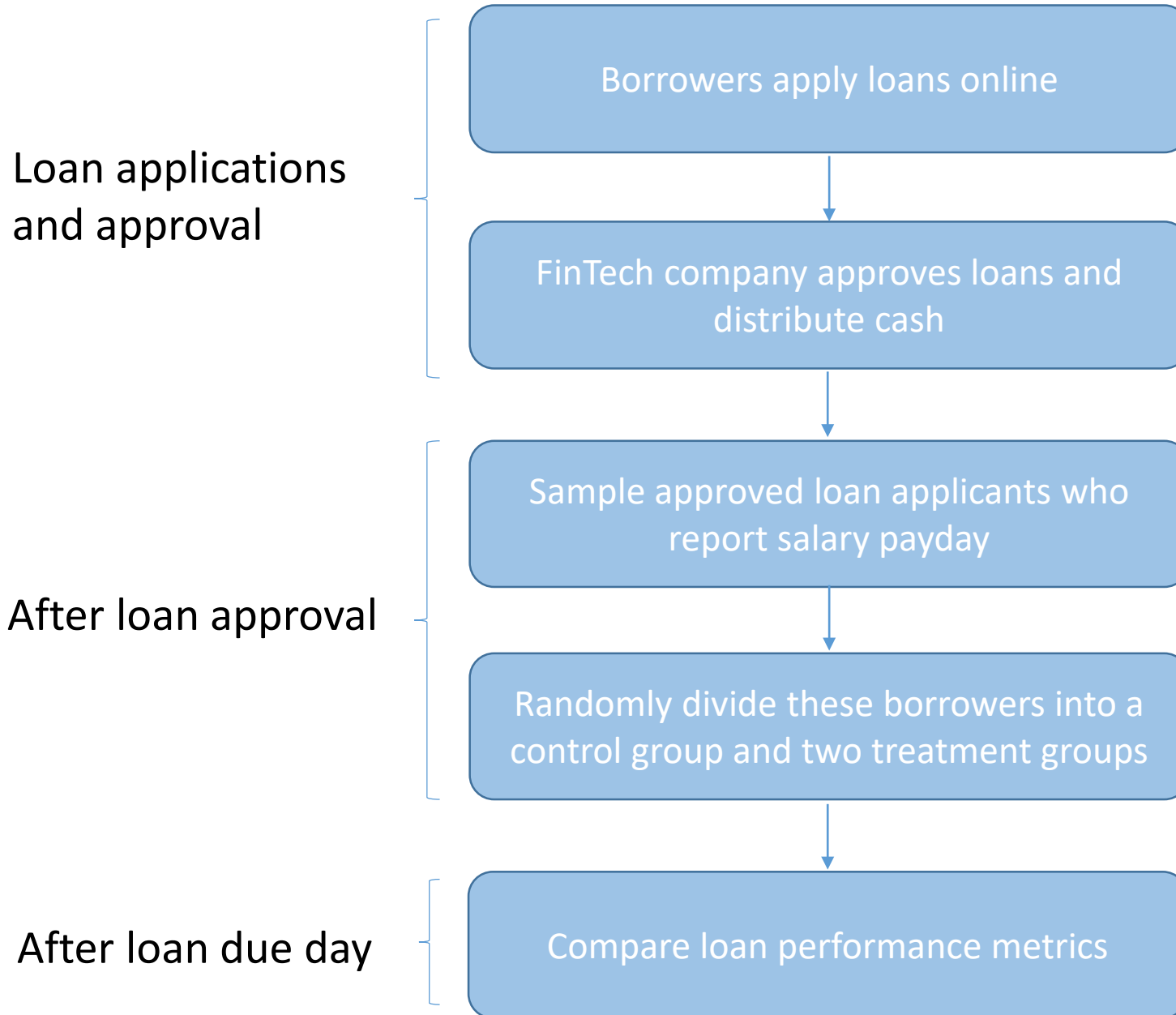
Research design: Match group



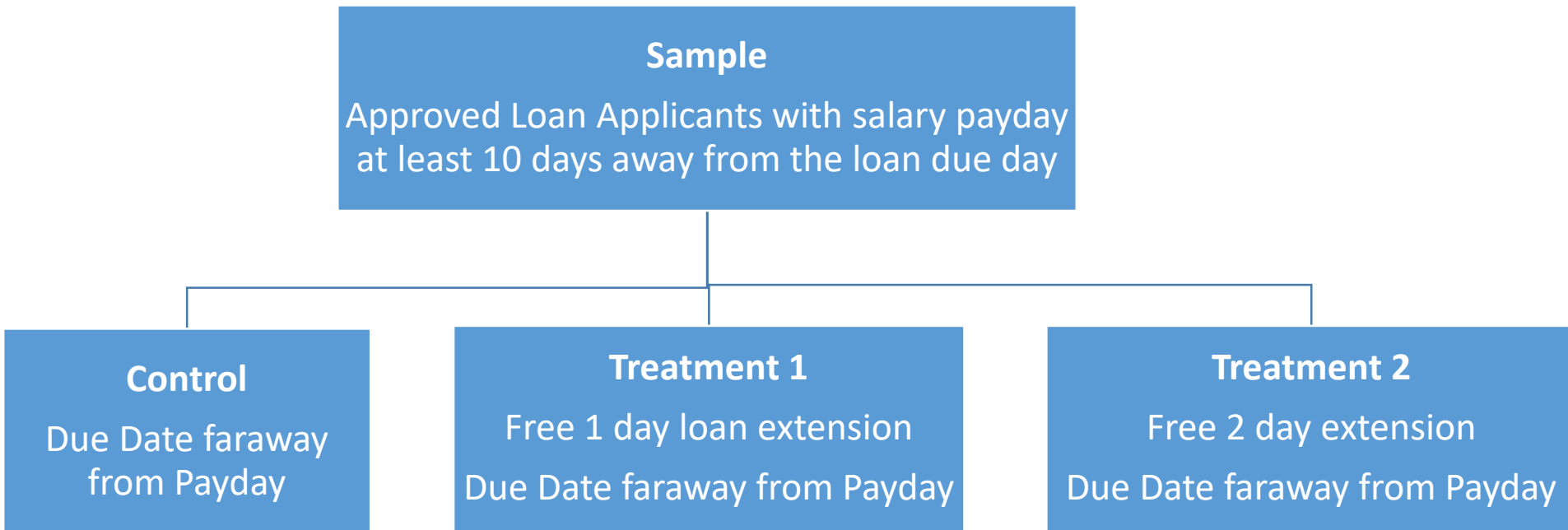
Hypothesis



Experiment timeline



Research design: Placebo group



Experiment Design

Cohort	Event Day	No. Days Extended	Targeted Payday Minus Maturity	Treatment	Match
1	-3	0	-3	0	1
2	-3	1	-2	.	1
3	-3	2	-1	.	1
4	-2	0	-2	0	1
5	-2	1	-1	.	1
6	-2	2	0	0	1
7	-1	0	-1	0	1
8	-1	1	0	0	1
9	-1	2	1	1	1
10	0	0	0	0	1
11	0	1	1	1	1
12	0	2	2	1	1
13	-3	0	-3	0	0
14	-3	1	-2	.	0
15	-3	2	-1	.	0
16	-2	0	-2	0	0
17	-2	1	-1	.	0
18	-2	2	0	0	0
19	-1	0	-1	0	0
20	-1	1	0	0	0
21	-1	2	1	1	0
22	0	0	0	0	0
23	0	1	1	1	0
24	0	2	2	1	0

Balance of Treatment

	Extend 0 day	Extend 1 Day	Extend 2 Days	P-value
Young	0.38 (0.49)	0.37 (0.48)	0.38 (0.48)	0.84
Female	0.43 (0.50)	0.40 (0.49)	0.41 (0.49)	0.47
Income	5.11 (3.71)	4.99 (3.31)	5.01 (3.55)	0.70
High Education	0.52 (0.50)	0.48 (0.50)	0.51 (0.50)	0.15
Married	0.53 (0.50)	0.55 (0.50)	0.55 (0.50)	0.35
Senior Position	0.17 (0.37)	0.17 (0.38)	0.15 (0.36)	0.54
Size	1.30 (0.44)	1.32 (0.44)	1.32 (0.44)	0.46
Credit	6.39 (4.05)	6.47 (4.05)	6.46 (3.95)	0.88
Behaviour	0.55 (0.05)	0.55 (0.05)	0.54 (0.05)	0.32
Past Overdue Days	0.37 (0.66)	0.38 (0.73)	0.35 (0.77)	0.68
Past Loan Size	12.93 (4.32)	12.99 (4.13)	13.29 (5.02)	0.13
Past Tenor	34.35 (13.67)	33.79 (13.09)	33.92 (16.89)	0.64
Past Application #	15.07 (10.03)	15.74 (10.64)	15.18 (10.44)	0.25
Observations	1104	1186	1112	

Empirical Results

- Overdue
- Heterogeneous effects
- Repayment

Overdue

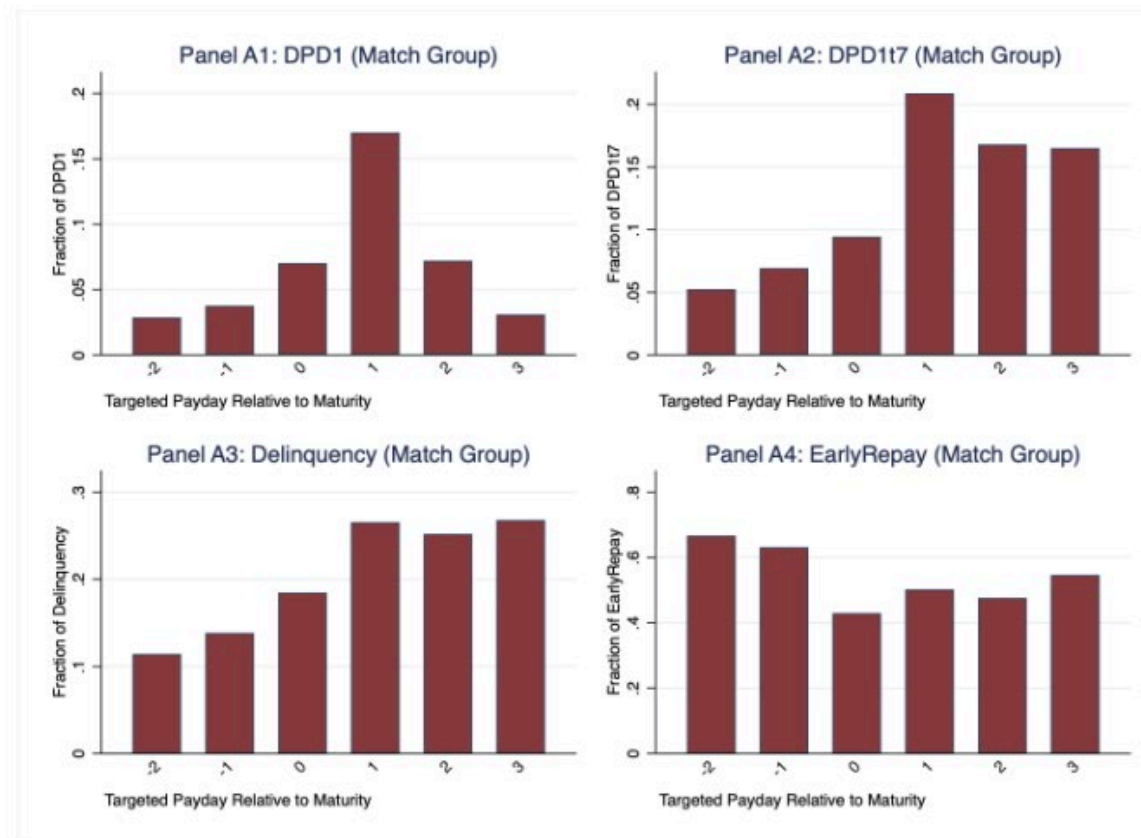
OLS Model (DiD): Overdue

Panel A: All Event Days				
	(1)	(2)	(3)	(4)
	<i>Overdue</i>	<i>DPD1</i>	<i>DPD1t7</i>	<i>EarlyRepay</i>
<i>Treatment</i>	-0.027 (-0.98)	-0.035** (-1.96)	-0.034 (-1.60)	0.091*** (2.62)
<i>Treatment*Match</i>	-0.056* (-1.77)	-0.043** (-1.99)	-0.059** (-2.33)	0.121*** (2.83)
<i>Match</i>	0.022 (0.93)	0.027 (1.63)	0.052*** (2.64)	-0.115*** (-3.78)
Disburse Day FE	Yes	Yes	Yes	Yes
Observations	2038	2038	2038	2038
R2	0.222	0.063	0.169	0.151
Panel B: Event Day -1 and 0				
	(1)	(2)	(3)	(4)
	<i>Overdue</i>	<i>DPD1</i>	<i>DPD1t7</i>	<i>EarlyRepay</i>
<i>Treatment</i>	-0.038* (-2.04)	-0.018 (-1.16)	-0.040** (-2.49)	0.092*** (4.21)
<i>Treatment*Match</i>	-0.038 (-1.82)	-0.074** (-3.03)	-0.049* (-1.84)	0.121*** (3.33)
Disburse Day FE	Yes	Yes	Yes	Yes
Observations	1521	1521	1521	1521
R2	0.178	0.066	0.126	0.129

Consistent with liquidity constraint

Figure 2: Outcome Variables by the Distance between Targeted Payday and Loan Maturity

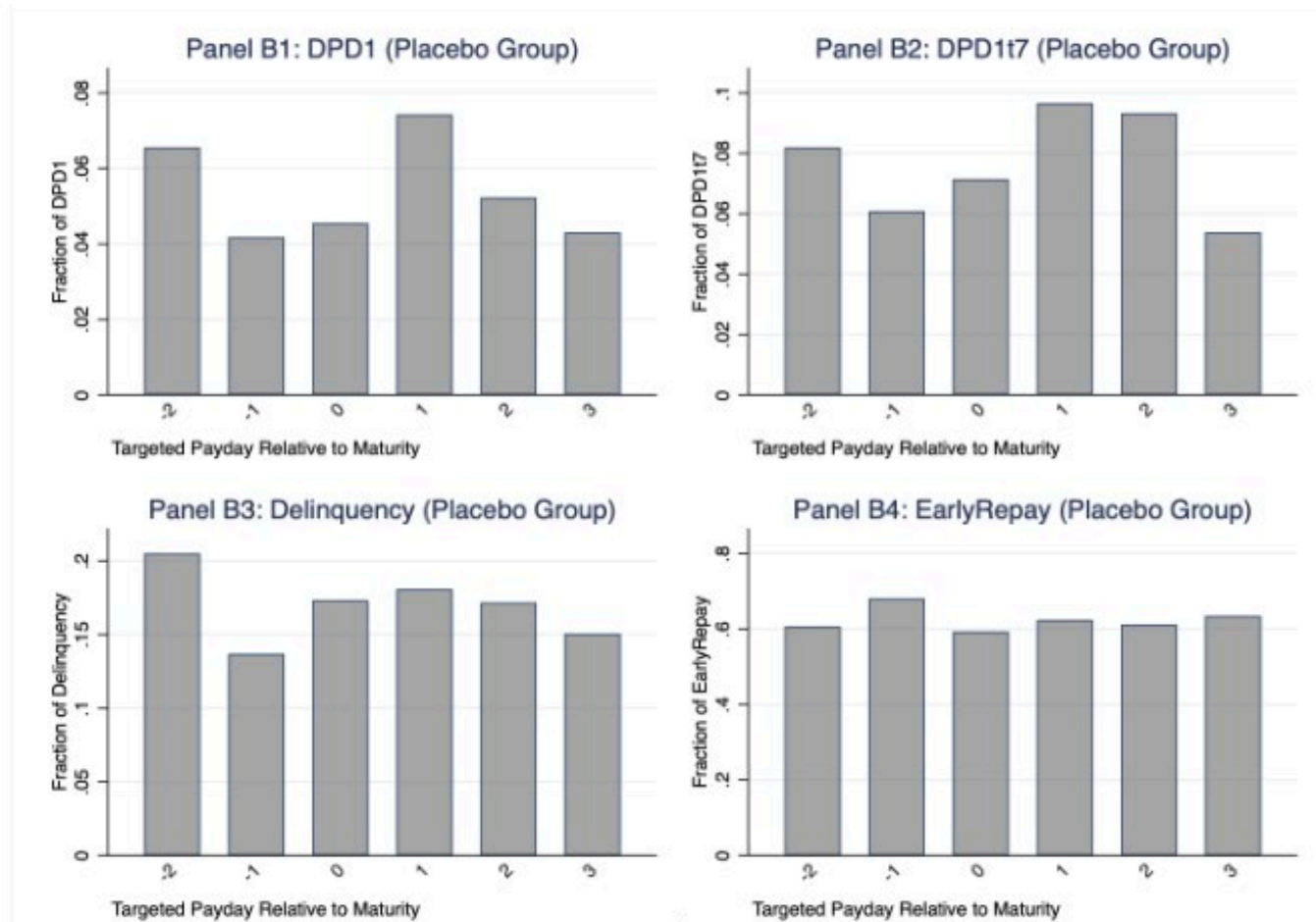
This graph plots different outcome variables over the distance between experiment-targeted payday (5th/10th/25th/28th each month) and loan maturity.



(a) Match Group

Figure 2: Outcome Variables by the Distance between Targeted Payday and Loan Maturity

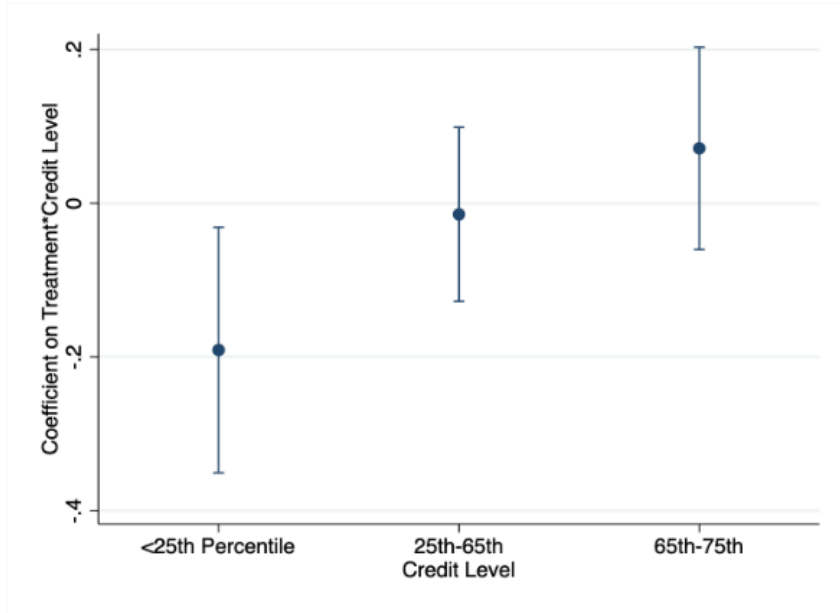
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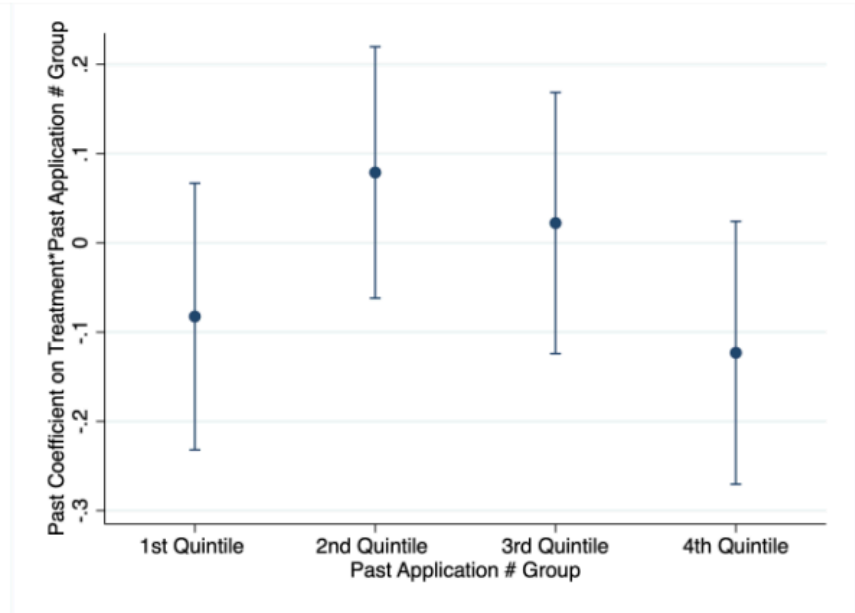
(b) Placebo Group

Heterogeneous Effects

Heterogenous Effects on Overdue



(b) Credit Level



(c) Past Application #

Heterogenous Effects wrt Loan Size and Past Records

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	<i>Overdue</i>	<i>Overdue</i>	<i>Overdue</i>	<i>DPD1</i>	<i>DPD1</i>	<i>DPD1</i>	<i>DPD1t7</i>	<i>DPD1t7</i>	<i>DPD1t7</i>
<i>Treatment</i>	-0.171** (-2.05)	-0.003 (-0.08)	-0.029 (-1.16)	-0.198*** (-2.83)	-0.057* (-1.96)	-0.055*** (-2.74)	-0.202*** (-2.67)	-0.045 (-1.42)	-0.053** (-2.41)
<i>Treatment*Size</i>	0.076 (1.29)			0.082* (1.69)			0.087* (1.68)		
<i>Treatment*Credit Low</i>		-0.102** (-2.10)			-0.046 (-1.18)			-0.059 (-1.40)	
<i>Treatment*Past Overdue</i>			-0.090*** (-2.82)			-0.073** (-2.10)			-0.069* (-1.91)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Disburse Day FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	880	880	880	880	880	880	880	880	880
R2	0.220	0.223	0.231	0.123	0.122	0.137	0.181	0.182	0.187

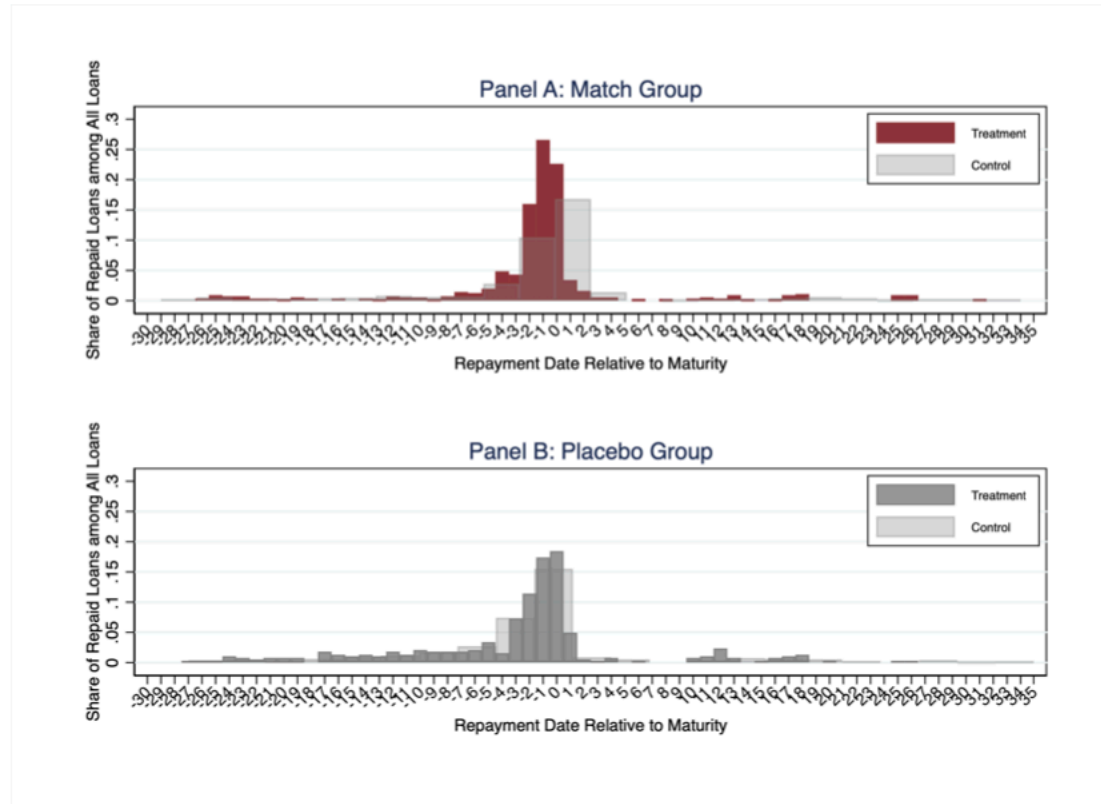
Heterogenous Effects wrt Borrower Demographic Features

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
	<i>Overdue</i>	<i>Overdue</i>	<i>Overdue</i>	<i>Overdue</i>	<i>Overdue</i>	<i>DPD1</i>	<i>DPD1</i>	<i>DPD1</i>	<i>DPD1</i>	<i>DPD1</i>	<i>DPD1t7</i>	<i>DPD1t7</i>	<i>DPD1t7</i>	<i>DPD1t7</i>	<i>DPD1t7</i>
<i>Treatment</i>	-0.038 (-0.38)	-0.066** (-2.04)	-0.034 (-0.98)	-0.040 (-1.12)	-0.059** (-2.21)	-0.108 (-1.42)	-0.092*** (-3.70)	-0.035 (-1.40)	-0.056** (-2.12)	-0.079*** (-3.87)	-0.095 (-1.10)	-0.091*** (-3.35)	-0.021 (-0.77)	-0.045 (-1.49)	-0.079*** (-3.53)
<i>Treatment*Age</i>	-0.001 (-0.19)					0.001 (0.49)					0.001 (0.28)				
<i>Treatment*Female</i>		-0.005 (-0.10)					0.013 (0.33)					0.021 (0.50)			
<i>Treatment*High Education</i>			-0.063 (-1.33)					-0.096** (-2.58)					-0.113*** (-2.79)		
<i>Treatment*High Income</i>				-0.053 (-1.07)					-0.056 (-1.43)					-0.070 (-1.63)	
<i>Treatment*Senior Position</i>					-0.059 (-0.95)					-0.047 (-0.82)					-0.022 (-0.37)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Disburse Day FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	880	880	880	880	880	880	880	880	880	880	880	880	880	880	880
R2	0.231	0.218	0.220	0.217	0.219	0.112	0.118	0.126	0.122	0.123	0.189	0.178	0.185	0.178	0.179

Repayment

Figure 5: Share of Repaid Loans

This graph plots the share of repaid loans over the re-centered repayment date relative to the loan maturity.



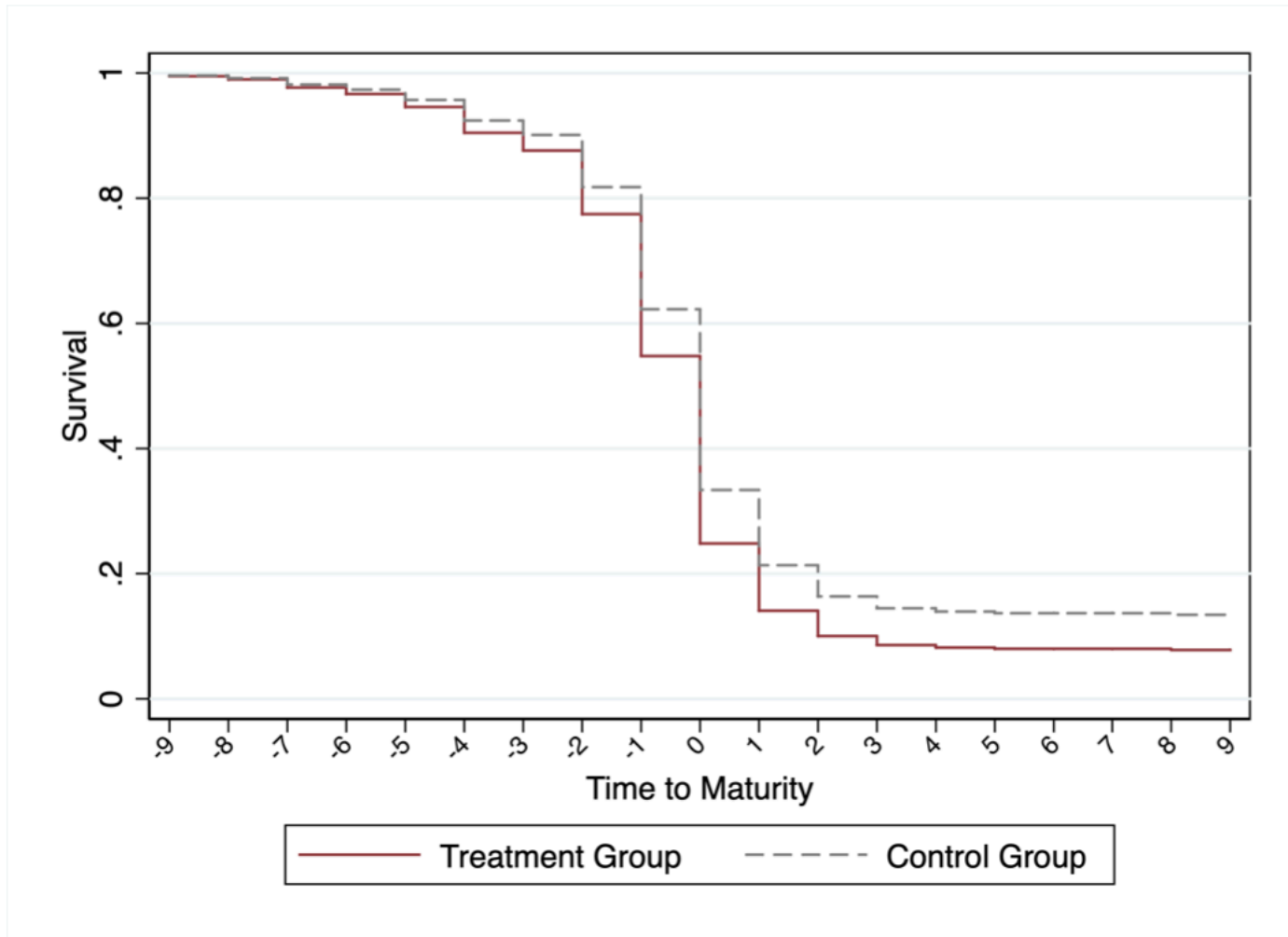
(a) Total loans as the denominator

Table 7: Two-sample Kolmogorov-Smirnov Test for Equality of the Distribution Functions of Days between Repayment Day and Maturity

Panel A: All Loans					
Match Group			Placebo Group		
	D	P-value		D	P-value
Control	0.018	0.825	Control	0.0038	0.994
Treatment	-0.188	0.000	Treatment	-0.0624	0.176
Combine K-S	0.188	0.000	Combine K-S	0.0624	0.350
Panel B: Delinquent Loans					
Match Group			Placebo Group		
	D	P-value		D	P-value
Control	0.246	0.003	Control	0.127	0.290
Treatment	-0.045	0.824	Treatment	-0.145	0.200
Combine K-S	0.246	0.007	Combine K-S	-0.145	0.396

Figure 7: Survival Function after Cox Regression.

This graph plots the survival function estimated from the cox regression in Table 5.



Hazard Model (DiD)

	(1) Full	(2) Event-1&0	(3) Event-1	(4) Event 0
<i>Treatment</i>	-0.035 (-0.48)	-0.006 (-0.06)	0.045 (0.39)	0.001 (0.01)
<i>Treatment*Match</i>	0.270*** (3.00)	0.207* (1.75)	0.136 (0.84)	0.235 (1.50)
<i>Match</i>	0.009 (0.14)	0.061 (0.62)	-0.057 (-0.46)	0.147 (1.11)
<i>Young</i>	-0.137*** (-2.61)	-0.105* (-1.73)	-0.123 (-1.05)	-0.093 (-1.41)
<i>Female</i>	0.088** (2.01)	0.140*** (2.63)	0.063 (0.70)	0.200*** (3.11)
<i>Size</i>	-0.030 (-0.54)	-0.010 (-0.15)	0.017 (0.14)	-0.005 (-0.06)
<i>Education</i>	0.006 (0.13)	0.034 (0.70)	-0.008 (-0.10)	0.068 (1.09)
<i>Married</i>	-0.005 (-0.10)	-0.016 (-0.27)	0.008 (0.07)	-0.036 (-0.49)
<i>Credit</i>	0.145*** (7.30)	0.125*** (5.45)	0.127*** (3.04)	0.121*** (3.99)
<i>Income</i>	-0.001 (-0.17)	0.001 (0.18)	0.001 (0.10)	-0.003 (-0.27)
<i>Behaviour</i>	-0.585 (-1.17)	-0.040 (-0.07)	-0.847 (-0.96)	0.481 (0.57)
Disbursement Week FE	Yes	Yes	Yes	Yes
Observations	21653	16066	5467	10599

Conclusion

- Extension postponing the due date after borrowers' salary payday increases the repayment likelihood by 27%.
- Such loan extension does not affect loan repayment when the due date is far away from salary payday.
 - Consistent with liquidity constraints
- The effect is larger for smaller loan size, borrowers with low credit ratings, and borrowers with more past overdue
 - Implication: flexible contract design improve the loan performance for low credit borrowers
- Future work: optimal contract flexibility
 - Customized due day align with payday