Extreme Weather and Low-Income Household Finance: Evidence from Payday Loan

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Climate change and household finance

- Extreme weather shocks are increasing in frequency and length with climate change
  - potentially more financial hardship for low-income households
- Existing papers using data on traditional consumer credit products Literature review
  - find short-lived impacts on credit scores and reductions in total debt
  - offer little evidence on alternative credit products accessed by low-income households
- **Research Questions**:
  - **How do weather shocks affect the payday loan market, and through what channels?**
  - Could public policies such as the Low Income Household Energy Assistance (LIHEAP) program mitigate such effects?

In this paper

- Data
  - an applicant-level payday loan dataset covering 2012 to 2019 from *Clarity*
  - a loan-level dataset covering 2013 to 2019 referred to as *tradeline*
  - monthly weather variables constructed from ERA5-Land reanalysis archive

- Empirical design
  - fixed effects temperature-bin approach
  - controls for seasonality, general warming trend, regional business cycles, etc.

- Outcomes
  - extreme heat shocks increase payday loan demand, default rate, delinquency rate and reduces credit approval

Payday loan

Payday loan background

Reasons for taking payday loan

- Short-term source of liquidity with two to four-week maturities
- Interest rate can be as high as 400 to 600 APR

Dataset

Summary statistics | Geographical distribution

- Source: lender reported database from *Clarity*
- Sample: one million consumers from 2012 to 2019
- *Inquiries* dataset:

  applicant ID, application date, loan type, income, age, months at address, ZIP code
- *Tradelines* dataset:

  applicant ID, origination date, loan type, loan terms, performance

Distribution of daytime mean temperature

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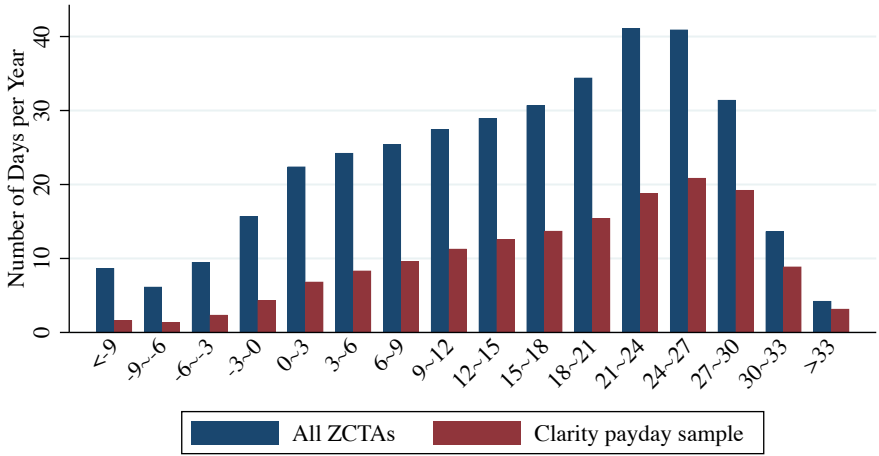
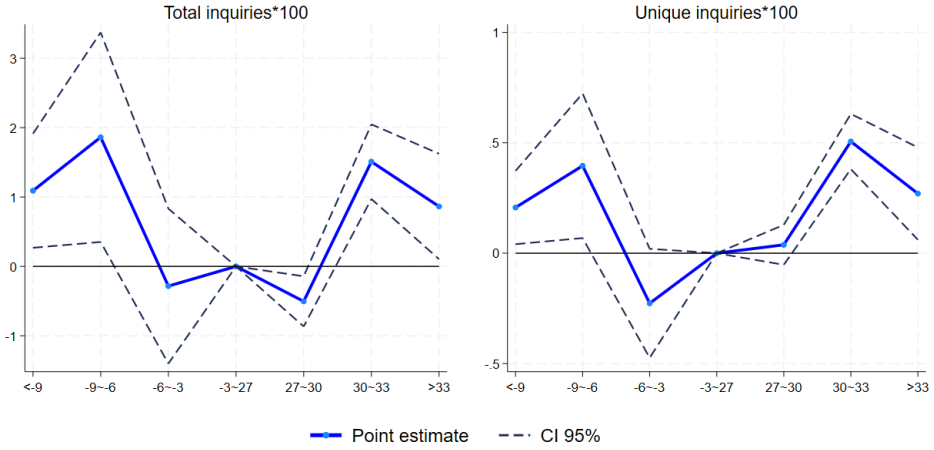


Empirical Strategy

$$\textit{Outcome}_{it} = \theta T_{it} + \mu_t + \eta_{cy} + \textit{Controls} + \varepsilon_{it}$$

- $\textit{Outcome}_{it}$: payday loan-related outcome variables of interest at ZCTA i in month t
- T_{it}: numbers of days in month t that ZCTA i fall into each temperature bin
  - Construct bins based on daytime (between 8am and 8pm) mean temperature
  - below -9°C, above 33°C, and 14 bins for every 3°C in between
  - Use -3°C to 27°C as the omitted baseline
- μ_t: year-month fixed effects; η_{cy}: county-year fixed effects

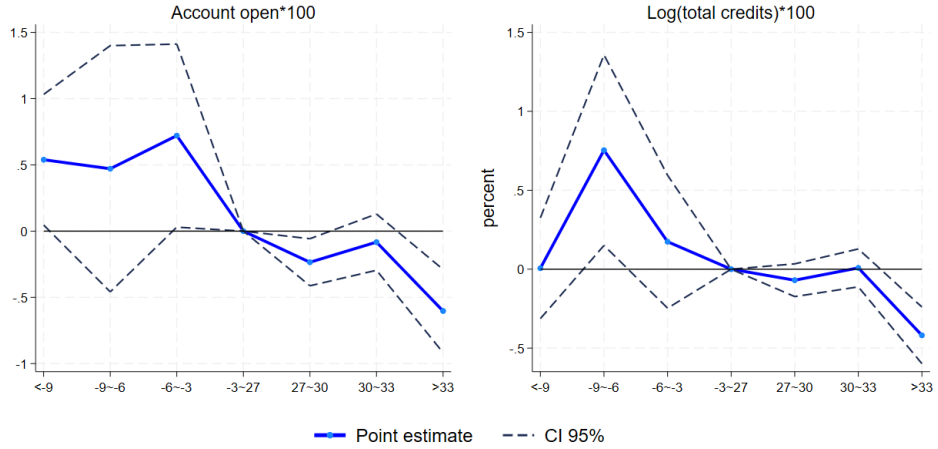
Payday Loan Demand: Inquiries



A one standard deviation increase in the number of extreme heat or cold days per month

$\Longrightarrow$ 0.4% increase in total inquiries relative to the baseline

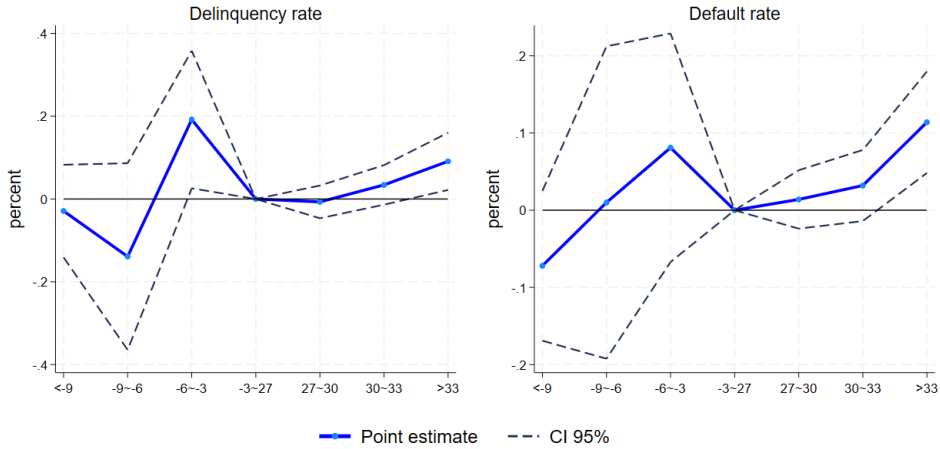
Equilibrium: Accounts Opened and Total Credits



A one standard deviation increase in the number of extreme heat days per month

$\Longrightarrow$ 0.7% decrease in accounts open and 0.4% drop in credit issued relative to the baseline

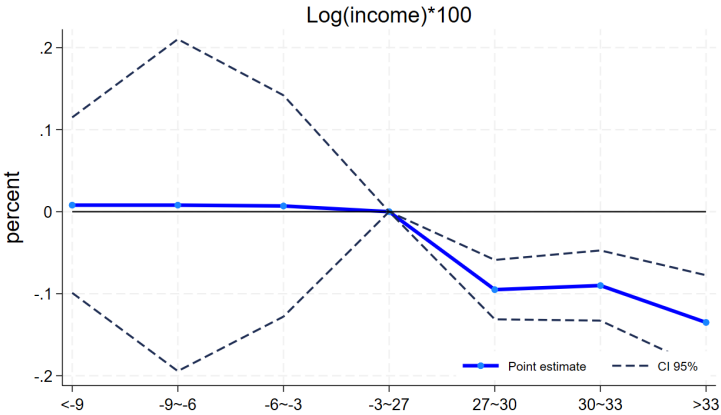
Loan Performance: Delinquency and Default Rates



A one standard deviation increase in the number of extreme heat days per month

$\Longrightarrow$ 3% decrease in default rates relative to the baseline

Borrower Income



A one standard deviation increase in the number of extreme heat days per month

$\Longrightarrow$ 0.14% decrease in monthly income relative to the baseline

Conclusions

Provide novel evidence on the effects of extreme weather on low-income household finances using data on the payday loan market

- Extreme temperature leads to increases in demand for payday loans.
- In particular, extreme heat days lead to
  - decreases in the number of accounts opened or the total amount of loans taken
  - increases in default rates and delinquency rates of existing loans
  - decreases in borrower income

  $\Longrightarrow$ consistent with a contraction in loan supply to screen borrowers
- We find no significant evidence that eligibility for the Low-Income Home Energy Assistance Program changes most payday loan market outcomes.

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Appendix

Related literature

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- Alternative credit markets: *e.g.* Allcott et al. (2022); Correia et al. (2022); Dobridge (2018); Gathergood et al. (2019); Melzer (2011); Morse (2011), etc.

  Our contributions: instead of evaluating the impact of payday loan access, we show extreme weather shocks directly **worsen payday loan market performance**

- Climate change and household finance: *e.g.* Blonz et al. (2023); Del Valle et al. (2022); Gallagher and Hartley (2017)

  Our contributions: show alternative credit markets operate **differently**

- Extreme temeprature exposures in the United States: *e.g.* Deschênes and Greenstone (2011); Wilson (2019); Addoum et al. (2020); Park et al. (2020), etc.

  Our contributions: document **large negative financial impacts for low-income households** through worsening credit cycles in payday loan markets

Reasons for Taking Payday Loans

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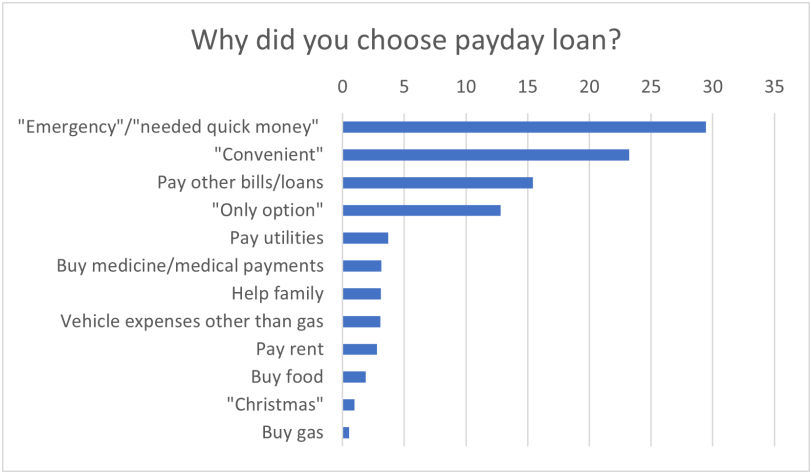

Source: Survey of Consumer Finances, 2013, 2016, 2019. In total, 3,175 respondents answered “YES" to the question “During the past year, have you (or anyone in your family living here) taken out a ‘payday loan’".

Payday loan: summary statistics

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	mean	SD	p25	p50	p75	N
account open	1.73	1.38	1	1	2	115,925
total highest credit	637.10	703.90	255	475	765	115,925
delinquency rate	8.69	26.51	0	0	0	115,925
default rate	7.33	24.57	0	0	0	115,925
inquiry made	4.66	5.43	1	3	6	476,928
unique inquiry	1.76	1.37	1	1	2	476,928
average monthly income	2661	1343	1742	2500	3261	456,435

Geographical Distribution of Payday Loans

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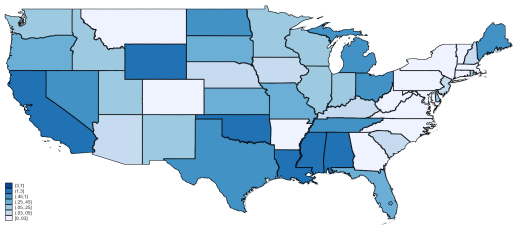
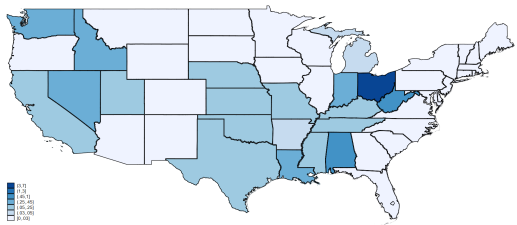


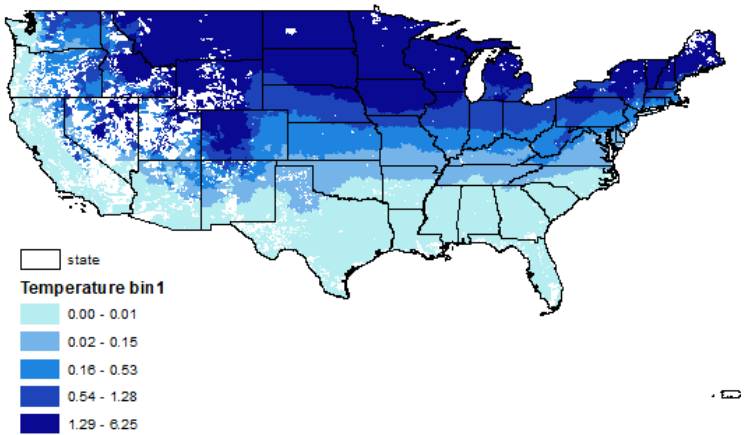
Online



Storefront

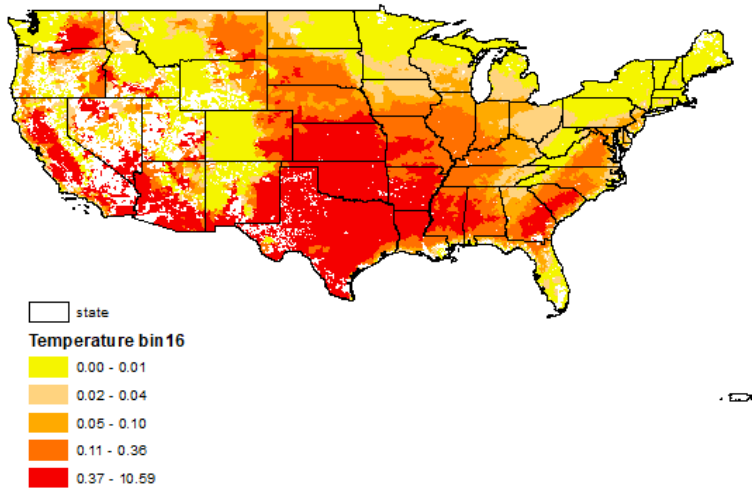
Weather Data

Average monthly number of days with daily mean temperature below -10°C



Weather Data

Average monthly number of days with daily mean temperature above 33°C



Summary Statistics of ZCTA Daily Temperatures

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	All ZCTAs								
	mean	sd	p99	p95	p90	p50	p10	p5	p1
Daytime mean	14.80	11.18	33.28	29.95	28.07	16.39	-0.56	-4.79	-13.38
24-hour mean	12.92	10.72	30.59	27.56	25.78	14.34	-1.61	-5.79	-14.49
Maximum	18.19	11.02	36.90	33.14	31.11	19.95	2.40	-1.23	-9.07

	ZCTAs with payday loan inquiries								
	mean	sd	p99	p95	p90	p50	p10	p5	p1
Daytime mean	17.55	10.32	34.38	31.04	29.28	19.45	2.72	-1.04	-9.18
24-hour mean	15.65	9.91	31.64	28.58	27.08	17.34	1.50	-2.01	-10.19
Maximum	20.90	10.20	38.17	34.36	32.34	22.89	5.92	1.81	-5.34

Low-Income Home Energy Assistance Program (LIHEAP)

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- LIHEAP assists eligible low-income households with their heating and cooling energy costs, bill payment assistance, energy crisis assistance, weatherization, and energy-related home repairs
- Eligibility: income less than (whatever is greater):
  - 150% of the Federal poverty line
  - 60% of the state's median income

Regression Design

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$$\text{Outcome}_{jt} = \theta \text{T}_{it} + \beta \text{Eligibility}_{jt} + \mu_t + \eta_{cy} + \varepsilon_{jt}$$

- *Outcome*$_{jt}$: payday loan-related outcome variables for borrower j in month t;
- Eligibility$_{jt}$: consider borrowers within small income bands around LIHEAP eligibility, takes the value 1 if borrower j is eligible in month t
- T_{it}: numbers of days in month t that ZCTA i fall into each temperature bin
- μ_t: year-month fixed effects
- η_{cy}: county-year fixed effects

Program Evaluation

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	(1) total inquiries*100	(2) days inquired*100	(3) log(credits)*100	(4) delinquency rate	(5) default rate
Treat	-17.49***	-3.235**	-5.749	1.171	2.789
	(5.564)	1.477	(4.208)	(1.940)	(1.838)
Observations	32,555	32,555	2,156	2,170	2,170
R-squared	0.221	0.178	0.5	0.402	0.351
Year-month FE	X	X	X	X	X
County*Year FE	X	X	X	X	X
Renter FE	X	X	X	X	X
Age group FE	X	X	X	X	X