

# Spillover Effects of the Opioid Epidemic on Consumer Finance

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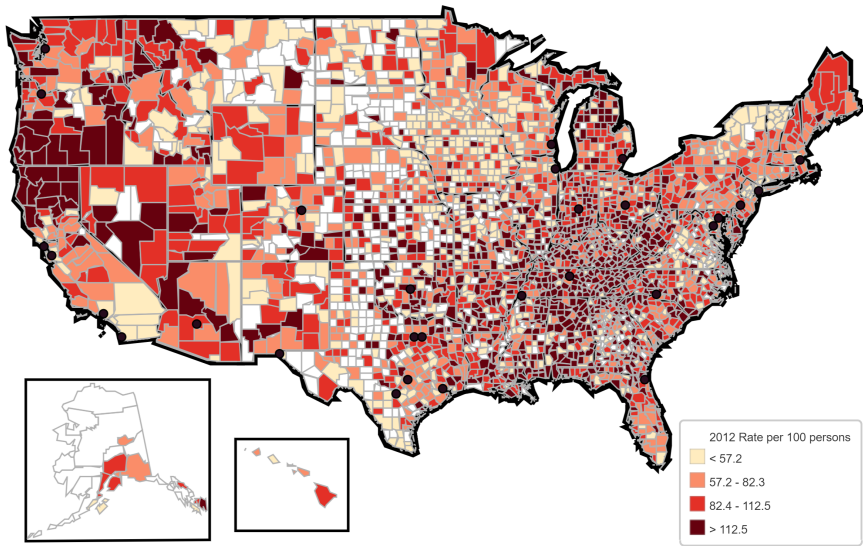
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# Opioid abuse is an epidemic.

- Over 3 million Americans suffer from substance use disorders related to prescription opioids (Schuckit, 2016).
- The consequences of this abuse are devastating and on the rise.
  - Between 1999 and 2018, over 450,000 people died from overdoses. Over-dose deaths attributable to opioids now exceed deaths from car accidents (CDC, 2018).
  - Opioid abuse-related costs from health care, criminal justice, and substance abuse treatment have been estimated at over \$500 billion in 2015 (CEA, 2017).

# Opioid prescribing rates peaked at 81.3 per 100 persons.



# The opioid crisis: What do we know?

## Opioids abuse affects the labor market.

- Labor market participation and opioid abuse are intertwined: 1/3 of prime-age men who do not participate in the labor force are using prescription pain medication. (Birnbaum et al., 2006, Meyer et al., 2014; Harris et al., 2017; Krueger, 2017; Hollingsworth et al., 2017; Aliprantis and Schweitzer, 2018; Ouimet et al., 2019)

## This paper:

- Despite the significant health and economic impact of the unprecedented opioid supply, little is known about the economic spillovers on consumer finance.

# I study how the opioid crisis affects the auto loan market.

## Research questions:

- 1 Does opioid abuse affect loan performance?
- 2 Do traditional credit attributes (e.g., FICO) allow lenders to identify risk factors associated with opioid addiction?
- 3 How does the opioid crisis affect borrowers?

# Why does this research matter?

- If communities with high rates of opioid abuse experience higher loan default rates, and if lenders are unable to identify borrowers who are prone to abusing opioids, then...
  - 1 Lenders in those markets will face higher credit risks.
  - 2 Consequently, borrowers may face credit rationing and higher prices for consumer finance products.
  - 3 Resulting deterioration in credit-market conditions may lead to further repercussions for consumers in afflicted areas. (Campbell et al., 2011; Anenberg and Kung, 2014; Mian et al., 2015; Mian and Sufi, 2018)

# I merge CDC opioids data with novel auto loan data.

- Approximately **250,000 sub-prime auto loans**
  - Proprietary data span origination dates from **1995 to 2017**, acquired from a lender that buys and securitizes loans in **44 states**.
  - Rich dataset with 162 fields including buyer, dealership, vehicle, origination terms and loan outcomes.
  - (Likely) representative sample of U.S. sub-prime auto loans
    - Lender competes at auction against thousands of other lenders
    - ABS structure (e.g. spreads and pricing) is similar to that of other large lenders.
- Loan data merged with CDC data on opioid prescriptions and opioid death rates.
  - County-level data on opioid death rates from 1999 to 2016
  - County-level data on opioid prescription rates from 2006 to 2016

# The subprime loan market is an ideal setting in which to study the impact of opioid abuse on consumer finance.

- Borrowers in this market fall within the at-risk population for opioid abuse (Zedler, et al., 2015, 2017).
- The market is large: most U.S. households have a vehicle, and more than one-third have an auto loan (Bricker et al., 2017). Recent auto loan balances exceed \$1.14 trillion, and 40% of loans are non-prime or lower credit (Zabritski, 2018).
- Delay discounting helps to explain impulsivity and loss of control exhibited by drug abusers. Further, opioid abusers spend considerable time and money to obtain and use drugs. (Bickel and Marsh, 2001; Bickel et al., 2014):

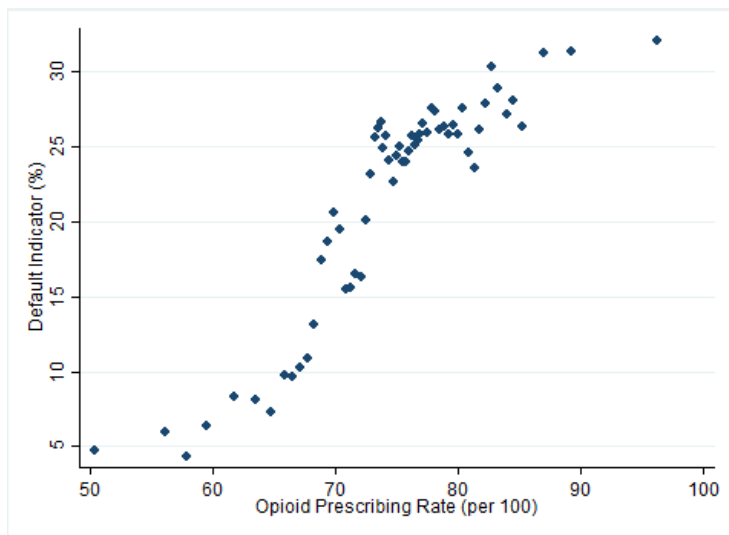


# Preview of Results

- **Opioid abuse affects loan defaults:** Borrowers in areas experiencing an opioid abuse crisis have higher default rates.
- **Lenders face new credit risk factor:** Traditional credit attributes fail to predict deterioration of loan performance in opioid afflicted areas. Lender credit models perform poorly in predicting out-of-sample loan performance in opioid-afflicted areas.
- **Consumers in opioid-afflicted areas face higher loan costs:** Similar borrowers in states most affected by the opioid crisis pay significantly more for sub-prime auto financing.

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A higher opioid prescription rate is associated with a higher loan default rate.



## Default rates are higher in opioid-afflicted counties.

- A one-standard deviation increase in county-level opioid abuse is associated with a 4.0% increase in loan defaults relative to the mean.

<b>Dep Var:</b>	<b>Default indicator</b>
Opioid abuse rate	0.079***
FICO Score	-0.148***
Monthly Income	-0.002***
Prior Bankruptcy	-13.044***
Unemployment Rate	1.661***
Labor force participation	1.981***
Alcohol abuse	0.054
County FE	Yes
Year FE	Yes
Observations	115,890
Adjusted $R^2$	0.116

# A Natural Experiment: Marijuana substitution

- I examine the effects of an exogenous increase in opioid substitutes.
- Both marijuana and prescription opioids are ascribed to mitigate effects of chronic pain.
- The substitution of legal marijuana for opioids has been well-documented in the medical literature. See for example, Bachhuber et al.(2014), Hill(2015), Jensen et al.(2015), Bradford and Bradford(2016, 2017), Pacula et al.(2017), Reiman et al. (2017) Powell et al.(2018)
- In the sample period, three states implemented laws that enable the legal sale of recreational marijuana:
  - ① Colorado (2014)
  - ② Washington (2014)
  - ③ Oregon (2015)

# Marijuana legalization's impact on opioid abuse

Dep Var:	Opioid Abuse rate		
	(1)	(2)	(3)
Post-legalization All	-2.773*		
Taxable marijuana sales (ln)		-0.157**	
Legalization ( $\tau - 2$ )			0.945
Legalization ( $\tau - 1$ )			0.377
Legalization ( $\tau + 1$ )			-2.705*
Legalization ( $\tau + 2$ )			-3.574***
Borrower controls	Yes	Yes	Yes
Time varying controls	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
State FE	Yes	Yes	Yes
Observations	51,534	51,534	51,534
Adjusted $R^2$	0.482	0.482	0.483

# Marijuana legalization's impact on loan performance

Dep Var:	Default rate (%)		
	(1)	(2)	(3)
Post-legalization All	-5.065***		
Taxable marijuana sales (ln)		-0.279***	
Legalization ( $\tau - 2$ )			2.295*
Legalization ( $\tau - 1$ )			1.722
Legalization ( $\tau + 1$ )			-2.114**
Legalization ( $\tau + 2$ )			-3.955***
Borrower controls	Yes	Yes	Yes
Time varying controls	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
State FE	Yes	Yes	Yes
Observations	61,646	61,646	61,646
Adjusted $R^2$	0.076	0.076	0.076

# A Contrasting Experiment: Heroin & Fentanyl as substitutes

- Next, I examine the effects of an exogenous increase in opioid potency on loan defaults as users shifted from prescribed pharmaceuticals to illicit street drugs.
- Reducing the prescription opioid supply leads to increases in heroin and fentanyl abuse. See for example, ONDCP(2011), Mars et al.(2014), Cicero et al.(2014), Surratt et al.(2014), Rutkow et al.(2015), Compton et al.(2016)
- >75% of current heroin users started with a prescription drug habit.



Florida supplied 43% of prescription opioids for the U.S. in 2010 and 2011



# Florida legislates prescription drug monitoring program

- In 2010, 90 of the top 100 U.S. physicians prescribing oxycodone were in Florida.
- In Sept 2011, Florida enacted a law requiring physicians to check whether a patient had recently received another opioid prescription from another physician. Prior to the passage of this law, patients were able to pick up multiple prescriptions for opioids.
- The change in legislation, resulted in:
  - ① A significant increase in the street price of prescription opioids.
  - ② A shift to heroin and fentanyl use – less costly and more powerful substitutes.
  - ③ An increase in opioid deaths in areas that were afflicted with the opioid crisis.<sup>1</sup>

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<sup>1</sup>See for example, Mars et al.(2014), Cicero et al.(2014), Surratt et al.(2014), Rutkow et al.(2015), and Compton et al.(2016)

# Florida regulatory change increases near-term opioid abuse with spillover effects on lending.

<b>Dep Var:</b>	Opioid abuse rate	Default rate (%)
High abuse rate $\times [\tau \Rightarrow 2012]$ $\times$ Florida proximate county	4.093***	4.126**
Borrower Controls	Yes	Yes
Time varying controls	Yes	Yes
County FE	Yes	Yes
Year FE	Yes	Yes
Observations	39,348	46,665
Adjusted $R^2$	0.771	0.108

# The differences between the two natural experiments

- In states with legal recreational marijuana, the marginal abuser of prescription opioids can shift to a less costly analgesic that is widely available and of predictable quality.
- In contrast, when the 2011 Florida laws reduced the opioid prescription supply, the marginal abuser was forced to choose between scarcer, more expensive prescription opioids and cheaper heroin.
- My results suggest that the substitution of heroin leads to an *increase* in opioid abuse, while the switch to marijuana leads to a *decrease* in opioid abuse.
- Each experiment reveals a substitution for prescription opioids, but only when marijuana is substituted do we observe positive spillover effects on credit markets.

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# I generate a measure of borrower creditworthiness.

To construct the lender credit model:

- 1 Using only data from loans that terminated prior to 2012, I regress **actual default rate** against **borrower** and **vehicle characteristics**, county FE and month-year FE.
- 2 I use those coefficient estimates to generate an out-of-sample *predicted default rate* for loans after 2011.
- 3 I interpret *predicted default rate* as the **counterfactual** loan riskiness and use it as a measure of creditworthiness.

# The impact of opioids on traditional credit scoring factors

Dep Var:	Default (%)			
	(1)	(2)	(3)	(4)
Predicted default rate	1.378***	1.408***	1.206***	1.447***
Opioid abuse rate		0.221***	0.008	0.234***
Time-varying controls	Yes	Yes	Yes	Yes
County FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Sample	Full	Full	MJ legal	No legal MJ
Observations	19,668	19,617	3,157	16,460
Adjusted $R^2$	0.133	0.147	0.118	0.138

# Opioid affected areas hinder lender's predictive payment models.

Dep Var:	Total payments to lender					
	In Sample		Out of Sample			
	(1)	(2)	(3)	(4)	(5)	(6)
Predicted payment	0.920***	1.004***	0.110***	0.148***	0.110***	0.155***
Opioid abuse rate					19.964	42.839***
County FE	No	No	No	No	No	No
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Opioid Tercile	Low	High	Low	High	Low	High
Observations	8,726	7,178	9,263	8911	9,263	8,911
Adjusted $R^2$	0.229	0.242	0.261	0.167	0.262	0.199



# The impact of opioid abuse on loan collections efforts

- State regulatory restrictions related to wage garnishment limit a lender's ability to collect on a loan deficiency after default (Brown and Jansen, 2018)
- ★ I investigate the impact of opioid abuse on collections using the differential ability of lenders to collect.

# The impact of opioid abuse on loan collections efforts

<b>Dep Var:</b>	Collections Income			
	(1)	(2)	(3)	(4)
Opioid abuse rate	10.491	-1.015	3.432	-6.332***
Borrower controls	Yes	Yes	Yes	Yes
Time-varying controls	Yes	Yes	Yes	Yes
County FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Years	2006 - 2008	2006 - 2008	2012 - 2016	2012 - 2016
Collection	Prohibited	Permitted	Prohibited	Permitted
Sample	Full	Full	Full	Full
Observations	14,578	58,072	10,482	39,178
Adjusted $R^2$	0.009	0.024	0.012	0.013

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In the early years of the opioid epidemic, regional opioid abuse rates had little impact on borrowing cost.

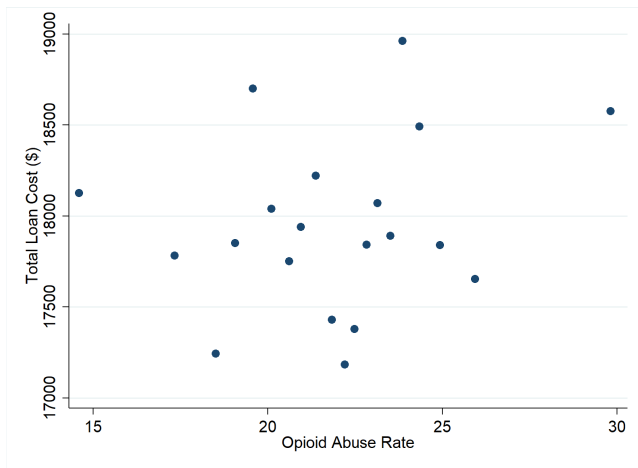
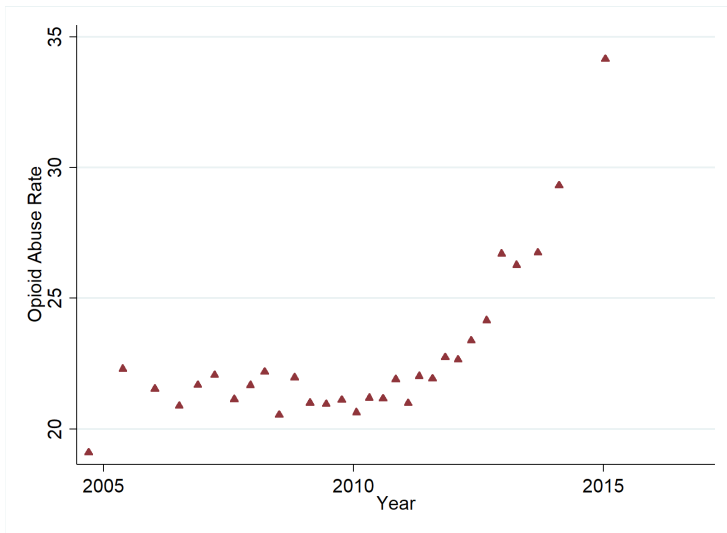


Figure: Opioid Abuse Rate (1999-07) vs. Total Loan Costs

# Opioid abuse increases after prescription supply cut



# Opioid abuse impacts total borrowing cost after 2011.

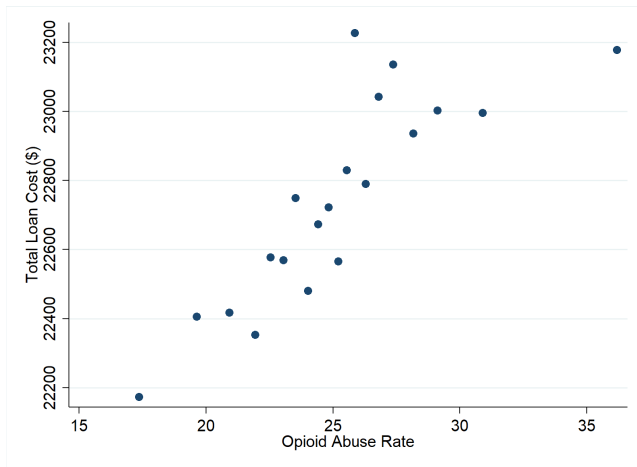


Figure: Opioid Abuse Rate (2012-16) vs. Total Loan Costs

# Opioids and total loan costs

- Average subprime borrowers in counties at the 75<sup>th</sup> percentile of opioid abuse pay \$967 more over the life of the loan than borrowers in counties at the 25<sup>th</sup> percentile — a 3.9% increase in total loan cost.

<b>Dep Var:</b>	Total loan cost	
	(1)	(2)
Opioid abuse rate	-0.843	83.043***
Borrower Controls	Yes	Yes
Loan Origination Controls	Yes	Yes
Time-varying controls	Yes	Yes
County FE	Yes	Yes
Year FE	Yes	Yes
Sample	1999 to 2007	2012 to 2016
Observations	45,735	48,499
Adjusted $R^2$	0.514	0.596

# Opioid abuse pushes lenders to increase loan payments, making borrowers in affected areas worse off.

## Conclusion

### What I find:

- Likelihood of default is higher for borrowers in counties with high levels of opioid abuse.
- Lenders face a new credit risk factor that traditional credit attributes fail to predict.
- Borrowers in afflicted areas face total higher loan costs.



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## Conclusion

### Why does this matter?

- The opioid epidemic may be responsible for an additional 80,000 auto loan defaults per year, representing \$1.2 billion of outstanding debt.
- Defaults and repossession have long-lasting impact on individuals' formal credit scores, access to other forms of consumer credit, and employment prospects (Raphael et al. 2001).
- I contribute to policy conversation by highlighting externalities of the opioid epidemic.

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