

# Privacy Regulation and Fintech Lending

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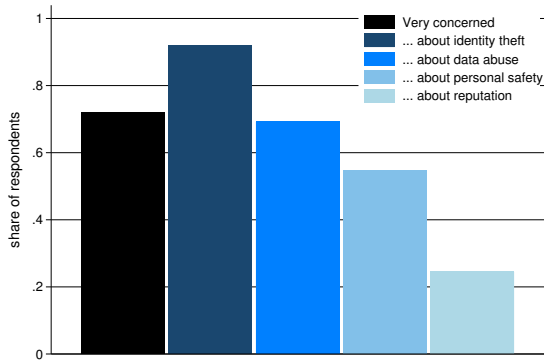
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August 2023

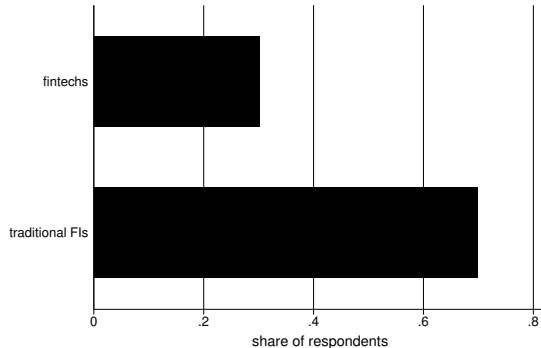
# Fintechs' market share is on the rise

- Fintechs' footprint is on the rise in many sectors:
  - Household credit, mortgages, payments, small business lending  
Buchak et al. (2018); Beaumont et al. (2022); Gopal and Schnabl (2022)
- One defining feature of fintechs is their use of alternative data sources  
Jagtiani and Lemieux (2019); Berg et al. (2020, 2022); Di Maggio et al. (2022)
- For fintechs to grow, they need access to data, and this poses a challenge...

# Individuals are concerned about sharing personal data



(a) Concerns over sharing



(b) Trust by counterparty

Source: Armantier et al. (2021)

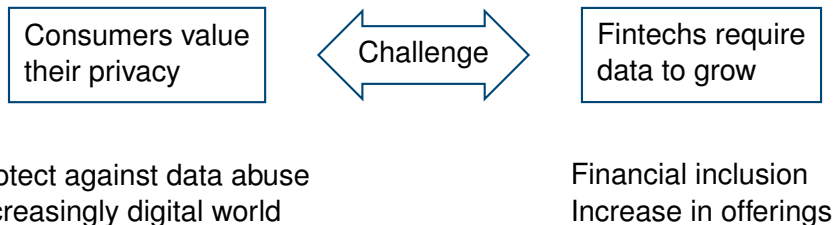
## Trade-off between data privacy and efficiency



Protect against data abuse  
Increasingly digital world

Financial inclusion  
Increase in offerings

## Trade-off between data privacy and efficiency



One approach to address this trade-off is the California Consumer Privacy Act

- It gives California residents the right to control their data
- Reduces concerns about abuse of personal data (Armantier et al., 2023)
- Blueprint for other jurisdictions considering introducing privacy legislation

# Preview of empirical analysis

We study the effects of the **CCPA** on bank and **fintech** lending

- Mitigates concerns about sharing data with fintechs more than with banks

Data and setting:

- Introduction of the California Consumer Privacy Act in 2020
- HMDA mortgage data (2018-2021), classify fintechs as in Fuster et al. (2019)

DiD specifications:

- Compare fintechs to banks in border counties in CA vs. those in AZ, NV, OR
- Include *census tract*  $\times$  *time* fixed effects and *lender type*  $\times$  *time* fixed effects

## Preview of results

- Applications with fintechs increase by  $\approx 14\%$  relative to banks
- Rates on fintech mortgages decrease by  $\approx 8$  basis points compared to banks
- Exploring the channel:
  - Fintechs' dispersion in interest rates increases
  - Fintechs' rejection rates increase
  - Fintechs increase use of non-standardized underwriting models
- Results stronger for 'thin file borrowers', loans not sold to GSEs
- Results not driven by applicant quality nor covid-19

# Contribution

We study the effects of the **CCPA** on bank and **fintech** lending

- Differs from policies limiting lenders' information set or force banks to share info
  - × Limit on data collection: bankruptcy flag removal, US Credit Card Act, GDPR (Nelson, 2018; Jansen et al., 2022; Aridor et al., 2022; Johnson, 2022)
  - × Open banking: mandates data sharing (Babina et al., 2022; Goldstein et al., 2022; Nam, 2022; He et al., 2023)
- Privacy legislation that mitigates privacy concerns can spur growth of fintech
  - Banking regulation and technology (Buchak et al., 2018; Fuster et al., 2019)
  - Access to (payments) data (Ghosh et al., 2021; Parlour et al., 2022)
- Results suggest that well-designed regulation mitigates efficiency-privacy trade-off



The California Consumer Privacy Act

A conceptual framework

The CCPA and fintech lending in the US mortgage market

Conclusion

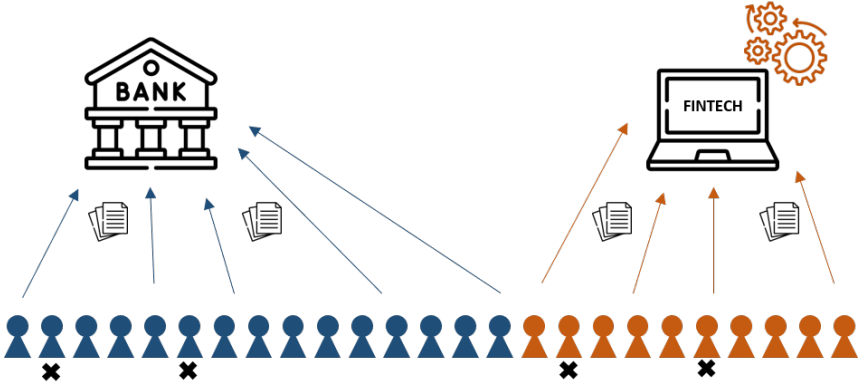
# The California Consumer Privacy Act

# California Consumer Privacy Act (CCPA)

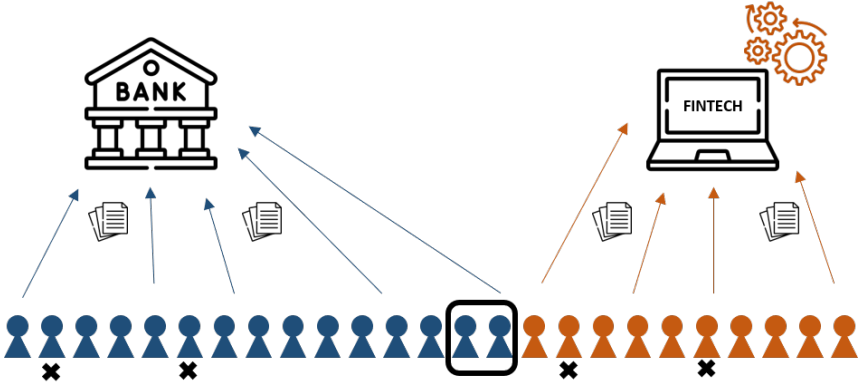
- Passed into law in 2018, came into effect in 2020, focus on personal information (PI)
- It endows Californians with rights regarding their PI collected:
  - Right to know what PI is being collected, whether it is sold and to whom
  - Right to access their PI, delete it, and opt-out of its sale (even after sharing)
- Enforced by the Office of the Attorney General and new privacy agency
- The CCPA gives consumers control over their data:
  - Greater certainty that their data will not be used for unintended purposes . . .
  - . . . makes consumers more willing to share them (Armantier et al., 2023)
  - Likely decreases sensitivity to sharing data with fintech:  
less regulated, perceived to be more intrusive, lower trust & no relationship
- Evidence that consumers were aware of the CCPA (Google trends, survey)

A conceptual framework

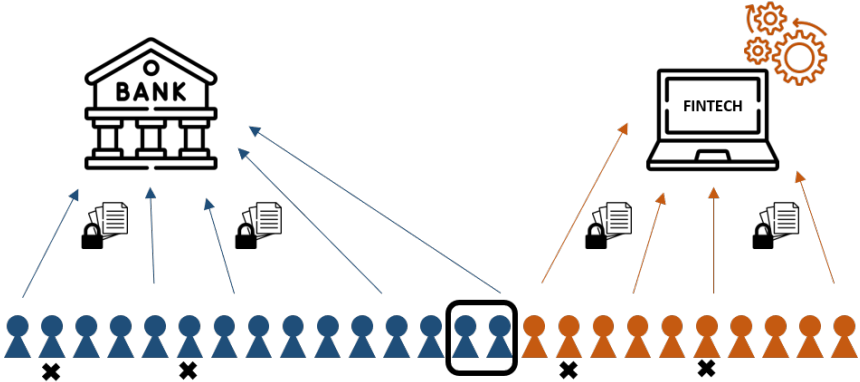
# Hypotheses development



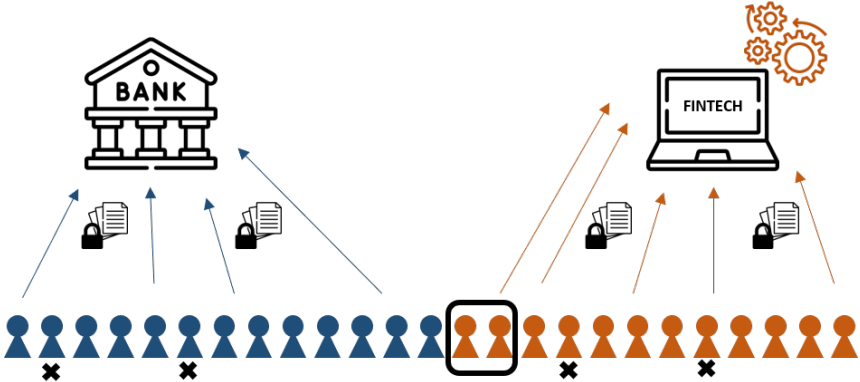
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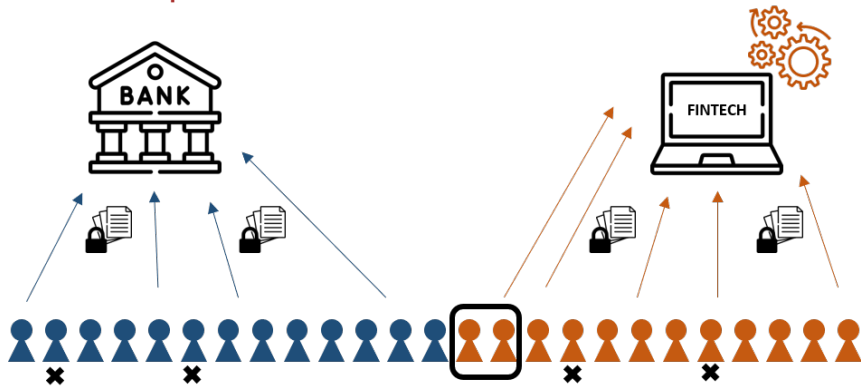


# Hypotheses development



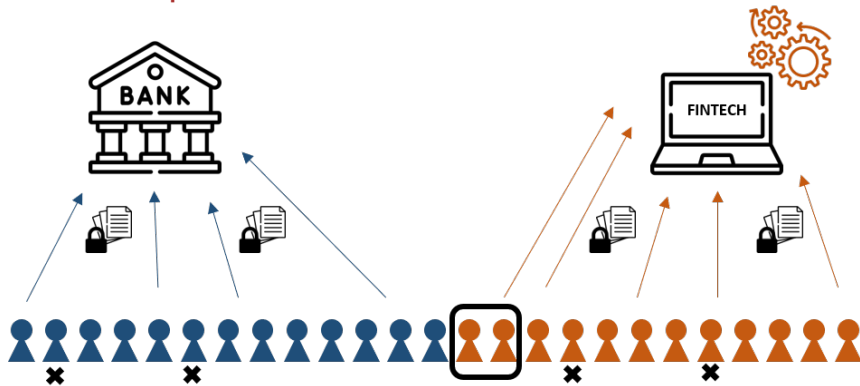


# Hypotheses development



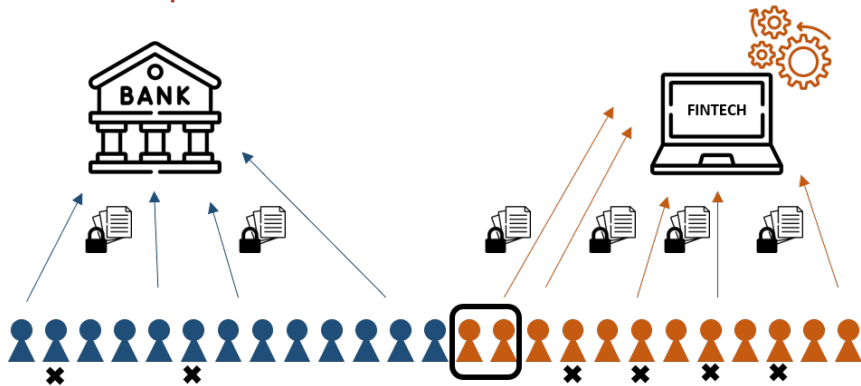
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# Hypotheses development



- **Hypothesis 1:** Loan applications to fintechs increase, compared to banks
- **Hypothesis 2:** Rates on loans originated by fintechs decrease compared to banks

# Hypotheses development



- **Hypothesis 1:** Loan applications to fintechs increase, compared to banks
- **Hypothesis 2:** Rates on loans originated by fintechs decrease compared to banks
- **Hypothesis 3:** The rate decrease is the result of better screening by the fintechs  
⇒ Wider range of interest rates, higher rejection rates, more data

The CCPA and fintech lending in the US mortgage market

# HMDA Data

- Yearly loan-level data on applications to residential mortgages:
  - Loan amount, interest rate, approval/denial . . .
  - Applicants' characteristics: income, race, gender, and ethnicity
  - Lender: bank or fintech (Fuster et al., 2019)
- Sample selection:
  - Years 2018 to 2021
  - Counties on border of California and Arizona, Nevada, and Oregon
  - Complete app. for principal residence conventional/conforming mortgages
- Descriptive statistics
  - Almost 1 million applications
  - Average fintech application share is 16.1%
  - Average interest rate (on all loans granted) 4.4%

## Empirical strategy

- Difference-in-differences specifications, at lender ( $l$ ) census tract ( $c$ ) year ( $t$ ) level

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- Difference-in-differences specifications, at lender ( $l$ ) census tract ( $c$ ) year ( $t$ ) level
- **Hypothesis 1**: applications to fintechs increase  $\beta_3 > 0$

$$\begin{aligned} \log(\text{applic})_{l,c,t} = & \beta_1 CA_c \times post_t + \beta_2 fintech_l \times post_t \\ & + \beta_3 CA_c \times fintech_l \times post_t + \theta_{l,c} + \tau_{c,t} + \phi_{l,t} + \varepsilon_{l,c,t} \end{aligned}$$

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- **Hypothesis 2:** fintechs offer lower interest rates relative to banks  $\delta_3 < 0$

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- Identification: border counties, no pre-trends between fintechs/ banks, granular FE

## Hypothesis 1: Applications to fintechs increase

VARIABLES	(1) applications	(2) applications	(3) applications
CA x post	0.120*** (0.011)		
fintech x post	0.273*** (0.014)	0.284*** (0.014)	
CA x fintech x post	0.133*** (0.020)	0.134*** (0.021)	0.146*** (0.021)
Observations	75,354	75,354	75,354
R-squared	0.763	0.790	0.791
Lender*Tract FE	✓	✓	✓
Time FE	✓	-	-
Tract*Time FE	-	✓	✓
Lender*Time FE	-	-	✓

Note: Applications to fintechs increase by 14.6%, market share increases by 2 pp.

## Hypothesis 2: Fintech interest rates decrease

VARIABLES	(1) applications	(2) applications	(3) applications	(4) rate	(5) rate	(6) rate
CA x post	0.120*** (0.011)			0.141*** (0.008)		
fintech x post	0.273*** (0.014)	0.284*** (0.014)		0.067*** (0.011)	0.057*** (0.011)	
CA x fintech x post	0.133*** (0.020)	0.134*** (0.021)	0.146*** (0.021)	-0.083*** (0.015)	-0.080*** (0.015)	-0.079*** (0.015)
Observations	75,354	75,354	75,354	75,354	75,354	75,354
R-squared	0.763	0.790	0.791	0.889	0.904	0.904
Lender*Tract FE	✓	✓	✓	✓	✓	✓
Time FE	✓	-	-	✓	-	-
Tract*Time FE	-	✓	✓	-	✓	✓
Lender*Time FE	-	-	✓	-	-	✓

Note: Fintechs decreased rates by 8 basis points (or 13% of the standard deviation)

## Exploring the channel

⇒ Dispersion in rates increases: More personalized pricing

VARIABLES	(1) sd(int rate)	(2) sd(int rate)
CA x post	-0.069*** (0.007)	
fintech x post	-0.028*** (0.010)	
CA x fintech x post	0.111*** (0.013)	0.093*** (0.014)
Observations	75,354	75,354
R-squared	0.535	0.592
Lender*Tract FE	✓	✓
Time FE	✓	-
Tract*Time FE	-	✓
Lender*Time FE	-	✓

## Exploring the channel

⇒ Fintechs' rejection rates increase: Better pool of borrowers

VARIABLES	(1) sd(int rate)	(2) sd(int rate)	(3) denied	(4) denied
CA x post	-0.069*** (0.007)		0.003* (0.002)	
fintech x post	-0.028*** (0.010)		-0.008** (0.003)	
CA x fintech x post	0.111*** (0.013)	0.093*** (0.014)	0.010** (0.005)	0.011** (0.005)
Observations	75,354	75,354	75,354	75,354
R-squared	0.535	0.592	0.550	0.599
Lender*Tract FE	✓	✓	✓	✓
Time FE	✓	-	✓	-
Tract*Time FE	-	✓	-	✓
Lender*Time FE	-	✓	-	✓

## Exploring the channel

⇒ Proxy for data: Use of alternative credit scoring models increases

VARIABLES	(1) sd(int rate)	(2) sd(int rate)	(3) denied	(4) denied	(5) alt CS	(6) alt CS
CA x post	-0.069*** (0.007)		0.003* (0.002)		-0.034*** (0.004)	
fintech x post	-0.028*** (0.010)		-0.008** (0.003)		0.022*** (0.003)	
CA x fintech x post	0.111*** (0.013)	0.093*** (0.014)	0.010** (0.005)	0.011** (0.005)	0.028*** (0.005)	0.029*** (0.005)
Observations	75,354	75,354	75,354	75,354	75,354	75,354
R-squared	0.535	0.592	0.550	0.599	0.770	0.796
Lender*Tract FE	✓	✓	✓	✓	✓	✓
Time FE	✓	-	✓	-	✓	-
Tract*Time FE	-	✓	-	✓	-	✓
Lender*Time FE	-	✓	-	✓	-	✓

## Extensions, robustness, and alternatives

- Results are stronger for 'thin credit file' applicants
- Results are stronger for non-GSE loans
- Alternative channels:
  - × Applicant quality
  - × Covid-19
- Robustness checks:
  - ✓ Only mortgages sold in the respective calendar year
  - ✓ By age: exclude applicants of age 62 and above
  - ✓ Not driven by control group: only CA mortgages, leave-one-border state-out
  - ✓ Include all counties
  - ✓ Using applicant level data
  - ✓ Different levels of clustering

## Conclusion



# Conclusion

- We study the impact of a privacy law that assuages concerns over sharing data
- In the U.S. mortgage market, the introduction of the CCPA has:
  - Increased applications to fintechs relative to banks
  - Increased fintechs' price dispersion, denial rates, and use of alternative data
  - Reduced fintechs' interest rates on mortgages compared to banks
- The CCPA is a blueprint for privacy legislation in the U.S.

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**Privacy regulation that grants users control over data can mitigate policy trade-off between privacy protection and efficiency**

## Conclusion ...and thank you!

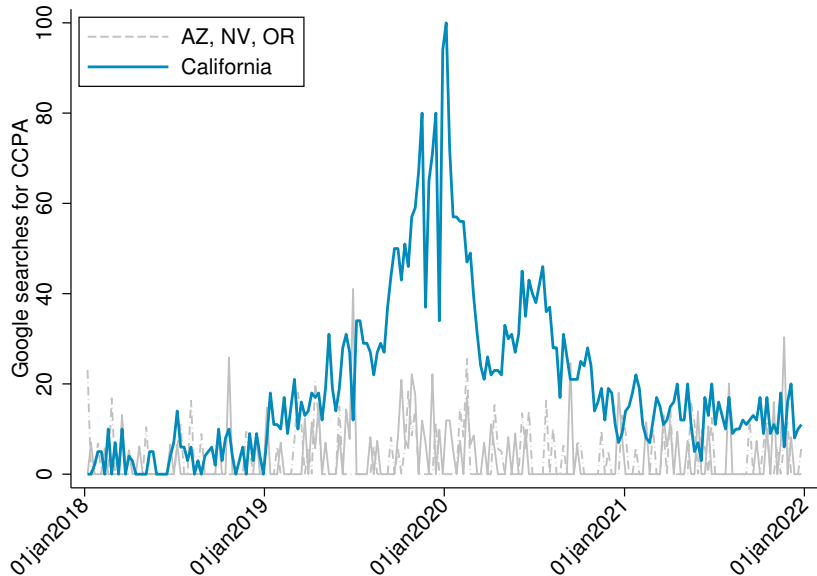
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# Appendix

# Google Trends

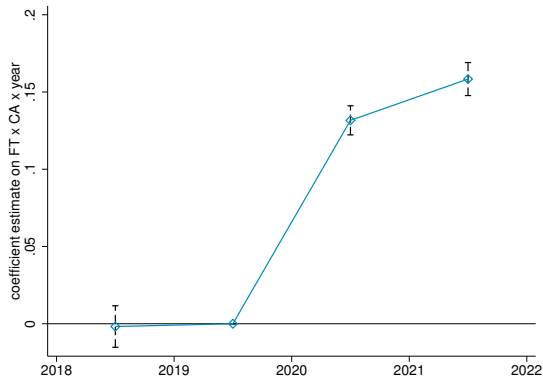
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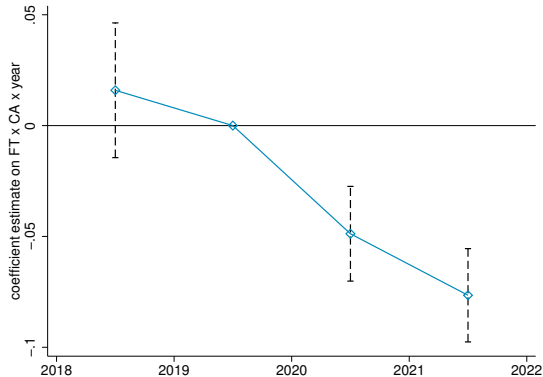
## Descriptive statistics, census tract, pre-CCPA [▶ Back](#)

Variable	Obs	Mean	Std. Dev.	Min	Max
applications	29215	5.648	6.999	2	181
log(applications)	29215	1.436	.675	.693	5.198
interest rate	29215	4.395	.63	1.875	6.16
other CS model	29215	.24	.346	0	1
sd(int rate)	29215	.515	.437	0	2.21
share denied	29215	.052	.115	0	.818

# Pre-trends [▶ Back](#)



(a) Loan applications



(b) Interest rates

# Thin credit file applicants [▶ Back](#)

VARIABLES	(1) p50 white rate	(2) p25 white rate	(3) p50 tr income rate	(4) p25 tr income rate	(5) p50 app income rate	(6) p25 app income rate
CA x fintech x post	-0.105*** (0.023)	-0.119*** (0.036)	-0.085*** (0.024)	-0.088** (0.037)	-0.086*** (0.024)	-0.090** (0.044)
Observations	33,065	14,213	36,942	18,748	32,947	15,675
R-squared	0.903	0.903	0.898	0.902	0.906	0.900
Lender*Tract FE	✓	✓	✓	✓	✓	✓
Tract*Time FE	✓	✓	✓	✓	✓	✓
Lender*Time FE	✓	✓	✓	✓	✓	✓



# Loans not sold to GSEs [▶ Back](#)

VARIABLES	(1) rate	(2) rate	(3) sd(int rate)	(4) sd(int rate)	(5) denied	(6) denied	(7) alt CS	(8) alt CS
CA x post	0.307*** (0.020)		-0.131*** (0.019)		-0.002 (0.003)		-0.056*** (0.008)	
fintech x post	0.181*** (0.035)		-0.086* (0.048)		0.004 (0.005)		-0.017* (0.009)	
CA x fintech x post	-0.224*** (0.043)	-0.164*** (0.046)	0.183*** (0.057)	0.114* (0.061)	0.021*** (0.007)	0.028*** (0.007)	0.056*** (0.011)	0.040*** (0.013)
Observations	34,630	34,630	18,005	18,005	34,630	34,630	34,630	34,630
R-squared	0.820	0.861	0.617	0.720	0.629	0.695	0.660	0.723
Lender*Tract FE	✓	✓	✓	✓	✓	✓	✓	✓
Time FE	-	-	-	-	-	-	-	-
Tract*Time FE	✓	✓	✓	✓	✓	✓	✓	✓
Lender*Time FE	-	✓	-	✓	-	✓	-	✓

# Alternatives

Applicant quality [▶ Back](#)

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	DTI < 36pct	LTV ratio	LTI ratio	log(inc)	risk PCA	baseline rate	PCA rate	PCA+other rate
CA x fintech x post	0.004 (0.012)	-0.008 (0.006)	-0.026 (0.018)	0.005 (0.010)	-0.050 (0.029)	-0.112*** (0.014)	-0.107*** (0.014)	-0.101*** (0.014)
Observations	68,118	68,155	68,155	68,155	68,155	68,118	68,118	68,118
R-squared	0.549	0.693	0.631	0.777	0.651	0.901	0.903	0.908
Lender*Tract FE	✓	✓	✓	✓	✓	✓	✓	✓
Tract*Time FE	✓	✓	✓	✓	✓	✓	✓	✓
Lender*Time FE	✓	✓	✓	✓	✓	✓	✓	✓
Risk controls	-	-	-	-	-	-	✓	✓

# Alternatives

Covid-19 [▶ Back](#)

VARIABLES	(1) baseline applications	(2) applications	(3) applications	(4) baseline rate	(5) rate	(6) rate
CA x fintech x post	0.145*** (0.021)	0.146*** (0.024)	0.140*** (0.025)	-0.080*** (0.015)	-0.100*** (0.017)	-0.100*** (0.019)
fintech × workplace mob		-0.002 (0.003)	-0.004 (0.003)		0.008*** (0.002)	0.007*** (0.002)
fintech × transit mob		0.001 (0.002)	0.005*** (0.002)		-0.002* (0.001)	-0.001 (0.001)
fintech × cases pc			0.058*** (0.013)			0.014 (0.010)
fintech × deaths pc			-1.258** (0.516)			-0.247 (0.434)
Observations	73,554	73,554	73,554	73,554	73,554	73,554
R-squared	0.791	0.791	0.791	0.903	0.903	0.903
Lender*Tract FE	✓	✓	✓	✓	✓	✓
Tract*Time FE	✓	✓	✓	✓	✓	✓
Lender*Time FE	✓	✓	✓	✓	✓	✓

VARIABLES	(1) purchase applications	(2) purchase rate	(3) refinance applications	(4) refinance rate	(5) young applications	(6) young rate	(7) controls applications	(8) controls rate	(9) HPI applications	(10) HPI rate
CA x fintech x post	0.092*** (0.035)	-0.064*** (0.023)	0.114*** (0.042)	-0.071*** (0.020)	0.137*** (0.022)	-0.124*** (0.017)	0.140*** (0.022)	-0.117*** (0.013)	0.059** (0.027)	-0.073*** (0.021)
Observations	53,972	53,972	37,418	37,418	72,441	72,441	73,767	73,767	45,547	45,547
R-squared	0.768	0.870	0.789	0.906	0.842	0.905	0.841	0.930	0.778	0.905
Lender*Tract FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Tract*Time FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Lender*Time FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

## Robustness – Applicant level [▶ Back](#)

VARIABLES	(1) app to FT	(2) app to FT	(3) interest rate	(4) interest rate	(5) interest rate
CA x post	0.025*** (0.003)	0.021*** (0.003)	0.127*** (0.006)		
fintech x post			-0.055*** (0.005)		
CA x fintech x post			-0.058*** (0.006)	-0.053*** (0.006)	-0.043*** (0.004)
Observations	674,720	674,720	595,226	595,188	595,188
R-squared	0.017	0.036	0.513	0.524	0.658
Tract FE	✓	✓	✓	✓	✓
Time FE	✓	✓	✓	-	-
Tract*Time FE	-	-	-	✓	✓
Lender*Time FE	-	-	-	✓	✓
Applicant Controls	-	✓	-	-	✓

# Robustness – Control group [▶ Back](#)

VARIABLES	(1) no AZ applications	(2) no AZ rate	(3) no NV applications	(4) no NV rate	(5) no OR applications	(6) no OR rate	(7) CA applications	(8) CA rate
fintech x post							0.516*** (0.006)	-0.069*** (0.004)
CA x fintech x post	0.142*** (0.021)	-0.072*** (0.015)	0.228*** (0.036)	-0.084*** (0.027)	0.136*** (0.022)	-0.086*** (0.016)		
Observations	72,863	72,863	47,189	47,189	72,197	72,197	259,156	259,156
R-squared	0.791	0.904	0.788	0.909	0.792	0.902	0.799	0.921
Lender*Tract FE	✓	✓	✓	✓	✓	✓	✓	✓
Tract*Time FE	✓	✓	✓	✓	✓	✓	✓	✓
Lender*Time FE	✓	✓	✓	✓	✓	✓	-	-

# Robustness – Clustering [▶ Back](#)

VARIABLES	(1) T applications	(2) T rate	(3) T*Y applications	(4) T*Y rate	(5) C applications	(6) C rate	(7) C*Y applications	(8) C*Y rate	(9) S*Y applications	(10) S*Y' rate
CA x fintech x post	0.146*** (0.021)	-0.079*** (0.015)	0.146*** (0.021)	-0.079*** (0.015)	0.146*** (0.041)	-0.079** (0.029)	0.146*** (0.048)	-0.079*** (0.025)	0.146** (0.064)	-0.079*** (0.019)
Observations	75,354	75,354	75,354	75,354	75,354	75,354	75,354	75,354	75,354	75,354
R-squared	0.791	0.904	0.791	0.904	0.791	0.904	0.791	0.904	0.791	0.904

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