

Online Appendix to

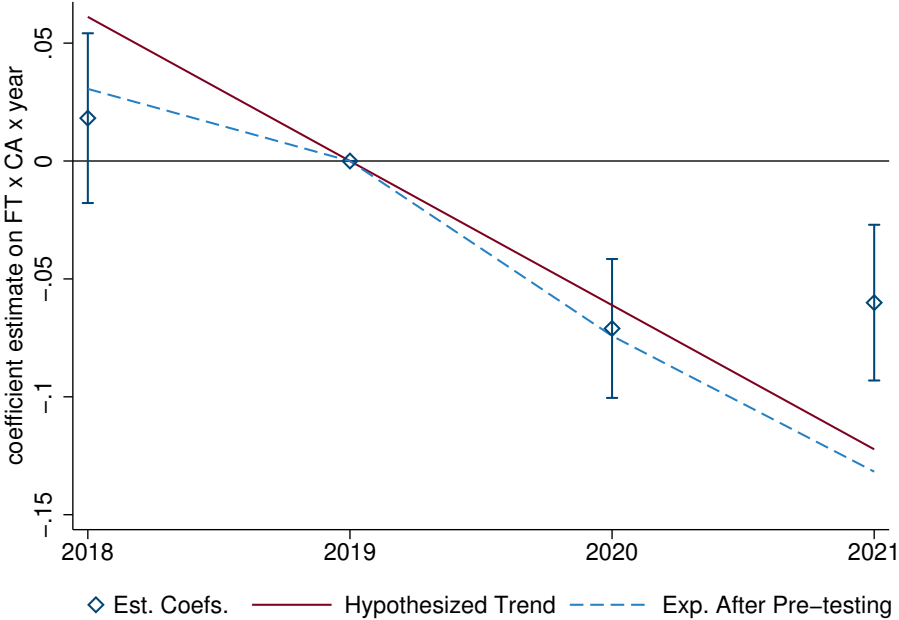
**Privacy regulation and fintech lending**

Sebastian Doerr, Leonardo Gambacorta, Luigi Guiso, and Marina Sanchez del Villar

Management Science

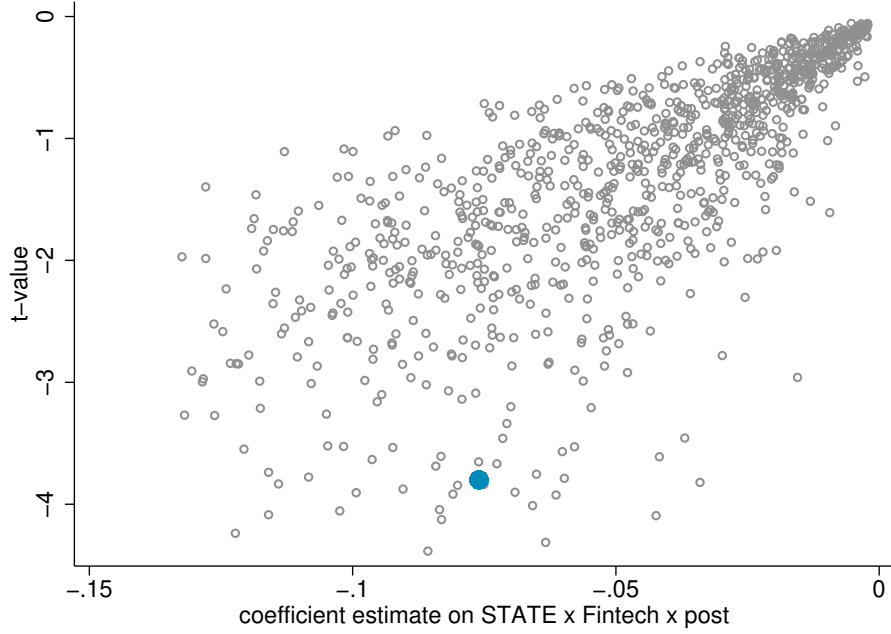
# Additional figures and tables

Figure OA1: Pre-trends



This figure plots coefficient estimates as in Figure 3. The red line displays a linear trend with slope  $-0.6$ , which corresponds to a slope that would provide significant pre-trends around 80% of the time, obtained from a power analysis following Roth (2022).

Figure OA2: **California vs other states**



This figure plots coefficient  $\delta_3$  from the following regression:  $rate_{i(l,c,t)} = \delta_3 STATE_c \times Fintech_l \times Post_t + controls_i + \theta_{l,c} + \tau_{c,t} + \phi_{l,t} + \varepsilon_i$ . The dependent variable  $y$  is the interest rate on originated mortgage  $i$  by lender  $l$  to a borrower in census tract  $c$  in year  $t$ . The dummy  $Post$  takes on a value of one in the years after the CCPA was enacted (i.e. for years 2020 and 2021) and a value of zero in 2018 and 2019.  $Fintech$  is a dummy that takes on a value of one if the lender is a fintech and a value of zero otherwise. The dummy variable  $STATE$  varies at the state level. We compare all states covered in the data set (minus California) to each other in a pairwise fashion. The blue marker is the estimated coefficient and associated t-value from Table 3, column (3) for California. This results in a total of 1,225 regressions.

Table OA1: **Denial rates among underserved borrowers are lower**

VARIABLES	(1)	(2)	(3)	(4)
	No minority Denied (0/1)	Minority Denied (0/1)	High inc Denied (0/1)	Low inc Denied (0/1)
CA x Fintech x Post	0.011*** (0.002)	0.008 (0.008)	0.016** (0.006)	0.011*** (0.002)
Observations	477,818	143,761	233,824	385,367
R-squared	0.537	0.615	0.449	0.607
Lender*Tract FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
Controls	✓	✓	✓	✓

This table reports results for Equation (1). The dependent variable is the dummy *Denied (0/1)*. The dummy *CA* takes on a value of one if the property is located in a tract in California. The dummy *Post* takes on a value of one in the years after the CCPA was enacted. The dummy *Fintech* takes on a value of one if the lender is a fintech and a value of zero otherwise. Minority (no minority) refers to borrowers that (do not) report their race/ethnicity as Black and/or Hispanic. High (low) income refers to borrowers with an income above (below) the average income of all borrowers. Standard errors (in parentheses) are clustered at the borrower-tract level. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

Table OA2: **The CCPA and applicant quality**

VARIABLES	(1)	(2)	(3)
	LTV ratio	LTI ratio	Log(income)
CA x Fintech x Post	-0.000 (0.000)	0.000 (0.005)	-0.002 (0.003)
Observations	646,528	646,528	646,528
R-squared	0.963	0.931	0.953
Lender*Tract FE	✓	✓	✓
Tract*Time FE	✓	✓	✓
Lender*Time FE	✓	✓	✓
Controls	✓	✓	✓

The dependent variables in columns (1)–(3) are different measures of applicant quality (the LTV ratio, the LTI ratio, the log of income). The dummy *CA* takes on a value of one if the property is located in a tract in California. The dummy *Post* takes on a value of one in the years after the CCPA was enacted. The dummy *Fintech* takes on a value of one if the lender is a fintech and a value of zero otherwise. Standard errors (in parentheses) are clustered at the borrower-tract level. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

Table OA3: Including banks in the control group

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
		No minority	Minority	High inc	Low inc			Not sold	Not sold	Tract	Tract	GSE
VARIABLES	Interest rate	Interest rate	Interest rate	Interest rate	Interest rate	Denied (0/1)	sd(rate)	Alt CS broad (0/1)	Alt CS narrow (0/1)	Nr of applications	Nr of originations	Default
CA x Fintech x Post	-0.041*** (0.008)	-0.033*** (0.010)	-0.057*** (0.011)	-0.025* (0.012)	-0.046*** (0.011)	0.007*** (0.002)	0.033*** (0.008)	0.064* (0.034)	0.047*** (0.005)	0.126*** (0.018)	0.099*** (0.019)	-0.003 (0.002)
Observations	703,141	523,293	148,982	261,843	405,622	884,110	96,090	181,317	181,317	237,220	233,944	465,871
R-squared	0.807	0.811	0.832	0.811	0.820	0.560	0.505	0.642	0.783			0.019
Lender*Tract FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Tract*Time FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Lender*Time FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

This table replicates the baseline results but includes banks in the control group. The dummy *CA* takes on a value of one if the property is located in a tract (for columns (1) to (11)) or a zip code (for column (12)) in California. The dummy *Post* takes on a value of one in the years after the CCPA was enacted. The dummy *Fintech* takes on a value of one if the lender is a fintech and a value of zero otherwise. Standard errors (in parentheses) are clustered at the borrower tract level in columns (1) to (11), and at the borrower zip code-time in column (12). Columns (10) and (11) estimate Poisson pseudo-maximum likelihood regressions. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

Table OA4: **Jumbo loans**

VARIABLES	(1) Jumbo only Interest rate	(2) Jumbo only Interest rate	(3) Jumbo loan (0/1)	(4) Jumbo loan (0/1)
CA x Post	-0.019 (0.022)		-0.022*** (0.006)	
Fintech x Post	0.039 (0.054)		0.002 (0.002)	
CA x Fintech x Post	0.030 (0.055)	0.026 (0.050)	0.006** (0.003)	0.004 (0.003)
Observations	20,875	20,271	569,712	569,586
R-squared	0.800	0.817	0.355	0.371
Lender*Tract FE	✓	✓	✓	✓
Year FE	✓	-	✓	-
Tract*Time FE	-	✓	-	✓
Lender*Time FE	-	✓	-	✓
Controls	✓	✓	✓	✓

This table reports results for Equation (1). The dependent variable is the interest rate in columns (1) and (2) and the dummy *Jumbo loan* that takes on a value of one if a loan is jumbo in columns (3) and (4). The dummy *CA* takes on a value of one if the property is located in a tract in California. The dummy *Post* takes on a value of one in the years after the CCPA was enacted. The dummy *Fintech* takes on a value of one if the lender is a fintech and a value of zero otherwise. Standard errors (in parentheses) are clustered at the borrower-tract level. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

Table OA5: **List of variables**

Variable name	Definition
Fintech (0/1)	Dummy for fintech lender yes/no as defined in Fuster et al (2019)
CA (0/1)	Dummy for property in California yes/no
Post (0/1)	Dummy for years 2020 and 2021
Interest rate	Loan interest rate in %
Rate spread	Loan annual percentage rate minus average prime offer rate in %
Denied (0/1)	Dummy for loan application denied yes/no
Alt CS (0/1)	Dummy for alternative credit scoring model used yes/no
Alt CS narrow (0/1)	Dummy for alternative credit scoring model used (narrow definition) yes/no
Alt CS very narrow (0/1)	Dummy for alternative credit scoring model used (very narrow definition) yes/no
Income	Applicant income in USD
Asian (0/1)	Applicant reports ethnicity as Asian yes/no
Black (0/1)	Applicant reports race as Black yes/no
Hispanic (0/1)	Applicant reports ethnicity as Hispanic yes/no
Female (0/1)	Applicant is female yes/no
Age below 35 (0/1)	Applicant age is below 35 yes/no
Age above 62 (0/1)	Applicant age is above 62 yes/no
DTI below 36pc (0/1)	Applicant debt-to-income ratio is below 36% yes/no
LTV ratio	Applicant loan-to-value ratio
Property value	Property value in USD
Loan amount	Loan amount in USD
Loan term	Loan term in months
Cost/amount	Total loan costs over total loan amount
Loan is ARM (0/1)	Loan is adjustable rate mortgage yes/no
Has coapplicant (0/1)	Applicant has co-applicant yes/no
Purchase (0/1)	Loan is purchase loan yes/no
Minority (0/1)	Applicant reports race/ethnicity as Black and/or Hispanic
Low/high income (0/1)	Applicant with income below/above the sample mean
sd(rate)	Standard dev. of interest rate within lender-tract-year cell
Nr of applications	Number of applications within lender-tract-year cell
Nr of originations	Number of originations within lender-tract-year cell
Default	Loan is at least 30 days delinquent a year after origination yes/no

Table OA6: **List of border counties**

FIPS code	County name
04012	La Paz
04015	Mohave
04027	Yuma
06003	Alpine
06015	Del Norte
06017	El Dorado
06025	Imperial
06027	Inyo
06035	Lassen
06049	Modoc
06051	Mono
06057	Nevada
06061	Placer
06065	Riverside
06071	San Bernardino
06091	Sierra
06093	Siskiyou
32003	Clark
32005	Douglas
32009	Esmeralda
32019	Lyon
32021	Mineral
32023	Nye
32031	Washoe
32510	Carson City
41015	Curry
41029	Jackson
41033	Josephine
41035	Klamath
41037	Lake

## Additional information on the CCPA

### General information

The California Consumer Privacy Act is a law passed in June 2018 that applies to companies handling personal information of California residents. It went into effect in January 2020. It endows Californians with several rights:

- The right to delete personal information collected from them;
- The right to know what personal information a business has collected about them and how it is used and shared;
- The right to opt out of the sale of their personal information; and
- The right to non-discrimination for exercising their CCPA rights.

Starting in 2023, the law will also include the right to correct inaccurate information and the right to limit the use and disclosure of sensitive personal information.

During our period of analysis, the companies that are subject to the CCPA are those that: Have a gross annual revenue of over \$25 million; buy, receive, or sell the personal information of 50,000 or more California residents, households, or devices in one year; or derive 50% or more of their annual revenue from selling California residents' personal information.<sup>1</sup>

The scope of what constitutes personal information under the CCPA is broad. For example, an IP address of an individual browsing a website is considered personal information. Therefore, the CCPA is likely to cover a large proportion of companies, including numerous small- to medium-sized enterprises.<sup>2</sup> Virtually all banks and fintech lenders fall under the CCPA.

### Saliency

Google searches for “CCPA” on Google Trends in [Figure OA3](#) suggest that the residents of California were aware of the introduction of the privacy legislation. Google searches for the CCPA in California increased steeply in late 2019 and remained elevated for most of 2020, while trends in Arizona, Nevada and Oregon did not replicate this interest.

[Figure OA4](#) and [Figure OA5](#) provide screenshots of the information on the CCPA consumers can find on mortgage application websites.

### Enforcement

Under the CCPA, individuals can file a consumer complaint with the Office of the Attorney General (OAG). Starting in July 2023, claims can also be filed with the recently founded California Privacy Protection Agency. The Attorney General and the Agency investigate violations, either following a consumer complaint or from their own initiative, and take enforcement actions.<sup>3</sup> Individual suing

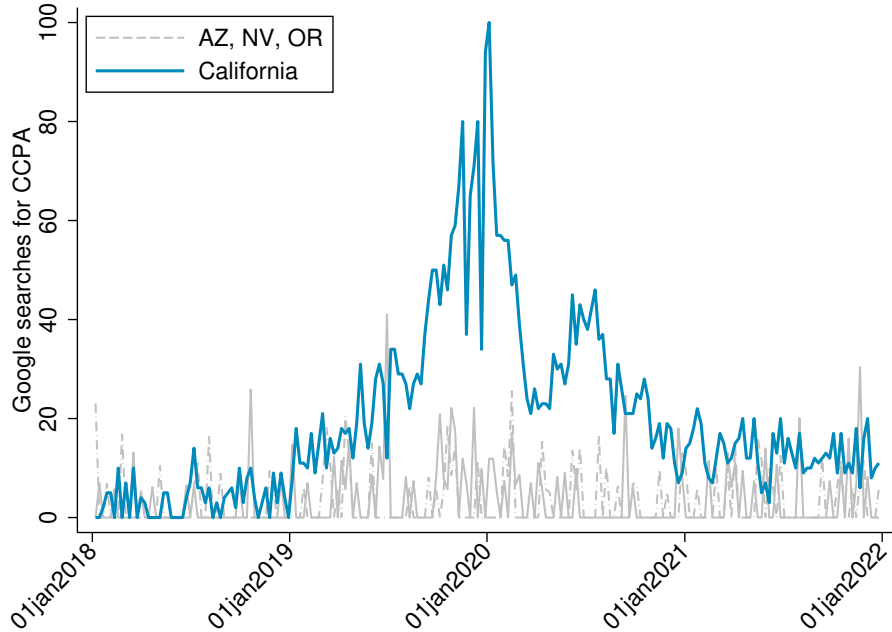
---

<sup>1</sup><https://cppa.ca.gov/faq.html>. Accessed November 25th, 2022. Starting in 2023 to meet the second threshold, businesses must annually buy, sell, or share the personal information of 100,000 or more consumers or households.

<sup>2</sup><https://iapp.org/news/a/new-california-privacy-law-to-affect-more-than-half-a-million-us-companies/>. Accessed November 25th, 2022.

<sup>3</sup><https://cppa.ca.gov/faq.html>. Accessed November 25th, 2022.

Figure OA3: Internet searches for CCPA



This figure shows internet searches from Google Trends for ‘CCPA’ in California and neighboring states over time. The CCPA came into effect in January 2020. Note that Google Trends normalizes the search interest so that the day with the most searches over the period of interest takes the value of 100, and all other dates are with respect to this value. To compare searches across states, series are standardized based on average search frequency in California relative to the other states over the period 01Jan2018 to 31Dec2021, with Washington D.C. serving as benchmark.

of a business is limited to data breaches where it is clear the company did not take the necessary measures to protect consumers’ data.

The OAG regularly sends companies notices of alleged noncompliance.<sup>4</sup> Once a company is notified of alleged noncompliance, it has 30 days to take the necessary steps to resolve the non-compliance. If it does not solve the issue that prompted the notice, the Attorney General can engage in civil law procedures. The first enforcement settlement related to the CCPA took place in August 2022 and it concerned the French cosmetics brand Sephora. The investigation found that Sephora was selling consumers’ personal information without disclosing it, as well as not complying with opt-out requests. Sephora failed to correct these issues within the 30 days of notification by the OAG. Sephora agreed to settle for \$1.2 million in fines and agreed to follow its compliance obligations.<sup>5</sup> Since then, other companies have also been fined. For example, the food delivery platform DoorDash was fined in February 2024 for selling the personal information of its customers without providing notice or the opportunity to opt out; and the video game developer and publisher Tilting Point Media LLC was fined in June 2024 for collecting and sharing children’s data without obtaining parental consent.

<sup>4</sup><https://oag.ca.gov/privacy/ccpa/enforcement>. Accessed March 24th, 2023.

<sup>5</sup><https://iapp.org/news/a/the-sephora-case-do-not-sell-but-are-you-selling/>. Accessed November 25th, 2022.

## CCPA

### California Consumer Privacy Act Privacy Notice:

This privacy notice supplements the general privacy policy notice of View Mortgage, LLC NMLS# 2185181 which can be found at <https://viewmortgage.com/privacy-policy>. This supplemental privacy policy applies solely to consumers who reside in the State of California (“you”). View Mortgage, LLC adopts this notice to comply with the California Consumer Privacy Act of 2018, as amended (“CCPA”) and other applicable California privacy laws. Any terms defined in the CCPA have the same meaning when used in this notice.

The CCPA was passed by the State of California in 2018 and provides California residents with the following rights over their personal information: (a) the right to access, transfer, edit and delete their personal data with a verifiable consumer request; and (b) the ability to opt out of certain data-processing practices. In addition, California residents have the right to: (a) know what information is being collected about them; (b) know if their personal information is sold or disclosed, and to whom; (c) say “no” to the sale of personal information; and (d) equal service and price, even if they exercise their privacy rights under the CCPA.

View Mortgage, LLC does not and will not discriminate in any way against any consumers who choose to exercise their rights under the CCPA.

### What Information We Collect About You:

We may obtain certain personal information (such as name and other contact details) through our Sites. Here are the most common types of information: Contact information (such as name, postal address, e-mail address, telephone number and fax number); Login and access credentials (such as username and password); Information about your property or mortgage loan; Age and gender; Real estate license number.

Figure OA4: This figure displays the CCPA information available in the website from View Mortgage, available at <https://www.viewmortgage.com/ccpa>.



## California Consumer Privacy Act

Open Mortgage is committed to compliance with the new California Consumer Privacy Act (CCPA) and to providing options to Opt-Out. Additionally, Open Mortgage never sells any of your data. That said, it is important to note that CCPA provides exemptions to companies that have consumer data that is necessary to carry out their business. A majority of the data that Open Mortgage collects is exempt from CCPA as it falls under federal privacy laws set out by the Gramm Leach Bliley Act (GLBA) and cannot, as a result, be part of the Opt-Out request. We are GLBA compliant and protect your data to our fullest capability. So, Open Mortgage will receive your Opt-Out request via the option you select, and will work to remove any data that is not exempt.

### What does that mean?

That means that if you have applied for a loan from Open Mortgage, we are exempt from removing personal data that was used in the loan process. Personal data that is exempt will include data like your name, phone number, social security number, date of birth, address, employment data, and income data. So while we have to keep that data, we want you to rest assured that Open Mortgage does not engage in the sale of data. Lastly, please keep in mind that data outside the loan process may not be exempt.

### What kind of data is outside the loan process?

Information that was not collected in your loan application and was collected from marketing activities, promotional activities, information from a non-borrowing spouse, IP addresses, geolocation data through the use of a third-party application, web page tracking, and information collected through a third party like a marketing list.

**To proceed with your request, please be prepared to provide your first and last name, your phone number, your email address, your loan number (if applicable), and the Loan Officer you have been or were working with. Providing this will help us locate your information and validate your request. Open Mortgage may request additional information if your request cannot be validated. You must be a resident of California to be eligible for this request.**

[Click here for the full CCPA privacy policy](#)

You can fill out and submit this form to request to opt-out.

Figure OA5: This figure displays the CCPA information available in the website from Open Mortgage, available at <https://openmortgage.com/ccpa>.