

Online Appendix: The Age Gap in Mortgage Access

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A cHMDA Sample Data Appendix

A.1 Regression Variable Definition

This section defines all right-hand side variables that I include in the regressions that use the cHMDA sample and provides additional details on how the control variables are included in each regression.

Age Group Indicator Variables – A set of indicator variables that captures the age group that the applicant belongs to. The age groups are 18 to 29, 30 to 39, 40 to 49, 50 to 59, 60 to 69, and 70 years or older. The regression uses mortgages associated with applicants in the first age group as the reference group.

Age – The applicant’s age in years. Age and age group indicator variables are never included in the same regression.

70+ – Equals one if the applicant is older than 69 years old and zero otherwise.

Female – Equals one if the borrower is female and zero otherwise.

Asian – Equals one if the borrower is Asian and zero otherwise.

Black – Equals one if the borrower is Black and zero otherwise.

Hispanic – Equals one if the borrower is Hispanic and zero otherwise.

Other Minority – Equals one if the borrower belongs to a racial minority group that is not Asian or Black and zero otherwise.

Unknown Sex – Equals one if the borrower’s sex is unknown and zero otherwise.

Both Sexes – Equals one if the borrower reported being both male and female, and zero otherwise.

Unknown Race – Equals one if the borrower’s race is unknown and zero otherwise.

Unknown Ethnicity – Equals one if the borrower’s ethnicity is unknown and zero otherwise.

Loan Purpose – Equals one if the mortgage is a home purchase mortgage and zero if the mortgage is a refinance mortgage.

Credit Score Indicator Variables – Applications are sorted into groups according to the applicant’s credit score value. Credit score values from 620 to 849 are broken into 10-point groups. Credit scores of 850 or greater form a group.

CLTV Indicator Variables – Applications are sorted into groups according to the loan’s CLTV value. CLTV values from 0 to 19 form one group. CLTV values from 20 to 79 form 10-point groups. CLTV

values from 80 to 94 form 5-point groups. CLTV values from 95 to 97 form 1-point groups.

DTI Indicator Variables – Applications are sorted into groups according to the loan’s DTI value. DTI values between 0 and 30 form 5-point groups. DTI values between 31 and 45 form 1-point groups.

Income Indicator Variables – Applications are sorted into groups according to the applicant’s annual income. The reference group consists of applicants with income values between 0 and \$50,000. The remaining groups are formed by increments of \$25,000 up to \$499,999. The final group consists of loans associated with applicants with income values greater than \$499,999. Loans with missing income values form a separate group.

Loan Amount Indicator Variables – Applications are sorted into groups according to their loan amounts. The reference group consists of applications with loan amounts between \$0 and \$50,000. The remaining groups are formed by \$50,000 increments of loan amount up to \$749,999. The final group consists of loans with loan amounts greater than \$749,999.

AUS Approved – Equals one if the loan application was approved by at least one AUS and zero otherwise. This variable is excluded from the regression when AUS rejection decision is used as the outcome variable.

Non-Conforming – Equals one if at least one AUS flagged the application as being ineligible for GSE purchase and zero otherwise. The non-conforming sample of applications is only included in Table 3.

Tract HHI – Tract-level Herfindahl–Hirschman index computed using all originated mortgages in cHMDA from 2018 to 2022 (Tables A6 and A16).

County HHI – County-level Herfindahl–Hirschman index computed using all originated mortgages in cHMDA from 2018 to 2022 (Tables A6 and A16).

Age Bias Score – State-level mean implicit age bias score from Table 1 of Giasson and Chopik (2020) (Tables A6 and A16). Higher values mean more implicit bias against older people.

Fintech Lender – Equals one if the application was submitted to a fintech lender, defined according to Jagtiani et al. (2021) (Tables A6 and A16).

Demographic control variables include Female, Asian, Black, Hispanic, Other Minority, Unknown Sex, Both Sexes, Unknown Race, and Unknown Ethnicity. For application characteristic control variables, the loan purpose indicator variable is separately interacted with CLTV-DTI-credit score grid, income bins, loan amount bins, and AUS approval indicator variable. The time dimension is action (rejection or approval) year-month.

B cHMDA-McDash-CRISM Sample Data Appendix

B.1 Regression Variable Definition

This section defines all right-hand side variables that I include in the regressions that use the cHMDA-McDash-CRISM sample and gives additional details on how the control variables are included in each regression.

Age Group Indicator Variables – A set of indicator variables that captures the age group that the borrower belongs to. The age groups are 18 to 29, 30 to 39, 40 to 49, 50 to 59, 60 to 69, and 70 years or older. The regression uses the first age group as the reference group.

Female – Equals one if the borrower is female and zero otherwise.

Asian – Equals one if the borrower is Asian and zero otherwise.

Black – Equals one if the borrower is Black and zero otherwise.

Hispanic – Equals one if the borrower is Hispanic and zero otherwise.

Other Minority – Equals one if the borrower belongs to a racial minority group that is not Asian or Black and zero otherwise.

Unknown Sex – Equals one if the borrower’s sex is unknown and zero otherwise.

Both Sexes – Equals one if the borrower reported being both male and female, and zero otherwise.

Unknown Race – Equals one if the borrower’s race is unknown and zero otherwise.

Unknown Ethnicity – Equals one if the borrower’s ethnicity is unknown and zero otherwise.

Loan Purpose – Equals one if the mortgage is a home purchase mortgage and zero if the mortgage is a refinance mortgage.

Credit Score Indicator Variables – Mortgages are sorted into groups according to the borrower’s credit score value at origination. Credit score values from 620 to 849 are broken into 10-point groups. Credit scores of 850 or greater form a group.

CLTV Indicator Variables – Mortgages are sorted into groups according to the loan’s CLTV value at origination. CLTV values from 0 to 19 form one group. CLTV values from 20 to 79 form 10-point groups. CLTV values from 80 to 94 form 5-point groups. CLTV values from 95 to 97 form 1-point groups.

DTI Indicator Variables – Mortgages are sorted into groups according to the loan’s DTI value at origination. DTI values between 0 and 30 form 5-point groups. DTI values between 31 and 45 form

1-point groups.

Income Indicator Variables – Borrowers are sorted into groups according to their annual income at origination. The reference group consists of borrowers with income values between 0 and \$50,000. The remaining groups are formed by \$25,000 increments of income values up to \$499,999. The final group consists of loans associated with borrowers with income values greater than \$499,999. Loans with missing income values form a separate group.

Loan Amount Indicator Variables – Mortgages are sorted into groups according to their loan amounts at origination. The reference group consists of applications with loan amounts between \$0 and \$50,000. The remaining groups are formed by \$50,000 increments of loan amount up to \$749,999. The final group consists of loans with loan amounts greater than \$749,999.

PMI – Equals one if, at origination, the mortgage has private mortgage insurance and zero otherwise.

Document Type Indicator Variables – A set of indicator variables that indicates whether the mortgage was originated with full documentation, low documentation, no documentation, or unknown documentation status.

Interest Rate Indicator Variables – Mortgages are sorted into groups according to the loan’s interest rate at origination. Groups are created by 25 basis point increments from 0 to 15.75. Mortgages with original interest rates greater than 15.75 form one group.

Demographic control variables include Female, Asian, Black, Hispanic, Other Minority, Unknown Sex, Both Sexes, Unknown Race, and Unknown Ethnicity. Loan characteristic control variables include the loan purpose indicator variable, which is separately interacted with the CLTV-DTI-credit score grid, income bins, loan amount bins, interest rate bins, documentation type, and PMI. The time dimension is close year-quarter. Due to data usage agreements, the cHMDA-McDash-CRISM merged data set does not provide the lender’s identity. Therefore, lender fixed effects cannot be included in the regressions and standard errors cannot be clustered at the lender level.

Delinquency outcome variables were constructed from McDash’s OTS STAT variable. Following Ghent and Kudlyak (2011), the default outcome variable was constructed from McDash TERMINATION TYPE variable. A loan is considered to have defaulted if TERMINATION TYPE = 2, 3, 4, 5, 7, or 8.

C NSMO Sample Data Appendix

C.1 Regression Variable Definition

This section defines all right-hand side variables that I include in the regressions that use the NSMO sample and gives additional details on how the control variables are included in each regression.

Age Group Indicator Variables – A set of indicator variables that captures the age group that the borrower belongs to. The age groups are 18 to 29, 30 to 39, 40 to 49, 50 to 59, 60 to 69, and 70 years or older. The regression uses the first age group as the reference group.

Female – Equals one if the borrower is female and zero otherwise.

Hispanic – Equals one if the borrower is Hispanic and zero otherwise.

Black – Equals one if the borrower is Black and zero otherwise.

Asian – Equals one if the borrower is Asian and zero otherwise.

Other Minority – Equals one if the borrower belongs to a racial minority group that is not Asian or Black and zero otherwise.

Marital Status Indicator Variables – A set of indicator variables that indicates whether the borrower is married, separated, never married, divorced, or widowed.

Census Tract LMI Status Indicator Variables – A set of indicator variables that indicates whether the property is located in a metropolitan CRA non-LMI tract, a metropolitan CRA LMI tract, or a non-metropolitan tract.

Survey Wave Indicator Variables – A set of indicator variables that indicates the survey wave that the observation belongs to.

Loan Purpose – Equals one if the mortgage is a home purchase mortgage and zero if the mortgage is a refinance mortgage.

Number of Borrowers Indicator Variables – A set of indicator variables that indicates the number of borrowers associated with the mortgage.

Credit Score Indicator Variables – Mortgages are sorted into groups according to the applicant's credit score value. Credit score values from 620 to 849 are broken into 10-point groups. Credit scores of 850 or greater form a group.

CLTV Indicator Variables – Mortgages are sorted into groups according to the loan's CLTV value. CLTV values from 0 to 19 form one group. CLTV values from 20 to 79 form 10-point groups. CLTV

values from 80 to 94 form 5-point groups. CLTV values from 95 to 97 form 1-point groups.

DTI Indicator Variables – Mortgages are sorted into groups according to the loan’s DTI value. DTI values between 0 and 30 form 5-point groups. DTI values between 31 and 45 form 1-point groups.

Income Indicator Variables – A set of indicator variables that indicates which income group the borrower belongs to. The groups are less than \$35,000, \$35,000 to \$49,999, \$50,000 to \$74,999, \$75,000 to \$99,999, \$100,000 to \$174,999, or greater than \$174,999.

Loan Amount Indicator Variables – A set of indicator variables that indicates which loan amount group the borrower belongs to. The groups are less than \$50,000, \$50,000 to \$99,000, \$100,000 to \$149,000, \$150,000 to \$199,000, \$200,000 to \$249,000, \$250,000 to \$299,000, \$300,000 to \$349,000, \$350,000 to \$399,000, and greater than \$399,000.

Demographic control variables include Female, Hispanic, Black, Asian, Other Minority, and marital status indicator variables. Application characteristic control variables include loan purpose indicator separately interacted with tract LMI status bin, DTI bins, income bins, loan amount bins, number of borrowers indicator variables, survey wave indicator variables, and the CLTV-credit score grid. The time dimension is origination year-quarter. Due to limited sample size, I cannot include DTI-CLTV-credit score grid fixed effects. Lender identity and property location are not provided in the NSMO data and so lender and census tract fixed effects cannot be included in the regressions and standard errors cannot be clustered at the lender or tract level. The time dimension is origination year-quarter.

D Appendix Figures

Figure A1: Fannie Mae LLPA Grid – 2018

This figure presents Fannie Mae’s loan-level price adjustment (LLPA) grid for eligible mortgages backed by single-family homes. This information was published on June 5, 2018. Data source: Fannie Mae.

Table 1: All Eligible Mortgages – LLPA by Credit Score/LTV Ratio										
Representative Credit Score	LTV Range									
	Applicable for all mortgages with terms greater than 15 years									
	≤ 60.00%	60.01 – 70.00%	70.01 – 75.00%	75.01 – 80.00%	80.01 – 85.00%	85.01 – 90.00%	90.01 – 95.00%	95.01 – 97.00%	>97.00%	SFC
≥ 740	0.000%	0.250%	0.250%	0.500%	0.250%	0.250%	0.250%	0.750%	0.750%	N/A
720 – 739	0.000%	0.250%	0.500%	0.750%	0.500%	0.500%	0.500%	1.000%	1.000%	N/A
700 – 719	0.000%	0.500%	1.000%	1.250%	1.000%	1.000%	1.000%	1.500%	1.500%	N/A
680 – 699	0.000%	0.500%	1.250%	1.750%	1.500%	1.250%	1.250%	1.500%	1.500%	N/A
660 – 679	0.000%	1.000%	2.250%	2.750%	2.750%	2.250%	2.250%	2.250%	2.250%	N/A
640 – 659	0.500%	1.250%	2.750%	3.000%	3.250%	2.750%	2.750%	2.750%	2.750%	N/A
620 – 639	0.500%	1.500%	3.000%	3.000%	3.250%	3.250%	3.250%	3.500%	3.500%	N/A
< 620 ¹	0.500%	1.500%	3.000%	3.000%	3.250%	3.250%	3.250%	3.750%	3.750%	N/A

Figure A2: Fannie Mae LLPA Grid – 2022

This figure presents Fannie Mae’s loan-level price adjustment (LLPA) grid for eligible mortgages backed by single-family homes. This information was published on April 6, 2022. Data source: Fannie Mae.

Table 1: All Eligible Loans – LLPA by Credit Score/LTV Ratio										
Representative Credit Score	LTV Range									
	Applicable for all loans with terms greater than 15 years									
	≤ 60.00%	60.01 – 70.00%	70.01 – 75.00%	75.01 – 80.00%	80.01 – 85.00%	85.01 – 90.00%	90.01 – 95.00%	95.01 – 97.00%	>97.00%	SFC
≥ 740	0.000%	0.250%	0.250%	0.500%	0.250%	0.250%	0.250%	0.750%	0.750%	N/A
720 – 739	0.000%	0.250%	0.500%	0.750%	0.500%	0.500%	0.500%	1.000%	1.000%	N/A
700 – 719	0.000%	0.500%	1.000%	1.250%	1.000%	1.000%	1.000%	1.500%	1.500%	N/A
680 – 699	0.000%	0.500%	1.250%	1.750%	1.500%	1.250%	1.250%	1.500%	1.500%	N/A
660 – 679	0.000%	1.000%	2.250%	2.750%	2.750%	2.250%	2.250%	2.250%	2.250%	N/A
640 – 659	0.500%	1.250%	2.750%	3.000%	3.250%	2.750%	2.750%	2.750%	2.750%	N/A
620 – 639	0.500%	1.500%	3.000%	3.000%	3.250%	3.250%	3.250%	3.500%	3.500%	N/A
< 620 ¹	0.500%	1.500%	3.000%	3.000%	3.250%	3.250%	3.250%	3.750%	3.750%	N/A

Figure A3: Freddie Mac Credit Fee Grid – 2018

This figure presents Freddie Mac’s loan-level credit fee grid for eligible mortgages backed by single-family homes. This information was published on March 28, 2018. Data source: Freddie Mac.

INDICATOR SCORE / LOAN-TO-VALUE FOR MORTGAGES OTHER THAN RELIEF REFINANCE MORTGAGES ^{1, 2, 3}									
Product	Credit Score ^{1, 2}	LTV Ratios							
		All Eligible							
		≤ 60%	> 60% & ≤ 70%	> 70% & ≤ 75%	> 75% & ≤ 80%	> 80% & ≤ 85%	> 85% & ≤ 90%	> 90% & ≤ 95%	> 95% & ≤ 97%
All Eligible Product	≥ 740	0.00%	0.25%	0.25%	0.50%	0.25%	0.25%	0.25%	0.75%
	≥ 720 & < 740	0.00%	0.25%	0.50%	0.75%	0.50%	0.50%	0.50%	1.00%
	≥ 700 & < 720	0.00%	0.50%	1.00%	1.25%	1.00%	1.00%	1.00%	1.50%
	≥ 680 & < 700	0.00%	0.50%	1.25%	1.75%	1.50%	1.25%	1.25%	1.50%
	≥ 660 & < 680	0.00%	1.00%	2.25%	2.75%	2.75%	2.25%	2.25%	2.25%
	≥ 640 & < 660	0.50%	1.25%	2.75%	3.00%	3.25%	2.75%	2.75%	2.75%
	≥ 620 & < 640	0.50%	1.50%	3.00%	3.00%	3.25%	3.25%	3.25%	3.50%
	< 620	0.50%	1.50%	3.00%	3.00%	3.25%	3.25%	3.25%	3.75%

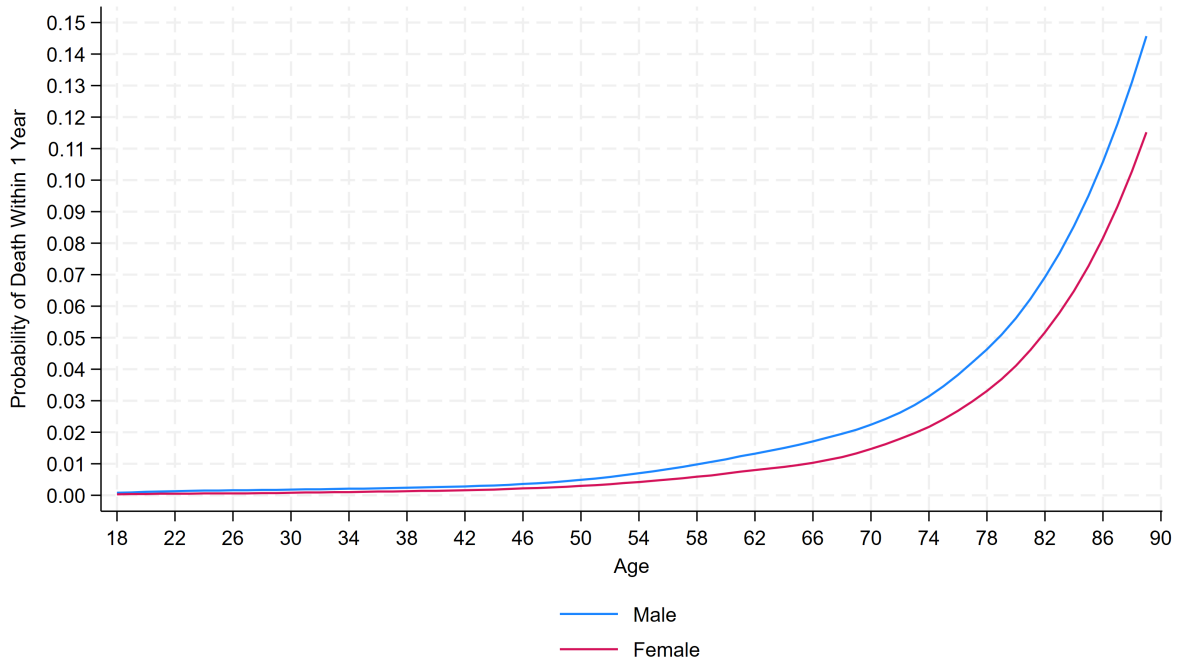
Figure A4: Freddie Mac Credit Fee Grid – 2022

This figure presents Freddie Mac’s loan-level credit fee grid for eligible mortgages backed by single-family homes. This information was published on May 4, 2022. Data source: Freddie Mac.

INDICATOR SCORE / LOAN-TO-VALUE ^{1, 2, 3}									
Product	Credit Score ^{1, 2}	LTV Ratios							
		All Eligible							
		≤ 60%	> 60% & ≤ 70%	> 70% & ≤ 75%	> 75% & ≤ 80%	> 80% & ≤ 85%	> 85% & ≤ 90%	> 90% & ≤ 95%	> 95%
All Eligible Product	≥ 740	0.00%	0.25%	0.25%	0.50%	0.25%	0.25%	0.25%	0.75%
	≥ 720 & < 740	0.00%	0.25%	0.50%	0.75%	0.50%	0.50%	0.50%	1.00%
	≥ 700 & < 720	0.00%	0.50%	1.00%	1.25%	1.00%	1.00%	1.00%	1.50%
	≥ 680 & < 700	0.00%	0.50%	1.25%	1.75%	1.50%	1.25%	1.25%	1.50%
	≥ 660 & < 680	0.00%	1.00%	2.25%	2.75%	2.75%	2.25%	2.25%	2.25%
	≥ 640 & < 660	0.50%	1.25%	2.75%	3.00%	3.25%	2.75%	2.75%	2.75%
	≥ 620 & < 640	0.50%	1.50%	3.00%	3.00%	3.25%	3.25%	3.25%	3.50%
	< 620	0.50%	1.50%	3.00%	3.00%	3.25%	3.25%	3.25%	3.75%

Figure A5: Probability of Death Within One Year by Age and Sex

This figure plots the probability of death within one year by age for men and women living in the United States. The blue line plots the probability of death for men and the red line plots the probability of death for women. Data source: Social Security Agency's 2019 Actuarial Life Table.



E Appendix Tables

Table A1: Sample Summary Statistics – cHMDA

This table presents summary statistics of key variables from the cHMDA sample. Dollar amounts are not adjusted for inflation. Variables presented in basis points (bps) are basis points of loan amount. Data sources: cHMDA and Giasson and Chopik (2020).

	n	Mean	Median	S.D.
Age	7,523,510	42.71	40.00	13.38
Female	7,523,510	0.38	0.00	0.49
Hispanic	7,523,510	0.10	0.00	0.30
Asian	7,523,510	0.09	0.00	0.28
Black	7,523,510	0.06	0.00	0.23
Other minority	7,523,510	0.01	0.00	0.09
Credit score	7,523,510	753.98	763.00	44.59
CLTV (%)	7,523,510	78.59	80.00	16.17
DTI (%)	7,523,510	33.07	34.32	8.33
Income ('000) USD	7,462,842	96.94	82.00	58.30
Loan amount ('000) USD	7,523,510	275.77	248.00	141.30
Home purchase	7,523,510	0.61	1.00	0.49
Refinance	7,523,510	0.39	0.00	0.49
AUS rejected (%)	7,523,510	1.43	0.00	11.85
Rejected (%)	7,523,510	5.65	0.00	23.09
Rejected for DTI (%)	7,523,510	0.46	0.00	6.78
Rejected for job history (%)	7,523,510	0.23	0.00	4.77
Rejected for credit history (%)	7,523,510	0.83	0.00	9.05
Rejected for insufficient collateral (%)	7,523,510	1.13	0.00	10.57
Rejected for insufficient closing cash (%)	7,523,510	0.42	0.00	6.47
Rejected for unverifiable information (%)	7,523,510	0.55	0.00	7.40
Rejected for mortgage insurance (%)	7,523,510	0.01	0.00	1.04
Tract HHI	7,523,482	438.06	346.47	300.10
County HHI	7,523,510	272.84	233.63	141.63
Age bias score	7,516,913	0.45	0.45	0.02
Fintech	7,523,510	0.15	0.00	0.36
Coupon rate (bps)	3,986,426	356.24	325.00	84.27
Points-adjusted coupon rate (bps)	3,986,426	360.17	333.53	87.81
Total upfront cost (bps)	6,824,742	179.06	155.89	112.49
Discount point (bps)	6,893,083	29.67	0.00	57.32
Lender credit (bps)	6,893,083	16.89	0.00	38.87

Table A2: Borrower Characteristics by Age Group

This table presents the means and standard errors, in parentheses, on selected credit risk variables by age group. Income is presented in thousands of 2022 USD. The CPI from the Bureau of Labor Statistics is used to adjust for inflation. Data source: cHMDA and the Bureau of Labor Statistics.

Age group	Credit score	CLTV (%)	DTI (%)	Income
18 – 29	746.48 (0.03)	87.03 (0.01)	33.88 (0.01)	81.15 (0.04)
30 – 39	756.73 (0.03)	81.90 (0.01)	33.12 (0.01)	113.34 (0.04)
40 – 49	751.48 (0.04)	77.67 (0.01)	32.79 (0.01)	128.68 (0.10)
50 – 59	751.46 (0.04)	74.16 (0.02)	32.41 (0.01)	122.94 (0.11)
60 – 69	760.68 (0.06)	68.59 (0.02)	32.7 (0.01)	102.13 (0.12)
70+	772.56 (0.08)	62.78 (0.04)	34.33 (0.01)	81.23 (0.15)

Table A3: Sample Summary Statistics

This table presents summary statistics for outcome variables from the cHMDA-McDash-CRISM (Panel A) and NSMO (Panel B) samples. cHMDA-McDash-CRISM variables are indicator variables that are equal to 0 or 1. NSMO variables are indicator variables that are equal to 0 or 100. Data sources: cHMDA, McDash, CRISM, and NSMO.

Panel A: cHMDA-McDash-CRISM	n	Mean	Median	S.D.
30+ days delinquent	1,548,443	0.05	0.00	0.21
60+ days delinquent	1,548,443	0.03	0.00	0.18
90+ days delinquent	1,548,443	0.03	0.00	0.16
Defaulted	1,550,067	0.01	0.00	0.09
Prepaid in 3 years	1,550,067	0.30	0.00	0.46
Prepaid in 5 years	1,550,067	0.52	1.00	0.50
Prepaid in 10 years	1,550,067	0.76	1.00	0.42
Prepaid	1,550,067	0.79	1.00	0.41

Panel B: NSMO	n	Mean	Median	S.D.
Broker	8,805	39.99	0	48.99
Co-sign	6,436	5.19	0	22.18
Gift	5,691	15.46	0	36.16
Banking relationship	8,805	48.97	0	49.99
Previous mortgage	8,805	35.53	0	47.86
Personal relationship	8,805	13.72	0	34.41
Friend referred	8,805	35.63	0	47.89
Agent referred	8,805	36.74	0	48.21
Reputation	8,805	65.08	100	47.68
Branch	8,805	44.15	0	49.66
Online	3,095	42.91	0	49.50
Considered multiple	8,805	53.91	100	49.85
Applied multiple	8,805	22.79	0	41.95
Better terms	2,007	87.44	100	33.14
Prior rejection	2,007	10.21	0	30.29
Shopped closing agent	8,805	9.02	0	28.65
Low rate	8,805	98.01	100	13.96
Low APR	8,805	88.56	100	31.83
Low fee	8,805	85.75	100	34.96
Low monthly	8,805	82.65	100	37.87
Asked others	6,436	32.04	0	46.67

Table A4: Age and Mortgage Application Rejection – Entropy Balancing

This table reports OLS regression results where the rejection indicator variable is regressed onto age group indicator variables. The outcome variable equals 100 if the application was rejected by the lender and zero otherwise. In column 1, entropy balancing is applied using credit score, CLTV, DTI, loan amount, and income as the balancing variables and the 70+ age group as the treatment group. In column 2, entropy balancing is applied using credit score, CLTV, DTI, loan amount, income, and non-age demographic variables as the balancing variables and the 70+ age group as the treatment group. Refer to the appendix for a detailed discussion of control variables and variable definitions. Heteroskedasticity-robust standard errors are clustered at the lender level. *, **, and *** denote 10%, 5%, and 1% statistical significance levels, respectively. Data source: cHMDA.

	(1)	(2)
30 – 39	0.21*** [0.06]	0.21*** [0.06]
40 – 49	0.71*** [0.07]	0.70*** [0.07]
50 – 59	1.15*** [0.13]	1.16*** [0.13]
60 – 69	1.20*** [0.17]	1.27*** [0.17]
70+	2.41*** [0.31]	2.45*** [0.32]
Balancing variables	Credit	Credit + demographics
Race and gender controls	Y	Y
Application characteristic controls	Y	Y
Tract × year-month × loan purpose FE	Y	Y
Lender × year-month × loan purpose FE	Y	Y
AUS decision × loan purpose FE	Y	Y
Observations	5,608,342	5,608,332
R-squared	0.74	0.74

Table A5: Age, Sex, and Mortgage Application Rejection

This table reports OLS regression results where mortgage application rejection indicator variable is regressed on borrower age and its interaction with Female and 70+ indicator variables. The outcome variable equals 100 if the application was rejected by the lender and zero otherwise. The sample is composed of mortgage applications where the applicant is either male or female. Refer to the appendix for a detailed discussion of control variables and variable definitions. Heteroskedasticity-robust standard errors are clustered at the lender level. *, **, and *** denote 10%, 5%, and 1% statistical significance levels, respectively. Data source: cHMDA.

	(1)	(2)
Age	0.06*** [0.01]	0.05*** [0.01]
Age × 70+	0.18*** [0.05]	0.15*** [0.04]
Age × Female	-0.02*** [0.00]	-0.02*** [0.00]
Age × Female × 70+	-0.12*** [0.04]	-0.11*** [0.04]
70+ × Female	8.25*** [2.97]	7.98*** [2.64]
70+	-12.39*** [3.14]	-10.90*** [2.92]
Female	0.45*** [0.12]	0.56*** [0.13]
Race and gender controls	Y	Y
Application characteristic controls	Y	Y
Tract × year-month × loan purpose FE	Y	Y
Lender × year-month × loan purpose FE		Y
AUS decision × loan purpose FE		Y
Observations	5,224,319	5,167,177
R-squared	0.38	0.46

Table A6: Indirect Test for Age Discrimination in Mortgage Application Rejection

This table reports OLS regression results where mortgage application rejection indicator variable is regressed on age group indicator variables and their interaction terms with market and lender characteristic indicator variables. The outcome variable equals 100 if the application was rejected by the lender and zero otherwise. The interaction variable in column 1 is the HHI calculated at the tract level using all HMDA mortgages originated during the sample period. The interaction variable in column 2 is the county-level HHI. The interaction variable in column 3 is the state-level implicit age bias score from Giasson and Chopik (2020). The interaction variable in column 4 is the indicator variable for fintech lender as defined by Jagtiani et al. (2021). Refer to the appendix for a detailed discussion of control variables and variable definitions. Heteroskedasticity-robust standard errors are clustered at the lender level. *, **, and *** denote 10%, 5%, and 1% statistical significance levels, respectively. Data source: cHMDA.

	(1)	(2)	(3)	(4)
30 – 39	0.33*** [0.05]	0.24*** [0.07]	0.71 [0.63]	0.31*** [0.05]
40 – 49	0.86*** [0.08]	0.90*** [0.10]	-1.48* [0.81]	0.79*** [0.07]
50 – 59	1.28*** [0.14]	1.25*** [0.14]	-3.41*** [1.07]	1.07*** [0.08]
60 – 69	1.62*** [0.21]	1.62*** [0.22]	1.01 [1.38]	1.16*** [0.13]
70+	2.40*** [0.44]	2.58*** [0.44]	1.18 [2.01]	1.64*** [0.27]
30 – 39 × Interaction variable	-0.01 [0.01]	0.01 [0.02]	-0.97 [1.40]	-0.19 [0.12]
40 – 49 × Interaction variable	-0.02* [0.01]	-0.04** [0.02]	5.07*** [1.81]	0.04 [0.22]
50 – 59 × Interaction variable	-0.02* [0.01]	-0.02 [0.03]	10.29*** [2.30]	0.91*** [0.22]
60 – 69 × Interaction variable	-0.05*** [0.01]	-0.07** [0.03]	0.94 [2.86]	1.68*** [0.51]
70+ × Interaction variable	-0.03 [0.02]	-0.11*** [0.04]	2.49 [4.05]	3.64*** [1.21]
Interaction variable	Tract HHI	County HHI	Age bias	Fintech
Race and gender controls	Y	Y	Y	Y
Application characteristic controls	Y	Y	Y	Y
Tract × year-month × loan purpose FE	Y	Y	Y	Y
Lender × year-month × loan purpose FE	Y	Y	Y	Y
AUS decision × loan purpose FE	Y	Y	Y	Y
Observations	5,668,151	5,668,151	5,666,501	5,668,151
R-squared	0.46	0.46	0.46	0.46

Table A7: Age and Mortgage Application Rejection – Refinance Only

This table reports OLS regression results where actual and AUS rejection indicator variable is regressed onto age group indicator variables. The sample includes only refinance applications. Refer to the appendix for a detailed discussion of control variables and variable definitions. Heteroskedasticity-robust standard errors are clustered at the lender level. *, **, and *** denote 10%, 5%, and 1% statistical significance levels, respectively. Data source: cHMDA.

	(1)	(2)	(3)	(4)
	Rejected	Rejected	AUS rejected	AUS rejected
30 – 39	0.00 [0.10]	0.54*** [0.11]	-0.07 [0.11]	0.12 [0.08]
40 – 49	1.22*** [0.15]	1.14*** [0.15]	0.18 [0.13]	0.19*** [0.07]
50 – 59	2.57*** [0.29]	1.72*** [0.26]	0.36** [0.16]	0.24*** [0.07]
60 – 69	3.48*** [0.54]	2.32*** [0.37]	0.21 [0.19]	0.09 [0.14]
70+	5.39*** [1.05]	3.85*** [0.66]	0.20 [0.26]	-0.07 [0.29]
Race and gender controls		Y		Y
Application characteristic controls		Y		Y
Tract × year-month × loan purpose FE		Y		Y
Lender × year-month × loan purpose FE		Y		Y
AUS decision × loan purpose FE		Y		
Observations	2,916,729	2,195,227	2,916,729	2,195,227
R-squared	0.00	0.47	0.00	0.45

Table A8: Age and Assistance with Mortgage Application

This table reports OLS regression results where various measures of assistance with mortgage application are regressed onto age group indicator variables. In column 1, the outcome variable equals 100 if the respondent used a mortgage broker for the mortgage under consideration and zero otherwise. In column 2, the outcome variable equals 100 if the respondent has a co-signer on the mortgage under consideration and zero otherwise. In column 3, the outcome variable equals 100 if the respondent received monetary gifts from family and friends to assist with the mortgage application and zero otherwise. Refer to the appendix for a detailed discussion of control variables. Heteroskedasticity-robust standard errors are reported. *, **, and *** denote 10%, 5%, and 1% statistical significance levels, respectively. Data sources: NSMO.

	(1)	(2)	(3)
	Broker	Co-signer	Gift
30 – 39	3.8 [2.5]	-1.8 [1.4]	-6.4*** [2.4]
40 – 49	9.4*** [2.6]	-1.2 [1.5]	-12.4*** [2.5]
50 – 59	5.4** [2.7]	-2.1 [1.4]	-17.9*** [2.5]
60 – 69	3.4 [2.8]	-1.1 [1.5]	-24.1*** [2.4]
70+	-0.3 [3.3]	-3.9** [1.9]	-26.0*** [2.7]
Race and gender controls	Y	Y	Y
Application characteristic controls	Y	Y	Y
Year-quarter FE	Y	Y	Y
Tract LMI status FE	Y	Y	Y
Observations	8,744	6,367	5,669
R-squared	0.1	0.2	0.2

Table A9: Age and Raw Coupon Rate

This table reports OLS regression results where the raw coupon rate is regressed on age group indicator variables. The dependent variable is the coupon rate on the mortgage reported in basis points. The sample is composed of single-borrower 30-year fixed rate conforming home purchase and refinance mortgages purchased by Fannie Mae or Freddie Mac. Refer to the appendix for a detailed discussion of control variables. Heteroskedasticity-robust standard errors are clustered at the lender level. *, **, and *** denote 10%, 5%, and 1% statistical significance levels, respectively. Data sources: cHMDA.

	(1)	(2)	(3)	(4)	(5)
30 – 39	-1.22*** [0.18]	-0.27** [0.11]	-1.19*** [0.12]	-1.09*** [0.13]	-0.12 [0.09]
40 – 49	-0.09 [0.19]	1.05*** [0.14]	-0.13 [0.12]	-0.05 [0.12]	1.09*** [0.13]
50 – 59	1.80*** [0.18]	2.27*** [0.22]	1.63*** [0.15]	1.61*** [0.13]	2.20*** [0.22]
60 – 69	3.65*** [0.30]	3.26*** [0.32]	3.35*** [0.29]	3.23*** [0.27]	3.14*** [0.33]
70+	6.01*** [0.49]	5.20*** [0.50]	5.61*** [0.49]	5.41*** [0.46]	5.05*** [0.51]
Race and gender controls	Y	Y	Y	Y	Y
LLPA × year-month × GSE FE	Y	Y	Y	Y	Y
Tract FE		Y			
Lender FE			Y		
Lender × year-month FE				Y	
Lender × tract FE					Y
Observations	3,986,073	3,981,701	3,985,994	3,976,639	3,016,582
R-squared	0.88	0.89	0.89	0.91	0.92

Table A10: Age and Coupon Rate – Entropy Balancing

This table reports OLS regression results where various measures of the coupon rate is regressed on age group indicator variables. The sample is composed of single-borrower 30-year fixed rate conforming refinance mortgages purchased by Fannie Mae or Freddie Mac. In columns 1 and 2, entropy balancing is applied using credit score, CLTV, DTI, loan amount, and income as the balancing variables and the 70+ age group as the treatment group. In columns 3 and 4, entropy balancing is applied using credit score, CLTV, DTI, loan amount, income, and non-age demographic variables as the balancing variables and the 70+ age group as the treatment group. Refer to the appendix for a detailed discussion of control variables. Heteroskedasticity-robust standard errors are clustered at the lender level. *, **, and *** denote 10%, 5%, and 1% statistical significance levels, respectively. Data sources: cHMDA.

	(1)	(2)	(3)	(4)
	Raw	Adjusted	Raw	Adjusted
30 – 39	-0.29* [0.15]	-0.29 [0.26]	0.00 [0.17]	0.10 [0.25]
40 – 49	0.65*** [0.21]	0.76*** [0.27]	1.05*** [0.23]	1.25*** [0.27]
50 – 59	1.79*** [0.27]	2.42*** [0.37]	2.04*** [0.25]	2.75*** [0.36]
60 – 69	2.87*** [0.32]	4.71*** [0.83]	3.00*** [0.31]	4.99*** [0.82]
70+	3.21*** [0.42]	5.07*** [0.91]	3.71*** [0.43]	5.77*** [1.00]
Balancing variables	Credit	Credit	Credit + demographics	Credit + demographics
Race and gender controls	Y	Y	Y	Y
LLPA × year-month × GSE FE	Y	Y	Y	Y
Lender × tract FE	Y	Y	Y	Y
Observations	2,985,667	2,985,667	2,985,667	2,985,667
R-squared	0.95	0.94	0.95	0.94

Table A11: Age and Raw Coupon Rate Conditional on Ex-Post Performance

This table reports OLS regression results where raw coupon rate is regressed on age group indicator variables. The sample is composed of single-borrower 30-year fixed rate conforming home purchase and refinance mortgages purchased by Fannie Mae or Freddie Mac. Refer to the appendix for a detailed discussion of control variables. Heteroskedasticity-robust standard errors are clustered at the tract level. *, **, and *** denote 10%, 5%, and 1% statistical significance levels, respectively. Data sources: cHMDA, McDash, and CRISM.

	(1)	(2)	(3)	(4)
30 – 39	-1.25*** [0.11]	-1.23*** [0.11]	-1.17*** [0.10]	-1.15*** [0.11]
40 – 49	-0.11 [0.13]	-0.03 [0.14]	-0.39*** [0.12]	-0.28** [0.13]
50 – 59	2.30*** [0.15]	2.44*** [0.15]	1.56*** [0.12]	1.72*** [0.12]
60 – 69	4.69*** [0.19]	4.89*** [0.19]	3.41*** [0.17]	3.64*** [0.17]
70+	7.33*** [0.25]	7.50*** [0.25]	5.57*** [0.23]	5.78*** [0.23]
30+ days delinquent		0.03*** [0.00]		0.02*** [0.00]
60+ days delinquent		0.01 [0.00]		0.01 [0.00]
90+ days delinquent		0.00 [0.00]		0.00 [0.00]
Defaulted		0.11*** [0.01]		0.09*** [0.01]
Prepaid		0.02*** [0.00]		0.02*** [0.00]
Race and gender controls	Y	Y	Y	Y
LLPA × year-month × GSE FE	Y	Y	Y	Y
Tract × year-month FE			Y	Y
Observations	799,301	799,301	778,284	778,284
R-squared	0.77	0.77	0.79	0.79

Table A12: Age and Upfront Costs – Entropy Balancing

This table reports OLS regression results where net upfront cost and lender credit are regressed on age group indicator variables. In columns 1 and 2, entropy balancing is applied using credit score, CLTV, DTI, loan amount, and income as the balancing variables and the 70+ age group as the treatment group. In columns 3 and 4, entropy balancing is applied using credit score, CLTV, DTI, loan amount, income, and non-age demographic variables as the balancing variables and the 70+ age group as the treatment group. Refer to the appendix for a detailed discussion of control variables. Heteroskedasticity-robust standard errors are reported. *, **, and *** denote 10%, 5%, and 1% statistical significance levels, respectively. Data sources: cHMDA.

	(1)	(2)	(3)	(4)
	Net cost	Lender credit	Net cost	Lender credit
30 – 39	0.66*** [0.17]	-0.38*** [0.13]	0.66*** [0.16]	-0.46*** [0.11]
40 – 49	1.19*** [0.24]	-1.23*** [0.17]	1.30*** [0.24]	-1.23*** [0.16]
50 – 59	1.63*** [0.29]	-1.42*** [0.22]	1.74*** [0.29]	-1.31*** [0.20]
60 – 69	2.66*** [0.41]	-1.87*** [0.29]	2.67*** [0.42]	-1.84*** [0.30]
70+	3.23*** [0.43]	-2.24*** [0.30]	3.68*** [0.47]	-2.23*** [0.31]
Balancing variables	Credit	Credit	Credit + demographics	Credit + demographics
Race and gender controls	Y	Y	Y	Y
Application characteristic controls	Y	Y	Y	Y
Tract × year-month × loan purpose FE	Y	Y	Y	Y
Lender × year-month × loan purpose FE	Y	Y	Y	Y
Observations	4,974,514	5,036,189	4,974,505	5,036,180
R-squared	0.91	0.73	0.91	0.72

Table A13: Age and Cost Consciousness

This table reports OLS regression results where various measures of cost consciousness are regressed onto age group indicator variables. Outcome variables in columns 1 through 4 are indicator variables that equal 100 if the respondent stated that the attribute is an important reason for why the respondent took out the mortgage in question and zero otherwise. The outcome variable in column 5 is an indicator variable that equals 100 if the respondent stated that he or she “checked other sources to confirm that the terms of this mortgage were reasonable” and zero otherwise. Refer to the appendix for a detailed discussion of control variables. Heteroskedasticity-robust standard errors are reported. *, **, and *** denote 10%, 5%, and 1% statistical significance levels, respectively. Data sources: NSMO.

	(1)	(2)	(3)	(4)	(5)
	Lower rate	Lower APR	Lower fee	Lower monthly	Asked others
30 – 39	1.3 [0.8]	3.5** [1.7]	1.8 [2.0]	0.5 [1.9]	-2.0 [2.9]
40 – 49	1.6** [0.8]	4.3** [1.8]	4.3** [2.0]	-0.6 [2.0]	-5.0 [3.1]
50 – 59	0.7 [0.8]	3.6* [1.8]	6.3*** [2.1]	0.9 [2.0]	-8.5*** [3.2]
60 – 69	1.1 [0.9]	2.1 [1.9]	4.7** [2.2]	0.2 [2.1]	-7.2** [3.3]
70+	-1.0 [1.1]	-3.6 [2.4]	-1.2 [2.6]	-4.3* [2.6]	-12.9*** [3.8]
Race and gender controls	Y	Y	Y	Y	Y
Application characteristic controls	Y	Y	Y	Y	Y
Year-quarter FE	Y	Y	Y	Y	Y
Tract LMI status FE	Y	Y	Y	Y	Y
Observations	8,744	8,744	8,744	8,744	6,367
R-squared	0.1	0.1	0.1	0.1	0.1

Table A14: Age and Points-Adjusted Coupon Rate – Refinance Only

This table reports OLS regression results where the points-adjusted coupon rate is regressed on age group indicator variables. The dependent variable is the points-adjusted coupon rate on the mortgage reported in basis points. Following Bartlett et al. (2022), each net point is worth 25 bps of coupon rate. Net points is defined as the dollar amount of points purchased minus the dollar amount of lender credits, all divided by the total loan amount. One percent of the loan amount equals one point. The sample is composed of single-borrower 30-year fixed rate conforming home purchase and refinance mortgages purchased by Fannie Mae or Freddie Mac. Refer to the appendix for a detailed discussion of control variables. Heteroskedasticity-robust standard errors are clustered at the lender level. *, **, and *** denote 10%, 5%, and 1% statistical significance levels, respectively. Data sources: cHMDA.

	(1)	(2)	(3)	(4)	(5)
30 – 39	-2.09*** [0.36]	-0.04 [0.32]	-2.31*** [0.27]	-2.19*** [0.26]	-0.66*** [0.17]
40 – 49	-0.99 [0.64]	1.93*** [0.67]	-1.73*** [0.31]	-1.65*** [0.29]	0.60 [0.40]
50 – 59	2.23** [1.12]	4.52*** [1.14]	0.56 [0.51]	0.54 [0.49]	2.45*** [0.80]
60 – 69	6.87*** [2.12]	7.69*** [1.83]	4.03*** [1.30]	3.93*** [1.29]	4.88*** [1.37]
70+	11.53*** [2.84]	11.68*** [2.38]	7.54*** [1.92]	7.51*** [1.92]	7.90*** [1.91]
Race and gender controls	Y	Y	Y	Y	Y
LLPA × year-month × GSE FE	Y	Y	Y	Y	Y
Tract FE		Y			
Lender FE			Y		
Lender × year-month FE				Y	
Lender × tract FE					Y
Observations	1,762,060	1,751,680	1,761,944	1,751,512	1,164,334
R-squared	0.75	0.78	0.8	0.82	0.87

Table A15: Age and Upfront Costs – Refinance Only

This table reports OLS regression results where various measures of upfront costs are regressed on age group indicator variables. The dependent variable in column 1 is total upfront cost, closing costs plus discount points, expressed as basis points of loan amount. The dependent variable in column 2 is the amount of discount points that the borrower purchased, expressed as basis points of loan amount. The dependent variable in column 3 is total upfront cost minus discount points, expressed as basis points of loan amount. The dependent variable in column 4 is the amount of lender credit that the borrower received, expressed as basis points of loan amount. Refer to the appendix for a detailed discussion of control variables. Heteroskedasticity-robust standard errors are reported. *, **, and *** denote 10%, 5%, and 1% statistical significance levels, respectively. Data sources: cHMDA.

	(1)	(2)	(3)	(4)
	Total cost	Points	Net cost	Lender credit
30 – 39	4.48*** [0.65]	3.83*** [0.52]	0.58** [0.24]	-0.78*** [0.18]
40 – 49	7.05*** [1.25]	5.82*** [0.99]	1.12*** [0.34]	-2.14*** [0.33]
50 – 59	8.77*** [1.68]	7.38*** [1.43]	1.27*** [0.44]	-2.52*** [0.43]
60 – 69	13.00*** [2.26]	10.76*** [1.92]	1.97*** [0.55]	-3.21*** [0.59]
70+	17.39*** [3.08]	14.27*** [2.67]	2.65*** [0.75]	-3.61*** [0.77]
Race and gender controls	Y	Y	Y	Y
Application characteristic controls	Y	Y	Y	Y
Tract × year-month × loan purpose FE	Y	Y	Y	Y
Lender × year-month × loan purpose FE	Y	Y	Y	Y
AUS decision × loan purpose FE	Y	Y	Y	Y
Observations	1,890,571	1,908,494	1,890,571	1,908,494
R-squared	0.69	0.52	0.72	0.45

Table A16: Indirect Test for Age Discrimination in Points-Adjusted Coupon Rate

This table reports OLS regression results where the points-adjusted coupon rate is regressed on age group indicator variables. The dependent variable is the points-adjusted coupon rate on the mortgage reported in basis points. Following Bartlett et al. (2022), each net point is worth 25 bps of coupon rate. Net points is defined as the dollar amount of points purchased minus the dollar amount of lender credits, all divided by the total loan amount. One percent of the loan amount equals one point. The interaction variable in column 1 is the HHI calculated at the tract level using all HMDA mortgages originated during the sample period. The interaction variable in column 2 is the the county-level HHI. The interaction variable in column 3 is the state-level implicit age bias score from Giasson and Chopik (2020). The interaction variable in column 4 is the indicator variable for fintech lender as defined by Jagtiani et al. (2021). The sample is composed of single-borrower 30-year fixed rate conforming home purchase and refinance mortgages purchased by Fannie Mae or Freddie Mac. Refer to the appendix for a detailed discussion of control variables and variable definitions. Heteroskedasticity-robust standard errors are clustered at the lender level. *, **, and *** denote 10%, 5%, and 1% statistical significance levels, respectively. Data source: cHMDA.

	(1)	(2)	(3)	(4)
30 – 39	-0.06 [0.21]	-0.12 [0.26]	6.10*** [1.95]	0.12 [0.22]
40 – 49	1.40*** [0.29]	1.41*** [0.39]	5.02** [2.22]	1.28*** [0.31]
50 – 59	3.08*** [0.52]	3.31*** [0.61]	0.27 [2.54]	2.33*** [0.36]
60 – 69	5.23*** [0.94]	5.53*** [1.13]	-5.35* [2.89]	3.68*** [0.52]
70+	8.43*** [1.34]	8.70*** [1.63]	-4.54 [3.57]	5.78*** [0.81]
30 – 39 × Interaction variable	0.01 [0.02]	0.04 [0.06]	-13.68*** [4.51]	-0.13 [0.65]
40 – 49 × Interaction variable	0.01 [0.03]	0.01 [0.07]	-8.05 [5.13]	1.22 [1.20]
50 – 59 × Interaction variable	-0.01 [0.03]	-0.09 [0.06]	6.21 [6.23]	3.50** [1.76]
60 – 69 × Interaction variable	0.00 [0.03]	-0.11 [0.09]	23.62*** [7.25]	6.42*** [2.28]
70+ × Interaction variable	-0.10** [0.04]	-0.25** [0.12]	28.00*** [8.34]	8.60*** [2.76]
Interaction variable	Tract HHI	County HHI	Age bias	Fintech
Race and gender controls	Y	Y	Y	Y
LLPA × year-month × GSE FE	Y	Y	Y	Y
Lender × tract FE	Y	Y	Y	Y
Observations	3,016,582	3,016,582	3,014,810	3,016,582
R-squared	0.91	0.91	0.91	0.91