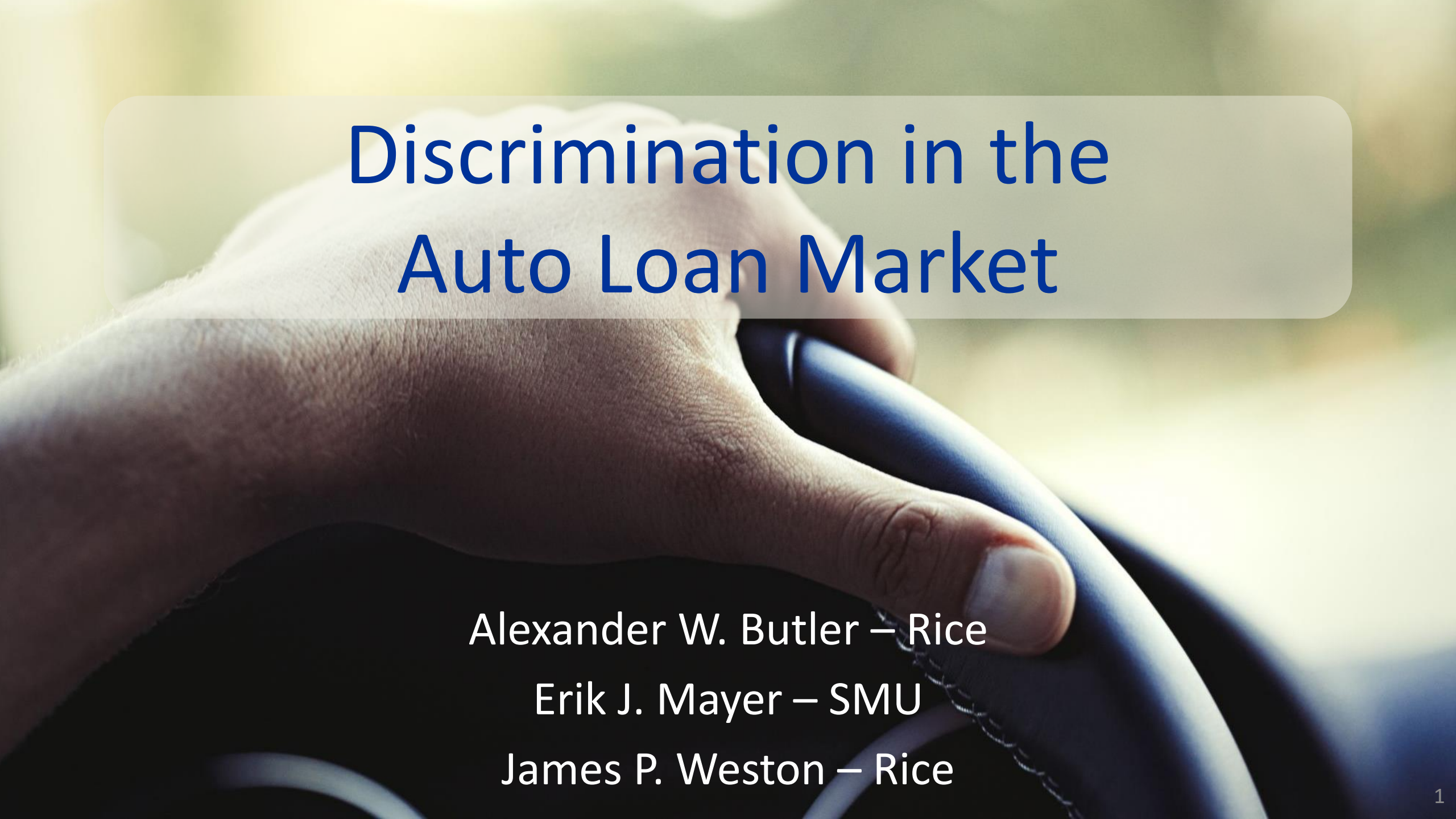


Discrimination in the Auto Loan Market

Alexander W. Butler – Rice

Erik J. Mayer – SMU

James P. Weston – Rice

Defining Lending Discrimination

- Taste-based discrimination (Becker (1957, 1993)):

  Lenders forgo some profitable contracts with minorities due to prejudice/bias

  → Loans to ***marginal*** minority borrowers generate more profits than loans to marginal whites

<u>Need to distinguish this from:</u>

- Omitted variable bias:

  Minority status may be correlated with factors that lower creditworthiness… which lenders see, but econometricians do not

- Statistical discrimination (Phelps (1972)):

  Lenders max profits by using race as a proxy for info that is unobservable (even to them) or costly to obtain… i.e. use beliefs about minorities *on average* as a stand-in for info about the *individual*

Testing for Lending Discrimination

Approach 1: Do minorities have lower credit approval rates?

- OVB may work in favor of finding discrimination
- Lower approval rates for minorities could reflect statistical discrimination

Approach 2: Do minorities pay higher interest rates?

- OVB may work in favor of finding discrimination
- Higher rates for minorities could reflect statistical discrimination

Approach 3: Are loans to marginal minority borrowers more profitable?

- Test whether minorities default less, *ceteris paribus*. This "outcome test" (Becker (1957, 1993)) is the clearest test for taste-based discrimination
  - OVB likely works against finding discrimination
  - Statistical discrimination should not generate lower default rates for minorities

What we know about discrimination in other consumer credit markets:

Outside of mortgage lending:

- Minorities face lower approval rates in peer-to-peer lending (Pope and Sydnor (2011))
- Credit card applicants from minority areas face lower approval rates (Cohen-Cole (2011))
- Loans to marginal minority borrowers are more profitable in high cost lending in UK (Dobbie et al. (2019))

Mortgage lending:

- Minorities face lower approval rates (> 20 papers)
- Minorities pay higher interest rates (at least 5 papers)
- Minorities default ***more*** ex post (at least 3 papers)

The contrasting expected biases of these tests generate heated debates.

Studies' settings/samples vary, and the majority look at just one outcome variable.

Why study discrimination in auto lending?

- Most widely used type of installment credit by U.S. households (>100 million consumers)

- Market is less regulated and less transparent than other consumer credit markets
  - May reduce the cost of discriminatory practices
  - Generates concern among regulators
    - 2013 – CFPB issued Special Bulletin, fined Ally Financial $98 million for charging minorities higher interest rates

- We know **alarmingly** little about the existence/prevalence of discrimination in this market

What we know about discrimination in auto lending:

Charles, Hurst, and Stephens (AER P&P 2008)

- Black borrowers pay higher interest rates than whites – estimated 75th percentile is 1.34 percentage points higher

Caveats:

- Based on Survey of Consumer Finances (2,725 white and 320 Black borrowers)
- Data do not contain credit scores
- Can't examine loan approval rates or default rates

Why do we know so little?

Data limitations – auto lenders do not report application/loan level data

We construct a novel dataset to test for lending discrimination.

Credit Bureau Data

- 1% nationally representative panel
- Rich set of financial variables:

  Hard credit checks (loan applications), new lines of credit, credit scores, outstanding debts, delinquencies, major credit events, etc.

Home Mortgage Disclosure Act (HMDA) Data

- Covers 95% of all mortgage applications and loans (only small rural lenders exempt - details)
- Contains borrower demographics:

  Race/ethnicity, sex, income, etc.

We link these databases based on 6 detailed characteristics of originated mortgages

- Match works well - uniquely match 69% of mortgages from credit bureau data, they are broadly representative, and the match is not influenced by race
- Target Population ≈ Homeowners:

  Borrowers taking out a home purchase or refinance loan on their own, for their primary residence, which is in a MSA, from 2010-2016.

We find strong evidence of discrimination in auto lending.

Tests use credit bureau data (demographics added) for panel of 79,000 people (2005-2017)

Minorities…

- Face 1.5 percentage point reduction in credit approval rates… over 80,000 minority credit shopping attempts fail each year due to discrimination
- Pay interest rates 70 basis points higher than comparable white borrowers
- Default ***less***, controlling for borrower and loan characteristics

Results are larger…

- In cases where loan officers have more discretion
- In states where racial biases are more prevalent
- In areas with less competition among lenders

Anti-discrimination Enforcement Policy Analysis:

- A controversial CFPB policy initiated in 2013, but halted in 2018, was effective in reducing unexplained racial disparities in interest rates by nearly 60%

Minority auto loan applicants face lower approval rates.

	Full Sample			Subprime Borrowers	Prime Borrowers	Falsification Test:
	Credit Approval (Auto)	Credit Approval (Auto)	Credit Approval (Auto)	Credit Approval (Auto)	Credit Approval (Auto)	Credit Approval (Credit Card)
	(1)	(2)	(3)	(4)	(5)	(6)
Demographics						
Minority	−4.465***	−1.480***	−1.661***	−2.375***	−0.840***	0.147
	(0.289)	(0.259)	(0.332)	(0.399)	(0.271)	(0.368)
Minority X Hispanic			0.328			
			(0.410)			
R-Squared	0.047	0.085	0.085	0.105	0.047	0.074
Observations	218,300	214,534	214,534	68,494	146,036	124,739

Table 4

Sample: All borrower-years containing auto loan applications in our Matched Panel, 2005-2017

Controls:

Demographics: Sex, Age, Income

Financial Health: Credit Score, Total Debt, Debt to Income Ratio, Past Due Debt

ZIP Code Characteristics: Per Capita Income, Population Density, % Bachelors Degree, % Commute Using Car

State-by-Year FE, and indicators for time relative to the link

Note: Column 1 omits the financial health controls

Where does race have the largest impact on credit approval?

	Credit Approval (Auto) (1)	Credit Approval (Auto) (2)
Minority	−0.906***	−1.268***
	(0.254)	(0.255)
Minority X High Racial Bias State	−1.910***	
	(0.443)	
Minority X Low Banking Competition		−0.728*
		(0.424)
Low Banking Competition		0.214
		(0.207)
R-Squared	0.085	0.085
Observations	214,534	214,534

Table 5

Same sample and controls as previous table.

Racial Biases and Racial Disparities in Credit Approval

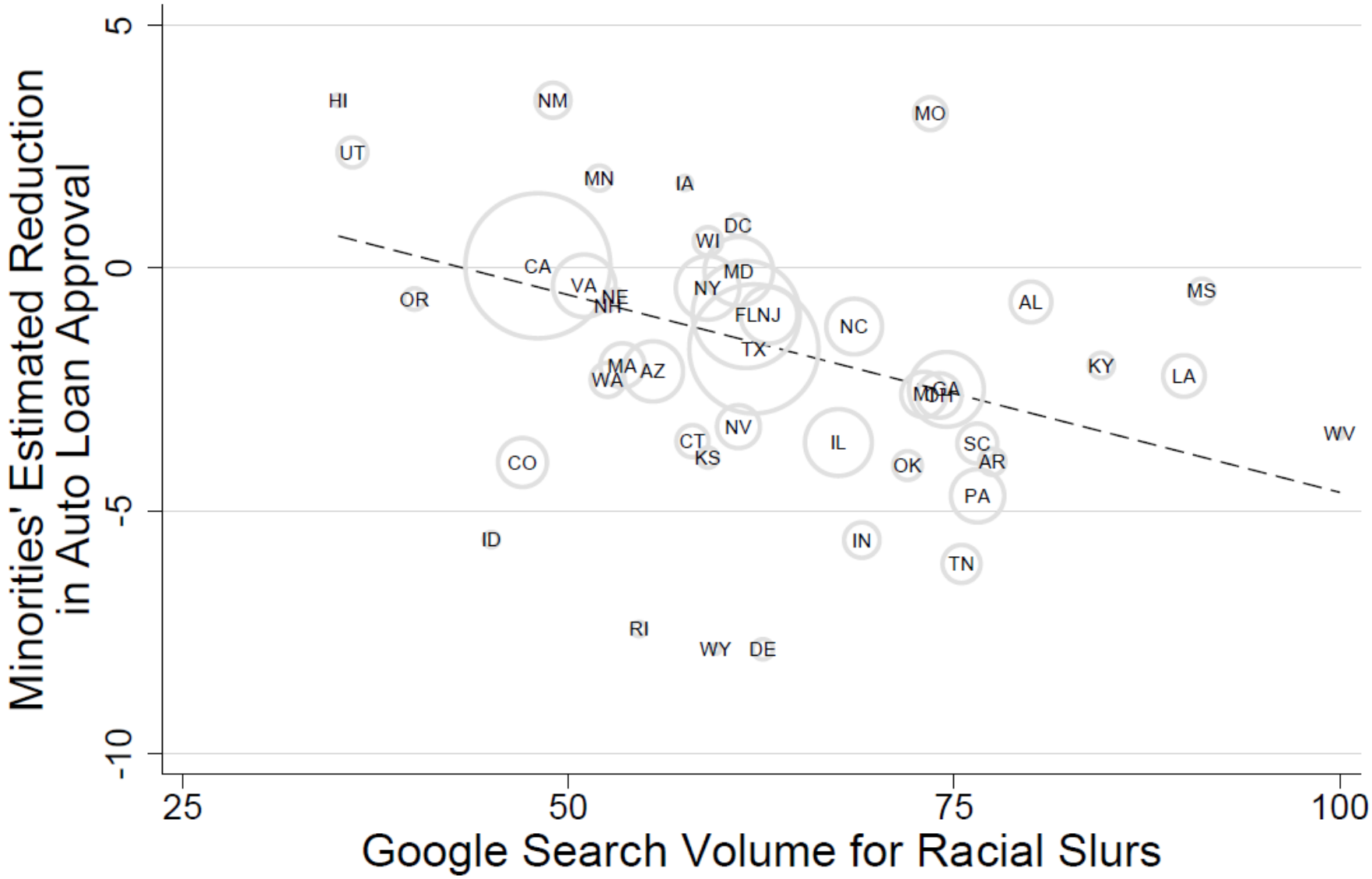


Figure 1

We estimate and plot *State$_i$ x Minority* effects from a regression similar to previous tables.

Correlation between *State$_i$ x Minority* effects and the state's *Racial Slur GSV* is -0.49 (p-value = 0.001)

Where is the evidence of discrimination strongest?

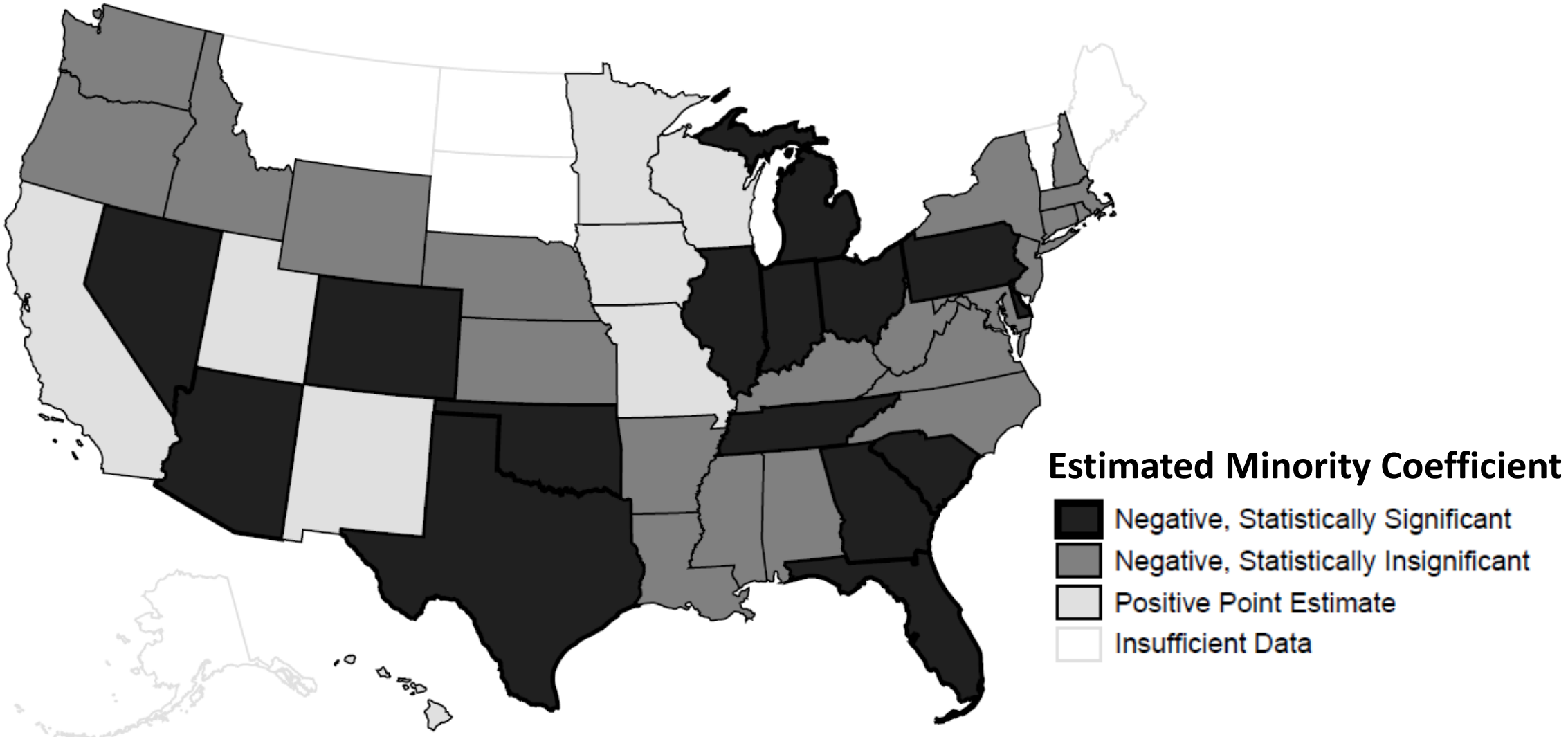


Figure 2

Minorities pay higher interest rates on auto loans than comparable white borrowers.

	APR (1)	APR (2)	APR (3)	APR (4)
Demographics and Interaction Terms				
Minority	1.600***	0.704***	0.442***	0.614***
	(0.169)	(0.117)	(0.084)	(0.110)
Minority X High Racial Bias State			0.805***	
			(0.166)	
Minority X Low Banking Competition				0.293
				(0.208)
Low Banking Competition				0.052
				(0.065)
R-Squared	0.255	0.440	0.441	0.441
Observations	25,531	25,523	25,523	25,523

Table 7

Controls:

New: Loan Term Indicators, Loan Amount, Auto Loan to Income Ratio, Auto Debt Share, Origination Month Indicators

All from Previous Tests: Demographics, Financial Health, ZIP Code Characteristics, State-by-Year FE, and indicators for time relative to the link

Note: Column 1 omits the financial health controls

Taste-based Discrimination?

- We find large racial disparities in credit approval and interest rates
  - But… it's always difficult to fully rule out statistical discrimination or OVB
- The cross-sectional variation in the racial disparities is much more convincing
- Any OVB should cut both ways… if minorities are less creditworthy than the econometric model predicts, they should ***default more***

<u>Becker (1957, 1993) "outcome test":</u>

Test whether loans to ***marginal*** minority borrowers are more profitable than loans to marginal white borrowers… i.e., test whether minorities ***default less***, *ceteris paribus*

Ceteris paribus, minorities ***default less.***

	Full Sample	Subprime Borrowers	Prime Borrowers
	Auto Loan Default	Auto Loan Default	Auto Loan Default
	(1)	(2)	(3)
Demographics			
Minority	−0.237	−2.337**	0.288
	(0.397)	(1.125)	(0.345)
R-Squared	0.096	0.173	0.054
Observations	10,509	2,005	8,480

Table 8

Controls:

New: Auto Loan Interest Rate

All from Previous Tests: Loan Characteristics, Demographics, Financial Health, ZIP Code Characteristics, State-by-Year FE, and indicators for origination month and time relative to the link

Policy Analysis:
In 2013, the CFPB sharply increased anti-discrimination enforcement.

Direct auto lending: apply for loan at a bank, credit union, etc.

Indirect auto lending: car dealership employee helps arrange financing with a third party

- March 2013 – CFPB issued a Special Bulletin warning indirect (non-bank) auto lenders they were liable for interest rate discrimination

- December 2013 – CFPB & DOJ fined Ally Bank $98 million for charging minorities higher interest rates

The CFPB initiative reduced interest rate discrimination by 60%.

	Outcome Var = Auto Loan APR	
	(1)	(2)
Minority	0.838***	0.614***
	(0.132)	(0.205)
Minority X Post	−0.490***	−0.156
	(0.163)	(0.233)
Minority X Post X High Non-Bank Financing		−0.625**
		(0.293)
Minority X High Non-Bank Financing		0.401*
		(0.242)
Post X High Non-Bank Financing		0.021
		(0.150)
High Non-Bank Financing		0.139
		(0.109)
R-Squared	0.398	0.398
Observations	25,523	25,523

Table 9

- Additional APR paid by minorities drops from 84 bps to 35 bps after CFPB oversight
- The reduction in discrimination occurs primarily in areas where non-bank auto lending is prevalent

The CFPB's 2013 enforcement initiative reduced discrimination at the non-bank lenders it targeted.

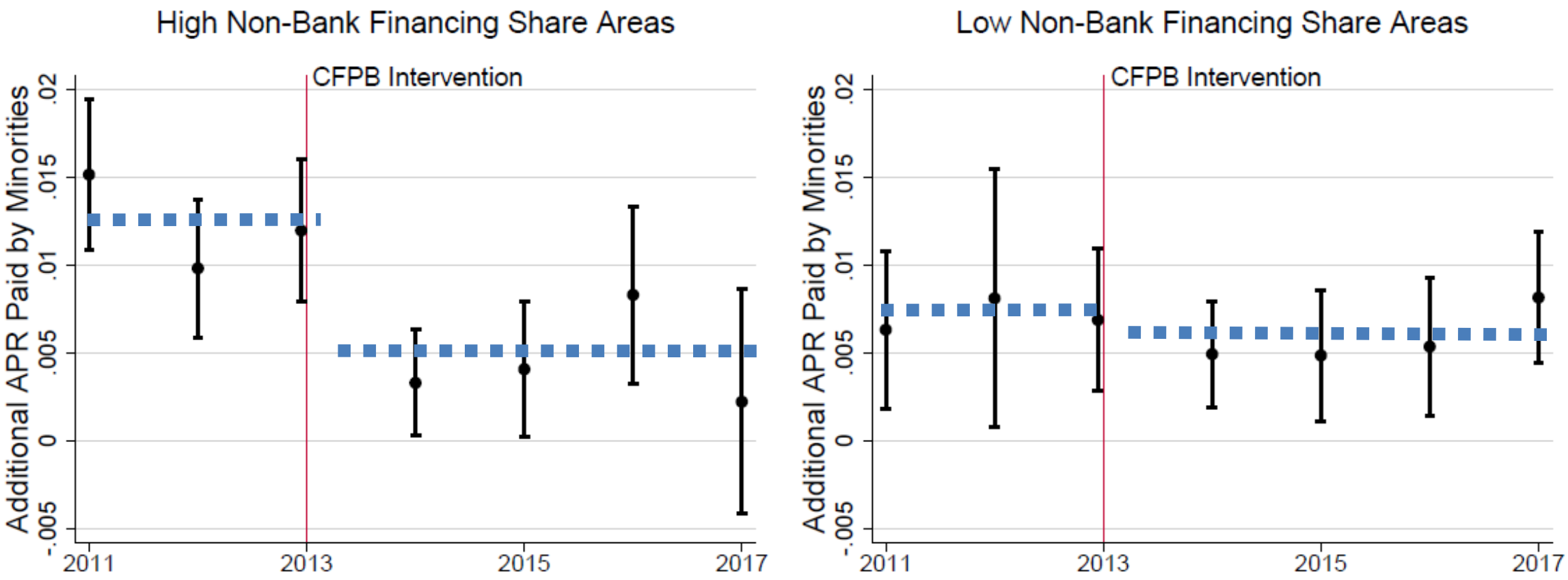


Figure 3

CFPB Oversight

2013 CFPB Initiative:

- Led to a large reduction in the additional APR minorities pay
- Had no effect on approval rates for minorities

- Until now, data limitations prevented an analysis of the CFPB's actions

- CFPB oversight is controversial… the Special Bulletin used to spearhead the anti-discrimination enforcement effort was repealed in 2018

Directions for Future Work

- Continue to rule out specific OVB concerns with targeted robustness tests
- Does anticipated discrimination prevent minorities from applying in the first place?
- Examine the financial trajectories of denied applicants

Thank You!

HMDA Reporting Requirements

Depository Institutions

Report to HMDA if it has at least one branch or office in a MSA, has at least $43 Million in assets (2014 threshold), and originated at least one mortgage in the previous year.

Non-depository Institutions

Report to HMDA if it has assets over $10 million, mortgage originations total at least $25 Million (or represent 10% of their loans), and they receive at least five mortgage applications from borrowers in MSAs.

In other words, only exceptionally small lenders, or those operating exclusively in rural areas can avoid HMDA reporting.

(Return)

Linking Credit Bureau and HMDA Records (1/2)

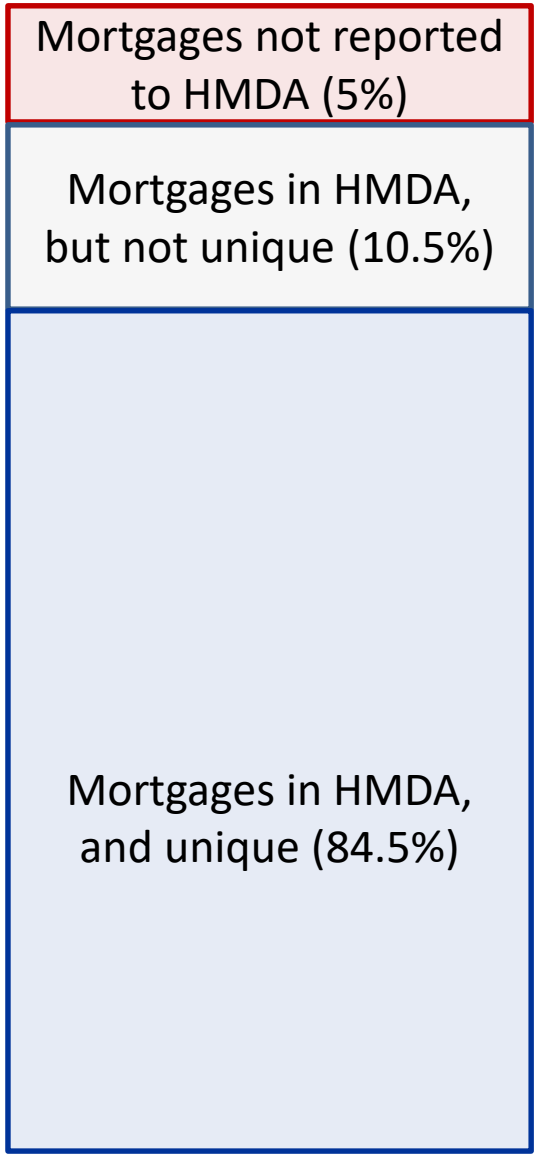
- Both datasets are de-identified (no direct link)
- But… detailed info on <u>originated mortgages</u> is reported in both datasets
- 89% of HMDA mortgages are ***unique*** based on the 6 characteristics below (95% HMDA reporting → 84.5% of all mortgages).

<u>Two potential sources of incorrect links:</u>

1) Data errors – rare since lenders systematically report to both databases
2) Link a credit bureau record for a non-HMDA loan to a HMDA record – this should be rare, random, and just add noise

Mortgages in credit bureau sample (1%)

Census tract
Year
Purchase/refinance
Loan amount
Conventional/FHA/VA
Purchased by Fannie/Freddie



Linking Credit Bureau and HMDA Records (2/2)

To improve the link, and ensure that HMDA borrower demographics match the person exactly (not a co-applicant), we impose filters:

- Must be a solo application
- Must be in a Metropolitan Statistical Area (MSA)
- Borrower's only first-lien / primary residence

<u>Target population:</u>

Borrowers taking out a home purchase or refinance loan on their own, for their primary residence, which is in a MSA, from 2010-2016.

The matching process works well.

- We are able to match 69% of the credit bureau mortgages to HMDA

Panel A: Match Rate			
	Credit Bureau Sample	Matched to HMDA	Match Rate
Home Purchase Mortgages	107,085	66,345	61.96%
Refinance Loans	65,046	52,115	80.12%
All Loans	172,131	118,460	68.82%

Table 1

- Broadly speaking, the matched and unmatched credit bureau mortgages look similar (HP Summary Stats) (Refi Summary Stats)

- Looking at the link from the HMDA perspective, which loans get matched does not depend on race, or the interaction of race and income (Results)

Matched vs. Unmatched Statistics (Home Purchase)

Panel B: Home Purchase Mortgages	Credit Bureau Sample	Matched to HMDA	Unmatched	Matched vs. Unmatched	
	(N = 107,085)	(N = 66,345)	(N = 40,740)	Norm. Diff	t-stat
Match Criteria					
Conventional Loan	0.631	0.623	0.643	-0.03	-4.70
FHA Loan	0.289	0.293	0.283	0.01	2.47
VA Loan	0.080	0.084	0.074	0.03	5.38
Fannie Mae	0.243	0.251	0.231	0.03	5.89
Freddie Mac	0.149	0.158	0.134	0.05	9.98
Loan Amount	192,142	193,758	189,508	0.02	3.99
Non-Match Characteristics					
Credit Score $_{t-1}$	717	719	715	0.04	7.78
Age	42.0	41.1	43.3	-0.12	-21.97
Have Mortgage $_{t-1}$	0.310	0.254	0.401	-0.23	-33.37
Total Debt $_{t-1}$	78,802	66,519	98,895	-0.19	-24.01
Past Due Debt $_{t-1}$	311	283	356	-0.02	-3.43
Auto Debt $_{t-1}$	8,176	8,145	8,227	-0.00	-1.00

(Return)

Matched vs. Unmatched Statistics (Refinance)

Panel C: Refinance Loans	Credit Bureau Sample	Matched to HMDA	Unmatched	Matched vs. Unmatched	
	(N = 65,046)	(N = 52,115)	(N = 12,931)	Norm. Diff	t-stat
Match Criteria					
Conventional Loan	0.815	0.814	0.821	-0.01	-1.85
FHA Loan	0.125	0.125	0.124	0.00	0.27
VA Loan	0.060	0.061	0.055	0.02	2.74
Fannie Mae	0.307	0.308	0.301	0.01	1.49
Freddie Mac	0.202	0.210	0.171	0.07	9.86
Loan Amount	196,062	193,971	204,491	-0.06	-7.21
Non-Match Characteristics					
Credit Score $_{t-1}$	738	738	739	-0.01	-1.04
Age	49.4	49.6	48.7	0.05	7.61
Have Mortgage $_{t-1}$	1.00	1.00	1.00	.	.
Total Debt $_{t-1}$	214,145	212,926	219,054	-0.03	-3.97
Past Due Debt $_{t-1}$	233	229	250	-0.00	-0.62
Auto Debt $_{t-1}$	8,128	8,058	8,409	-0.02	-2.67

(Return)

Does Race Influence the Matching Process?

(Return)

	Full Sample	Home Purchase Mortgages	Refinance Loans
	Matched	Matched	Matched
	(1)	(2)	(3)
Match Criteria			
FHA Loan	0.008	−0.116***	0.005
	(0.006)	(0.008)	(0.010)
VA Loan	0.057***	−0.025**	0.021
	(0.009)	(0.012)	(0.016)
Purchased by Fannie Mae	0.107***	0.212***	0.093***
	(0.005)	(0.010)	(0.006)
Purchased by Freddie Mac	0.130***	0.281***	0.114***
	(0.006)	(0.013)	(0.007)
Log(Loan Amount)	0.026***	−0.016*	−0.003
	(0.005)	(0.009)	(0.006)
Non-Match Characteristics			
Black	−0.157	−0.167	−0.345
	(0.154)	(0.225)	(0.215)
Hispanic	−0.013	−0.320*	0.137
	(0.129)	(0.184)	(0.188)
Black X Log(Income)	0.012	0.012	0.031
	(0.014)	(0.020)	(0.019)
Hispanic X Log(Income)	0.001	0.027	−0.011
	(0.012)	(0.017)	(0.017)
Log(Income)	−0.137***	−0.189***	−0.060***
	(0.004)	(0.008)	(0.005)
Census Tract-by-Year FE	Yes	Yes	Yes
R-Squared	0.022	0.044	0.042
Observations	18,085,605	8,921,824	9,141,794

2010 Snapshot of the Credit Bureau/HMDA Matched Panel

Panel A: 2010 Snapshot	Full Credit Bureau Sample (N = 2,597,877)	Matched Sample (N = 78,932)	White (N = 65,207)	Black (N = 6,338)	Hispanic (N = 7,387)
Credit Score $_{t-1}$	669	707	715	660	678
Age	49.8	42.3	42.6	42.8	39.9
Have Mortgage $_{t-1}$	0.295	0.552	0.577	0.431	0.428
Total Debt $_{t-1}$	67,475	123,552	129,415	92,478	98,034
Past Due Debt $_{t-1}$	1,890	805	654	1,609	1,457
Auto Debt $_{t-1}$	3,665	6,587	6,468	7,161	7,152
Income	.	73,295	75,805	62,686	60,239
Debt to Income $_{t-1}$	.	1.86	1.89	1.54	1.82

(Return)

	Full Sample	White Borrowers	Minority Borrowers	White vs. Minority Borrowers	
	(N = 10,577)	(N = 8,647)	(N = 1,930)	Norm. Diff	t-stat
Demographics					
Female	0.439	0.435	0.459	-0.03	-1.33
Age	44.8	45.2	43.2	0.11	4.47
Income	66,410	68,658	56,337	0.23	7.44
Auto Loan Variables					
Auto Loan Default	0.015	0.011	0.030	-0.09	-3.65
Auto Loan APR	0.055	0.052	0.069	-0.26	-9.86
Auto Loan Amount	21,216	20,928	22,505	-0.11	-5.24
Auto Loan to Income Ratio	0.400	0.380	0.488	-0.29	-11.08
Auto Loan Term (Months)	65.0	64.4	67.6	-0.18	-8.62
Credit Characteristics					
Credit Score $_{t-1}$	727	735	693	0.40	15.09
Total Debt $_{t-1}$	146,982	150,974	129,096	0.14	4.27
Debt to Income $_{t-1}$	2.430	2.424	2.456	-0.01	-0.44
Past Due Debt $_{t-1}$	199	138	472	-0.18	-6.68
Auto Debt Share	0.162	0.160	0.172	-0.04	-3.63
ZIP Code Characteristics					
Personal Income Per Capita	30,957	31,984	26,360	0.40	7.06
Population Density	2,550	2,270	3,804	-0.30	-4.40
Bachelors Degree	0.326	0.339	0.267	0.34	6.72
Commute Using Car	0.890	0.893	0.879	0.11	1.70

Summary Statistics on Auto Loans in the Matched Panel (2011-2015)

(Return)