

CONSUMER-LENDING DISCRIMINATION IN THE FINTECH ERA

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Setting: Household debt

- Latinx & African-American ethnic groups hold \$2.25 trillion of the \$13 trillion of U.S. household debt. (Most is housing debt – our focus.)
 - Any interest rate discrimination is material:
 - A 1 basis point (0.01%) higher mortgage rate => minorities pay \$160 million extra in interest per year
 - Any rejection rate discrimination is material: In 2017, homeownership rates:
 - Majority ethnicities (72.4%), Latinx (48.4%), African-American (43.0%)
 - If any of this disparity is due to discrimination => welfare inequalities caused by financial services

Our goal

When we started this project...

- Wanted to estimate discrimination
- Also wanted to understand what fin-technology means for discrimination going forward
 - Platforms: Quicken, largest GSE counterparty by volume
 - Non-platforms: Of 2,098 largest issuers, 945 were fully algorithmic by 2018
- Ex ante: Unclear whether technology lessens discrimination:
 - Platforms remove loan officer biases from face-to-face interaction
 - But platforms increasingly use more data in statistical discrimination
 - Fuster, Goldsmith-Pinkham, Ramadorai, and Walther (2018): Machine-learning results in differential loan provision to minority borrowers.

What we do

- Establish an economic basis for the legal “standard of proof”.
 - In an era of Big Data, how can a court distinguish between legitimate and illegitimate discrimination?
 - Disparate treatment vs. disparate impact
- Estimate level of ethnic discrimination (if any) and by whom
 - Study mortgages to address the two empirical challenges of data and identification
 - Identification aided by pricing rules of Fannie Mae and Freddie Mac
 - Allows us to avoid “omitted-variable” problem.

Legal Standard

Two U.S. Federal statutes prohibit discrimination in mortgage processes

- Fair Housing Act of 1968 (FHA)
- Equal Credit Opportunity Act of 1974 (ECOA)

Issue is not the statutes, but how to implement them in the courts.

Legal Standard

- Imagine a lender cannot see wealth
- **Court:** Lenders can use proxy variables (read: Big Data)...
 1. Proxies are allowable:
 - If lender can show that these variables have a *legitimate business necessity*.
 - where *legitimate business necessity* is the act of scoring credit risk.
 2. Proxies are not allowable:
 - If variables are used for other purposes, including a lender's efforts to earn higher *markup above costs* on a minority group

Outcomes of discrimination

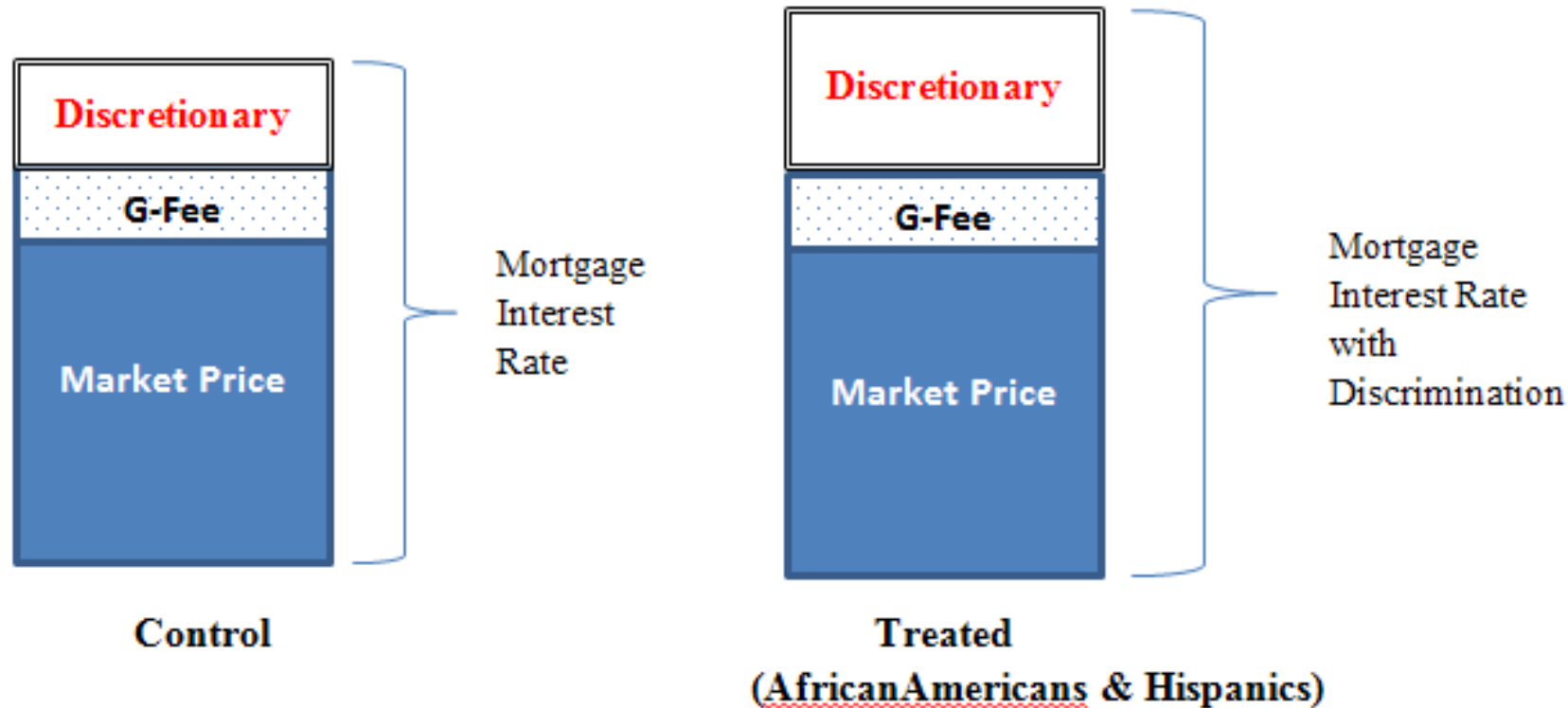
I. Pricing Decisions

II. Accept/Reject Decisions

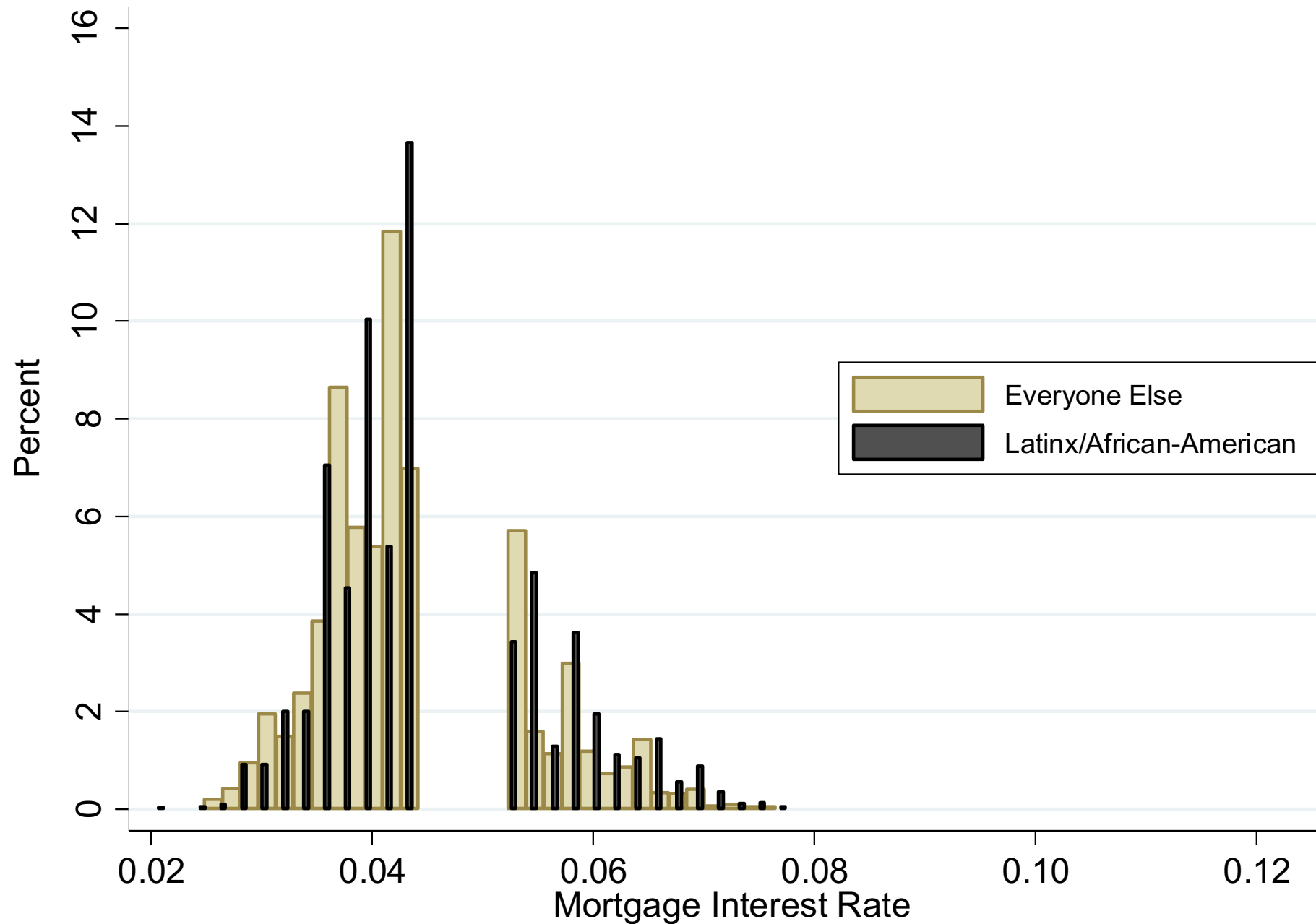
GSEs help on Identification: Pricing of Loan

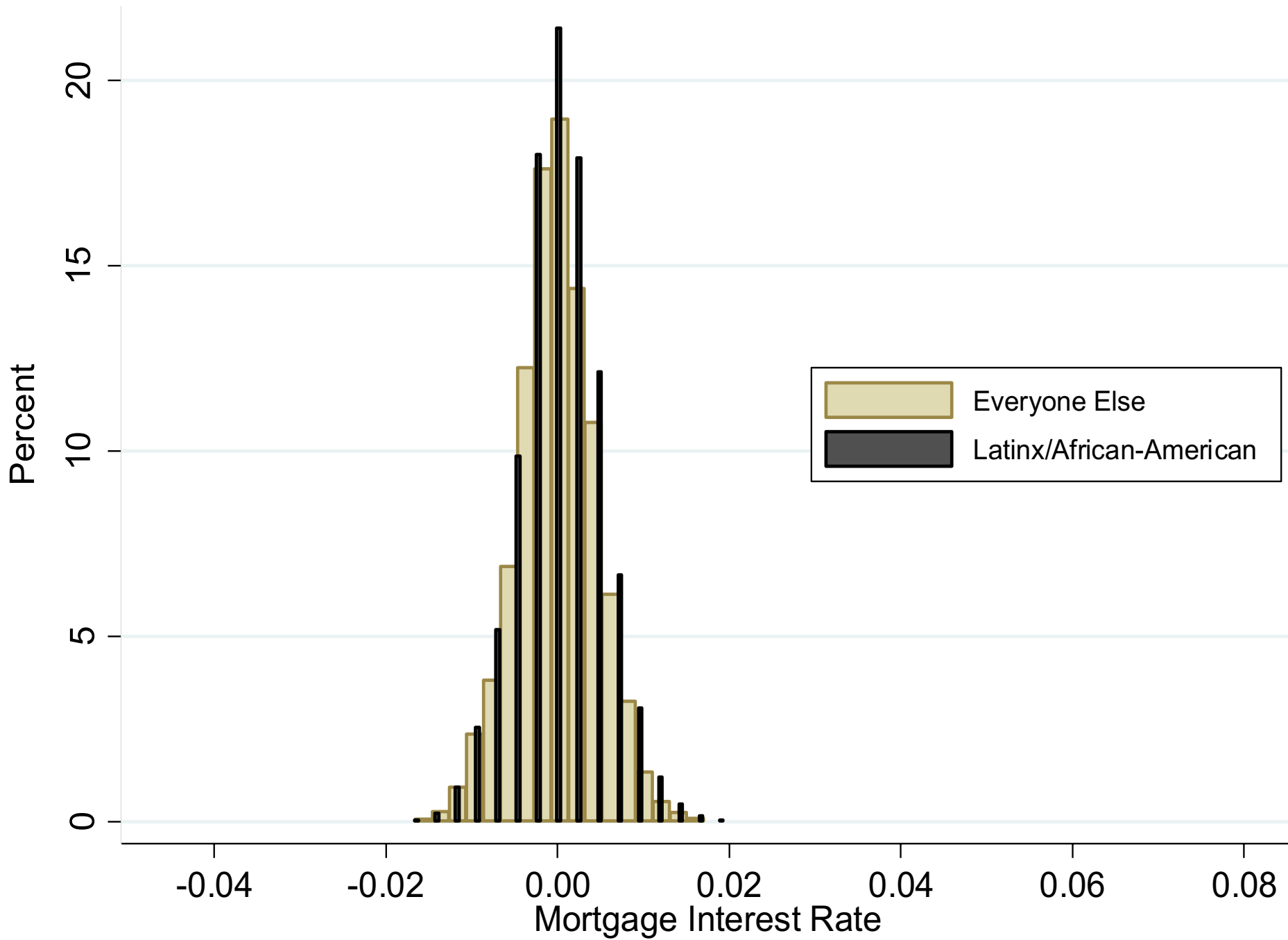
Interest rate pricing

- = Market rate
- + Expected cost of default
(credit risk= G-Fee)
- + Discretionary part for
lender profits & strategic
incentives



Raw Interest Rates





**Interest Rates
Adjusted
for GSE
Grid**

Data

- Focus on mortgages – because HMDA has ethnicity
 - Focus on 30-year fixed for comparability & conforming for GSE process
- Datasets (2008–2015):
 - **HMDA**- ethnicity and income local geography but not address
 - **ATTOM** – origination, performance and exact location
 - **McDash** – detailed contract terms and performance
 - **Equifax** – consumer debt
- Merge using performance strings

Pricing Results

Interest Rate Discrimination

Dependent Variable: Mortgage Interest Rate

	Purchase Mortgages		Refinance Mortgages	
	(1)	(2)	(3)	(4)
Latinx/African-Americans	0.000903*** [0.000101]	0.000792*** [3.09e-05]	0.000299*** [7.96e-05]	0.000356*** [2.96e-05]
Observations	1,480,186	1,480,186	2,068,453	2,068,271
R-squared	0.003	0.729	0.000	0.693
Year-Month FE	N	Y	N	Y
GSE Grid FE	N	Y	N	Y

- Minorities pay 9 basis points (bps) more in purchase interest rates. (3bps in refis)
 - Incorporating the credit risk model (time differences and GSE grid effects = R-square >0.70) discrimination remains.
- Discrimination: 7.92 bps in purchases, 3.56 in refis
 - Is 7.92 bps worth talking about?
 - Mortgage Bankers Association: **Average mortgage makes 50 bps in profit.**
 - **Together, \$748 million more interest paid by minorities annually on existing stock of mortgages**

Interest Rate Discrimination – Issuances by FinTechs

Dependent Variable: Mortgage Interest Rate

	Purchase Mortgages		Refinance Mortgages	
	FinTech	FinTech + Algorithm	FinTech	FinTech + Algorithm
Latinx/African-Americans	0.000534*** [4.36e-05]	0.000680*** [5.50e-05]	0.000200** [6.34e-05]	0.000249*** [3.08e-05]
Observations	41,832	354,680	110,870	348,833
R-squared	0.731	0.607	0.707	0.65
Year-Month FE	Y	Y	Y	Y
GSE Grid FE	Y	Y	Y	Y

- FinTechs & Algorithm-Based Lenders Discriminate almost as much as traditional lenders
 - FinTechs cannot see borrowers.
 - Thus, it must be that the algorithms build in discrimination into their pricing strategies. Even if unintentional, this is still illegal.
 - Pricing for low shopping behavior, financial deserts, etc... correlated with ethnicity

Omitted Variables - Costs vs Profit Margins

Which costs?

1. Geography: It could be that locations in areas with higher minority populations involve higher costs
2. Lender: It could be that lenders servicing more minorities have higher fixed costs

Interest Rate Discrimination: Results in Purchase Mortgages

Robustness: Costs may vary by geography or by fixed cost of lender

Dependent Variable: Mortgage Interest Rate				
Latinx/African-Americans	0.000792*** [3.09e-05]	0.000701*** [2.37e-05]	0.000552*** [2.76e-05]	0.000525*** [3.33e-05]
Observations	1,480,186	1,480,170	1,478,947	1,453,606
R-squared	0.729	0.733	0.747	0.758
Year-Month FE	Y	Y	Y	Y
GSE Grid FE	Y	Y	Y	Y
County FE	N	Y	Y	N
Lender FE	N	N	Y	N
County-Lender FE	N	N	N	Y

- Of the nearly 7.9 bps of potential discrimination
 - 0.9 bps might be due to varying location costs,
 - 1.5 bps might be due to varying lender fixed costs
 - **5.25 bps of discrimination is robust (probably more)**
 - Follow-up work: **“The geography of discrimination”**.
 - Our view: what we are identifying is monopoly rent-seeking in financial deserts and other communities known for low shopping. Not allowed under court ruling.

Omitted Variables - Costs vs Profit Margins

Robustness

1. Geography: It could be that locations in areas with higher minority populations involve higher costs
2. Lender: It could be that lenders servicing more minorities have higher fixed costs
3. Servicing costs
4. Points

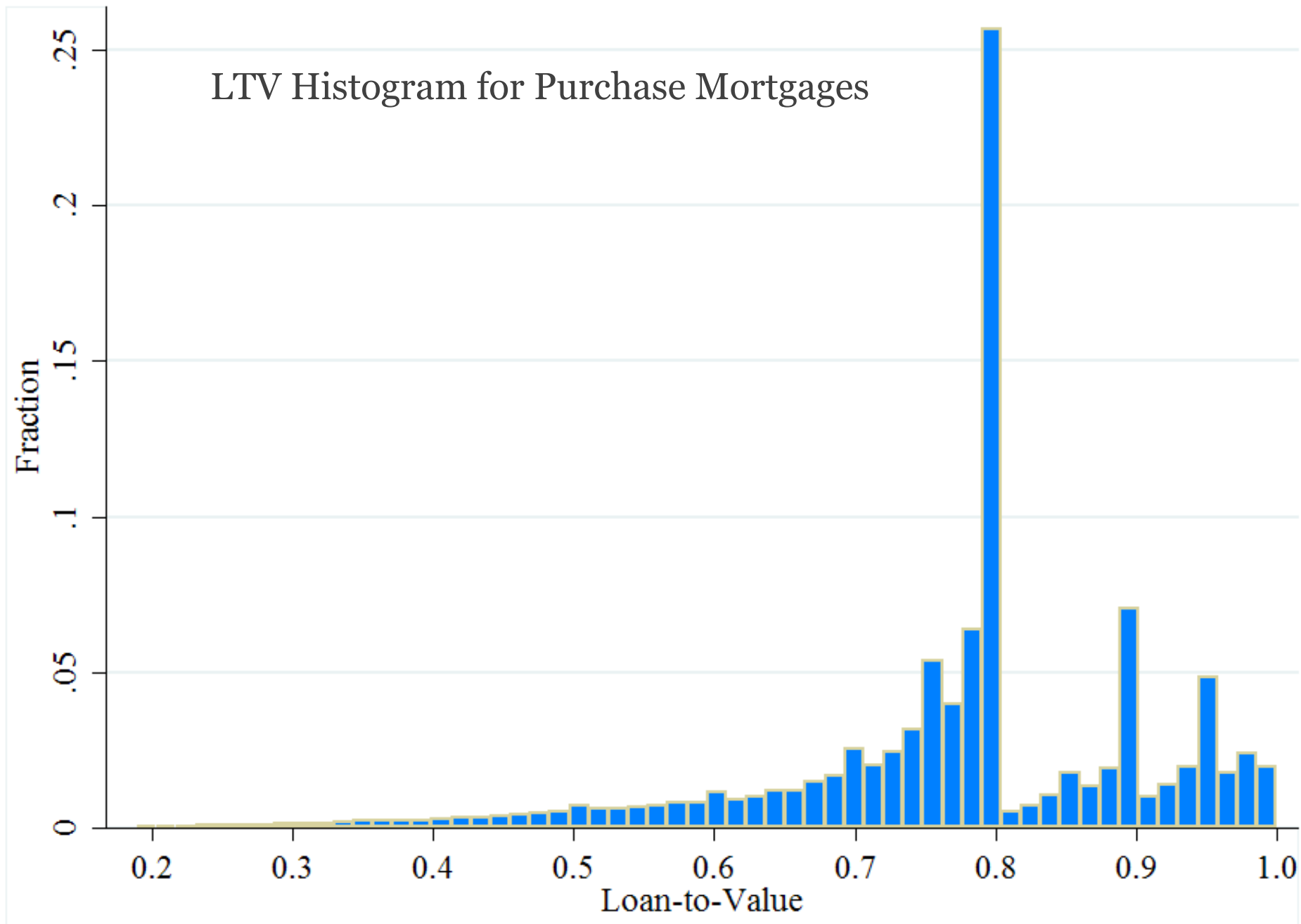
Robustness Concerns

	Robustness Concern:	Points	Residual Risk via Servicing or MBS Holding	Ethnicity Designation
	Sub-Sample:	$0.795 < \text{LTV} < 0.801$	Small Lenders	Only use HMDA-Classified Ethnicity Observations
	Reasoning:	At budget constraint	Unlikely to service the loans or hold as MBS on balance sheet	Eliminate software errors in classification

Points: It could be that we are picking up non-minority borrowers lowering interest rates by paying points

- Solution: Down-payment behavior
 - Many borrowers do whatever they can to get the house they want
 - Right at LTV of 0.80, borrowers have scraped to meet down-payment (Avoid paying insurance cost above 0.80)
 - Limit to sample LTV = 0.80 (see histogram)

LTV Histogram for Purchase Mortgages



Robustness Concerns

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Residual Risk: It could be that discrimination we show reflects residual risk for lenders exposed to default risk, not in the loan default, but in additional costs of servicing loans that are delinquent

- Solution: Eliminate large lenders

Robustness Concerns

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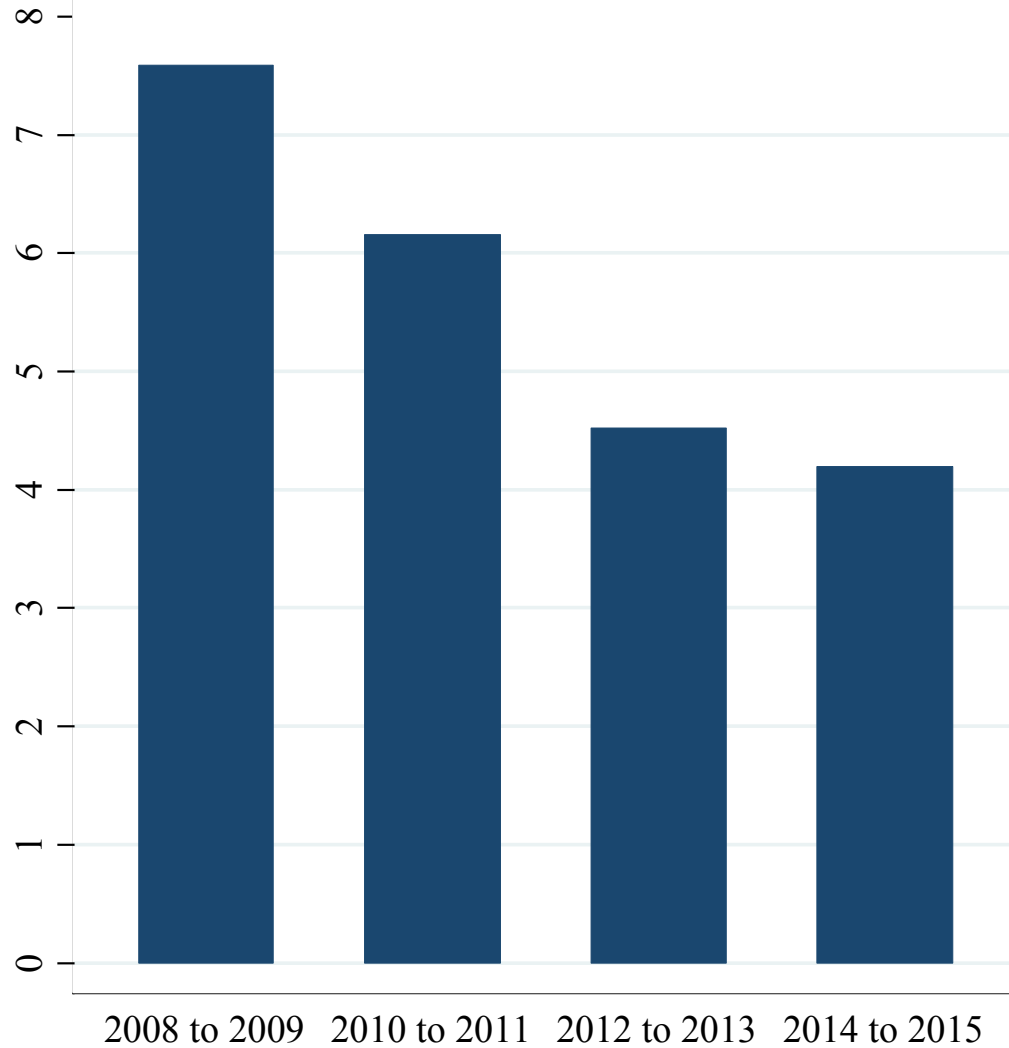
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Panel A: Purchases			
Latinx-/African- American	0.000944*** [4.21e-05]	0.000868*** [3.49e-05]	0.000814*** [3.23e-05]
Observations	327,355	833,579	1,356,670
R-squared	0.739	0.730	0.729
Month-Year FE	Y	Y	Y
GSE Grid FE	Y	Y	Y

2 Silver Linings for Fin-Technology

1> Time pattern

2> Rejection rates

Purchase



Refinance



Rate discrimination is declining

Pattern consistent with:

- + New entry of FinTech platforms
- + Simpler and quicker online applications of Incumbents

Resulting in

=> Greater competition

=> Less taking of monopoly rents

Dependent Variable: Application Rejection

Small Lenders

FinTech Lenders: Buchak, et al (2017)

FinTech Lenders with Full Online Application 2018

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Latinx/African-American	0.0934*** [0.00646]	0.0858*** [0.00563]	0.0639*** [0.00266]	0.023 [0.0200]	0.0112 [0]	0.0259** [0.00881]	0.0531*** [0.0160]	0.0496*** [0.0136]	0.0344*** [0.0118]
Observations	2,007,520	2,007,520	2,007,520	116,893	116,893	116,893	926,542	926,542	926,542
R-squared	0.058	0.064	0.329	0.082	0.088	0.301	0.039	0.046	0.345
Application Variable Splines	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Census Tract %iles: LTV, Credit Score	N	Y	Y	N	Y	Y	N	Y	Y
County FE	N	N	Y	N	N	Y	N	N	Y
Lender F.E	N	N	Y	N	N	Y	N	N	Y

- 6.4% extra rejections overall: Consistent with material discrimination.
- Yet (silver lining #2) FinTechs discriminate much less, if at all.

Conclusions

1. This work could provide a tool for regulators and the courts
 - Big data is just starting... lenders may be testing the waters on how courts will handle statistically discriminating variables
2. Back of the envelope: \$750 million in extra interest per year. Our estimates are a lower bound, but show that discrimination is happening (sometimes without purpose)
3. Surprise contributions:
 - GSEs may be serving a role in preventing discrimination.
 - Algorithms may be improving competitive landscape
4. Work in progress:
 - The targeting of monopoly rents & the geography of disparate impact