Testing Models of Economic Discrimination

Using the Discretionary Markup of Indirect Auto Loans

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*Note: this project is the result of the author's independent research and does not necessarily represent the views of the Federal Reserve Bank of Chicago, the Federal Reserve System, the Consumer Financial Protection Bureau, or the United States.

What does this paper do?

- Uses a unique supervisory data set to conduct tests of "standard" models of taste-based, statistical, and search discrimination using data from an actual market.
- Shows that patterns of disparities in discretionary "dealer markup" of indirect auto loans are consistent with specific predictions of a Becker-style model of discrimination.
- Shows evidence contrary to the predictions of models of statistical discrimination or search with discrimination.

Motivation: Lots of studies of discrimination, few link evidence to a specific theory

- Theories of discrimination need to explain *how/why* discrimination may pop up in a market.
  - Most models rely on some type of market failure.
  - Persistence of the market failure can be difficult to rationalize.
- Empirical studies of discrimination try to show *that* discrimination is present in the market.
  - Often assume or hand-wave at a theoretical source.
  - Disconnect from theory makes policy prescription difficult/rare.
- Very few empirical tests of discrimination.
  - Different models can lead to different optimal antidiscrimination policies.

Motivation: Market for indirect auto loans is important and interesting.

- Vehicles are among the largest purchases in a consumer's life.
  - Transaction repeated more than other large purchases.
- Most auto purchases are financed with indirect loans.
  - Loans are large enough to substantially impact financial well-being.
  - Different treatment could contribute to gaps beyond just the market for auto loans.
- The market for indirect auto loans is quirky/"cool."
  - Large and opaque, numerous stages, simultaneously cooperative and adversarial, etc.
  - Loans are subject to discretionary markup, meaning similar customers often pay different prices.
- Despite this, the economics literature hasn't focused much on this market.

Supervisory auto data

- Administrative data collected from financial institutions as part of the CFPB's supervisory responsibilities; contain all information used by lender to underwrite and price loans.
- These data show a number of key measures, including the "algorithmic" risk-based interest rate, markup added by the dealer, vehicle price and characteristics, signals of financial sophistication, etc.*
- These data are more detailed than surveys or "summary" data, and potentially more representative of the market than lender-specific data.

Empirical testing strategy

- Use supervisory auto data to see if "negotiation skill" is related to markup (descriptive).
- Conduct formal test for Becker-style discrimination in markup (similar to Charles and Guryan, 2008).
  - See if the specific Becker proposition that disparity is related to marginal, but not average, prejudice holds.
- Conduct tests of models of statistical discrimination and search with discrimination.
  - Include signals of financial sophistication/credit awareness in regressions to see if there are differential returns.
  - See if the share of black/prejudiced/unprejudiced respondents in a region impacts markup gaps.

Rough descriptive test: Does negotiation skill matter for markup?

Markup characteristics by quartile of price paid for vehicle:

	Quart. 1	Quart. 2	Quart. 3	Quart. 4
Markup Amount	1.189	1.184	1.174	1.180
	(0.882)	(0.842)	(0.825)	(0.809)
Prop. Marked Up	0.745	0.764	0.772	0.786
	(0.436)	(0.425)	(0.419)	(0.410)
Black	0.108	0.109	0.109	0.107
	(0.204)	(0.206)	(0.206)	(0.206)
N	>1.5M	>1.5M	>1.5M	>1.5M

Note – Price quartiles controlling for a vehicle's make, model, age, new/used status, as well as year and region.

Standard deviations in parentheses.

Representative Results: Tests of Becker-style taste-based and statistical discrimination

	Taste	Stat 1	Stat 2
Black x Marg. Index	0.980	0.847	0.754
	(0.046)	(0.107)	(0.120)
Black x Avg. Index	0.123	0.140	0.150
	(0.704)	(0.661)	(0.641)
Black x FICO $\geq$ 720		-0.041	
		(0.036)	
Black x Buy Rate			-0.020
			(0.000)
N	$\geq 7.5M$	$\geq 7.5M$	$\geq 7.5M$

Note – Dependent variable is markup. Results presented in interest rate points (e.g. 0.50 = 50 basis points).

Standard errors are clusters at the state-year level. P-values in parenthesis.

Summary of findings

- In every specification, the results are consistent with Becker-style taste-based discrimination.
  - Maybe more than "consistent," as sharp predictions satisfied.
  - Estimated effects of marginal prejudice are quite large.
  - Estimated effects of the average prejudice are not.
- There is also evidence that neither statistical discrimination nor search with discrimination is at play.
  - Many key coefficients have the "wrong" sign.
  - In the few robustness checks where the "right" sign is achieved, the magnitudes are inconsequential.
  - Even in these specification the nested Becker predictions remain strongly consistent with the results.

BONUS SLIDES

Visual confirmation that the distribution of markup for Black and White borrowers is different

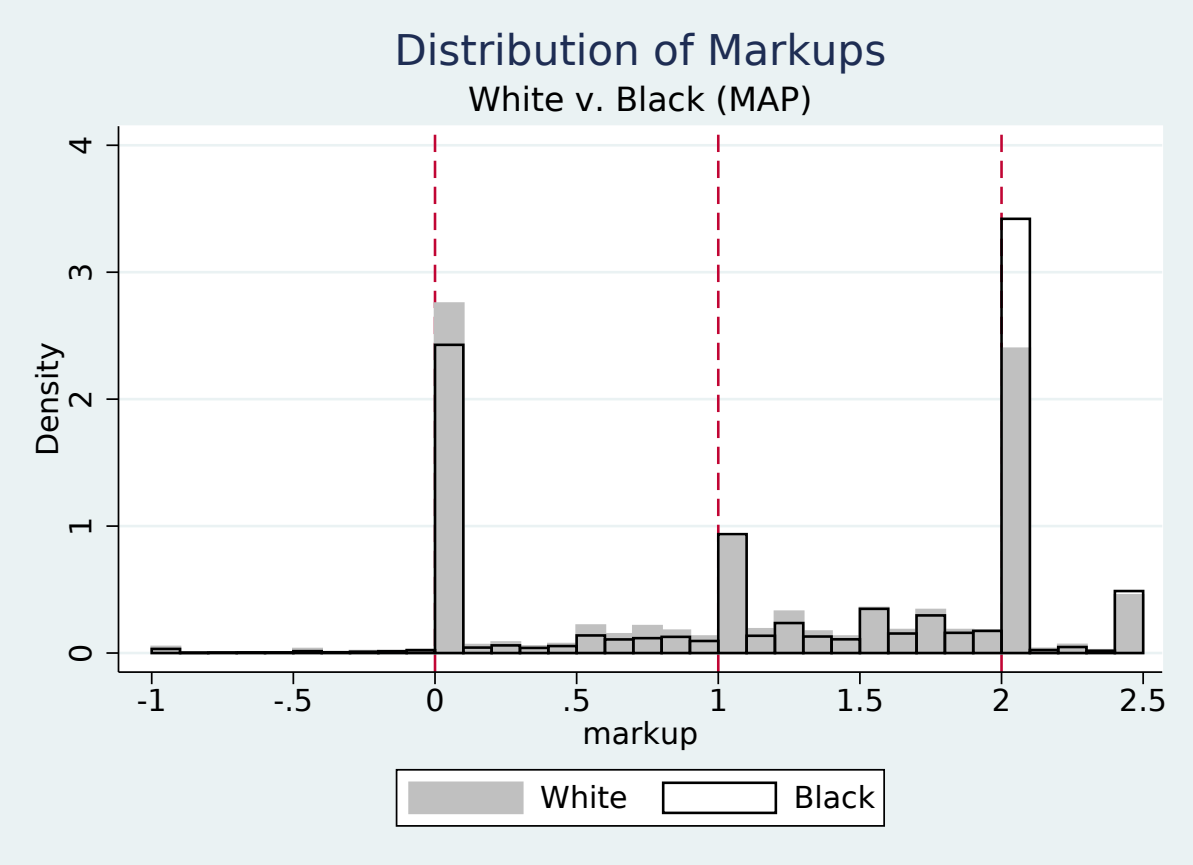

Figure: Distribution of markups imposed on loans for Black and White customers, with race approximated by MAP assignment.

Why I like the direct probability approach in this context (even though it doesn't really affect the results)

- Direct probabilities are likely to more actually capture the low probability events that matter in aggregate.
- Minorities likely overestimated in HMDA data because they are underrepresented in the population of home buyers.
- The population of auto buyers is fairly representative.

	White	Black	Other
Overall	80.6%	14.1%	5.3%
% ever purchased home	88.5%	8.6%	2.9%
% purchased home (last 5 yrs.)	90.5%	7.0%	2.5%
% purchased car from a dealer (last 5 yrs.)	81.7%	12.5%	5.8%
% purchased any used car (last 5 yrs.)	80.8%	12.4%	6.8%

Note – Data are from GSS.

Results: Test of Becker-style taste-based discrimination

	Direct	MAP	Imputation
Black x Marg. Index	0.980	0.491	0.560
	(0.046)	(0.040)	[0.526,0.595]
Black x Avg. Index	0.123	0.088	0.060
	(0.704)	(0.584)	[0.043,0.078]

Note – Results presented in interest rate points (e.g. 0.50 = 50 basis points). Dependent variable is markup.

Standard errors are clusters at the state-year level. P-values in parenthesis, 95 percent empirical interval in brackets.

Results: Test of search with discrimination (direct proxy)

	I	II	III	IV
Black x Share Black	2.541	1.598	-2.343	-2.675
	(0.000)	(0.000)	(0.006)	(0.003)
Black x Share Prej.	-3.957	-5.188	-5.163	-5.262
	(0.000)	(0.000)	(0.000)	(0.000)
Black x Share Non-Prej.		-8.041		8.903
		(0.000)		(0.084)
Black x Marg. Index			4.674	4.832
			(0.000)	(0.000)
Black x Avg. Index			0.939	2.512
			(0.002)	(0.000)

Note – Results presented in interest rate points (e.g. 0.50 = 50 basis points); p-values, based on standard errors clustered at the state-year level, in parentheses. Dependent variable is markup.