Judging Disparities

Information Quality, Image Concerns, and Judge In-Group Bias in Wisconsin Criminal Courts
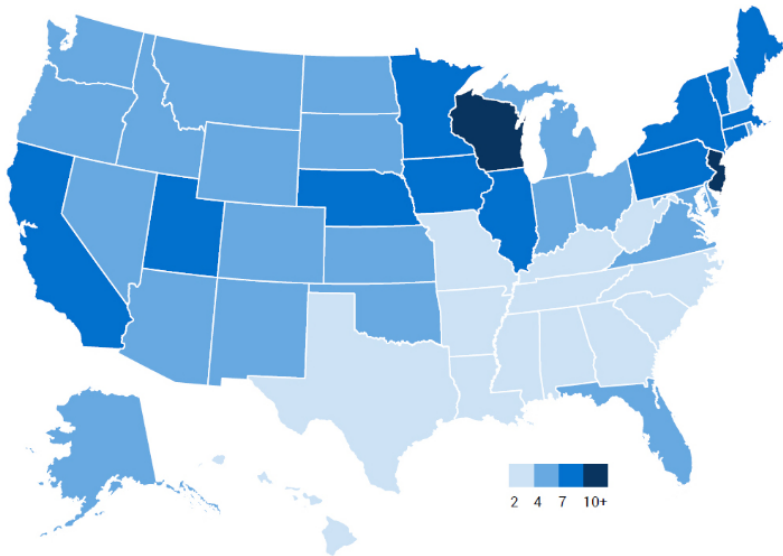
Elliott Ash & Claudia Marangon

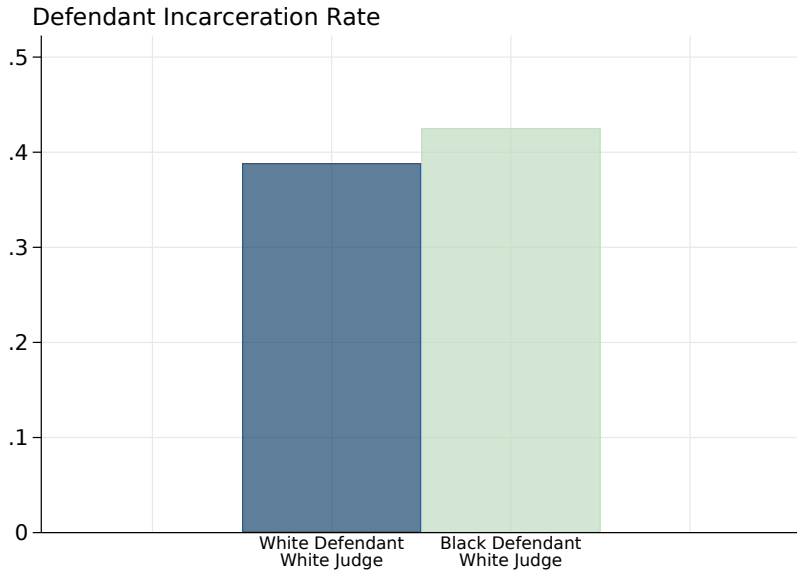ETH Zürich

NBER Summer Institute

25 July 2024

Black-to-White Incarceration Ratio, by U.S. State

Data Source: Carson, E. A. (2021). Prisoners in 2019. Bureau of Justice Statistics; U.S. Census Bureau (n.d.). Age, sex, race, and Hispanic-origin–6 race groups. (SC EST 2019-ALLDATA6).

Defendant Incarceration Rate

Adjusted means of the "incarcerate" decision in Wisconsin criminal cases, for black/white defendants and black/white judges, as indicated. Shares are linear predictions after adjusting for court-year FE, charge severity FE, defendant recidivism risk, and judge FE.

Defendant Incarceration Rate
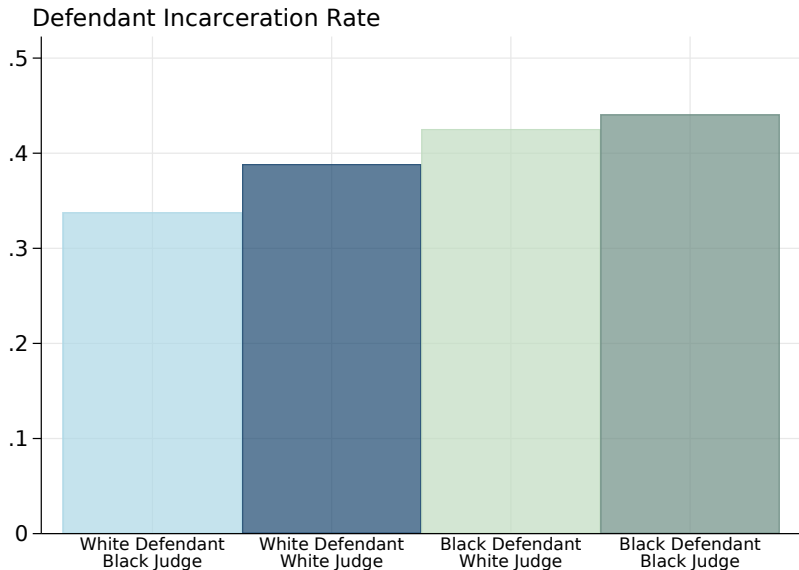
Adjusted means of the "incarcerate" decision in Wisconsin criminal cases, for black/white defendants and black/white judges, as indicated. Shares are linear predictions after adjusting for court-year FE, charge severity FE, defendant recidivism risk, and judge FE.

Potential Mechanisms for (Anti-)In-Group Bias

To help us better understand differences in decisions, we introduce a model of judge decision-making with three potential ingredients:

1. Taste-based group preferences for defendants:
   previous literature has focused on *pro*-in-group bias (e.g. Shayo and Zussman, 2011), but other work is mixed (e.g. Ash et al., 2021).

2. Information on recidivism risk:
   defendants might vary in their riskiness (Arnold et al., 2022); information on that riskiness might vary according to group identity (Cornell and Welch, 1996; Fisman et al., 2017).

3. Group image concerns:
   anti-in-group harshness due to perceived harm to the image of the group (Guo et al., 2023);
   Defendant race is highly correlated with victim race (Depew et al., 2017).

We find evidence for (2) and (3) in driving the decisions of Wisconsin judges.

Contribution

- Large body of evidence on criminal-justice disparities (Anwar and Fang, 2006; Fagan and Ash, 2017; Arnold, Dobbie, and Yang, 2018).
    - Not only due to bias/prejudice – can be due to statistical discrimination, errors in outcome predictions, etc. (Arnold, Dobbie, and Hull, 2022; Canay, Mogstad, and Mountjoy, 2020).
    - Mixed evidence on in-group disparities (Shayo and Zussman, 2011; Lim, Silveira, and Snyder, 2016; Anwar, Bayer, and Hjalmarsson, 2019; Ash, Asher, Bhowmick, Bhupatiraju, Chen, Devi, Goessmann, Novosad, and Siddiqi, 2021).

- We show that group image concerns and information are important factors in group disparities.
    - Relevant for interpreting previous evidence on in-group bias.
    - Relevant to policy decisions on reducing those disparities.

Background and Data

- **Circuit Courts Overview**
  - 69 Circuit Courts, each serving a county.
  - Cases are initiated by a prosecutor filing a complaint.
  - Cases are then (as good as) randomly assigned to judges.

Sentencing Guidelines

- Wisconsin Circuit Court Access API:
  - Universe of criminal cases from 2005 to 2017 ($N = 882K$).
  - Defendants' information (dob, gender, race, address).
  - Case information (name of judge and prosecutor, charge, sentencing, etc.).
- New data collection on judge biographies (gender, race, campaign donations, etc.).

Summary Statistics   Summary Statistics for Judges

Measuring Recidivism Risk with Machine Learning

Following Ash, Goel, Li, Marangon, and Sun (NeurIPS 2023):

- ML outcome:
  - Recidivism (defined as re-offense within 2 years from the date of disposition).
    Re-offense distribution
- ML predictors:
  - Criminal history (using extended panel 1970-2019), case characteristics, gender, and age.
- ML algorithm:
  - XGBoost, gradient boosted variant of random forests getting state-of-the-art performance on tabular datasets (Chen and Guestrin, 2016). XGBoost
- Evaluation: performance in held-out test set (Acc. = 0.65, AUC = 0.7).
  Model Performance

Predicting Recidivism Risk
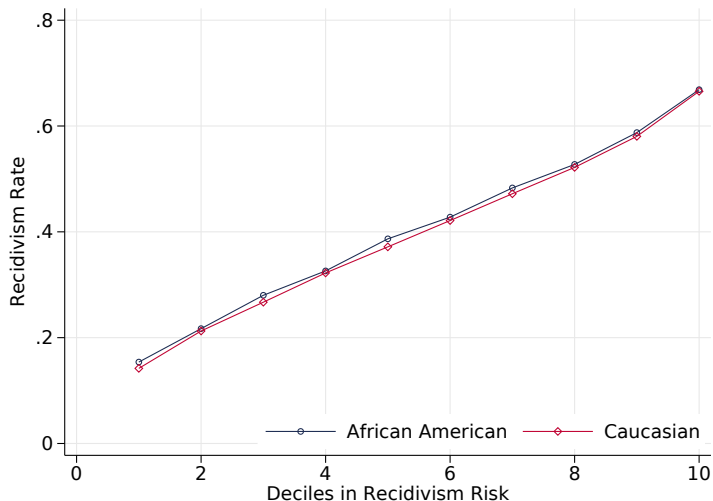
True recidivism rate in held-out test set, binned by deciles in predicted recidivism risk from XGBoost ML model.

Overall Judge In-Group Bias

Empirical Strategy: Estimation of In-Group Bias

Incarceration decision in case/defendant i, judge j, court/county c, time t:

$$y_{ijct} = \beta_1 \mathsf{BlackDef}_i + \beta_2 \mathsf{BlackJudge}_j + \beta_3 \mathsf{BlackDef}_i \times \mathsf{BlackJudge}_j$$
$$+ \alpha_{ct} + \alpha_i^s + \alpha_j + X'_{ijct}\delta + \varepsilon_{ijct}$$

- $\alpha_{ct} =$ county$\times$time fixed effects, α_i^s=charge severity fixed effects:
  - Leverage (conditional) random assignment of judges to cases.
    Randomization Check
- $\alpha_j =$ judge fixed effects:
  - adjust for all judge characteristics that are constant across cases.
- X_{ijct} includes additional defendant, judge, and case characteristics.
  - e.g. flexible controls for defendant recidivism risk (ventile FE).
- Clustering by county-year (robust to clustering by judge).

In-Group Bias: Main Regression Results

	Defendant is Incarcerated				
	(1)	(2)	(3)	(4)	(5)
Black Judge	-0.0300	-0.0175	-0.0168	0	0
	(0.0356)	(0.0326)	(0.0323)	(.)	(.)
Black Defendant	0.0414**	0.0630**	0.0506**	0.0512**	0.0519**
	(0.00268)	(0.00297)	(0.00292)	(0.00242)	(0.00231)
Black Judge × Black Defendant	0.0263	0.0205	0.0216	0.0599**	0.0518**
	(0.0208)	(0.0171)	(0.0175)	(0.0118)	(0.0105)
Obs.	894311	894311	894311	894291	883893
R^2	0.0403	0.0919	0.101	0.114	0.136
County-Year FE	X	X	X	X	X
Charge Severity FE		X	X	X	X
Risk Ventile FE			X	X	X
Judge FE				X	X
Additional Interactions & Controls					X

Notes: Estimated racial in-group bias in jail decision by judges. All specifications include county×year fixed effects. Charge severity indicates the severity of the case, defined as the severity of the highest charge in the case. Risk ventiles are computed separately across all ethnicities using our machine-learning predicted recidivism risk. Additional interactions and controls include defendants' characteristics other than race and the interaction between these and judges' characteristics, like gender or political affiliation, measured with party contributions. Standard errors are clustered at the county and at the year level (in parenthesis): + $p < 0.1$, * $p < 0.05$, ** $p < 0.01$.

Drivers of Judge In-Group Bias

A Model of Judge Sentencing

- Judge j with type $\theta_j \in \{0, 1\}$ decides $Y_{ij} \in \{\text{jail}, \text{release}\}$, gets utility $U(Y_{ij})$.
- Defendant i with type $\theta_i \in \{0, 1\}$ and recidivism risk r_i (more below).
- Let $m_{ij} = 1$ if judge and defendant types match ($\theta_i = \theta_j$), $m_{ij} = 0$ otherwise.

Judge incarcerates if $U(\text{jail}) > U(\text{release})$:

$$U(\text{release}) = \phi m_{ij} - \tau \bar{r}_{ij}$$

- $\phi m_{ij} = $ taste-based group bias for the defendant.
- $\tau \bar{r}_{ij} = $ costs of recidivism; $\bar{r}_{ij} = j$'s expectation on i's risk.

$$U(\text{jail}) = \gamma m_{ij} s_i - \kappa_0$$

- $\gamma m_{ij} s_i = $ group image concerns; $s_i = |\theta_i|$, defendant share of type i.
- $\kappa_0 = $ additional (potentially judge-specific) incarceration cost.

Judge Incarceration Decision

- Judge incarcerates if $U(\text{jail}) > U(\text{release})$, which can be rewritten as:

$$\gamma m_{ij} s_i + \tau \bar{r}_{ij} > \phi m_{ij} + \kappa_0.$$

  - $\gamma m_{ij} s_i$, group image concerns
  - $\tau \bar{r}_{ij}$, information on riskiness
  - ϕm_{ij}, preferences on defendant group

$$\gamma m_{ij} s_i + \tau \bar{r}_{ij} > \phi m_{ij} + \kappa_0$$

- $\gamma m_{ij} s_i =$ **group image concerns** ($\gamma \geq 0$). Increases judge j's benefit from incarcerating i when:
  - i and j are in the same group ($m_{ij} = 1$).
  - i's group are responsible for a relatively large portion of crimes ($s_i \gg 0$).

- Underlying mechanisms:
  - group criminality damages group's social image (Marques and Yzerbyt, 1988; Guo et al., 2023).
    - if group is over-represented, can become a stereotypical association (Bordalo et al., 2016).
  - in-group criminals tend to have in-group victims (Depew et al., 2017).
  - general deterrence effects of sentencing harshness could increase with group size (e.g. Becker, 1968).

Judge incarcerates if

$$\gamma m_{ij} s_i + \tau \bar{r}_{ij} > \phi m_{ij} + \kappa_0$$

- $\gamma m_{ij} s_i \rightarrow$ group image concerns, activated *when i's and j's group has higher population share $s_i > 0$.*

- $\phi m_{ij} \rightarrow$ group preferences for defendant, always active, *even when $s_i \approx 0$.*

- **Empirically**:
  - Estimate $\beta_3 BlackDef_i \times BlackJudge_j$ for j's with *high share* of black defendants and *low share* of black defendants.

Anti-In-Group Bias Driven by Group Image Concerns
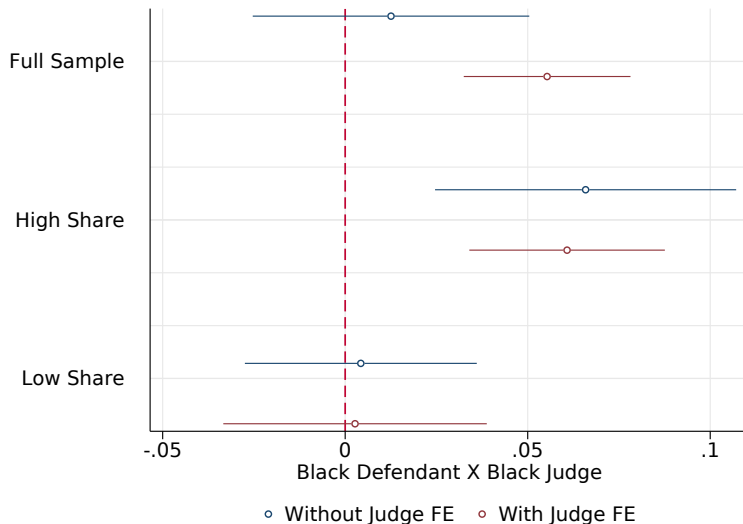
Coefficient plot for regression of incarceration outcome on interaction term for Black Judge × Black Defendant, giving the diff-in-diff in-group bias effect. County-year FE and charge severity FE absorbed. Judge FE absorbed as indicated. Top set: full sample; middle set: at least 50% of defendants in judge-year are black; bottom set: Less than 50% of defendants in judge-year are black. [Table] [Crimes with/without Victims]

Information: Recidivism Risk Signal

- Defendant i has true (unobserved) recidivism risk r_i, with prior $r_i \sim \mathcal{N}(\mu_i, 1)$.
- Judge j observes noisy signal $\tilde{r}_{ij} = r_i + \epsilon_{ij}$, where $\epsilon_{ij} \sim \mathcal{N}(0, \frac{1}{\rho_{ij}})$
- Posterior belief $\hat{r}_i \sim \mathcal{N}\left(\bar{r}_{ij}, \frac{1}{1+\rho_{ij}}\right)$ with

$$\bar{r}_{ij} = \mathbb{E}(r_{ij}) = \frac{1}{1 + \rho_{ij}}\mu_i + \frac{\rho_{ij}}{1 + \rho_{ij}}\tilde{r}_{ij}$$

  - (can assume $\mu_i = 0$ wlog)
- Assume $\rho_{ij} = \rho(e_j, m_{ij}, s_i) > 0$, with the following first derivatives:
  - $\rho_e > 0$, precision increases with judge experience e_j.
  - $\rho_m > 0$, precision increases if judge and defendant identity match ($m_{ij} = 1$)
    (Cornell and Welch, 1996; Fisman et al., 2017).
  - $\rho_s > 0$ if $m_{ij} = 0$; $\rho_s = 0$ if $m_{ij} = 1$: i.e., precision increases with defendant's type share s_i, if judge and defendant group do not match.

Judge incarcerates if

$$\gamma m_{ij} s_i + \tau \left(\frac{\rho_{ij}}{1 + \rho_{ij}} \tilde{r}_{ij} \right) > \phi m_{ij} + \kappa_0$$

$$\frac{\partial U(\text{jail})}{\partial \tilde{r}_{ij}} = \tau \frac{\rho_{ij}}{1 + \rho_{ij}} > 0$$

$\rightarrow$ Utility from jail increases with the risk signal $\rightarrow$ On average, defendants with higher observed recidivism risk are more likely to be incarcerated.

Assume

$$\rho_{ij} = \rho(e_j, m_{ij}, s_i) = \rho_e e_j + \rho_m m_{ij} + \rho_s(1 - m_{ij})s_i$$

Then:

$$\frac{\partial U(\text{jail})}{\partial \tilde{r}_{ij}} = \tau \frac{\rho(\cdot)}{1 + \rho(\cdot)}$$

$$\frac{\partial^2 U(\text{jail})}{\partial \tilde{r}_{ij} \partial e_j} = \tau \frac{\rho_e}{(1 + \rho(\cdot))^2} > 0$$

$\rightarrow$ Cross-partial on risk signal and experience is positive; more experienced judges get more benefit from incarcerating higher-risk defendants.

More-experienced judges are more responsive to risk

Defendant Incarceration Rate - Full Sample

○ Low Experience   ◇ High Experience

Binscatters for the incarceration rate (residualized on court-year, charge severity, and judge FE), binned by ventiles in recidivism risk, and plotted separately for above-median-experience judges (red) and below-median-experience judges (blue). [Table]

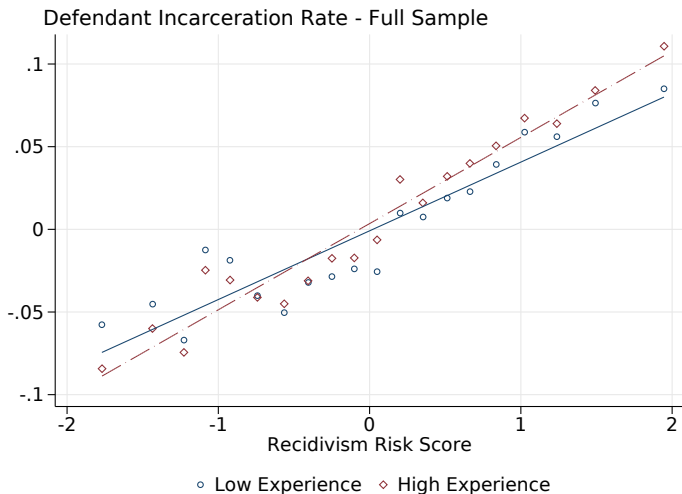- Normalize $e_j = 0$: $\rho_{ij} = \rho(e_j, m_{ij}, s_i) = \rho_m m_{ij} + \rho_s(1 - m_{ij})s_i$.
- Then:

$$\frac{\partial U(\text{jail})}{\partial \tilde{r}_{ij}} = \tau \frac{\rho(\cdot)}{1 + \rho(\cdot)} = \begin{cases} \tau \frac{\rho_s s_i}{1 + \rho_s s_i} & m_{ij} = 0 \\ \tau \frac{\rho_m}{1 + \rho_m} & m_{ij} = 1 \end{cases}$$

   → Judges get a more precise signal on their in-group (and are hence more responsive for the in-group) when $\rho_m > \rho_s s_i$.

- Further:

$$\frac{\partial^2 U(\text{jail})}{\partial \tilde{r}_{ij} \partial s_i} = \begin{cases} \tau \frac{\rho_s}{(1 + \rho_s s_i)^2} > 0 & m_{ij} = 0 \\ 0 & m_{ij} = 1 \end{cases}$$

   → Cross-partial on risk signal and defendant share is positive when $\theta_i \neq \theta_j$ → judges are less responsive to recidivism risk for other-type defendants when they are a smaller share of the population.

White judges are less responsive to riskiness of black defendants when there are few black defendants
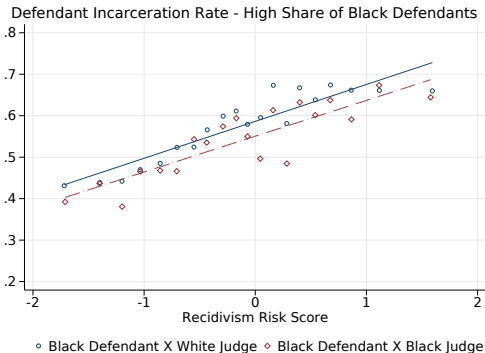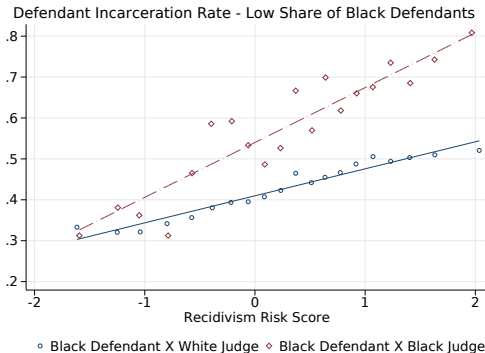
Binscatters for the incarceration rate of black defendants, binned by ventiles in recidivism risk, and plotted separately for white judges (blue) and black judges (red). Left graph: black defendants make up less than 50% of a judge's caseload. Right graph: black defendants make up more than 50% of a judge's caseload. Table

Robustness Checks

- Rule out alternative stories:
  - Victimless crimes `Victimless Crimes`
  - Prosecutor fixed effects `Prosecutor Fixed Effects`
  - Effect of COMPAS `Before COMPAS`
  - Judge response to economic status `Zip Fixed Effects`
- Results are robust to:
  - Alternative specifications `County-Year-Severity FE`
  - Score predicted with a Logistic Classifier `Logistic Classifier`
  - Alternative ways to calculate share of Black def. `Alternative Shares`
  - Only courts with Black defendants `Only Black Def.`
  - Only courts with Black judges `Only Black Judges`
  - Risk score trained on lenient judges (selective labeling) `Leninet Judges` `2 Most Lenient Judges`
  - Controlling for first offense `First Offense Controls`
  - Removing One Black Judge at a time `Removing Black Judges`
  - Interaction with share of Black Defendants `Interacted with Shr. Black`

Conclusion

Conclusion

- Mixed evidence of group bias in criminal sentencing decisions in Wisconsin.
- In-group bias driven by
  - Group-image concerns when there's a high share of minority defendants.
  - More responsiveness to recidivism risk when there's a low share of minority defendants.
- Upshot:
  - Previous work documenting group biases should be reconsidered in light of these alternative explanations.
  - Results could be helpful in the design of policies to address criminal-justice disparities.

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Thank you!

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APPENDIX SLIDES

References

Shamena Anwar and Hanming Fang. An Alternative Test of Racial Prejudice in Motor Vehicle Searches: Theory and Evidence. *American Economic Review*, 96 (1):127–151, 2006.

Shamena Anwar, Patrick Bayer, and Randi Hjalmarsson. A Jury of Her Peers: The Impact of the First Female Jurors on Criminal Convictions. *The Economic Journal*, 129(618):603–650, 2019.

David Arnold, Will Dobbie, and Crystal S Yang. Racial Bias in Bail Decisions. *The Quarterly Journal of Economics*, 133(4):1885–1932, November 2018. ISSN 0033-5533, 1531-4650. doi: $10.1093/\text{qje}/\text{qjy}012$. URL https://academic.oup.com/qje/article/133/4/1885/5025665.

David Arnold, Will Dobbie, and Peter Hull. Measuring Racial Discrimination in Bail Decisions. *American Economic Review*, 112(9):2992–3038, September 2022. ISSN 0002-8282. doi: $10.1257/\text{aer}.20201653$. URL https://www.aeaweb.org/articles?id=10.1257/aer.20201653.

Follow ruling by Wisconsin Supreme Court case State v. Gallion (2004)

- Main objectives: community protection, punishment, rehabilitation, deterrence.
- Factors considered: criminal record, nature of crime, defendant's personal situation

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Notes: Share of defendant/cases with recidivism episodes by time intervals between current and subsequent offense.

	Full sample	Caucasian	African American	Hispanic	Native American	Asian
Sample size	1,029,314	674,474	219,837	77,893	47,079	10,031
Sample share		0.66	0.21	0.08	0.05	0.0097
Incarcerated	0.39	0.37	0.48	0.36	0.38	0.36
Recidivism Rate	0.40	0.39	0.43	0.36	0.55	0.36
Sentence Length	299	253	407	265	217	373
Sex						
Female	0.20	0.22	0.16	0.12	0.32	0.13
Age						
Below 30	0.53	0.51	0.56	0.57	0.56	0.68
30 to 60	0.47	0.49	0.43	0.43	0.44	0.32
Case type						
Felony	0.33	0.32	0.43	0.21	0.31	0.37
Misdemeanor	0.43	0.44	0.44	0.33	0.48	0.40
Criminal Traffic	0.23	0.24	0.23	0.46	0.21	0.23

Notes: The unit of observation is defendant-case. *Incarcerated* represents the share of judge's decision to sentence the defendant to jail in that case, while *Recidivism* is the share of observed episodes of recidivism. *Sentence Length* represents the harshness of the sentence and is measured in number of days.

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	Mean		
	White Judges	Black Judges	Difference
	(1)	(2)	(3)
Female Judge	0.179	0.000	-0.178***
	(0.384)	(0.000)	(0.016)
Harshness (Terciles)	2.813	2.667	-0.147
	(0.483)	(0.651)	(0.189)
Experience	29.055	26.924	-2.193
	(8.142)	(8.309)	(2.424)
Political Contributions	-0.035	-0.522	-0.487
	(1.098)	(0.968)	(0.283)

Notes: Summary statistics of judges in the sample calculated using judges as units of observation. *Experience* indicates the years of judicial activity of judges, and *Political Contributions* indicates a political contributions score (where positive values indicate contribution by Republicans). We define leniency by looking at the number of incarcerated defendants by judges in each county and year. Lenient judges are those for whom the share of incarcerated defendants is in the first tercile of the distribution of incarceration rates, while moderate and harsh ones are those in the second and third terciles, respectively.

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	Lenient	Moderate	Harsh	Total
Female Judge	0.184	0.133	0.239	0.145
	(0.388)	(0.339)	(0.426)	(0.352)
Black Judge	0.0194	0.0128	0.0207	0.0142
	(0.138)	(0.112)	(0.142)	(0.118)
Experience	33.00	31.69	26.75	31.87
	(7.343)	(6.855)	(8.479)	(7.035)
Political Contributions	-0.0733	0.00694	-0.0311	-0.00967
	(1.011)	(1.049)	(0.954)	(1.040)
Black Defendant	0.380	0.172	0.271	0.215
	(0.485)	(0.377)	(0.444)	(0.411)
Female Defendant	0.182	0.211	0.215	0.205
	(0.385)	(0.408)	(0.411)	(0.404)
Charge Severity	11.32	9.458	8.992	9.821
	(3.092)	(2.461)	(2.490)	(2.705)
Defendant Age	30.96	31.45	31.66	31.36
	(11.09)	(11.05)	(11.05)	(11.06)

Notes: Summary statistics of judges' and defendants' characteristics. *Experience* indicates the years of judicial activity of judges, and *Political Contributions* indicates a political contributions score (where positive values indicate contribution by Republicans). We define leniency by looking at the average sentence length given by judges. Lenient judges are those who give average sentence length in the first tercile of the distribution of sentence length, while moderate and harsh ones are those in the second and third terciles, respectively.

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XGBoost

Bootstrap aggregating or Bagging is a ensemble meta-algorithm combining predictions from multiple-decision trees through a majority voting mechanism

Models are built sequentially by minimizing the errors from previous models while increasing (or boosting) influence of high-performing models

Optimized Gradient Boosting algorithm through parallel processing, tree-pruning, handling missing values and regularization to avoid overfitting/bias

Bagging

Boosting

XGBoost

Decision Trees

Random Forest

Gradient Boosting

A graphical representation of possible solutions to a decision based on certain conditions

Bagging-based algorithm where only a subset of features are selected at random to build a forest or collection of decision trees

Gradient Boosting employs gradient descent algorithm to minimize errors in sequential models

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ML Model Performance

Metric	Caucasian	African American
Accuracy	0.6648	0.6459
AUC	0.7044	0.7033
FPR	0.2159	0.2454
FNR	0.5113	0.4792

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(a) Raw Characteristics | (b) Residualized Characteristics
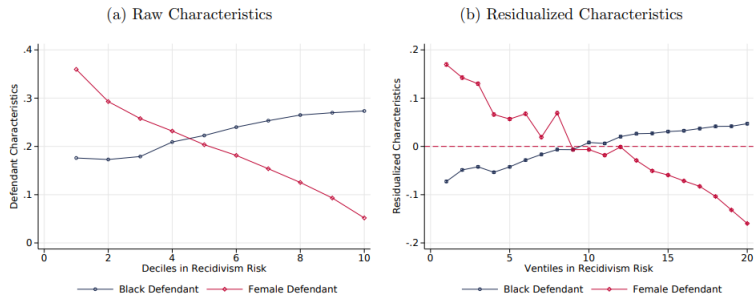
Notes: Panel (a) shows the average share of Female and Black defendants plotted by recidivism risk deciles. Recidivism risk deciles are computed across all ethnicities and are centered by court-year and charge severity. Panel (b) shows the residuals from regressions of defendants' characteristics on court-year and charge severity fixed effects plotted by recidivism risk ventiles, with 95% confidence intervals.

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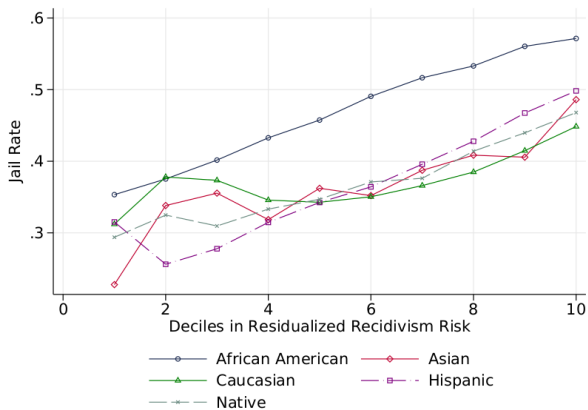
Notes: Average share of incarcerated defendants plotted by recidivism risk deciles and separately by ethnicity. Recidivism risk deciles are computed across all ethnicities and are centered by court-year and charge severity.

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Balance Table

	Mean		Difference in Means	
	White Judges	Black Judges	Without FE	With FE
	(1)	(2)	(3)	
Charge Severity	9.894	10.431	-0.537**	-0.217
	(2.705)	(3.025)	(0.024)	(0.189)
Recid. Risk	0.427	0.406	0.020**	0.00523
	(0.172)	(0.162)	(0.001)	(0.00352)
Black Defendant	0.241	0.579	-0.339**	0.0149
	(0.428)	(0.494)	(0.004)	(0.0107)
Female Defendant	0.208	0.170	0.038**	0.00109
	(0.406)	(0.375)	(0.004)	(0.00776)
Defendant Age	31.616	30.669	0.948**	0.277
	(11.242)	(10.810)	(0.098)	(0.336)
Prior Offense	0.772	0.732	0.040**	0.0160+
	(0.420)	(0.443)	(0.004)	(0.00861)
Misdemeanor	0.437	0.384	0.053**	-0.0172
	(0.496)	(0.486)	(0.004)	(0.0147)
Felony	0.347	0.454	-0.107**	-0.0319+
	(0.476)	(0.498)	(0.004)	(0.0192)
Criminal Traffic	0.216	0.162	0.054**	0.0490**
	(0.411)	(0.369)	(0.004)	(0.0108)
Zip Shr. Black	0.104	0.317	-0.213**	0.00905+
	(0.208)	(0.303)	(0.002)	(0.00513)
Zip Shr. Male	0.499	0.487	0.012**	0.000301
	(0.035)	(0.030)	(0.000)	(0.000552)
Zip Shr. Urban	0.578	0.912	-0.334**	0.00242
	(0.458)	(0.243)	(0.004)	(0.00396)
Zip Shr. College	0.230	0.261	-0.031**	0.00247
	(0.109)	(0.149)	(0.001)	(0.00187)
Zip Shr. Food Stamps	0.122	0.185	-0.063**	0.00131
	(0.078)	(0.109)	(0.001)	(0.00174)
Zip Median Income (Log)	10.766	10.626	0.140**	-0.016*
	(0.270)	(0.358)	(0.002)	(0.007)

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Image Concerns: Reg Table

	All	All	High Black Shr.	High Black Shr.	Low Black Shr.	Low Black Shr.
	(1)	(2)	(3)	(4)	(5)	(6)
Black Defendant	0.0420**	0.0405**	0.0257**	0.0341**	0.0416**	0.0452**
	(0.00491)	(0.00310)	(0.00858)	(0.00646)	(0.00509)	(0.00316)
Black Judge × Black Defendant	0.0126	0.0553**	0.0659**	0.0608**	0.00428	0.00270
	(0.0193)	(0.0116)	(0.0204)	(0.0132)	(0.0162)	(0.0184)
Obs.	883913	883893	122430	122425	761476	761461
R^2	0.124	0.137	0.112	0.144	0.110	0.120
County-Year FE	X	X	X	X	X	X
Charge Severity FE	X	X	X	X	X	X
Judge FE		X		X		X
Other Judge/Def Characteristics	X	X	X	X	X	X
Other Judge/Def. Characteristics-Risk Score Interactions	X	X	X	X	X	X

(Defendant is Incarcerated)

Notes: Estimates for in-group bias in jail decisions by judges separately for different shares of Black defendants seen by the judge. Columns 1 and 2 show the results for the whole sample. Columns 3 and 4 for the samples of judges seeing a share of Black defendants higher than 0.5; Columns 5 and 6 for the samples of judges seeing a share of Black defendants lower than 0.5. All specifications include county×year fixed effects. Charge severity indicates the severity of the case, defined as the severity of the highest charge in the case. Additional interactions and controls include defendants' characteristics other than race and the interaction between these, the recidivism risk score, and additional judges' characteristics. Standard errors are clustered at the court and at the year level (in parenthesis): $+ \ p < 0.1$, $* \ p < 0.05$, $** \ p < 0.01$.

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| | Defendant is Incarcerated | | |
	(1)	(2)	(3)
Exp. Judge	0.0179**	0.0174*	0.0125
	(0.00388)	(0.00688)	(0.00805)
Recid. Score	0.0340**	0.0346**	0.0186**
	(0.00148)	(0.00134)	(0.00264)
Exp. Judge × Recid. Score	0.00701**	0.00641**	0.00539*
	(0.00214)	(0.00206)	(0.00235)
Obs.	894311	894291	883893
R^2	0.102	0.115	0.137
County-Year FE	X	X	X
Charge Severity FE	X	X	X
Judge FE		X	X
Other Judge/Def Characteristics			X
Other Judge/Def. Characteristics-Risk Score Interactions			X

Notes: Estimated effect of judges' experience and recidivism risk on jail decisions. The recidivism risk score is standardized to have a mean of 0 and a standard deviation of 1. All specifications include county×year fixed effects. Charge severity indicates the severity of the case, defined as the severity of the highest charge in the case. Additional interactions and controls include defendants' characteristics other than race and the interaction between these, the recidivism risk score, and judges' characteristics, like gender or political affiliation, measured with party contributions. Standard errors are clustered at the court and at the year level (in parenthesis): + p < 0.1, * p < 0.05, ** p < 0.01.

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Group Identity and Risk: Reg Table

	All (1)	All (2)	Defendant is Incarcerated High Black Shr. (3)	High Black Shr. (4)	Low Black Shr. (5)	Low Black Shr. (6)
Black Defendant	0.0420**	0.0405**	0.0257**	0.0341**	0.0416**	0.0452**
	(0.00491)	(0.00310)	(0.00858)	(0.00646)	(0.00509)	(0.00316)
Black Judge × Black Defendant	0.0126	0.0553**	0.0659**	0.0608**	0.00428	0.00270
	(0.0193)	(0.0116)	(0.0204)	(0.0132)	(0.0162)	(0.0184)
Recid. Score	0.0213**	0.0226**	0.0113	0.0158	0.0237**	0.0239**
	(0.00279)	(0.00253)	(0.0125)	(0.0113)	(0.00251)	(0.00245)
Black Judge × Recid. Score	0.0169	-0.0259	-0.0183	-0.0460[+]	-0.0138	-0.00912
	(0.0170)	(0.0164)	(0.0312)	(0.0263)	(0.0222)	(0.0218)
Black Defendant × Recid. Score	0.0193**	0.0252**	0.0318**	0.0340**	0.0170**	0.0217**
	(0.00394)	(0.00272)	(0.00633)	(0.00607)	(0.00423)	(0.00260)
Black Judge × Black Defendant × Recid. Score	0.0236[+]	0.0109	0.0118	0.0103	0.0565**	0.0442**
	(0.0135)	(0.0108)	(0.0159)	(0.0156)	(0.0115)	(0.0115)
Obs.	883913	883893	122430	122425	761476	761461
R^2	0.124	0.137	0.112	0.144	0.110	0.120
County-Year FE	X	X	X	X	X	X
Charge Severity FE	X	X	X	X	X	X
Judge FE		X		X		X
Other Judge/Def Characteristics	X	X	X	X	X	X
Other Judge/Def. Characteristics-Risk Score Interactions	X	X	X	X	X	X

Notes: Estimates for in-group bias in jail decisions by judges, interacted with recidivism risk. Columns 1 and 2 show the results for the whole sample. Columns 3 and 4 for the samples of judges seeing a share of Black defendants higher than 0.5; Columns 5 and 6 for the samples of judges seeing a share of Black defendants lower than 0.5. Recidivism risk score is standardized to have a mean of 0 and a standard deviation of 1. All specifications include county×year fixed effects. Charge severity indicates the severity of the case, defined as the severity of the highest charge in the case. Additional interactions and controls include defendants' characteristics other than race and the interaction between these, the recidivism risk score, and additional judges' characteristics. Standard errors are clustered at the court and at the year level (in parenthesis): + p < 0.1, * p < 0.05, ** p < 0.01.

Victim vs. Victimless Crimes

Crimes with Victim
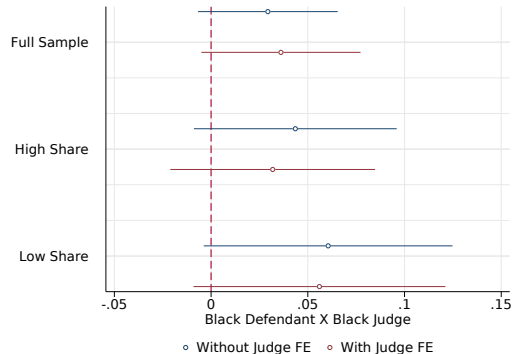
Victimless Crimes
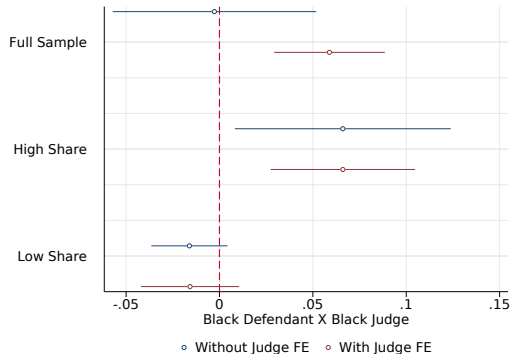
Coefficient plot for regression of incarceration outcome on interaction term for Black Judge × Black Defendant, giving the diff-in-diff in-group bias effect. County-year FE and charge severity FE absorbed. Judge FE absorbed as indicated. Top set: full sample; middle set: at least 50% of defendants in judge-year are black; bottom set: Less than 50% of defendants in judge-year are black. Crimes with/without victims were manually identified by looking at the class of the charge. Crimes for which the classification was uncertain are excluded from this analysis. Back (Image Concerns) Back (Robustness Checks)

Prosecutor Fixed Effects

	All	All	High Black Shr.	Low Black Shr.
	Defendant is Incarcerated			
	(1)	(2)	(3)	(4)
Black Defendant	0.0507**	0.0453**	0.0571**	0.0467**
	(0.00283)	(0.00281)	(0.00677)	(0.00298)
Black Judge × Black Defendant	0.0419**	0.0435**	0.0575**	0.00495
	(0.0109)	(0.0131)	(0.0108)	(0.0175)
Recid. Score		0.0236**	0.0238	0.0236**
		(0.00241)	(0.0162)	(0.00243)
Black Judge × Recid. Score		-0.0396*	-0.111**	-0.00752
		(0.0190)	(0.0310)	(0.0213)
Black Defendant × Recid. Score		0.0239**	0.0215*	0.0202**
		(0.00257)	(0.00820)	(0.00257)
Black Judge × Black Defendant × Recid. Score		0.0192+	0.0457**	0.0481**
		(0.0117)	(0.0165)	(0.0138)
Obs.	819746	819746	68824	750857
R²	0.146	0.146	0.180	0.134
County-Year FE	X	X	X	X
Charge Severity FE	X	X	X	X
Risk Ventile FE	X			
Judge FE	X	X	X	X
Other Judge/Def Characteristics	X	X	X	X
Other Judge/Def. Characteristics-Risk Score Interactions		X	X	X
Prosecutor FE	X	X	X	X

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		Defendant is Incarcerated		
	All	All	High Black Shr.	Low Black Shr.
	(1)	(2)	(3)	(4)
Black Defendant	0.0458**	0.0405**	0.0341**	0.0452**
	(0.00315)	(0.00310)	(0.00646)	(0.00316)
Black Judge × Black Defendant	0.0529**	0.0553**	0.0608**	0.00270
	(0.0108)	(0.0116)	(0.0132)	(0.0184)
Recid. Score		0.0226**	0.0158	0.0239**
		(0.00253)	(0.0113)	(0.00245)
Black Judge × Recid. Score		-0.0259	-0.0460+	-0.00912
		(0.0164)	(0.0263)	(0.0218)
Black Defendant × Recid. Score		0.0252**	0.0340**	0.0217**
		(0.00272)	(0.00607)	(0.00260)
Black Judge × Black Defendant × Recid. Score		0.0109	0.0103	0.0442**
		(0.0108)	(0.0156)	(0.0115)
Obs.	883893	883893	122425	761461
R²	0.136	0.137	0.144	0.120
County-Year FE	X	X	X	X
Charge Severity FE	X	X	X	X
Risk Ventile FE	X			
Judge FE	X	X	X	X
Other Judge/Def Characteristics	X	X	X	X
Other Judge/Def. Characteristics-Risk Score Interactions		X	X	X

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Zip Fixed Effects

	All (1)	All (2)	Defendant is Incarcerated High Black Shr. (3)	Low Black Shr. (4)
Black Defendant	0.0414** (0.00334)	0.0342** (0.00337)	0.0303** (0.00882)	0.0395** (0.00312)
Black Judge × Black Defendant	0.0515** (0.0124)	0.0560** (0.0126)	0.0619** (0.0191)	0.00848 (0.0187)
Recid. Score		0.0228** (0.00249)	0.0233+ (0.0118)	0.0235** (0.00248)
Black Judge × Recid. Score		-0.0317+ (0.0173)	-0.0627* (0.0256)	-0.0106 (0.0171)
Black Defendant × Recid. Score		0.0274** (0.00256)	0.0379** (0.00623)	0.0235** (0.00245)
Black Judge × Black Defendant × Recid. Score		0.0165 (0.0107)	0.0223 (0.0154)	0.0440** (0.0123)
Obs.	852228	852228	108340	742898
R^2	0.153	0.153	0.168	0.137
County-Year FE	X	X	X	X
Charge Severity FE	X	X	X	X
Risk Ventile FE	X			
Judge FE	X	X	X	X
Other Judge/Def Characteristics	X	X	X	X
Other Judge/Def. Characteristics-Risk Score Interactions		X	X	X
Zip FE	X	X	X	X

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County-Year-Severity Fixed Effects

	Defendant is Incarcerated			
	All	All	High Black Shr.	Low Black Shr.
	(1)	(2)	(3)	(4)
Black Defendant	0.0436**	0.0383**	0.0333**	0.0433**
	(0.00308)	(0.00299)	(0.00605)	(0.00301)
Black Judge × Black Defendant	0.0461**	0.0486**	0.0584**	0.00157
	(0.00923)	(0.00987)	(0.0111)	(0.0150)
Recid. Score		0.0235**	0.0209+	0.0243**
		(0.00242)	(0.0117)	(0.00242)
Black Judge × Recid. Score		-0.0310+	-0.0493+	-0.0118
		(0.0160)	(0.0251)	(0.0211)
Black Defendant × Recid. Score		0.0265**	0.0328**	0.0221**
		(0.00264)	(0.00608)	(0.00254)
Black Judge × Black Defendant × Recid. Score		0.0114	0.0115	0.0462**
		(0.0103)	(0.0147)	(0.0124)
Obs.	882642	882642	122352	760191
R^2	0.162	0.163	0.155	0.148
County-Year-C. Severity FE	X	X	X	X
Risk Ventile FE	X			
Judge FE	X	X	X	X
Other Judge/Def Characteristics	X	X	X	X
Other Judge/Def. Characteristics-Risk Score Interactions		X	X	X

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		Defendant is Incarcerated		
	All	All	High Black Shr.	Low Black Shr.
	(1)	(2)	(3)	(4)
Black Defendant	0.0449**	0.0443**	0.0385**	0.0485**
	(0.00307)	(0.00305)	(0.00696)	(0.00319)
Black Judge × Black Defendant	0.0542**	0.0567**	0.0616**	0.0185
	(0.0110)	(0.0123)	(0.0161)	(0.0185)
Recid. Score		0.0658**	0.0815**	0.0658**
		(0.00306)	(0.0147)	(0.00308)
Black Judge × Recid. Score		-0.0227	-0.0986*	0.0535+
		(0.0297)	(0.0453)	(0.0296)
Black Defendant × Recid. Score		0.0146**	0.0189*	0.0111**
		(0.00288)	(0.00726)	(0.00265)
Black Judge × Black Defendant × Recid. Score		0.00939	0.0201	0.0139
		(0.0135)	(0.0225)	(0.0163)
Obs.	883893	883893	122425	761461
R^2	0.140	0.139	0.140	0.124
County-Year FE	X	X	X	X
Charge Severity FE	X	X	X	X
Risk Ventile FE	X			
Judge FE	X	X	X	X
Other Judge/Def Characteristics	X	X	X	X
Other Judge/Def. Characteristics-Risk Score Interactions		X	X	X

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Alternative Black Shares

	Defendant is Incarcerated			
	Share within county-year		Share within county-year-judge	
	High Black Shr.	Low Black Shr.	High Black Shr.	Low Black Shr
	(1)	(2)	(3)	(4)
Black Defendant	0.0356**	0.0454**	0.0436**	0.0438**
	(0.00672)	(0.00316)	(0.00628)	(0.00311)
Black Judge × Black Defendant	0.0605**	0.00136	0.0436**	0.0195
	(0.0140)	(0.0184)	(0.0151)	(0.0172)
Recid. Score	0.0115	0.0240**	0.0226*	0.0235**
	(0.0115)	(0.00246)	(0.0113)	(0.00245)
Black Judge × Recid. Score	-0.0429	-0.0111	-0.0382	-0.0207
	(0.0270)	(0.0216)	(0.0319)	(0.0222)
Black Defendant × Recid. Score	0.0367**	0.0216**	0.0289**	0.0218**
	(0.00593)	(0.00257)	(0.00590)	(0.00253)
Black Judge × Black Defendant × Recid. Score	0.00827	0.0452**	-0.00183	0.0353*
	(0.0160)	(0.0114)	(0.0162)	(0.0139)
Obs.	122260	761625	119692	764101
R^2	0.143	0.119	0.151	0.121
County-Year FE	X	X	X	X
Charge Severity FE	X	X	X	X
Risk Ventile FE	X			
Judge FE	X	X	X	X
Other Judge/Def Characteristics	X	X	X	X
Other Judge/Def. Characteristics-Risk Score Interactions		X	X	X

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	All	All	Defendant is Incarcerated High Black Shr.	Low Black Shr.
	(1)	(2)	(3)	(4)
Black Defendant	0.0458**	0.0405**	0.0341**	0.0452**
	(0.00315)	(0.00309)	(0.00646)	(0.00316)
Black Judge × Black Defendant	0.0529**	0.0553**	0.0608**	0.00269
	(0.0108)	(0.0116)	(0.0132)	(0.0184)
Recid. Score		0.0228**	0.0158	0.0241**
		(0.00254)	(0.0113)	(0.00246)
Black Judge × Recid. Score		-0.0262	-0.0460+	-0.00943
		(0.0164)	(0.0263)	(0.0218)
Black Defendant × Recid. Score		0.0252**	0.0340**	0.0217**
		(0.00272)	(0.00607)	(0.00260)
Black Judge × Black Defendant × Recid. Score		0.0109	0.0103	0.0442**
		(0.0108)	(0.0156)	(0.0115)
Obs.	882408	882408	122425	759976
R²	0.136	0.136	0.144	0.120
County-Year FE	X	X	X	X
Charge Severity FE	X	X	X	X
Risk Ventile FE	X			
Judge FE	X	X	X	X
Other Judge/Def Characteristics	X	X	X	X
Other Judge/Def. Characteristics-Risk Score Interactions		X	X	X

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Only Black Judges

	All (1)	All (2)	Defendant is Incarcerated High Black Shr. (3)	Low Black Shr. (4)
Black Defendant	0.0292**	0.0318**	0.0341**	0.0325**
	(0.00620)	(0.00671)	(0.00669)	(0.0109)
Black Judge × Black Defendant	0.0607**	0.0598**	0.0615**	0.0221
	(0.0124)	(0.0125)	(0.0137)	(0.0204)
Recid. Score		0.00539	0.0137	-0.00203
		(0.00755)	(0.0115)	(0.00883)
Black Judge × Recid. Score		-0.00791	-0.0436	0.0146
		(0.0175)	(0.0263)	(0.0235)
Black Defendant × Recid. Score		0.0336**	0.0359**	0.0271**
		(0.00504)	(0.00602)	(0.00779)
Black Judge × Black Defendant × Recid. Score		0.00739	0.00796	0.0393*
		(0.0124)	(0.0156)	(0.0173)
Obs.	186716	186716	118937	67777
R²	0.139	0.140	0.143	0.141
County-Year FE	X	X	X	X
Charge Severity FE	X	X	X	X
Risk Ventile FE	X			
Judge FE	X	X	X	X
Other Judge/Def Characteristics	X	X	X	X
Other Judge/Def. Characteristics-Risk Score Interactions		X	X	X

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Risk Score Trained on Lenient Judges

	All (1)	All (2)	Defendant is Incarcerated High Black Shr. (3)	Low Black Shr. (4)
Black Defendant	0.0461** (0.00318)	0.0404** (0.00310)	0.0341** (0.00656)	0.0453** (0.00317)
Black Judge × Black Defendant	0.0527** (0.0109)	0.0556** (0.0120)	0.0605** (0.0141)	0.000901 (0.0188)
Recid. Score		0.0187** (0.00242)	0.0161 (0.0109)	0.0197** (0.00238)
Black Judge × Recid. Score		-0.0259 (0.0169)	-0.0508+ (0.0272)	-0.00714 (0.0195)
Black Defendant × Recid. Score		0.0280** (0.00278)	0.0382** (0.00669)	0.0235** (0.00260)
Black Judge × Black Defendant × Recid. Score		0.0115 (0.0117)	0.00803 (0.0159)	0.0505** (0.0156)
Obs.	883893	883893	122425	761461
R²	0.136	0.136	0.144	0.119
County-Year FE	X	X	X	X
Charge Severity FE	X	X	X	X
Risk Ventile FE	X			
Judge FE	X	X	X	X
Other Judge/Def Characteristics	X	X	X	X
Other Judge/Def. Characteristics-Risk Score Interactions		X	X	X

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Risk Score Trained on 2 Most Lenient Judges

	All (1)	All (2)	Defendant is Incarcerated High Black Shr. (3)	Low Black Shr. (4)
Black Defendant	0.0458** (0.00315)	0.0406** (0.00309)	0.0344** (0.00651)	0.0453** (0.00317)
Black Judge × Black Defendant	0.0530** (0.0107)	0.0556** (0.0119)	0.0602** (0.0138)	0.00152 (0.0187)
Recid. Score		0.0220** (0.00246)	0.0201+ (0.0108)	0.0229** (0.00243)
Black Judge × Recid. Score		-0.0311+ (0.0170)	-0.0573* (0.0265)	-0.0102 (0.0224)
Black Defendant × Recid. Score		0.0257** (0.00276)	0.0341** (0.00644)	0.0218** (0.00264)
Black Judge × Black Defendant × Recid. Score		0.0119 (0.0114)	0.00999 (0.0153)	0.0494** (0.0147)
Obs.	883893	883893	122425	761461
R^2	0.136	0.136	0.144	0.120
County-Year FE	X	X	X	X
Charge Severity FE	X	X	X	X
Risk Ventile FE	X			
Judge FE	X	X	X	X
Other Judge/Def Characteristics	X	X	X	X
Other Judge/Def. Characteristics-Risk Score Interactions		X	X	X

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		Defendant is Incarcerated		
	All	All	High Black Shr.	Low Black Shr.
	(1)	(2)	(3)	(4)
Black Defendant	0.0462**	0.0411**	0.0319**	0.0459**
	(0.00314)	(0.00310)	(0.00641)	(0.00315)
Black Judge × Black Defendant	0.0481**	0.0538**	0.0624**	-0.000922
	(0.0105)	(0.0116)	(0.0128)	(0.0171)
Recid. Score		0.0266**	0.00321	0.0291**
		(0.00256)	(0.0121)	(0.00239)
Black Judge × Recid. Score		-0.0325*	-0.0342	-0.0262
		(0.0163)	(0.0271)	(0.0259)
Black Defendant × Recid. Score		0.0248**	0.0351**	0.0206**
		(0.00279)	(0.00604)	(0.00262)
Black Judge × Black Defendant × Recid. Score		0.0112	0.00923	0.0450**
		(0.0109)	(0.0156)	(0.0138)
Obs.	883893	883893	122425	761461
R^2	0.137	0.138	0.145	0.121
County-Year FE	X	X	X	X
Charge Severity FE	X	X	X	X
Risk Ventile FE	X			
Judge FE	X	X	X	X
Other Judge/Def Characteristics	X	X	X	X
Other Judge/Def. Characteristics-Risk Score Interactions		X	X	X

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Interaction with Share of Black Defendants

	Defendant is Incarcerated			
	(1)	(2)	(3)	(4)
Black Defendant	0.0356**	0.0405**	0.0352**	0.0349**
	(0.00459)	(0.00310)	(0.00509)	(0.00416)
Black Judge × Black Defendant	0.00786	0.0553**	-0.0758	-0.0849
	(0.0153)	(0.0116)	(0.0503)	(0.0572)
Recid. Score		0.0226**	0.0180**	0.0182**
		(0.00253)	(0.00299)	(0.00283)
Black Judge × Recid. Score		-0.0259	-0.0347	-0.0144
		(0.0164)	(0.0336)	(0.0297)
Black Defendant × Recid. Score		0.0252**	0.00692+	0.0106**
		(0.00272)	(0.00376)	(0.00313)
Black Judge × Black Defendant × Recid. Score		0.0109	0.141**	0.0896**
		(0.0108)	(0.0348)	(0.0313)
Black Defendant × Shr. Black Defendants			0.0225+	0.0232*
			(0.0127)	(0.0109)
Black Judge × Black Defendant × Shr. Black Defendants			0.222*	0.251**
			(0.102)	(0.0828)
Black Judge × Black Defendant × Recid. Score ×Shr. Black Defendants			-0.209**	-0.119+
			(0.0729)	(0.0676)
Obs.	293188	883893	883913	883893
R²	0.209	0.137	0.124	0.137
County-Year FE	X	X	X	X
Charge Severity FE	X	X	X	X
Risk Ventile FE	X			
Judge FE		X		X
Other Judge/Def Characteristics	X	X	X	X
Other Judge/Def. Characteristics-Risk Score Interactions		X	X	X

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Coefficient plot for regression of incarceration outcome on interaction term for Black Judge × Black Defendant, giving the diff-in-diff in-group bias effect, removing one black judge at a time. County-year FE, charge severity FE, recidivism risk FE and judge FE absorbed. [Back]