

USING HIGH-FREQUENCY EVALUATIONS TO ESTIMATE DISCRIMINATION: EVIDENCE FROM MORTGAGE LOAN OFFICERS

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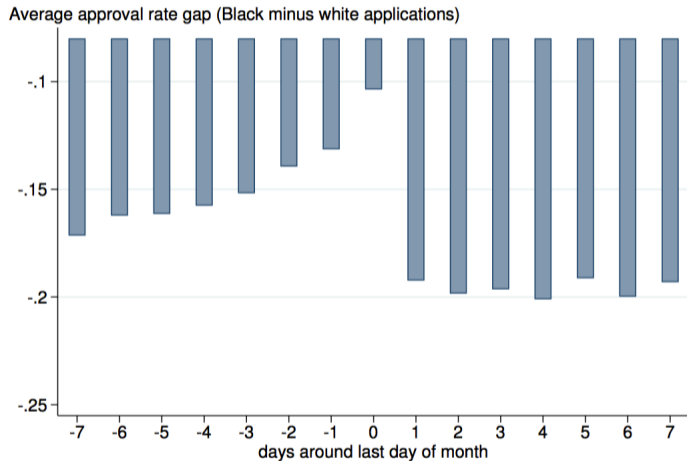
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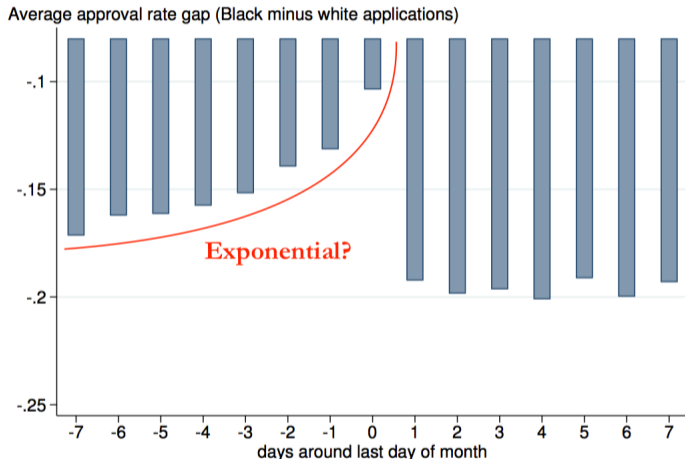
THIS PAPER: A SIMPLE WAY TO TEST FOR DISCRIMINATION

- **Identifying discrimination is tricky (in any market)**
- Two common approaches:
 1. Benchmarking tests: minorities receive worse evaluations
 - ★ But...omitted variable bias! (e.g. loan default rates)
 2. Outcome tests: if discrimination, should see minorities have better *ex post* outcomes
 - ★ Not a sufficient condition!
 - ★ Self-fulfilling prophecies + gap in observed outcomes \neq gap in marginal outcomes
- This paper: high-frequency DiD comparing Black-white mortgage approval gap at beginning vs. end of the month

THE PAPER IN ONE FIGURE



THE PAPER IN ONE FIGURE



- A benchmarking test where within-month changes limit scope for omitted variables
- Black-white approval gap shrinks by 10 p.p. from first to last week of month
- Within-month gap closes by **3-5 p.p.** after adjusting for covariates

OTHER KEY RESULTS

- **Identification:** unobserved applicant characteristics time-invariant within the month
 - ▶ % Black and below-median income applications or originations flat over the month
 - ▶ Similar bunching for high and low-FICO mortgages → officers don't save "easy" applications for last
- Some heterogeneity in origination patterns
 - ▶ Black approvals at end of month *increase* in share of Black applicants lender processes
 - ▶ FinTech: more equal treatment, less of a month-end jump (but less F2F lending!)
 - ▶ Competition (HHI) has very small effects on closing the approval gap
- Geographic variation in mortgage loan discrimination? **(more on this later)**

MY COMMENTS

1. **Taste-based discrimination: validation check using geography**
2. Behavioral interpretation: why do loan officers delay until the end of the month?
3. Policy implications: if not being competed away, how can we regulate?

USING GEOGRAPHY TO ARGUE TASTE-BASED DISCRIMINATION

- **Statistical discrimination unlikely given results in this paper**
 - ▶ Requires loan officers to learn more or less about applicants over month
 - ▶ Depends on nature of F2F vs. internet applications?
 - ▶ Same pattern for HECMs which require HUD counseling? → flag in HMDA as of 2018
- **Question:** how much of the Black-white approval gap gets killed by county or month-year county FEs? (did not find in current draft)
- **Why?** We know racial animus is geographically concentrated...
 - ▶ Series of writings by Seth Stephens-Davidowitz on racism and Google Trends
 - ▶ Correlated with “real” displays of discrimination: compare difference in Democrat vote shares for Kerry in 2004 vs. for Obama in 2008 against searches for racial epithets

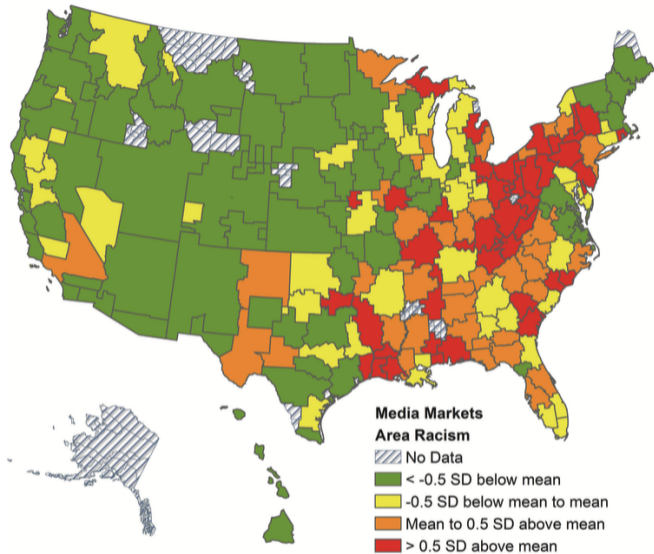


Fig 1. Proportion of Google queries containing the "N-word" by designated market area, 2004–2007.

- Racial animus worst in Rust Belt, but lots of variation on East Coast
- Update Google series to recent years (issues with older data)
- Aggregate up loan applications to DMA or "city" level
- **Unrestricted HMDA:** ideally use lender's address, but should be little difference in using property address

Source: Chae et al. (2015): "Association between an Internet-Based Measure of Area Racism and Black Mortality," *PLoS One*

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EXPONENTIAL GROWTH IN ORIGINATIONS

- Authors mention two stories for why subjectivity goes down at end of the month
 1. Rational: convex (daily) effort costs \rightarrow work concentrated at end of month
 2. Behavioral: **procrastination** or overconfidence
- **Idea:** within-month patterns in application processing might give us some additional information about loan officers' decision problem
 - ▶ Exponential growth in last week of the month
 - ▶ Hyperbolic discounting of future effort input \rightarrow can back out daily discount rate
- Analogy to the “payment cycles” literature

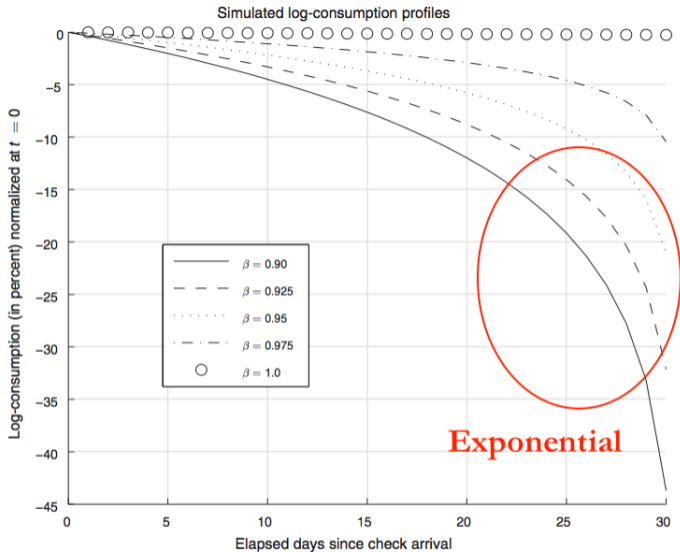


FIGURE 1. MONTHLY CONSUMPTION PATTERN: $\delta = 0.97$; $\rho = 1$

Source: Mastrobuoni & Weinberg (2009): "Heterogeneity in Intra-Monthly Consumption Patterns, Self-Control, and Savings at Retirement," *AEJ Policy*

- This context: Laibson's "golden eggs" lower overall effort costs instead of increasing consumption
- Isoelastic (convex) effort cost + present-bias \implies applications jump in proportion to ρ and β
- Check combinations of (ρ, β, δ) at lender and aggregate level that can fit data
- If reasonable parameters then **procrastination** plays a role here

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A SIMPLE FRAMEWORK

- Present-biased (procrastinator) officer's problem:

$$\min_{\{x_t\}} \left\{ -e(x_0) - \beta \cdot \sum_{t=1}^T \delta^t e(x_t) \right\} \quad \text{s.t.} \quad \underbrace{\sum_{t=0}^T x_t}_{\text{monthly quota}} = Q_T$$

- Abstract from time budget constraint for simplicity (e.g. 24 hours in a day)
- Tangency condition: $e'(x_0^*)/e'(x_1^*) = \beta\delta < \delta$ (à la Akerlof)
- Suppose $\delta = 1$ and $e(\cdot)$ is isoelastic with IES of applications $\rho \implies$

$$\frac{\partial \log x_t}{\partial t} = -\frac{1}{\rho} \log \beta + \frac{1}{T-t+1} - \frac{1}{T-t+\beta^{-1/\rho}} > 0$$

POLICY PRESCRIPTIONS

1. Possible fix: regulating overtime among loan officers (time budget)

- ▶ Would nudge officers closer to the optimal effort plan $(x_0^*, x_1^*, x_2^*, \dots)$
- ▶ Model implementation: either add a weekly quota constraint or assume officers are “sophisticated” in that they value commitment device
- ▶ Problem: time crunch seems to help reduce bias inherent in subjective evaluations!

2. Alternatively, could outlaw monthly origination quotas (Q_T)

- ▶ Same issue: removes a constraint but might increase subjectivity
- ▶ Subsidize effort towards applications from minority groups, or group-specific quotas?
- ▶ Balance against moral hazard cost of more lax lending standards

CONCLUSION

- Very nicely executed paper...not much to improve in terms of robustness
- Main innovation: high frequency DiD improves standard benchmarking test
 - ▶ Mortgage market is big \implies discrimination represents \$213 billion in “missing” loans
 - ▶ Broader applications: need timestamped data + [time-varying] subjective gatekeeping
- **My take: interpretation of officer behavior important for policy recommendations and applying test to other markets**
 - ▶ Within-month change due to compensation structure (i.e. monthly targets)?
 - ▶ Or due to a more general phenomenon (e.g. procrastination)?
- Could write down a structural model but might be another paper!