Automation Can Mitigate Racial Disparities in Small Business Lending: Evidence from the Paycheck Protection Program

Sabrina T. Howell (NYU Stern and NBER)
Theresa Kuchler (NYU Stern and NBER)
David Snitkof (Ocrolus)
Johannes Stroebel (NYU Stern and NBER)
Jun Wong (University of Chicago)

Motivation

- Longstanding concerns about racial disparities in lending outcomes
- Debate about whether fintech lenders amplify or reduce disparities
  - Complex algorithms might lead to more statistical discrimination
  - Automation might mitigate disparities
    1. Lower fixed cost → Serve smaller businesses
    2. Online → Serve broader array of locations
    3. Eliminate human decision-making → Reduce discrimination
- Role of **automation** for racial disparities in Paycheck Protection Program (PPP)
  - $806 billion in small businesses loans during COVID-19
  - Lenders faced no credit risk but decided who to serve
  - Loan amount and terms predetermined
- We ask two questions:
  1. Are there *systematic* racial differences in PPP loans by lender type?
  2. What is the role of automation in explaining these differences?

Overview of Findings: Striking Descriptive Disparities

- Black-owned businesses disproportionately obtain PPP loans from Fintech lenders
- 2/3 of the unconditional difference explained by observables:
  - Location, industry, loan characteristics, firm characteristics

  → Ability of fintech to make smaller loans, serve different areas
- Conditional on controls, Black-owned businesses still much more likely (12 pp, 70%) to obtain PPP loan from Fintech firm
  - And much less likely to get PPP loans from smaller banks
  - No difference for Top-4 banks
- Some differences across Asian, Hispanic, White-owned borrowers, but not nearly as striking as the Black vs. all other difference

Does Automation Reduce Racial Disparities?

- Small banks that automated processes during PPP
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  - This effect is larger in areas with higher anti-Black racial animus

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- Application behavior and disparities in getting any PPP loan
  - Sample of loans applying through Fintech platform
  - Black-owned businesses substantially less likely to get PPP loan if (conditionally randomly) routed to conventional lender
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  - Black-owned businesses substantially less likely to get PPP loan if (conditionally randomly) routed to conventional lender
  - No difference if routed to Fintech lenders
- Can other factors explain racial disparities in PPP lender?
  - Pre-existing banking relationships and capacity constraints of lenders
  - Real-time firm revenues
  - Differential fraud rates

Outline

Institutional Context

Data

Lending to Black-Owned Firms by Institution Type

Effect of Automation

Application Behavior and Disparities in getting any PPP

Can something else explain disparities in PPP lender?

Concluding Discussion

The Paycheck Protection Program

- March 2020 CARES Act: Paycheck Protection Program (PPP)
  - First loans early April 2020, closed in May 2021,
  - Total: 11.8m PPP loans granted
  - Substantial changes to program starting February 24, 2021

    → Focus on lending prior to that date
- Loan amount determined by payroll (2.5x monthly payroll)
- Loan fully forgiven if used for qualified expenses (76% as of Nov 1)
- Processed and administered by private lenders
  - Lender compensation based on loan amount
  - Not collateralized, 100% government guaranteed
  - Minimal risk for lenders even in case of default or fraud

Outline

Data

- SBA PPP data: Use 5.7 mill unique first loans before 2/24/2021
  - Lender identity ($\approx$ 4,900 unique lenders)
  - Loan amount
  - Borrower identity, industry, org form
- Owner / officer names from state business registrations via Middesk $\rightarrow$ Race prediction
- Bank statement data from Ocrolus
- Credit/debit card revenue data from Enigma
- PPP applications to Lendio platform
- List of Fintechs, Full Sample Sum Stats, Analysis Sample Sum Stats

Identifying Borrower Race and Ethnicity

- Some borrowers voluntarily self-identify race in PPP application
  → Highly selected
- **Baseline approach:** Predict race from names and other observables (e.g., Imai and Khanna, 2016; Tzioumis, 2018)
  1. Obtain business owner name
  2. Predict race based on last name and location
  3. Train random forest model on self-identified borrowers. Features: posterior from step 2, racial distribution of first names, industry

  → Predicted probability of business owner being a certain race for 4.2 mill loans

Identifying Borrower Race and Ethnicity

- Algorithm achieves good performance within holdout sample of self-identified borrowers
- Results robust to using self-reported race sample (1 million), or algorith from Zest.ai
- Signal arguably more interesting: Loan officers observe applicant name and location (i.e., the inputs into our model) and not usually self-identified race
  - → Likely to respond to signal contained in name
  - → Discrimination against "African American Sounding" names in Bertrand and Mullainathan (2004): *"Are Emily and Greg More Employable than Lakisha and Jamal?"*

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- Institutional Context
- Data
- **Lending to Black-Owned Firms by Institution Type**
- Effect of Automation
- Application Behavior and Disparities in getting any PPP
- Can something else explain disparities in PPP lender?
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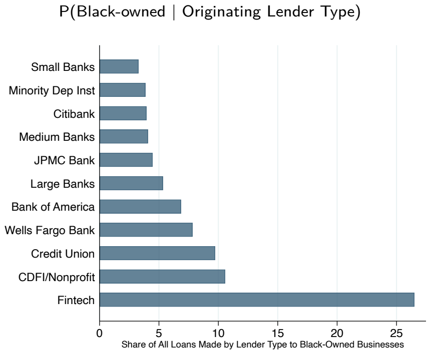
Black-Owned PPP Lending by Institution Type



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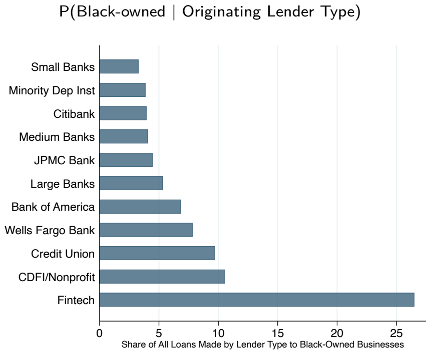

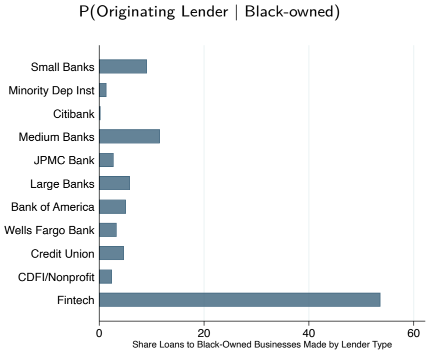

- Fintech lenders lend disproportionately to Black-owned businesses
- 54% of Black-owned borrowers receive Fintech PPP loan (Fintechs make only 17.2% of all PPP loans)
- Disparities for Black-owned businesses much more striking than for other groups → Focus of paper

Black-Owned PPP Lending by Institution Type

- So far: Raw averages
- But: Black-owned businesses differ on observable characteristics
  - **Loan size:** Banks compensated with fixed % of loan amount
    - If fintechs had fewer capacity constraints or lower fixed cost, profitably serve more small businesses which are more likely to be Black-owned
  - **Location:** Banks more likely to serve areas where they have local presence
    - If banks had fewer branches in minority neighborhoods, borrowers from these neighborhoods more likely to apply to fintech

Geographic Dist of Black Pop, Loans

→ Now: Control for these differences

Black-Owned PPP Lending by Institution Type with Controls

$$\mathbb{1}(\text{LenderType}_i) = \beta \mathbb{1}(\text{BlackOwned}_i) + \mathbf{X}_i \delta + \varepsilon_i$$

	$\mathbb{1}$(Fintech)	$\mathbb{1}$(Top 4 Bank)	$\mathbb{1}$(Large Bank)	$\mathbb{1}$(Sm/Med Bank)
$\mathbb{1}$(Black-Owned)	0.121***	-0.008***	-0.025***	-0.081***
	(0.002)	(0.001)	(0.001)	(0.001)
Loan Amount FE	Y	Y	Y	Y
Zip Code FE	Y	Y	Y	Y
Approval Week FE	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y
Business Type FE	Y	Y	Y	Y
Employer Status FE	Y	Y	Y	Y
Dep Var Mean	0.174	0.159	0.094	0.482
R^2	0.356	0.317	0.131	0.376
Observations	4,183,623	4,183,623	4,183,623	4,183,623

- Black-owned $\rightarrow \uparrow$ P(PPP loan from Fintech lender)

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- Black-owned $\rightarrow$ Little effect on P(PPP loan from Top-4 bank)

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- Black-owned $\rightarrow \downarrow$ P(PPP loan from small/medium bank)

Outline

Automation and PPP Lending to Black-Owned businesses

- What do fintechs and top-4 banks have in common with each other but not with smaller banks that might explain these patterns?

→ Substantial automation in loan processing & approval

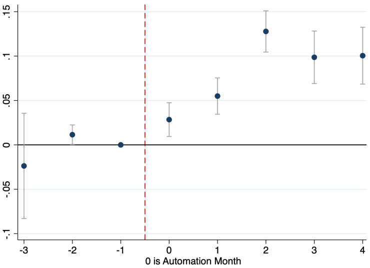
The Piedmont Bank reviews some automation solutions, but they decide to process the loan applications manually. Everyone who works there is preparing to put in long hours and a lot of elbow grease. They know they're going up against big banks and their automated systems. It's reminiscent of the folklore of John Henry, the "steel-driving man" who competed against a machine with manual labor.

Automation and PPP Lending to Black-Owned businesses

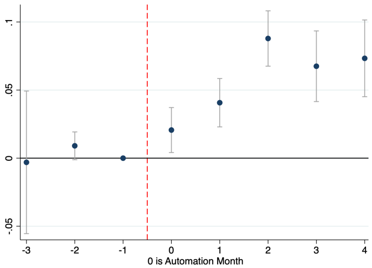
- During PPP, to cope with application volume, some small banks automated through collaborations with white-label SaaS providers
- Identify 20 automating small banks
  - From Biz2Credit: Launch date of their services to PPP banks
  - Manually through newspaper articles
- Does lending to Black-owned businesses increase after automation relative to other non-automating small banks?

Effect of Small Bank Automation

$$\mathbb{1}(\text{BlackOwned}_{ibt}) = \sum_{k \neq -1} \beta_k \mathbb{1}(t - A_b = k) + \alpha_b + \alpha_t + \mathbf{X}_{ibt}\delta + \varepsilon_{ibt}$$



Simple Diff-in-Diff



With Additional Controls

- Automation $\rightarrow \uparrow$ PPP loans to Black-owned businesses

Weekly Event Study

Effect of Small Bank Automation

Dependent Variable:	$\mathbb{1}$(Black-Owned)		$\mathbb{1}$(Owned by:) Hispanic	Asian	White
	(1)	(2)	(3)	(4)	(5)
$\mathbb{1}$(After Automation)	0.060***	0.043***	0.008***	0.009***	-0.060***
	(0.003)	(0.003)	(0.002)	(0.003)	(0.004)
Bank FE	Y	Y	Y	Y	Y
Approval Week FE	Y	Y	Y	Y	Y
Loan Amount FE		Y	Y	Y	Y
Zip Code FE		Y	Y	Y	Y
Industry FE		Y	Y	Y	Y
Business Type FE		Y	Y	Y	Y
Employer Status FE		Y	Y	Y	Y
Dep Var Mean	0.037	0.037	0.043	0.055	0.865
Observations	2,024,674	2,024,674	2,024,674	2,024,674	2,024,674

- Automation increases lending to Black-owned businesses, at expense of White-owned ones

Why does automation affect racial disparities?

- Automation can mitigate disparities through
  1. Lower fixed cost $\rightarrow$ Serve small businesses
  2. Online $\rightarrow$ Serve broader array of locations
  3. Eliminate human decision-making $\rightarrow$ Reduce discrimination
- Tight controls for loan amount, geography reduce racial disparities
  $\rightarrow$ Automation allows fintech to make smaller loans, serve different locations
- Direct evidence for reduced discrimination?

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- Direct evidence for reduced discrimination?
  - Disparities stronger in areas with high anti-Black racial animus
  - Effect of small bank automation larger in areas with higher anti-Black racial animus

  → Automation reduces anti-Black discrimination

Outline

PPP Application Analysis

- **Possible Story:** Black-owned businesses more likely to apply to Fintech lenders?
  - More tech-savvy? More Fintech-affine?
  - Less trusting of traditional banking system
- SBA data: Loans made, not applications
- Obtained data on PPP loan applications from Lendio
  - Lendio refers application to partner lenders
  - Observe which lenders application was sent to
  - Referrals based on pre-set criteria (loan size, geography) and quotas, random conditional on these criteria

Any PPP Loan Conditional on Application Routing?

- Assume application rejected if: Business applied via Lendio; Lendio sent to at least 1 lender; Business never got PPP loan

Any PPP Loan Conditional on Application Routing?

- Assume application rejected if: Business applied via Lendio; Lendio sent to at least 1 lender; Business never got PPP loan

	$\mathbb{1}$(No PPP Loan)				
	(1)	(2)	(3)	(4)	(5)
$\mathbb{1}$(Black-owned)	0.015***	0.040***	0.032***	0.002	0.005**
	(0.002)	(0.005)	(0.004)	(0.003)	(0.003)
$\mathbb{1}$(Black-owned) × Only Conv.					0.040***
					(0.005)
$\mathbb{1}$(Black-owned)×Conv.&Fintech					0.001
					(0.005)
Baseline FE	Y	Y	Y	Y	Y
Application Week FE	Y	Y	Y	Y	Y
#Fintech×#Non-Fintech Sent FE	Y	Y	Y	Y	Y
Lenders Sent	All	Only Conv.	Any Conv.	Only Fintech	All
Dep Var Mean	0.346	0.352	0.395	0.417	0.346
Observations	320,766	73,480	118,221	154,044	320,766

- Black-owned → P(any PPP) ↓ if sent only to conventional lender, no difference if sent to Fintech

→ Real effects on getting any PPP

Outline

Bank & Credit Relationships

- **Possible Story:** Banks prioritized existing clients, Black-owned businesses work with banks not engaged in PPP lending
  - Easier administratively (already have a lot of relevant data)
  - Continuation value of customer
- Business checking account bank statement data
  - Applicants to Fintech loan through Ocrolus
    - Borrowers with higher Fintech affinity (168k matched to PPP data)
  - Provides information on
    - Identity of checking account bank
    - Prior credit relationships
    - Cash flows

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- Business checking account bank statement data
- Disparity in lending to Black-owned businesses not explained by primariy checking account bank or pre-existing lending relationships
  - → Black-owned firms do not bank with lenders less active in the PPP
- Disparity within or across checking account banks?
  - Preferential lending to own checking account customers irrespective of race
  - Disparities at non-top 4 banks driven by new clients
  - → Preferential treatment of existing customers cannot explain disparities

Real-Time Performance

- **Possible Story:** Black-owned firms experienced worse COVID-19 revenue shock
- No effect on profitability of PPP loan
- But: May affect attractiveness of future interactions with firm
- Disparities not explained by:
  - Cash flows in bank statement data
  - Real-time credit & debit card revenue in loan approval month (provided by Enigma for 1 mill PPP borrowers) Results

Statistical discrimination based on differential fraud rates?

- **Possible Story:** Results driven by higher likelihood of fraud among Black business owners
  - Smaller banks more concerned or aware of this

- Ex-ante unlikely:
  1. CARES Act effectively indemnifies lender against liability for borrower fraud if lender unaware
  2. Effect driven by small banks, but top banks most tightly regulated and have most advanced compliance systems

- Sample of unsealed DOJ PPP enforcement fraud cases (268 matched by name to our sample)
  - Fintechs issued disproportionate share of fraudulent loans consistent with Griffin (2021)
  - But: 8.4% of fraud cases by Black-owned firms, in line with total share in analysis sample (8.6%)

    → No evidence of higher fraud among Black-owned businesses

Outline

Related Work on Minority Lending in the PPP

- Erel and Liebersohn (2020) & Fairlie and Fossen (2021): Use geographic variation to study PPP allocation to minorities
  - Our analysis is within narrow geographies, so bank branch location cannot fully explain patterns
- Chernenko and Scharfstein (2021): PPP lending in sample of 10,888 Florida restaurants they can link to voter registration records (where self-reporting race is optional)
  - Show minority-owned businesses more likely to get non-bank PPP loans, conclude racial bias is factor
  - Our paper complementary:
    - Larger sample (4.2 mill in main analysis), representative across geographies (beyond Florida) and industries (beyond restaurants)
    - We use checking account data, credit card data, loan application data to directly assess variety of explanations
    - Use time-series variation in automation of lending process during PPP to show that degree of automation is key factor

Conclusion

- In PPP – with no credit risk – Black-owned firms much more likely to get loan from Fintechs, much less likely from non-Top 4 bank

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→ Automation reduces racial disparities in small business lending during PPP (and likely elsewhere)