




# ECON 438: ANALYZING RACIAL BIASES IN TRAFFIC STOPS

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50,000

NUMBER OF TRAFFIC STOPS PER DAY IN THE  
UNITED STATES

# Background

- The **Stanford Open Policing Project** has collected data on vehicle stops from law enforcement departments across the country
  - *Over 200 million records from 20+ states*
- Data granularity varies by city and state
  - *Stop attributes include date, time, location, police district, driver race, driver sex, driver age, whether a search was conducted, whether contraband was found, whether an arrest was made, and more*
  - *Most data from late 2000s to early 2020s*
- Open source at [openpolicing.stanford.edu](https://openpolicing.stanford.edu)

# A large-scale analysis of racial disparities in police stops across the United States

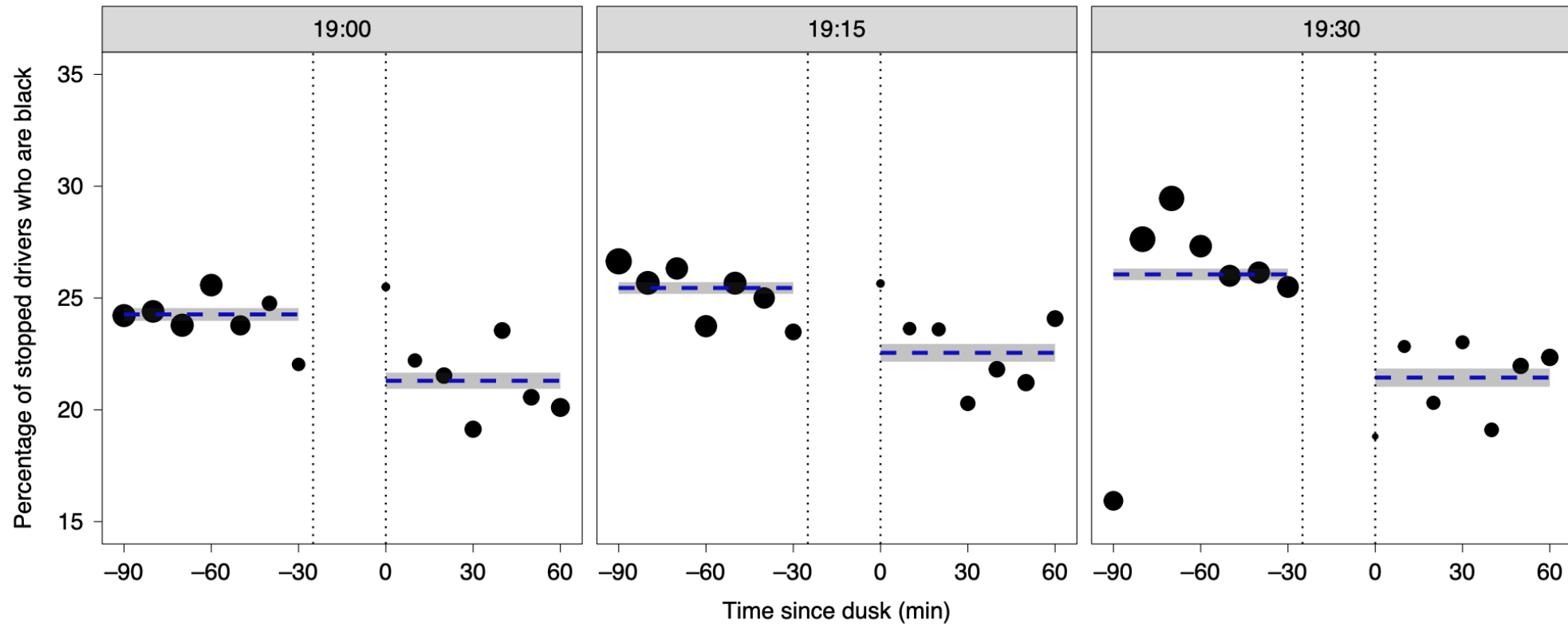
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- Pierson et al. (2020) analyze a dataset with nearly 100 million traffic stops in 21 different states, finding evidence of **racial bias in police stop and search decisions**
- Specifically, black drivers were less likely to be stopped after sunset, when a ‘veil of darkness’ conceals one's face
- Found evidence that the bar for searching blacks and Hispanic drivers was lower than that for searching white drivers

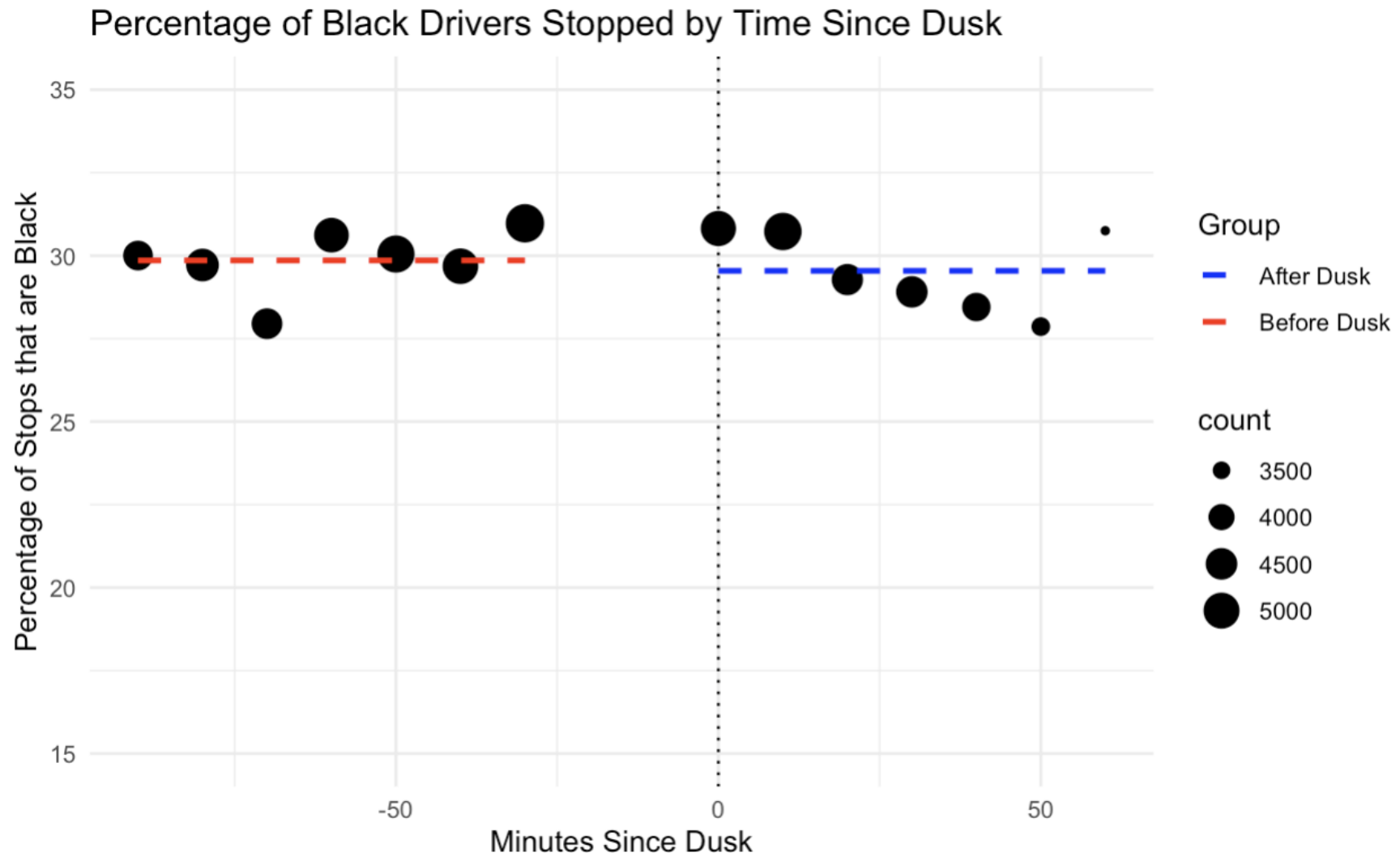
# Key Questions for Paper 3

- Are the results of Pierson et al. (2020) consistent on a local scale?
  - *Analyze traffic stop dynamics in San Francisco from Dec 2006 to Jun 2016*
  - *Idea: San Francisco is the most liberal city in the U.S.<sup>1</sup> and among the most diverse. Therefore, San Francisco police may potentially exhibit behavior different from U.S. police as a whole*
  - *Hypothesis: San Francisco exhibits racial biases to a lesser extent than the U.S. as a whole*
- Within San Francisco, do different police districts differ in racial biases found in traffic stop data?
  - *Idea: different districts have different demographic and socioeconomic breakdowns, so potentially may exhibit different trends in police behavior*

# ‘Veil of Darkness Effect’



Source: Pierson et al. (2020)  
Graphs represent traffic stops within three short time windows in a single state, Texas



Note: traffic stops occurring between 4PM and 9PM, and within 60 minutes of the 30-minute period before sunset, were used for this plot

# Methodology

- Logistic Regression Model

- $\Pr(black|t, l, DST, d, p) = \text{logit}^{-1}(\beta_d \times d + \beta_t \times ns_p(t) + \boldsymbol{\gamma}[l] + \boldsymbol{\gamma}[l] \times d + \delta[DST])$ 
  - $d \in \{0,1\}$  represents whether a stop occurred before dusk or not (1 if after dusk, 0 if before)
    - $\beta_d$  is coefficient of interest in Pierson et al. (2020). They find a negative coefficient, suggesting discrimination
  - $ns_p(t)$  is a natural spline over time with with  $p$  degrees of freedom
    - Handle nonlinear effects of time
    - Pierson et al. (2020) use  $p = 6$
  - $\boldsymbol{\gamma}[l]$  is a fixed effect for location (police district *or* county)
    - Include an interaction term to allow 'veil of darkness' effect to vary across locations
  - $\delta[DST]$  is a fixed effect for Daylight Savings Time
- Analyze differences across locations in San Francisco