EARLY AND ACCURATE RECESSION DETECTION USING CLASSIFIERS ON THE ANTICIPATION-PRECISION FRONTIER

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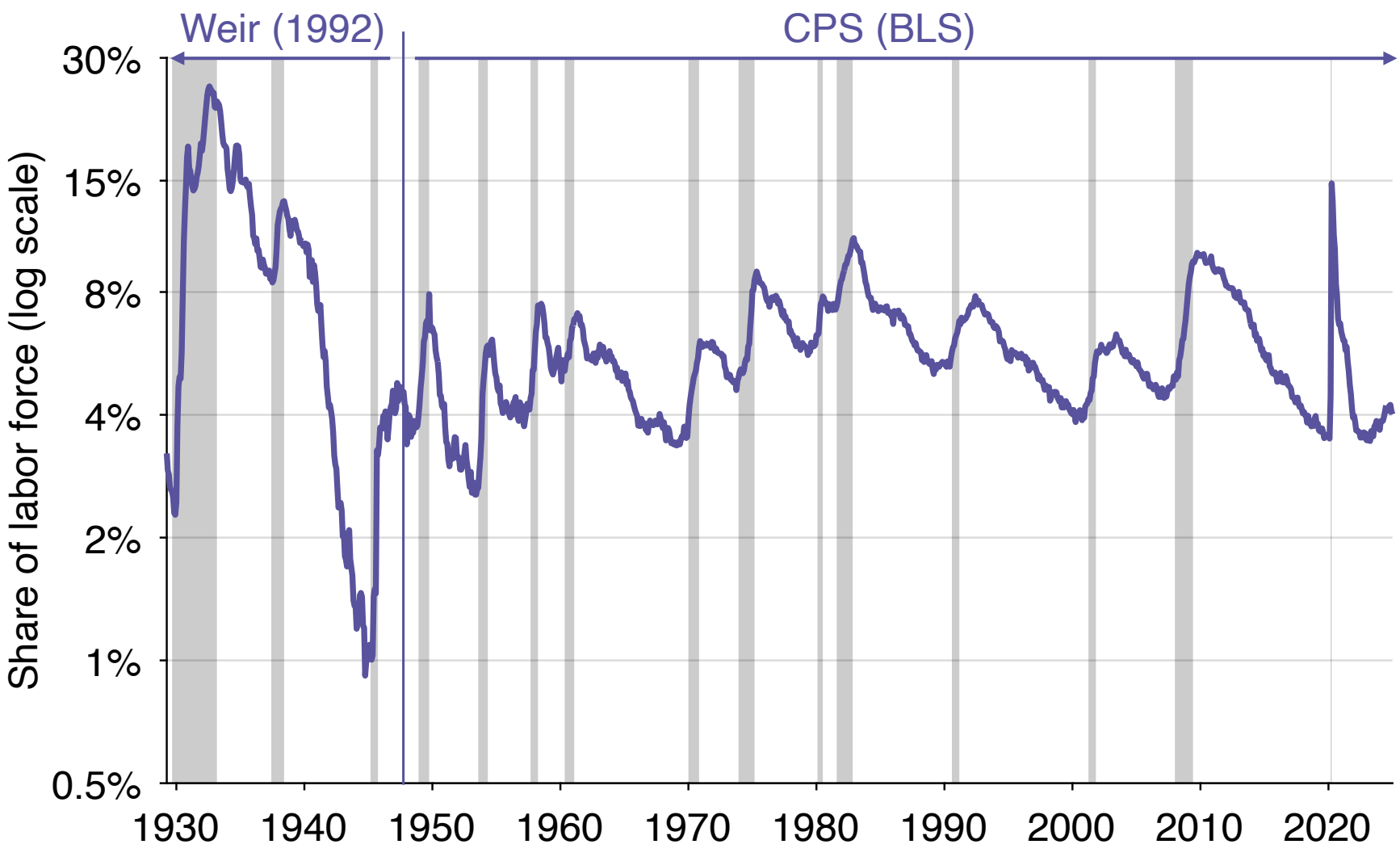
Available at https://pascalmichaillat.org/17/

DETECTING US RECESSIONS IN REAL TIME

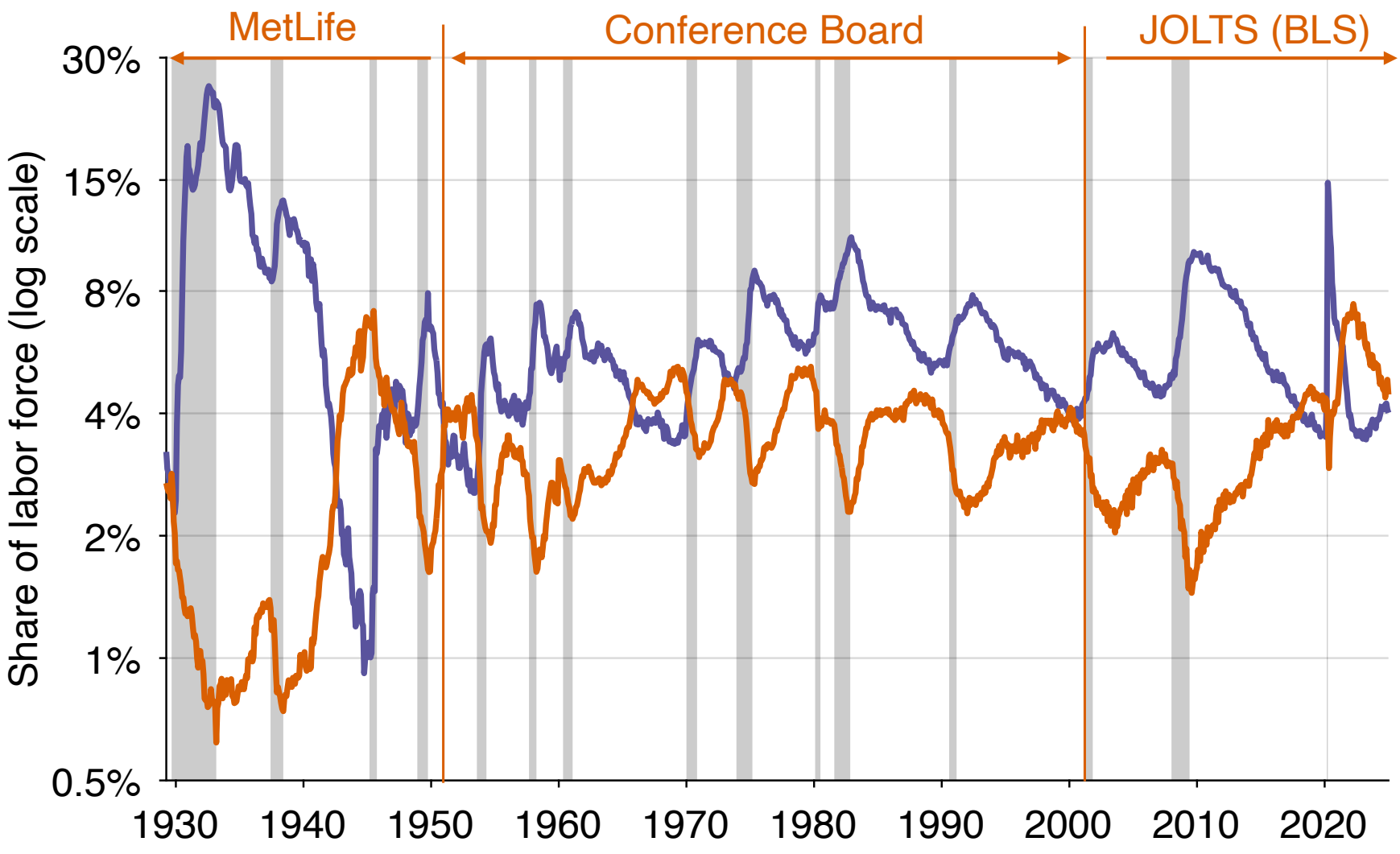
- Crump, Giannone, Lucca (2020): threshold rules with labor market data detect recessions best
- Sahm (2019): popular example
  - Based on unemployment
  - No false positives, no false negatives on 1960–2021
- Michaillat, Saez (2025): faster and more robust rule
  - Based on unemployment and job vacancies
  - Average detection delay: 1.2 months < 2.7 months
  - No false positives, no false negatives on 1929–2021
- This paper: detect recessions earlier and more precisely by filtering labor market data optimally

US UNEMPLOYMENT AND VACANCIES, 1929–2025

US UNEMPLOYMENT RATE (PETROSKY-NADEAU, ZHANG 2021)



US VACANCY RATE (PETROSKY-NADEAU, ZHANG 2021)



CONSTRUCTING RECESSION CLASSIFIERS

1. Smoothing data by moving average ($0 \leq \alpha$)
    a. Simple: $\bar{u}(t) = \left[\sum_{j=0}^{\alpha} u(t-i)\right] / (\alpha + 1)$
    b. Exponentially weighted: $\bar{u}(t) = \alpha u(t) + (1-\alpha)\bar{u}(t-1)$
2. Detecting turning points ($1 \leq \beta$):

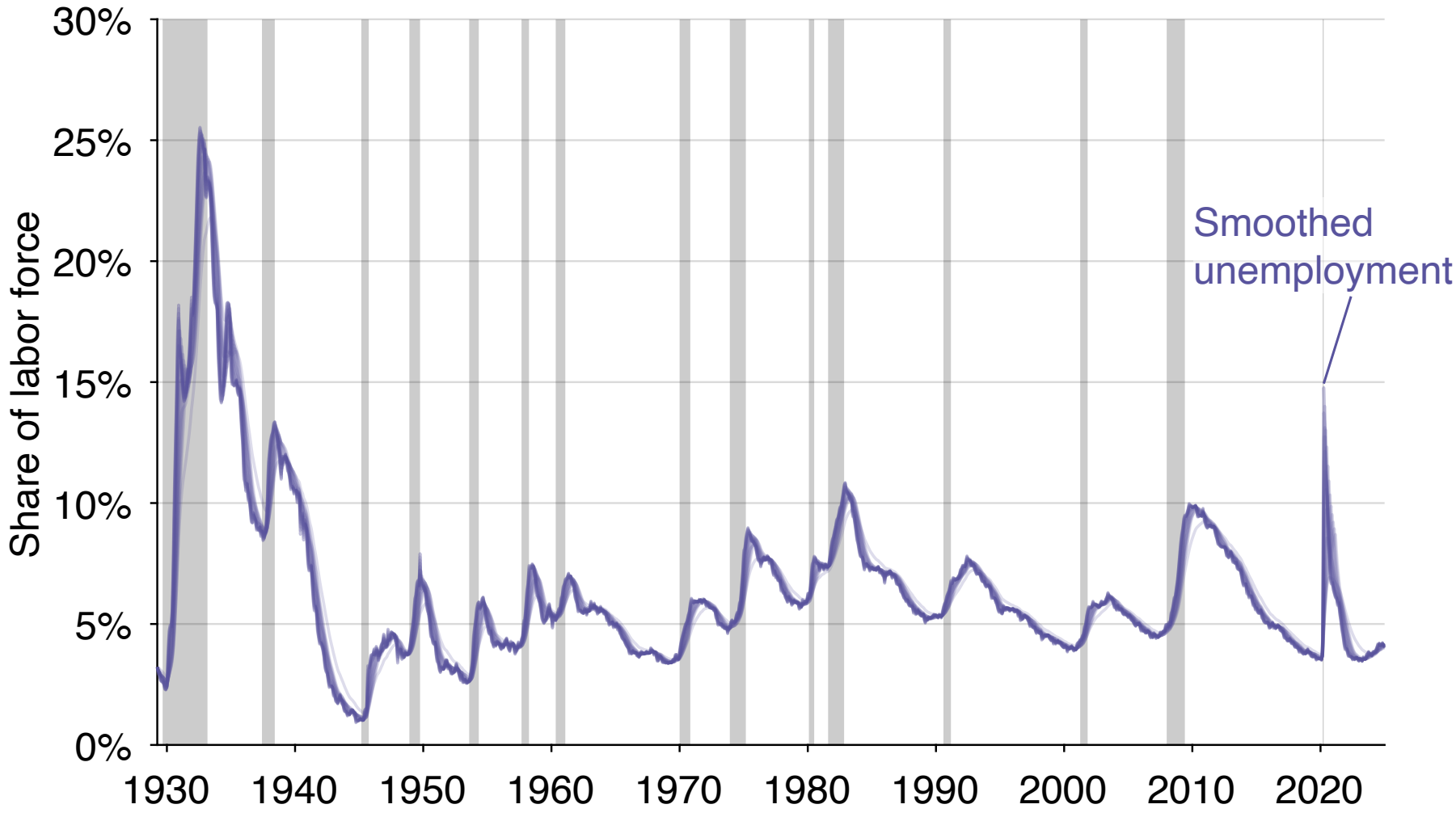
$$\tilde{u}(t) = \bar{u}(t) - \min_{0 \leq j \leq \beta} \bar{u}(t-i)$$

3. Curving data changes ($0 \leq \gamma \leq 1$):

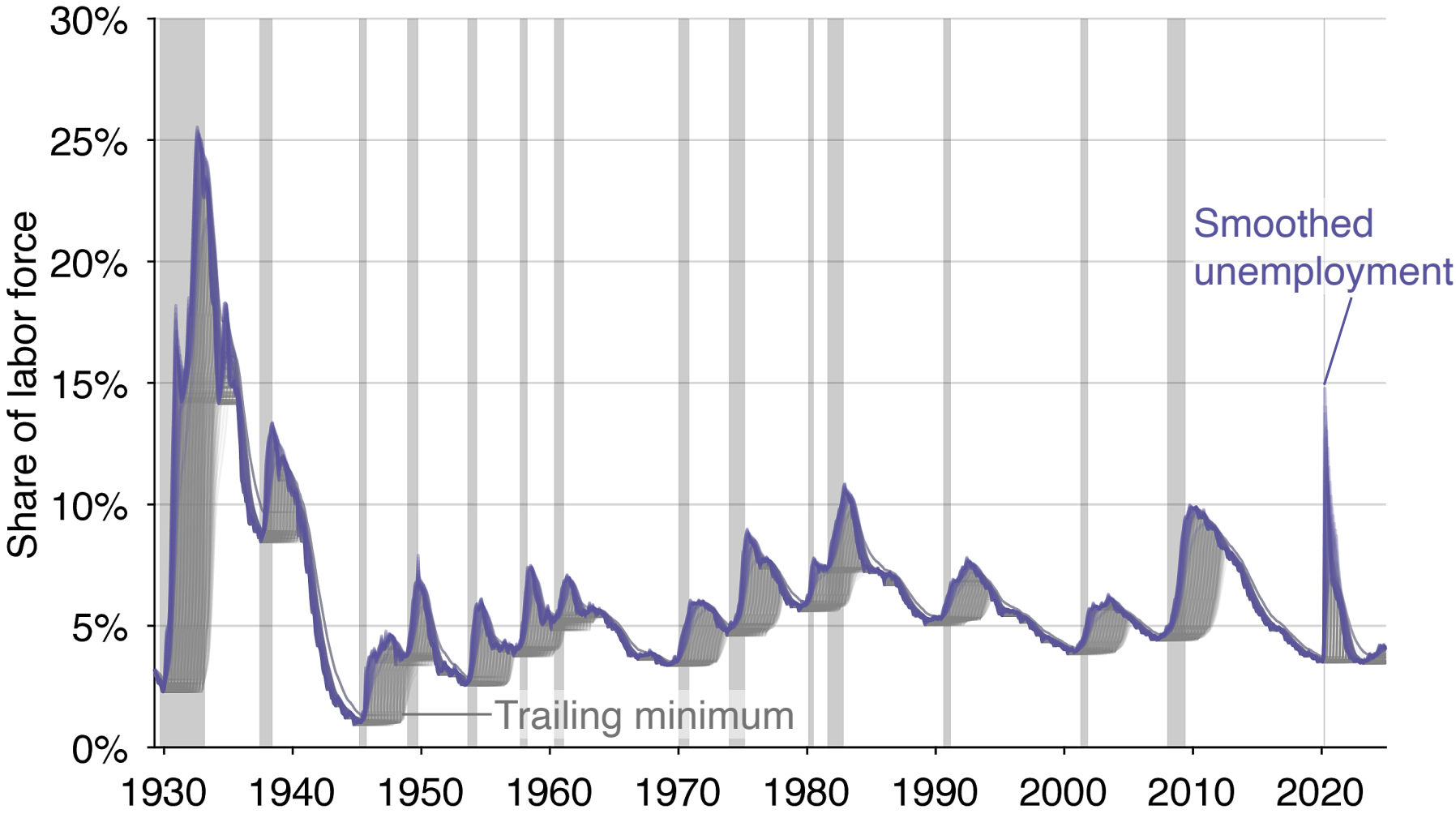
$$\hat{u}(t) = \frac{\tilde{u}(t)}{\bar{u}(t)^{\gamma}}$$

4. Combining indicators ($0 \leq \delta \leq 1$)
    a. Unemployment-vacancy: $i(t) = \delta \hat{u}(t) + (1-\delta)\hat{v}(t)$
    b. Min-max: $i(t) = \delta \min(\hat{u}(t), \hat{v}(t)) + (1-\delta)\max(\hat{u}(t), \hat{v}(t))$

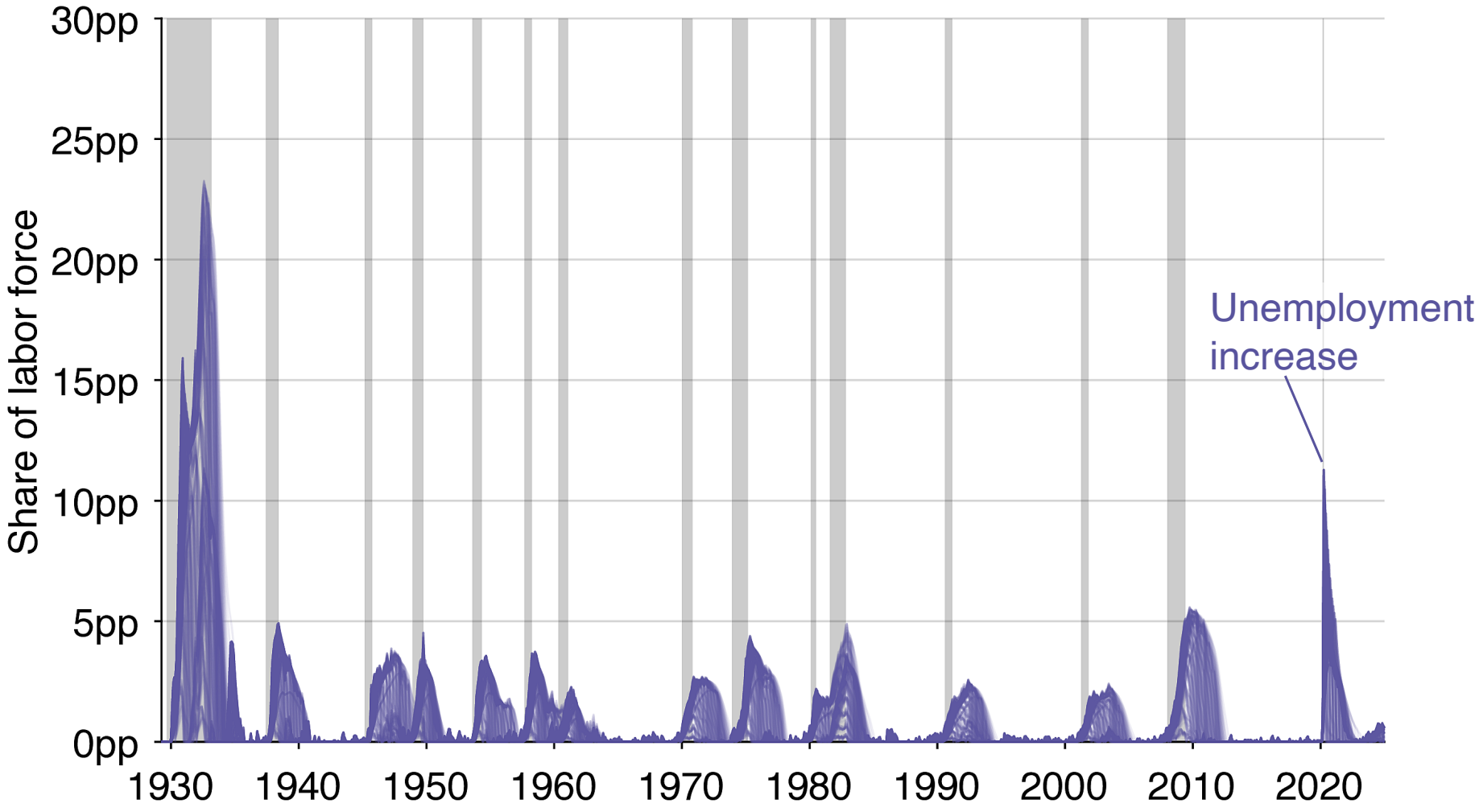
SMOOTHING UNEMPLOYMENT RATE



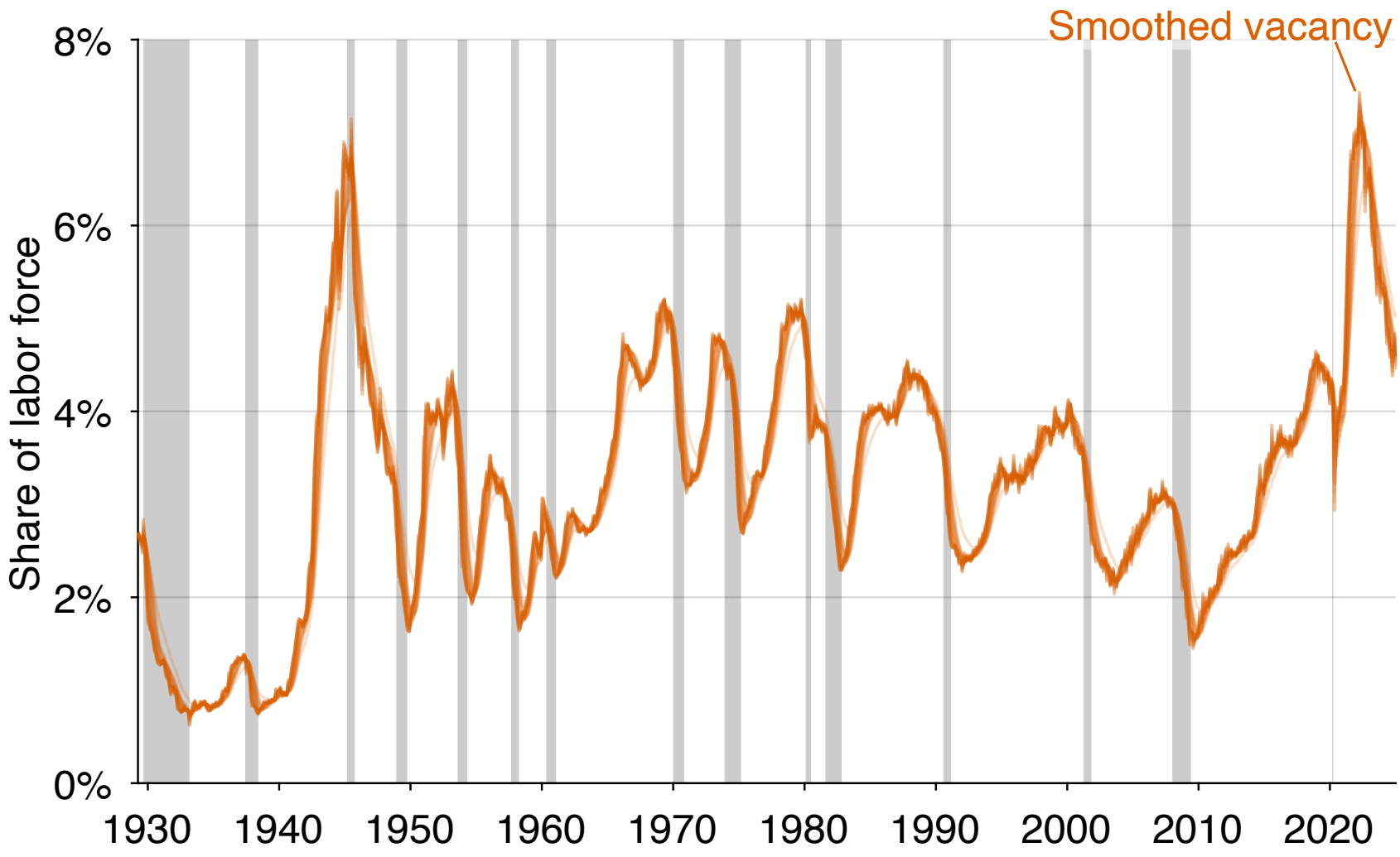
DETECTING UNEMPLOYMENT TURNING POINTS



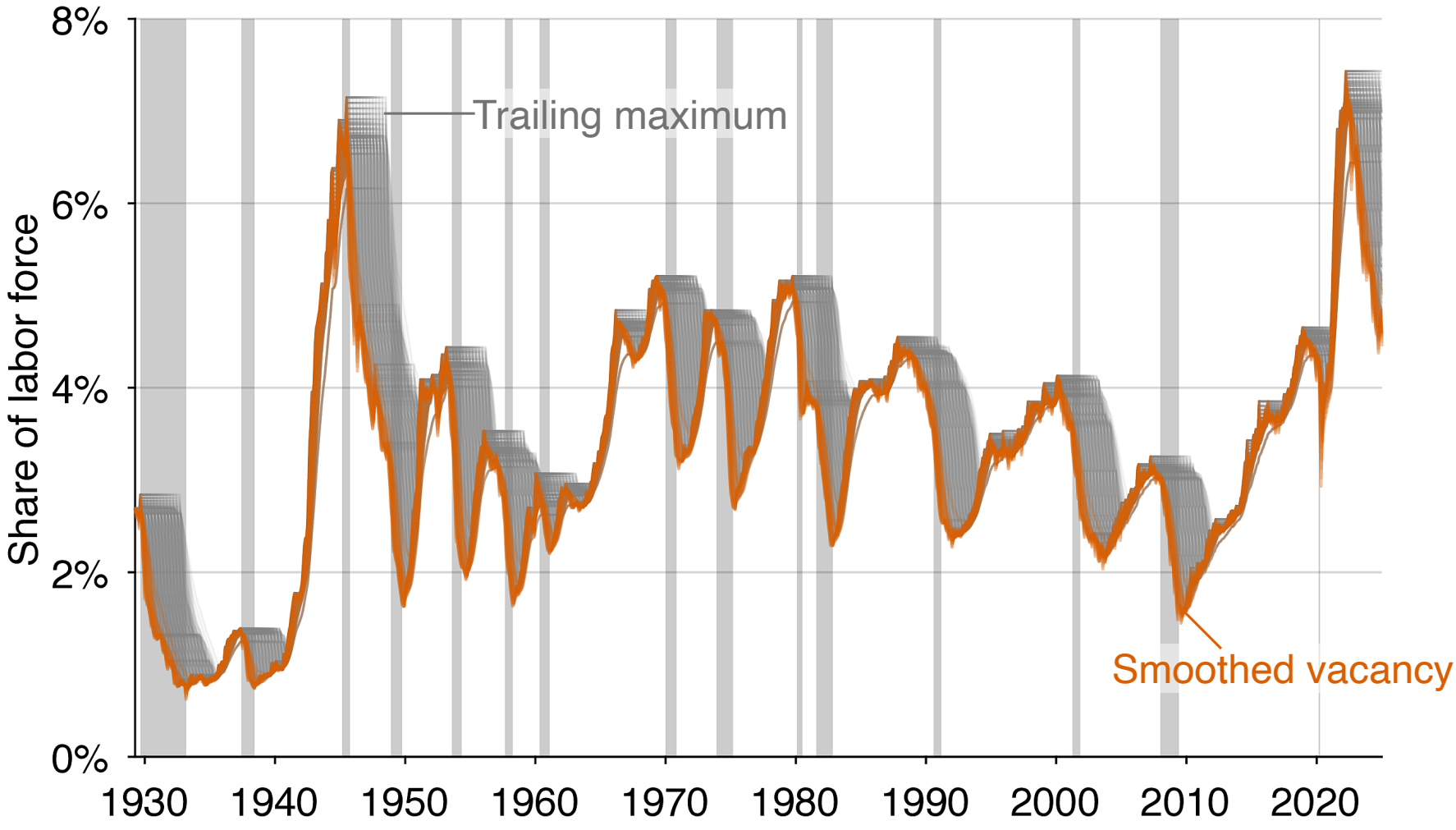
DETECTING UNEMPLOYMENT TURNING POINTS



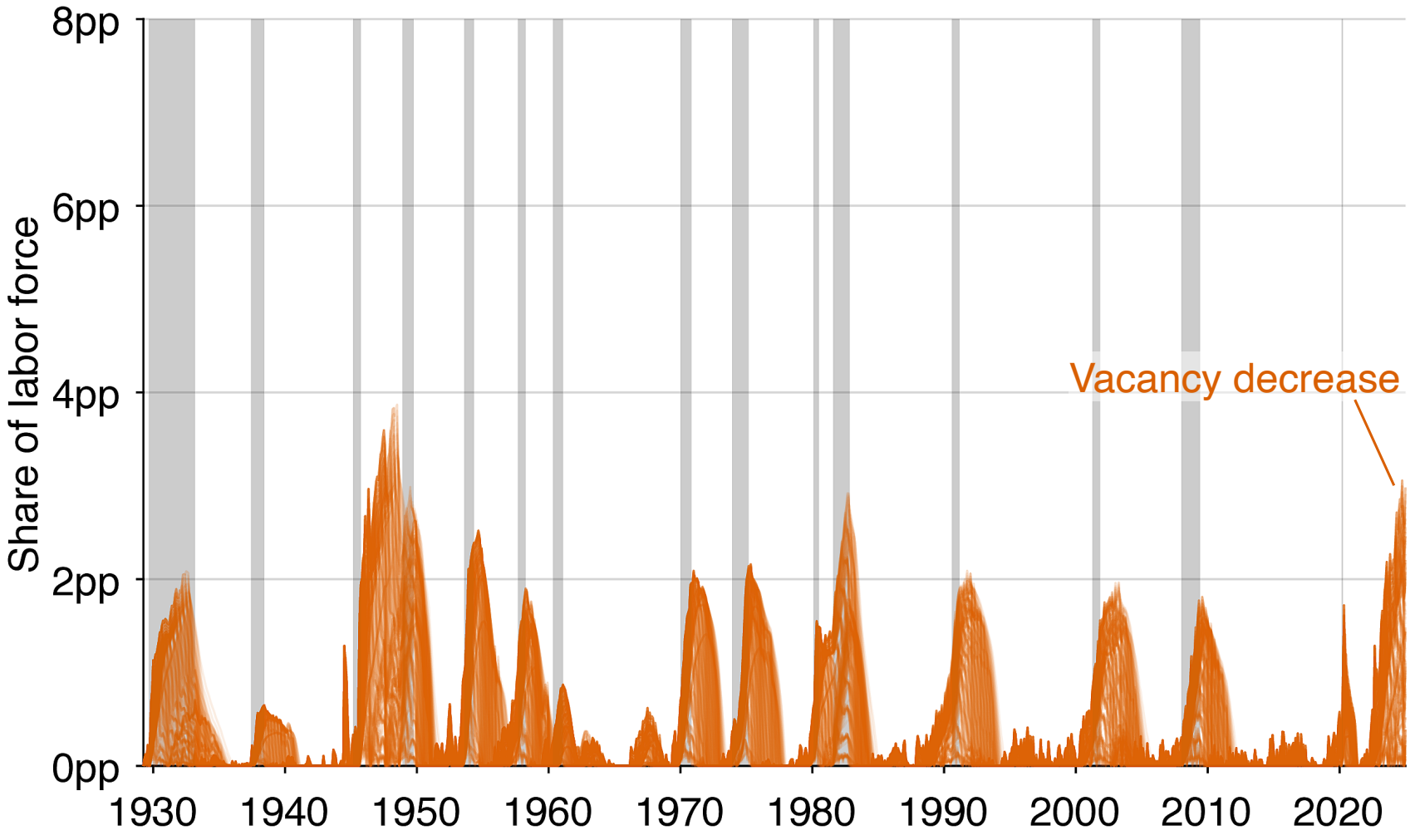
SMOOTHING VACANCY RATE



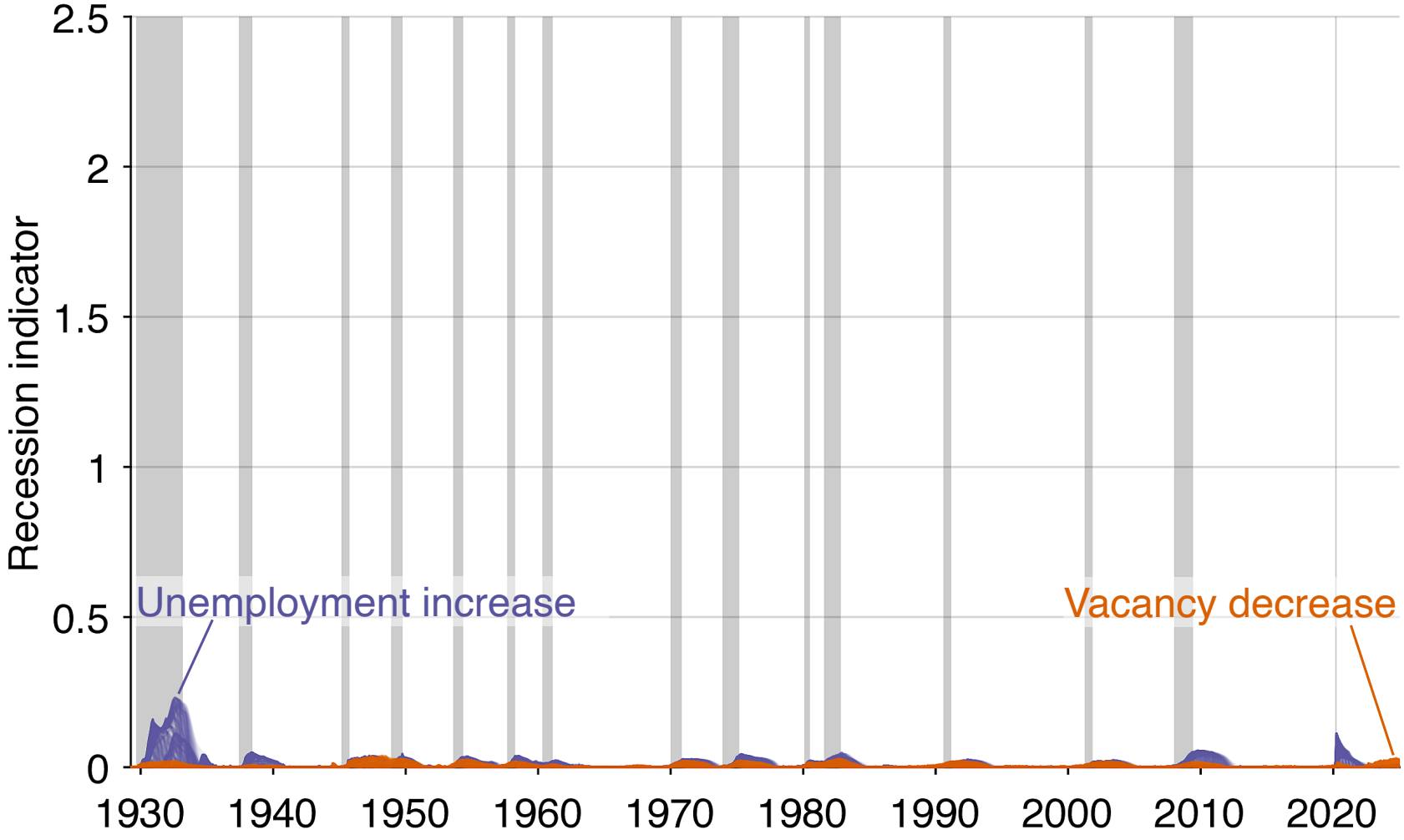
DETECTING VACANCY TURNING POINTS



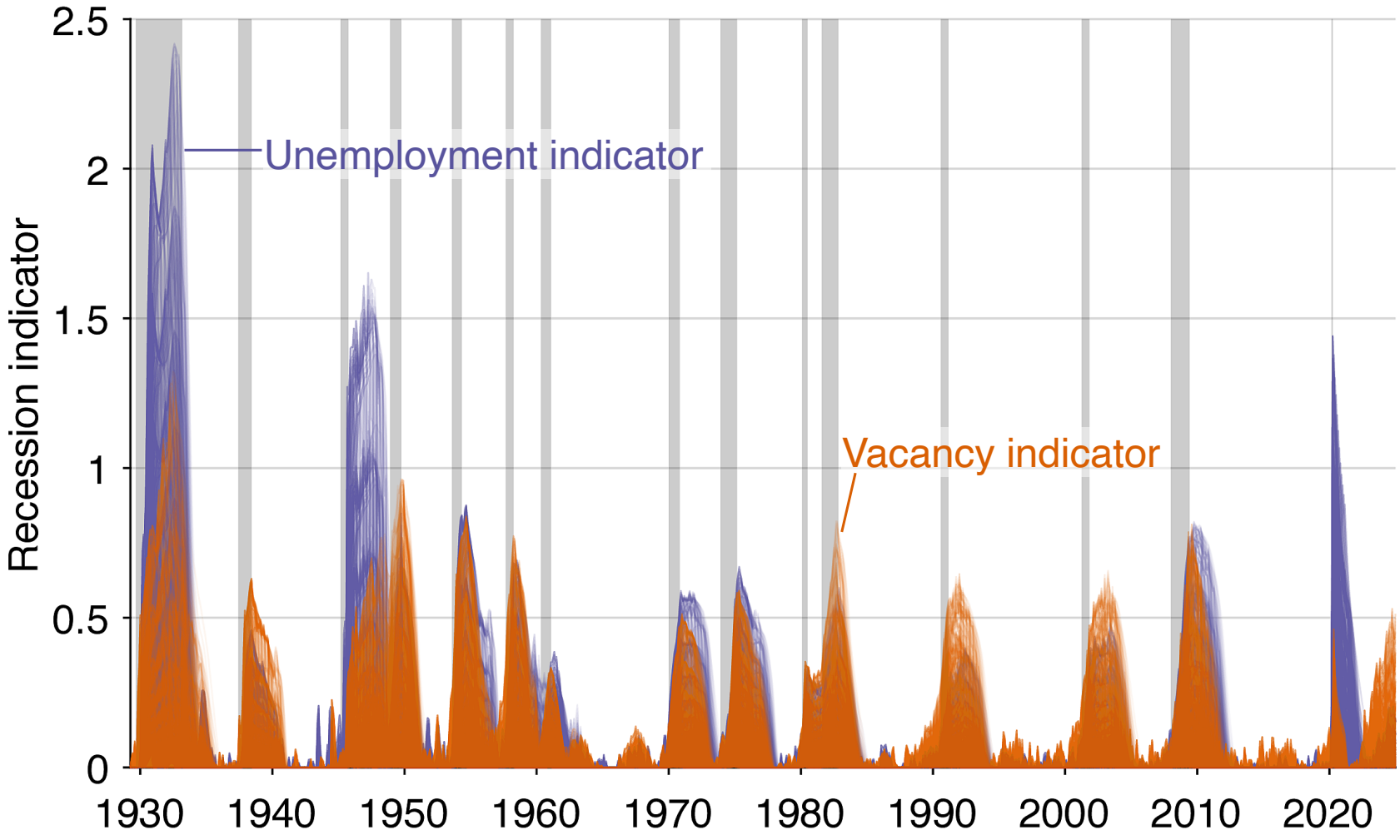
DETECTING VACANCY TURNING POINTS



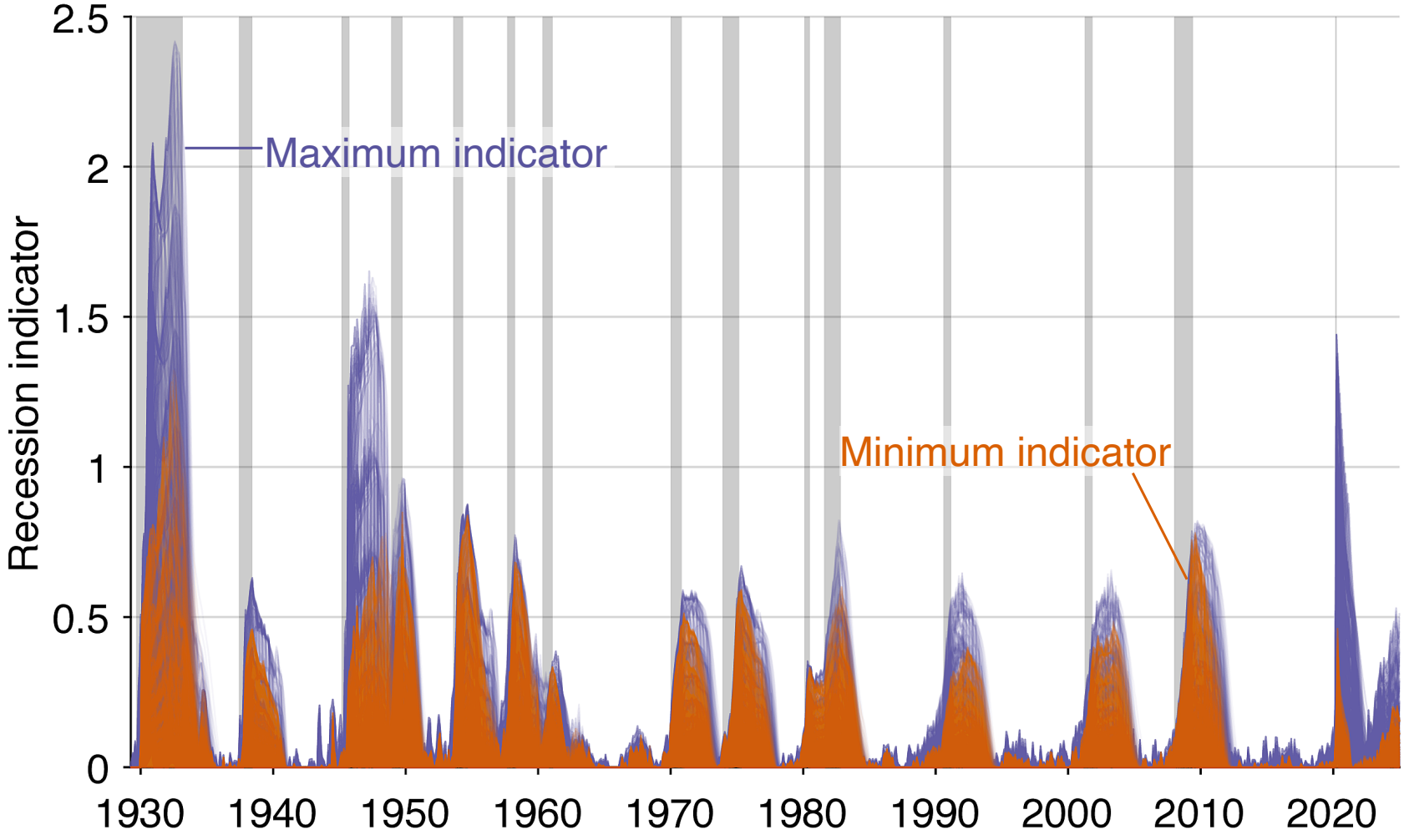
CURVING UNEMPLOYMENT AND VACANCY INCREASES



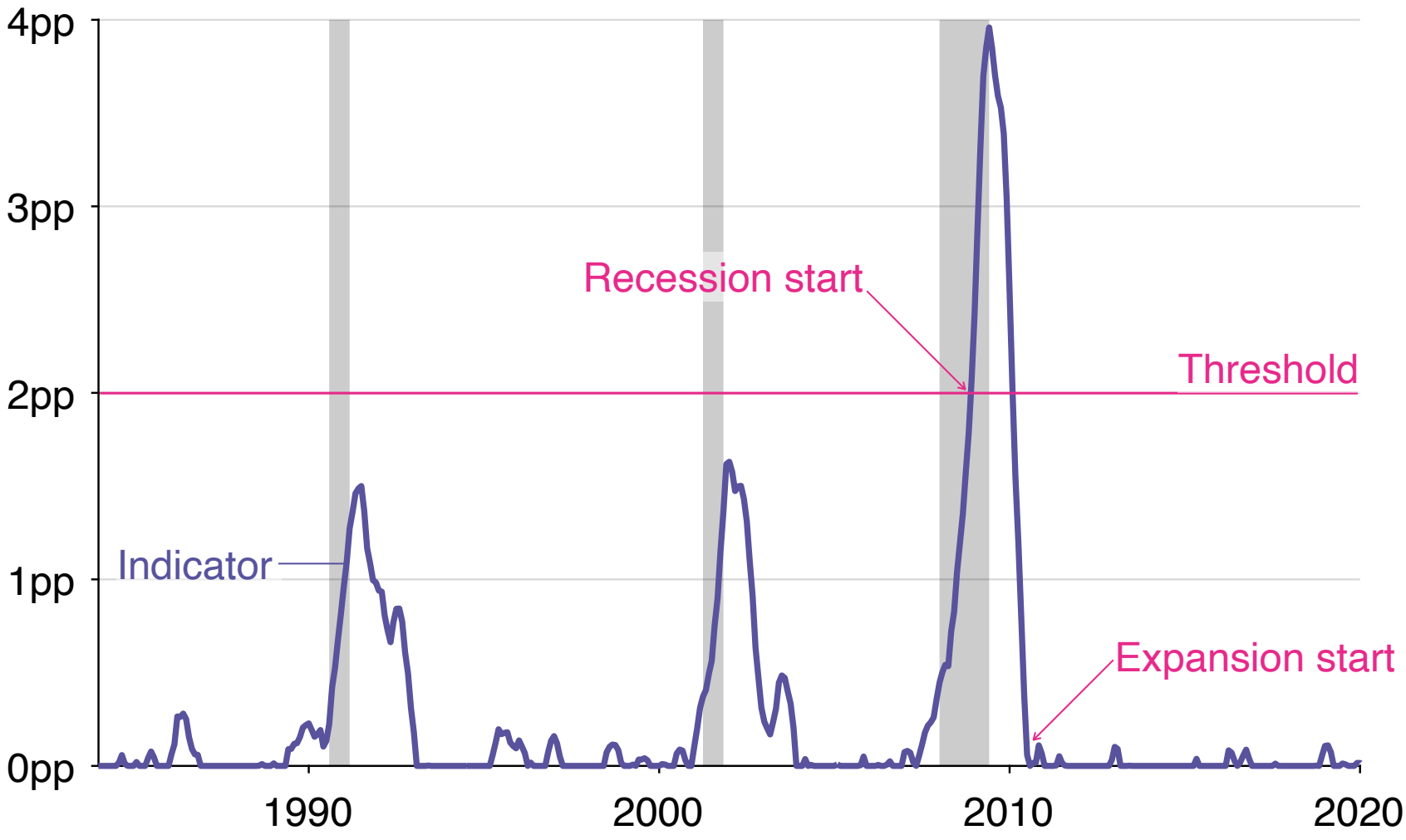
CURVING UNEMPLOYMENT AND VACANCY INCREASES



CREATING MINIMUM AND MAXIMUM INDICATORS

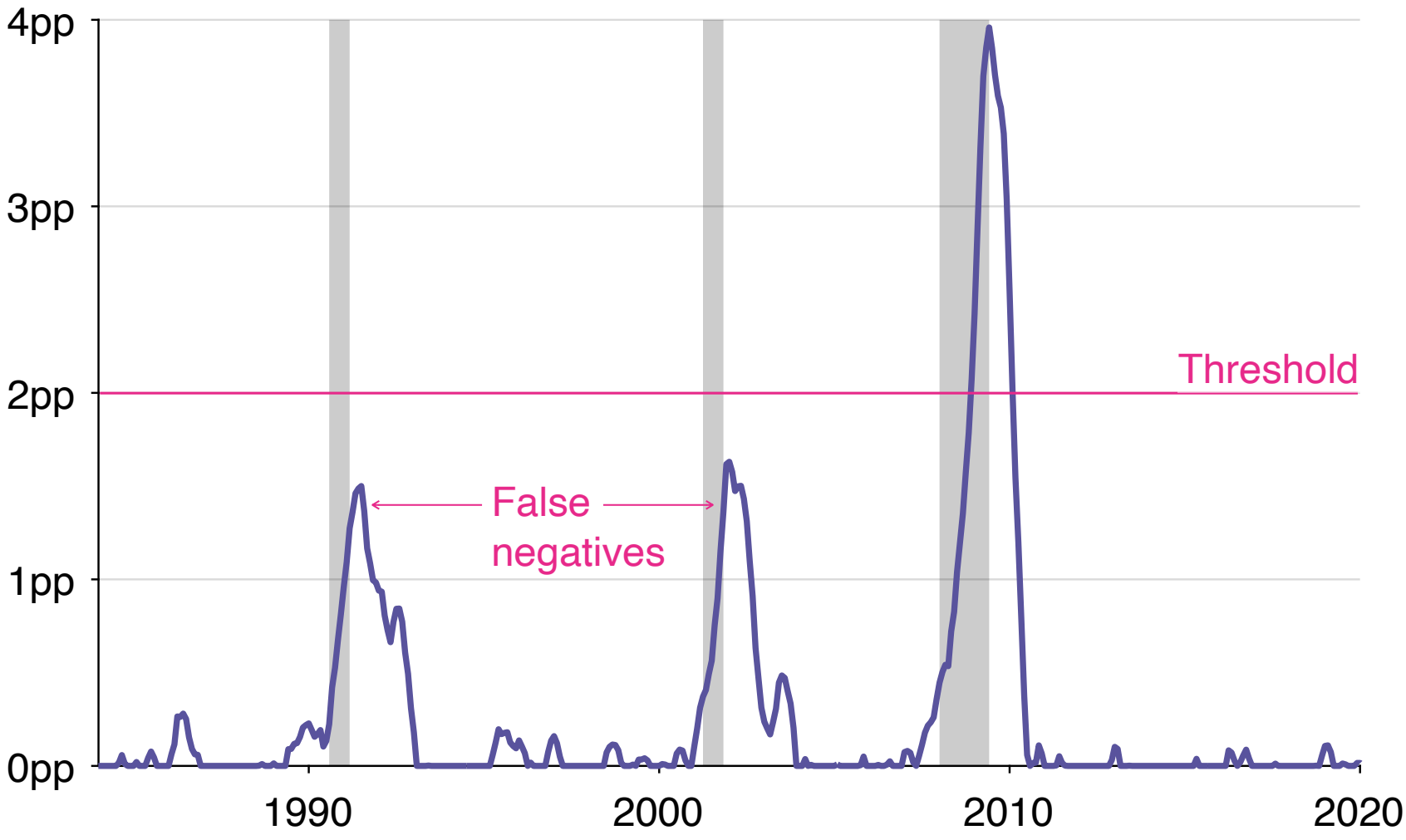


RECESSION CLASSIFIER = INDICATOR + THRESHOLD

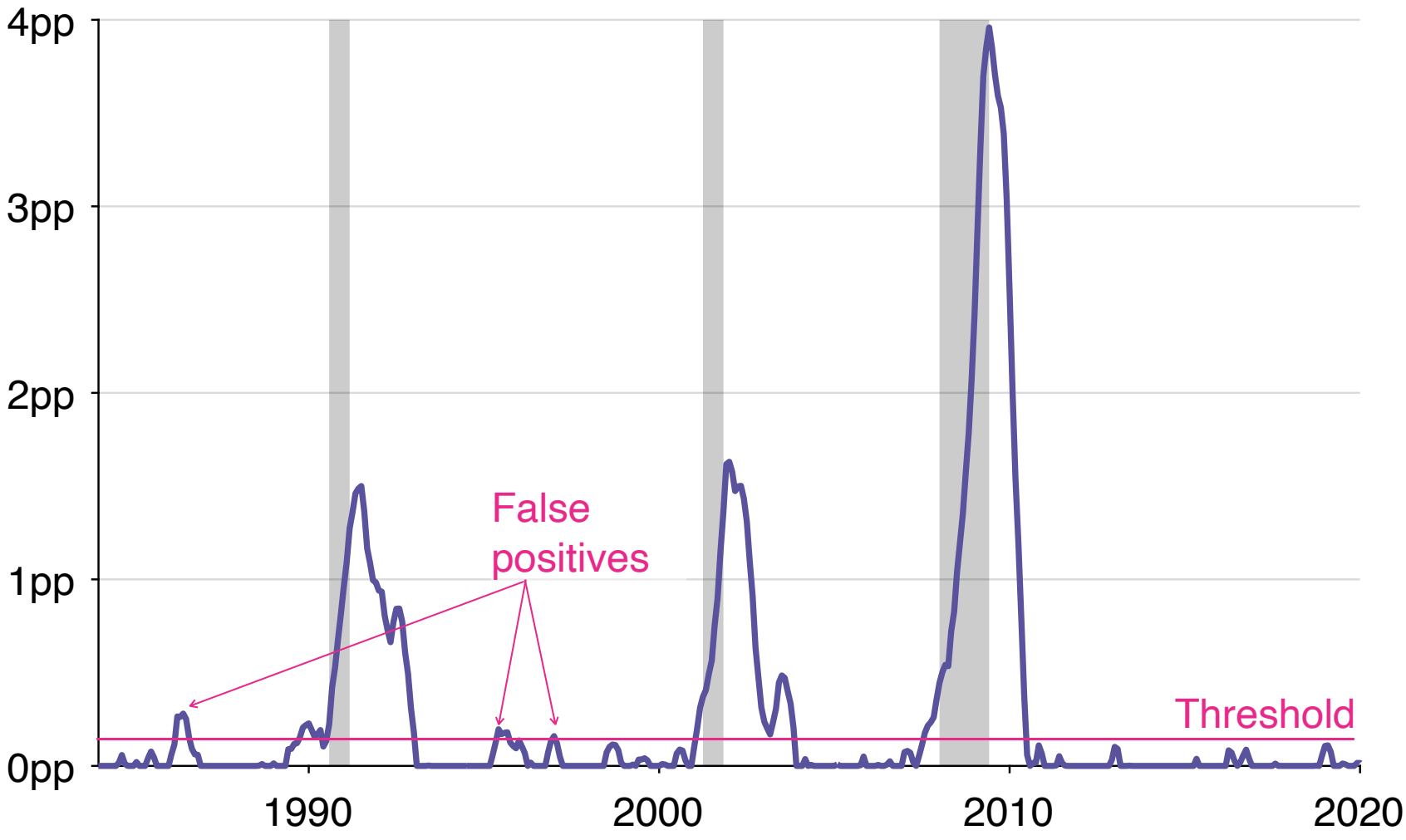


SELECTING RECESSION CLASSIFIERS

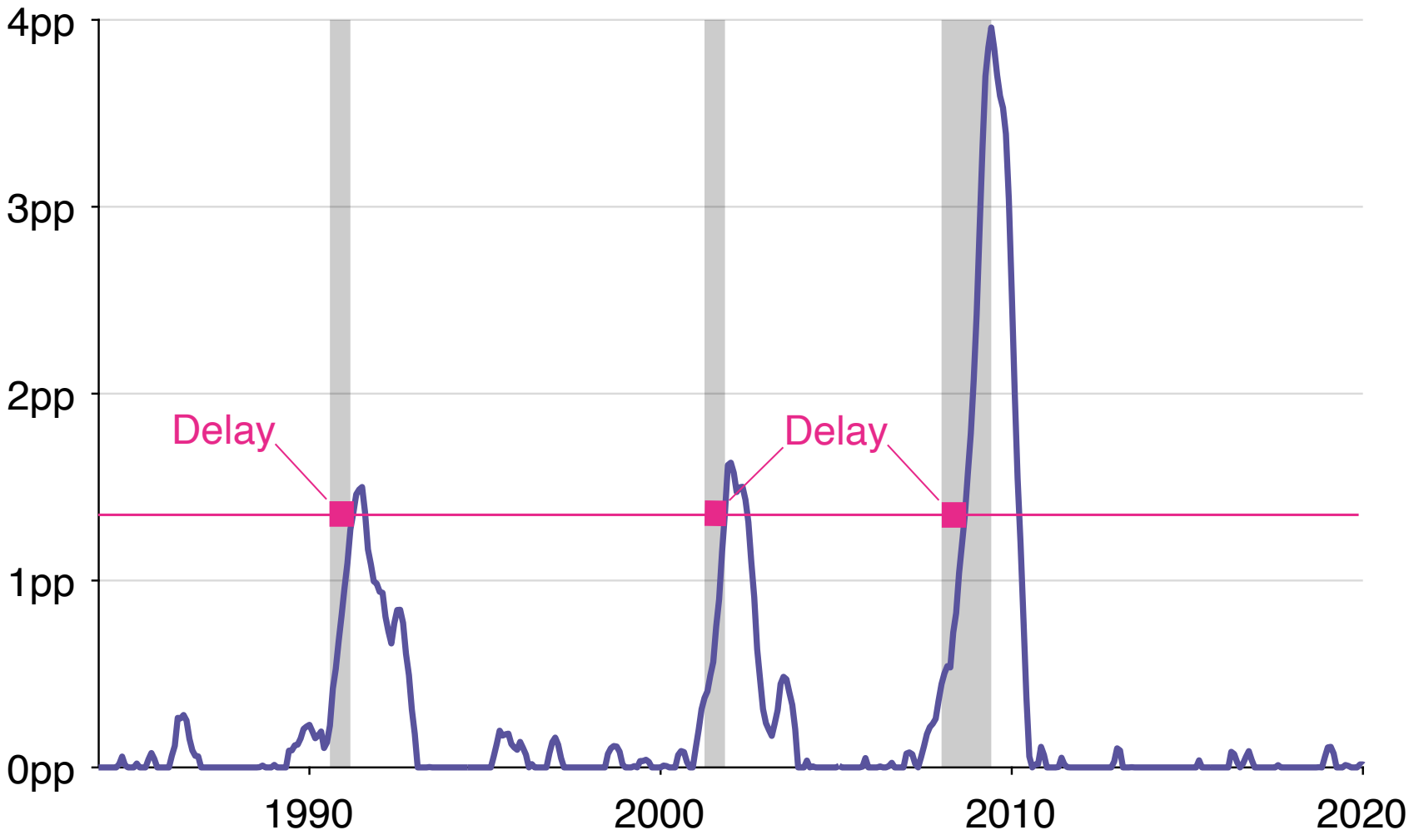
SELECT CLASSIFIERS WITHOUT FALSE NEGATIVES...



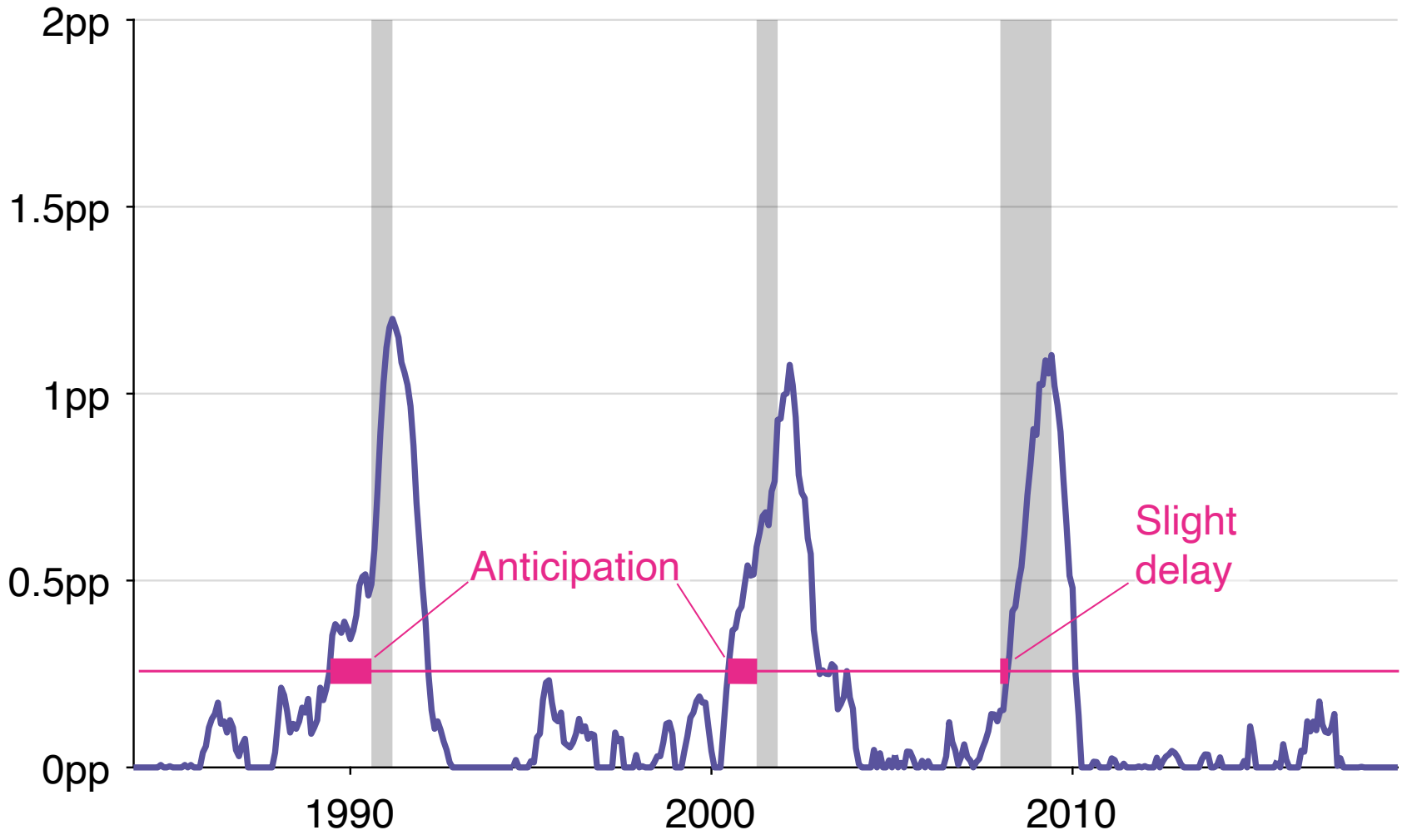
. . . AND WITHOUT FALSE POSITIVES



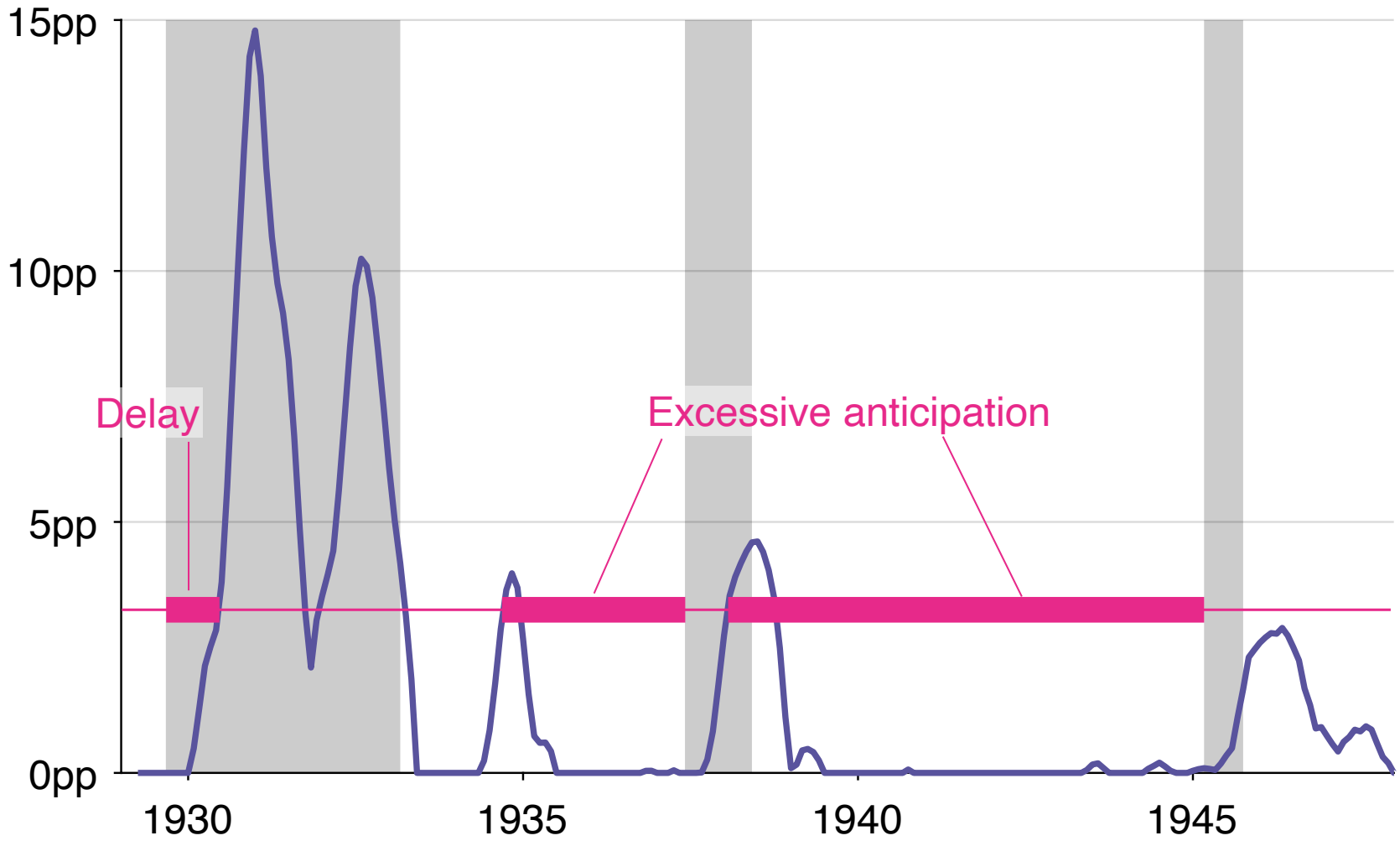
SELECTED CLASSIFIER WITH DELAY



SELECTED CLASSIFIER WITH HIGHER ANTICIPATION

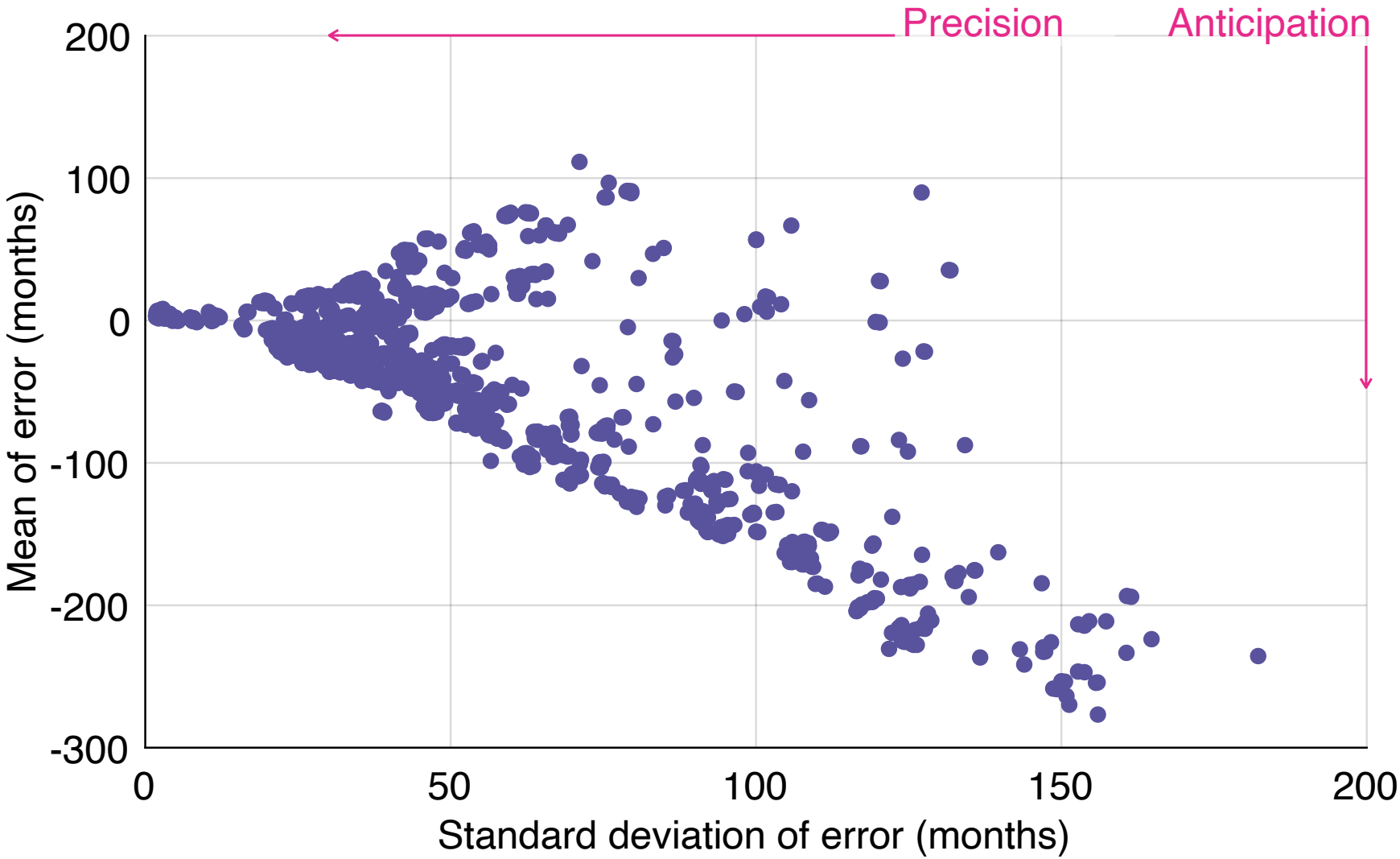


SELECTED CLASSIFIER WITH LOWER PRECISION

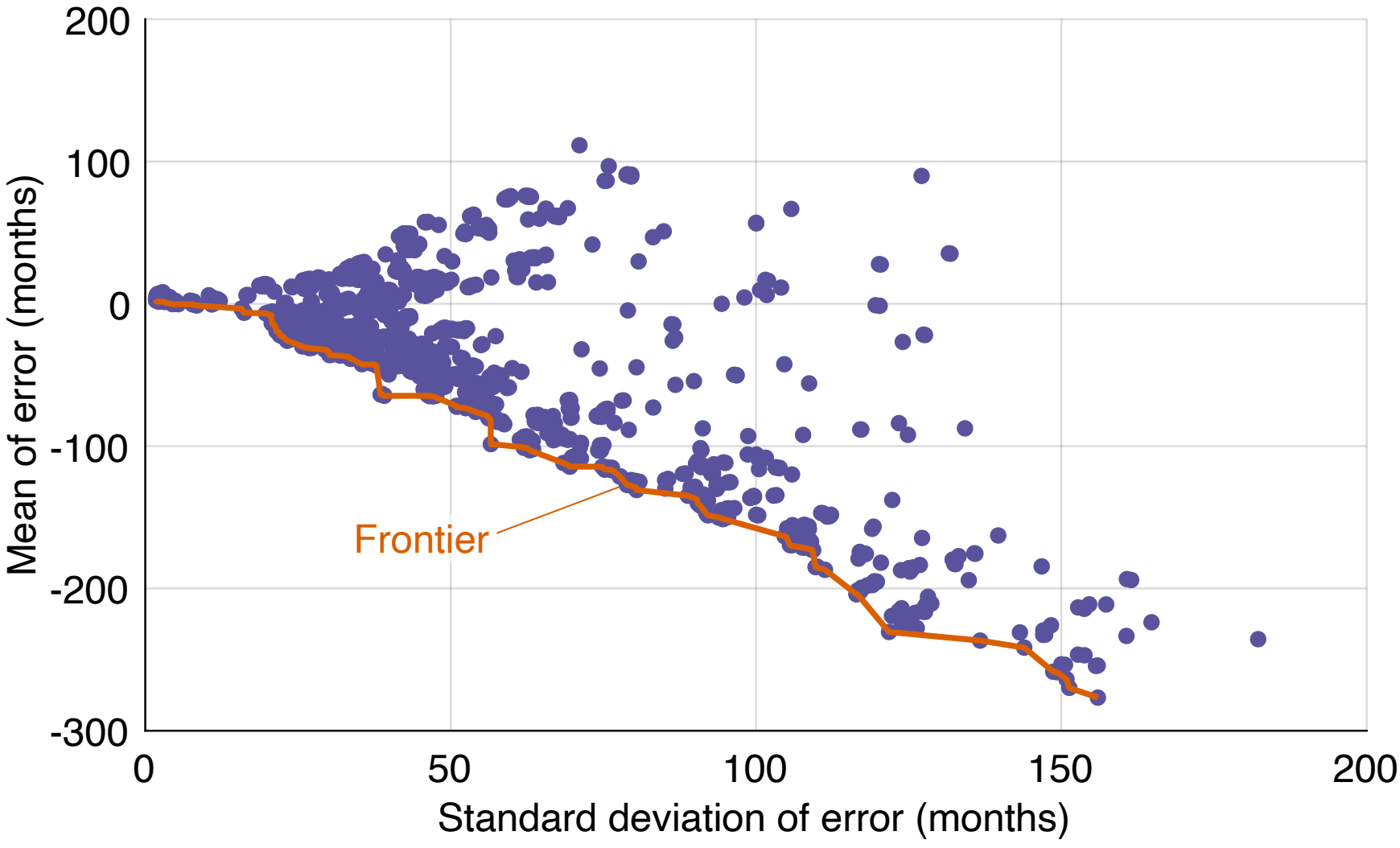


RANKING RECESSION CLASSIFIERS

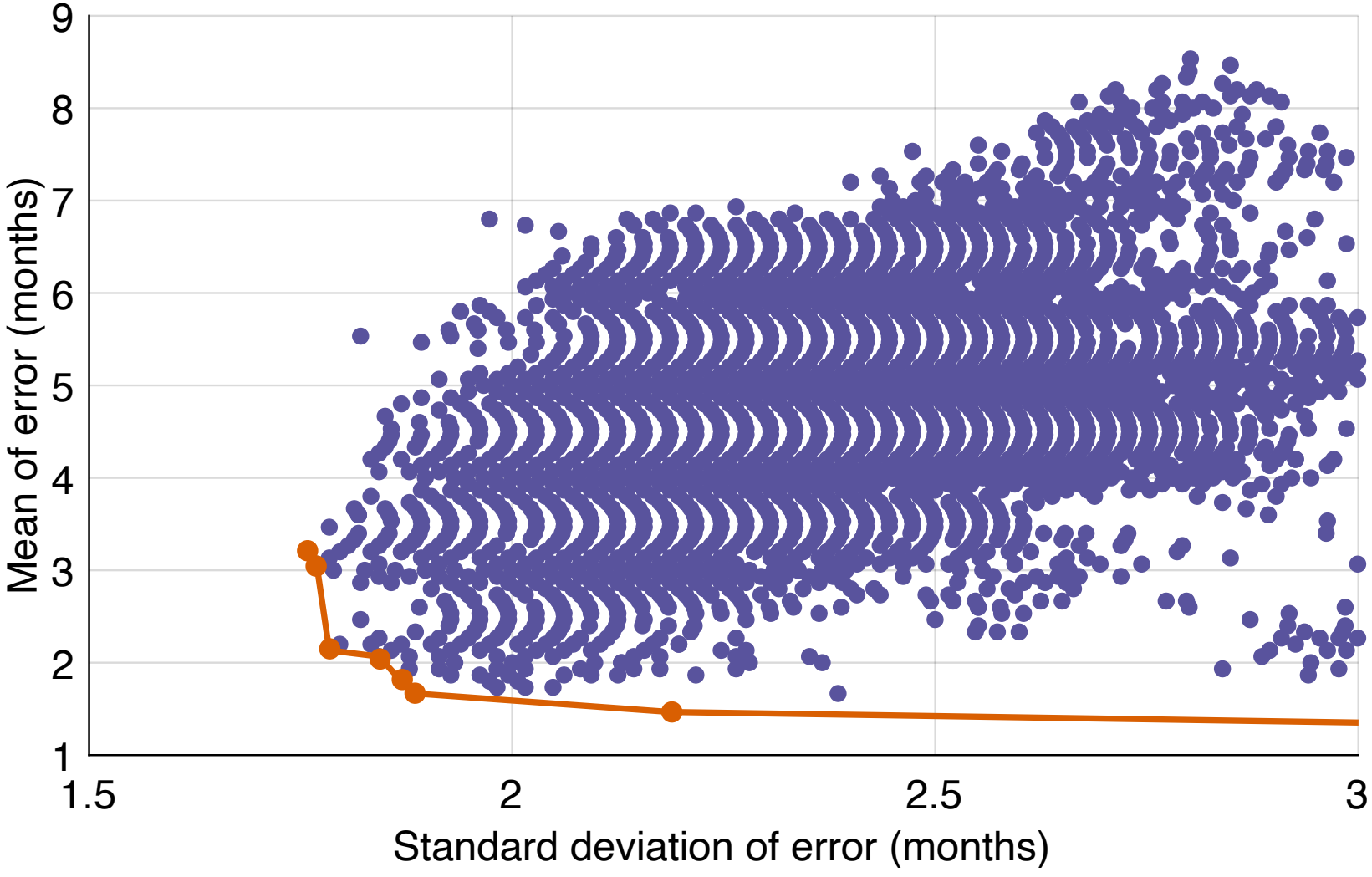
ANTICIPATION-PRECISION OF 2,343,752 CLASSIFIERS



ANTICIPATION-PRECISION FRONTIER: 210 CLASSIFIERS



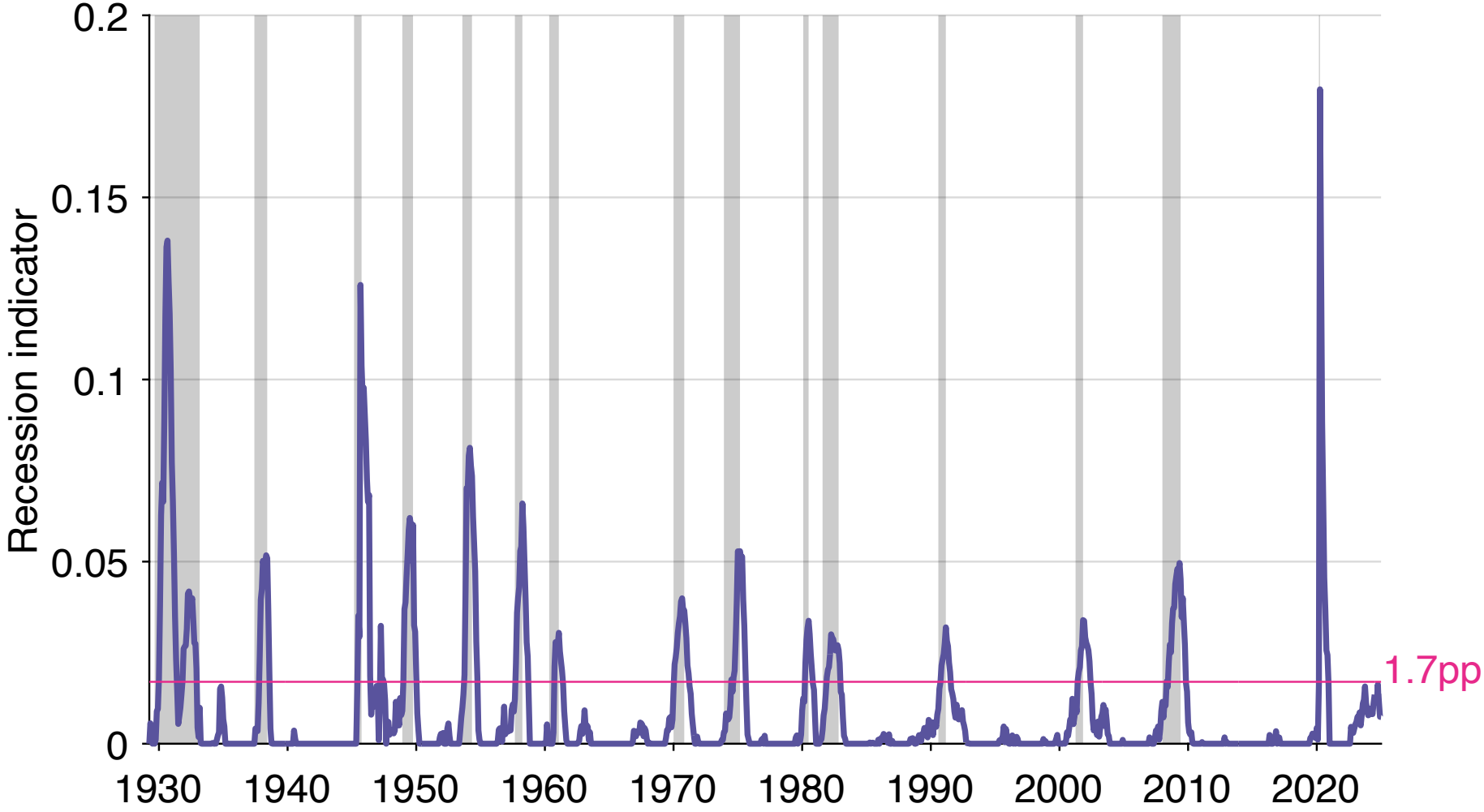
DETECT RECESSION WITHIN 1 YEAR: 7 FRONTIER CLASSIFIERS



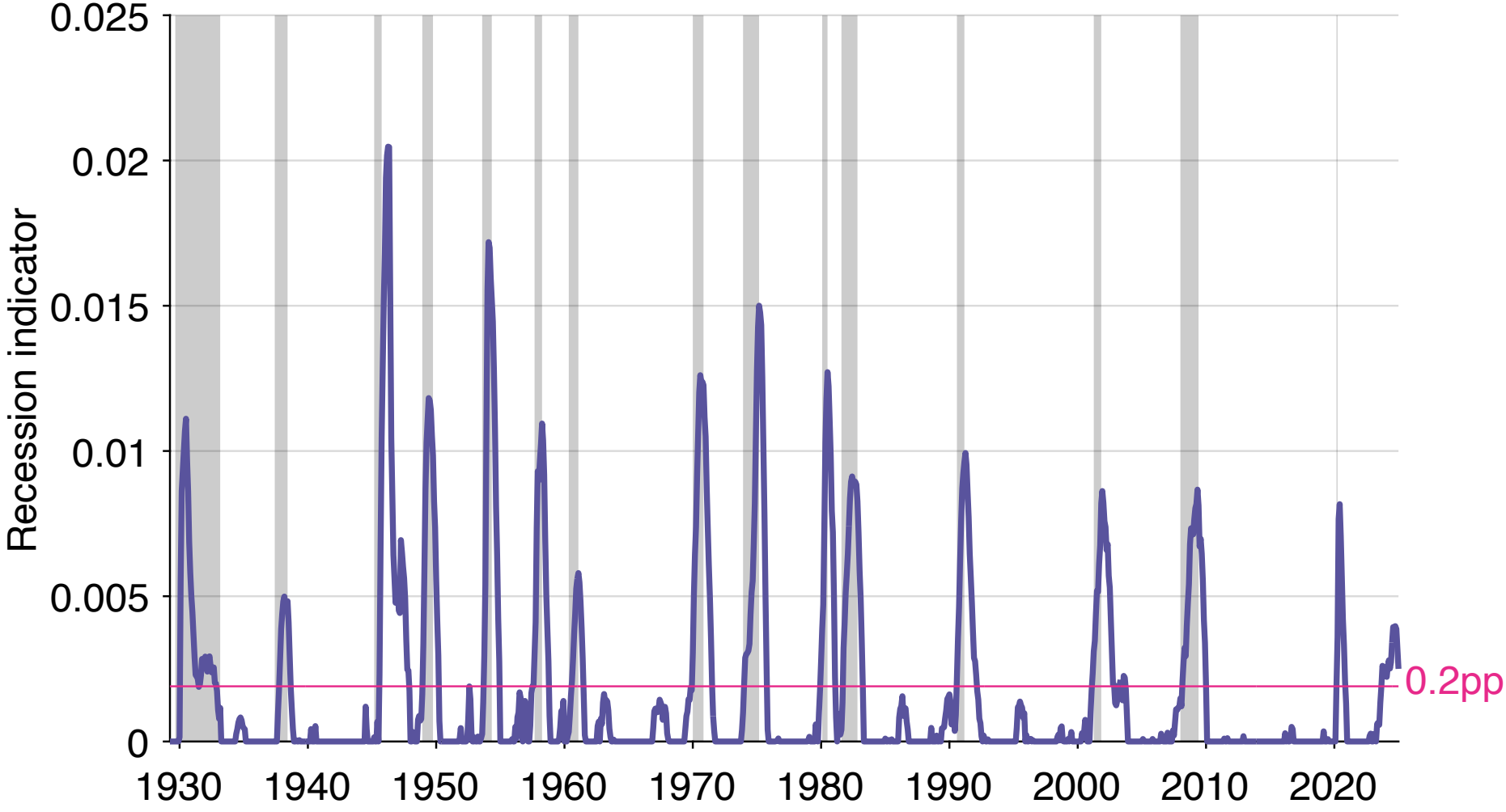
SOME CLASSIFIERS ON THE FRONTIER

	Classifier A	Classifier B	Sahm
Smoothing method	simple	exponential	simple
Smoothing horizon α	8m	0.4	3m
Turning horizon β	1m	9m	12m
Curving weight γ	log	linear	linear
Combination method	u-v	min-max	u-v
Combination weight δ	0.6	1	1
Threshold ζ	1.7pp	0.2pp	0.5pp
Std deviation of error	1.8m	2.2m	
Mean of error	3.1m	1.5m	

CLASSIFIER A

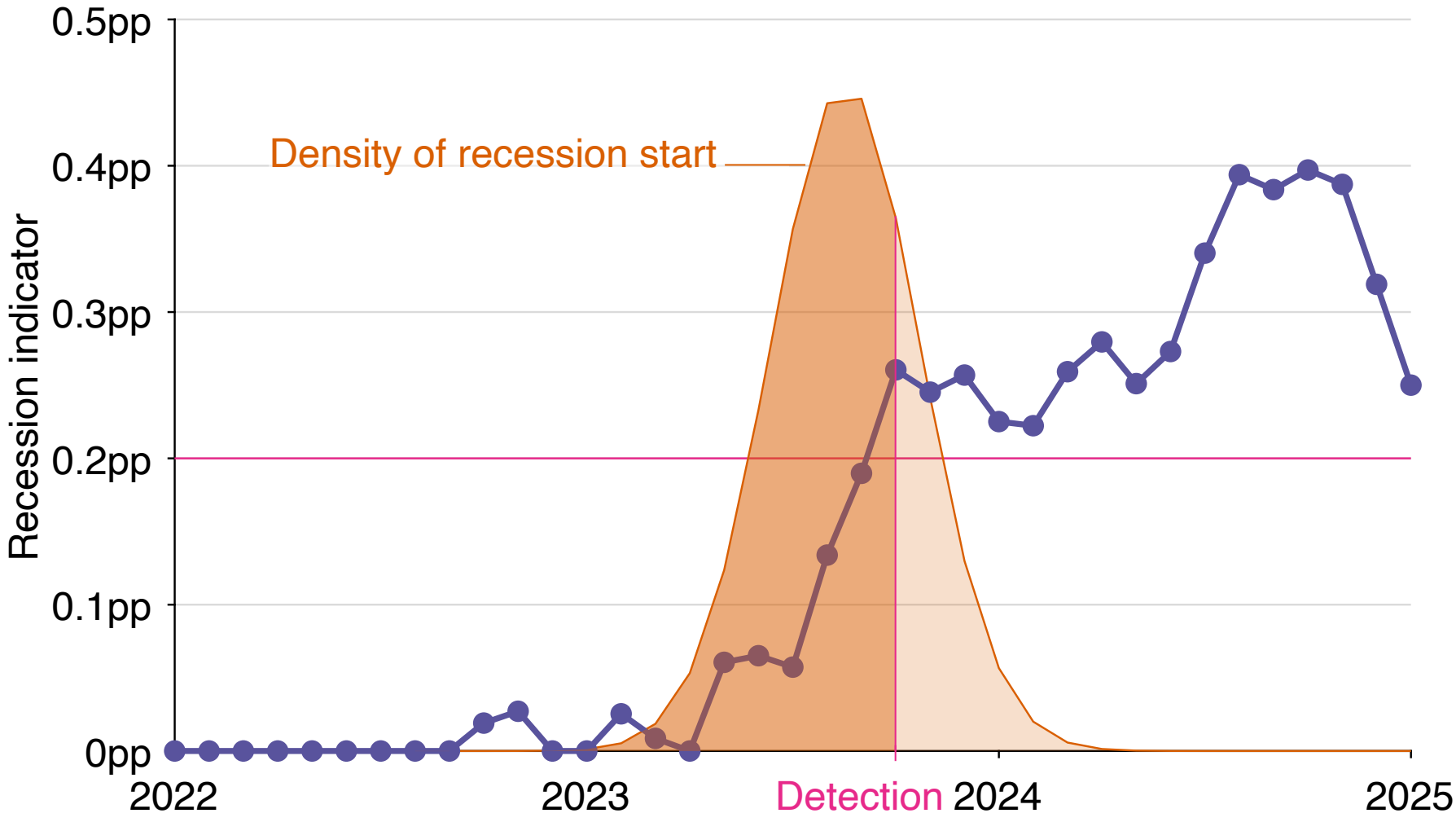


CLASSIFIER B

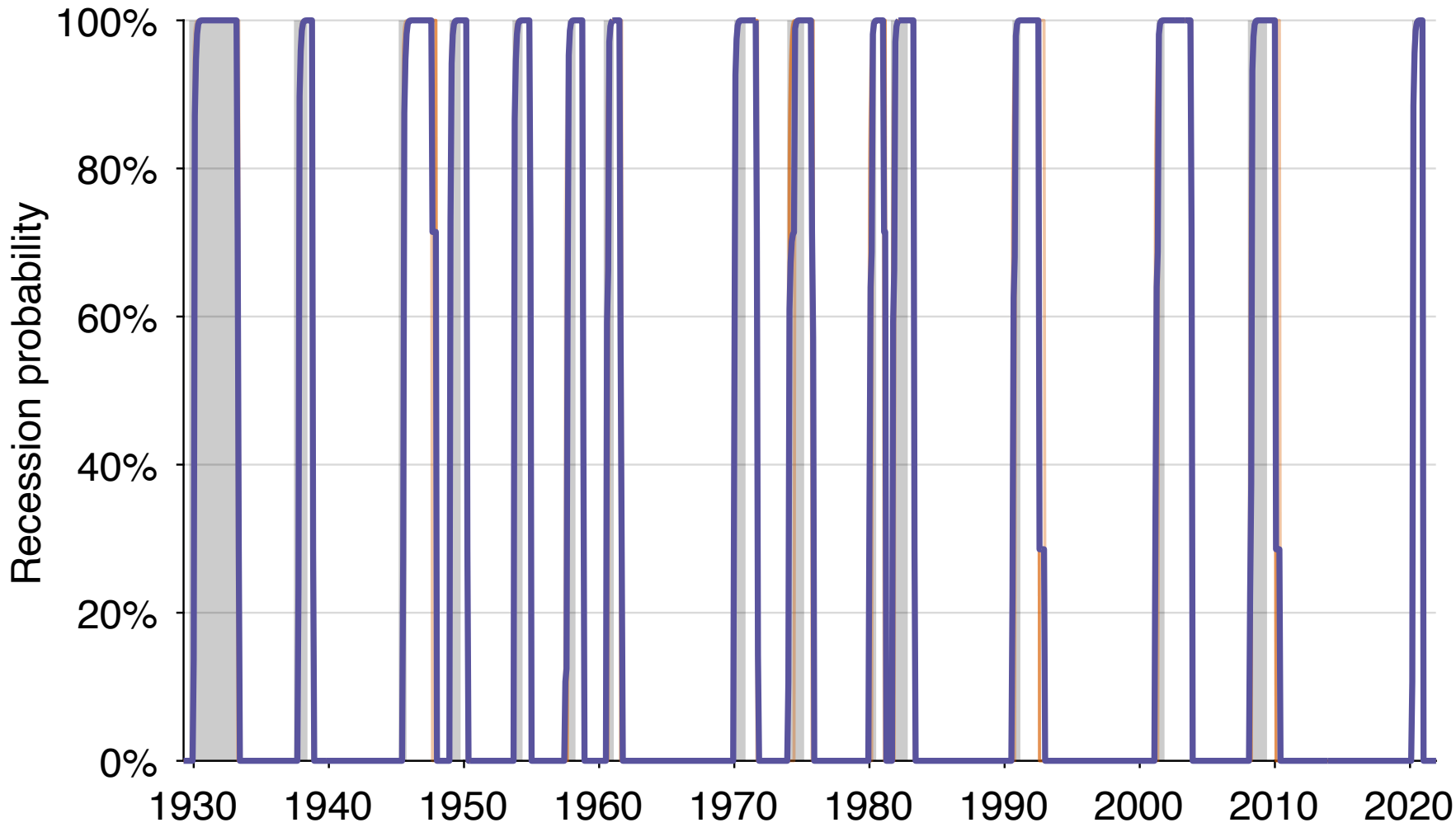


DETECTING US RECESSIONS

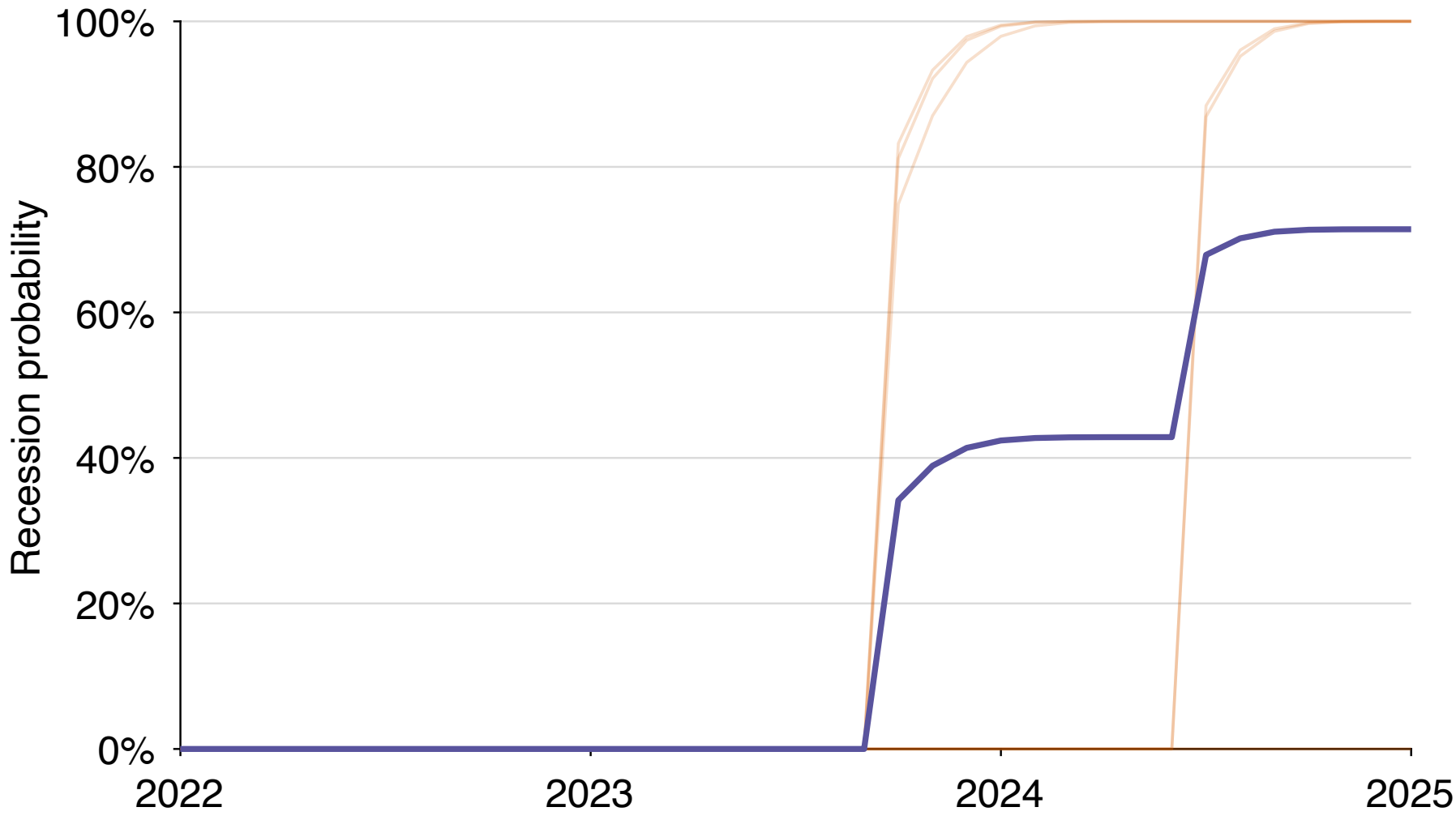
CLASSIFIERS ALSO GIVE RECESSION PROBABILITIES



AVERAGE RECESSION PROBABILITY FROM 7 FRONTIER CLASSIFIERS ON TRAINING SET (1929–2021)



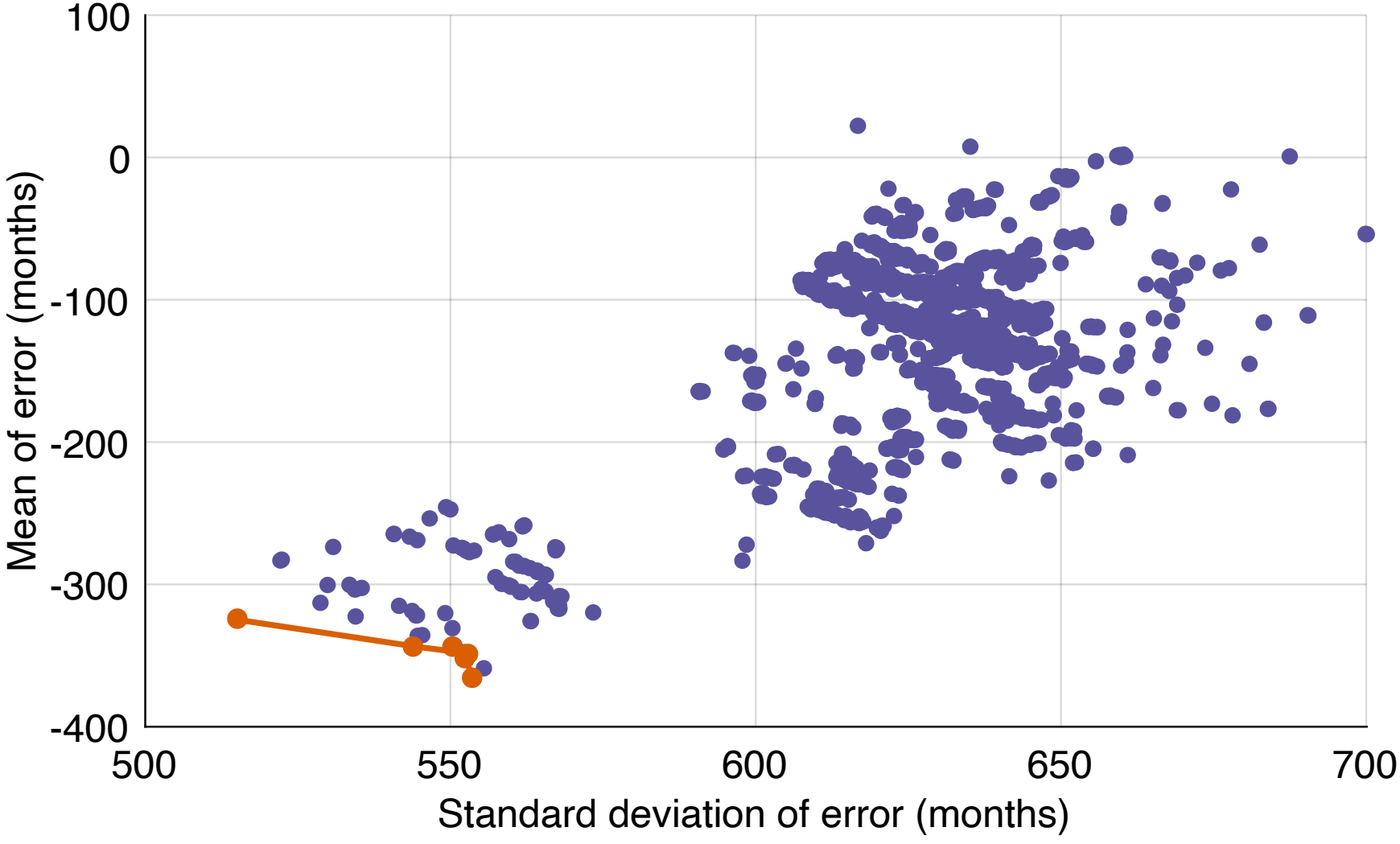
HAS THE RECESSION STARTED? YES, WITH 71% PROBABILITY



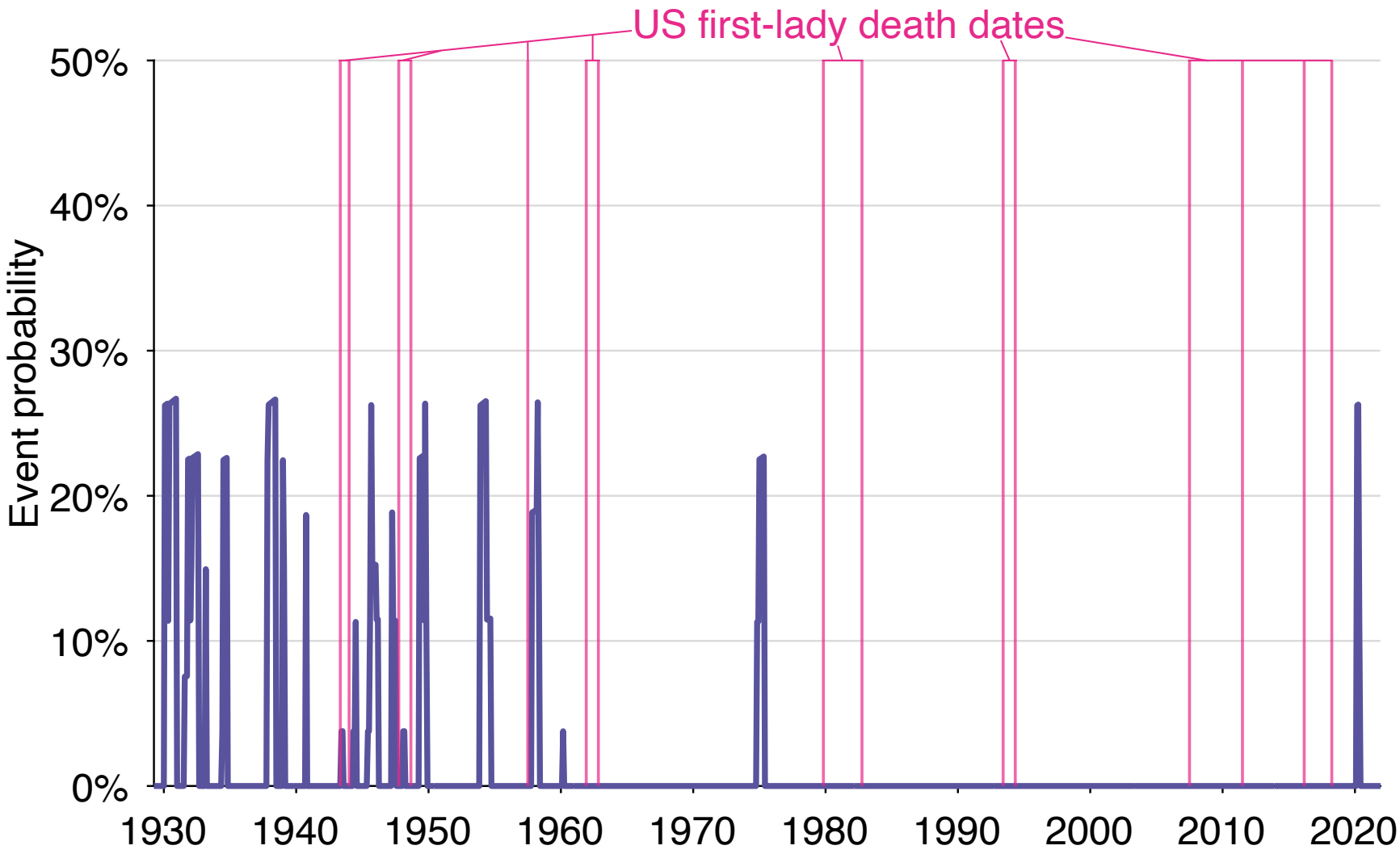
PLACEBO TEST: DETECTING US FIRST-LADY DEATHS

	First lady	In office	Date of death
1.	Helen Taft	1909–1913	May 1943
2.	Lou Hoover	1929–1933	January 1944
3.	Frances Cleveland	1886–1889, 1893–1897	October 1947
4.	Edith Roosevelt	1901–1909	September 1948
5.	Grace Coolidge	1923–1929	July 1957
6.	Edith Wilson	1915–1921	December 1961
7.	Eleanor Roosevelt	1933–1945	November 1962
8.	Mamie Eisenhower	1953–1961	November 1979
9.	Bess Truman	1945–1953	October 1982
10.	Pat Nixon	1969–1974	June 1993
11.	Jacqueline Kennedy	1961–1963	May 1994
12.	Lady Bird Johnson	1963–1969	July 2007
13.	Betty Ford	1974–1977	July 2011
14.	Nancy Reagan	1981–1989	March 2016
15.	Barbara Bush	1989–1993	April 2018

BEST CLASSIFIERS HAVE PRECISION > 40 YEARS

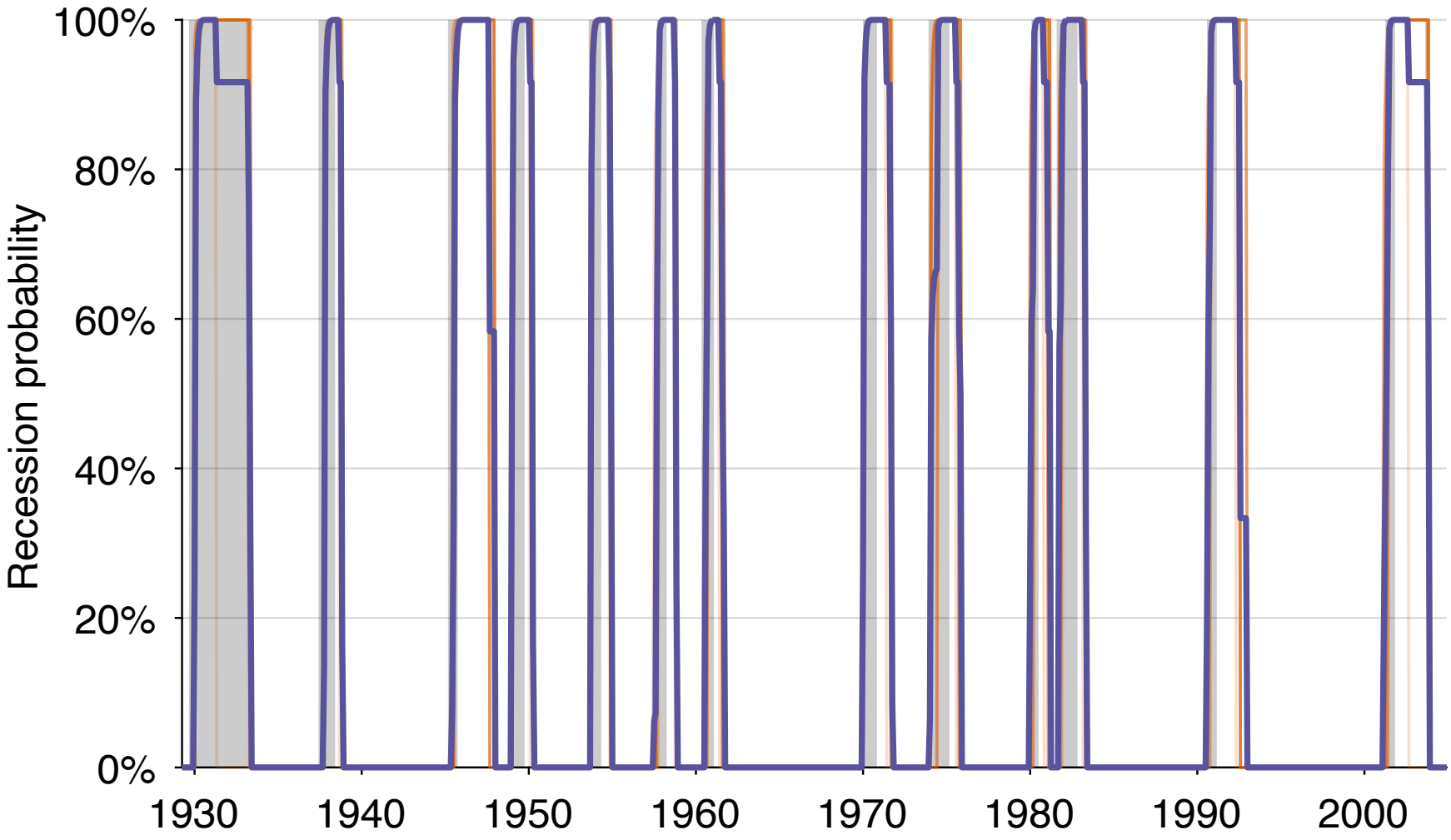


EVENT PROBABILITIES GIVEN BY FRONTIER CLASSIFIERS

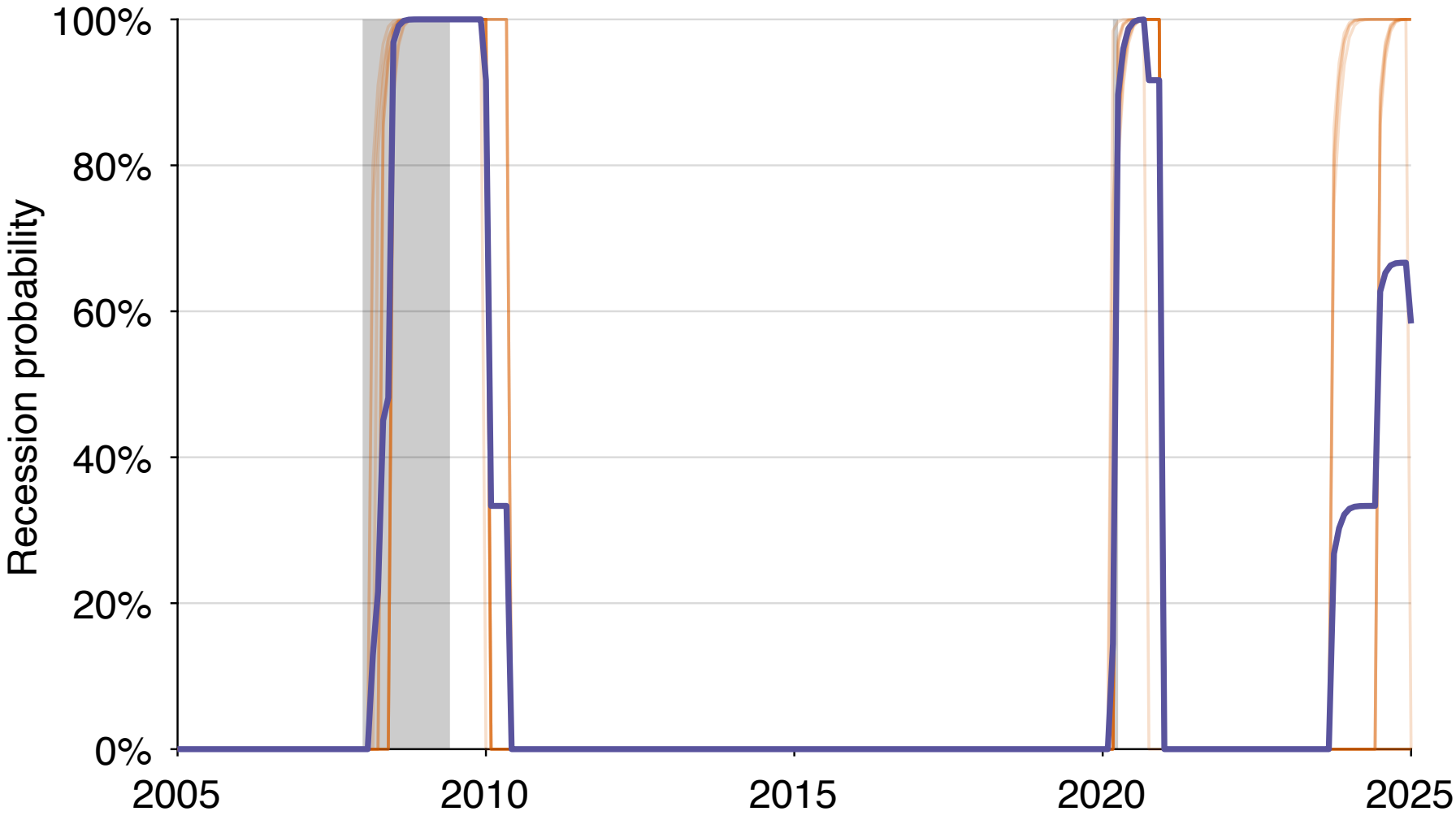


BACKTESTS

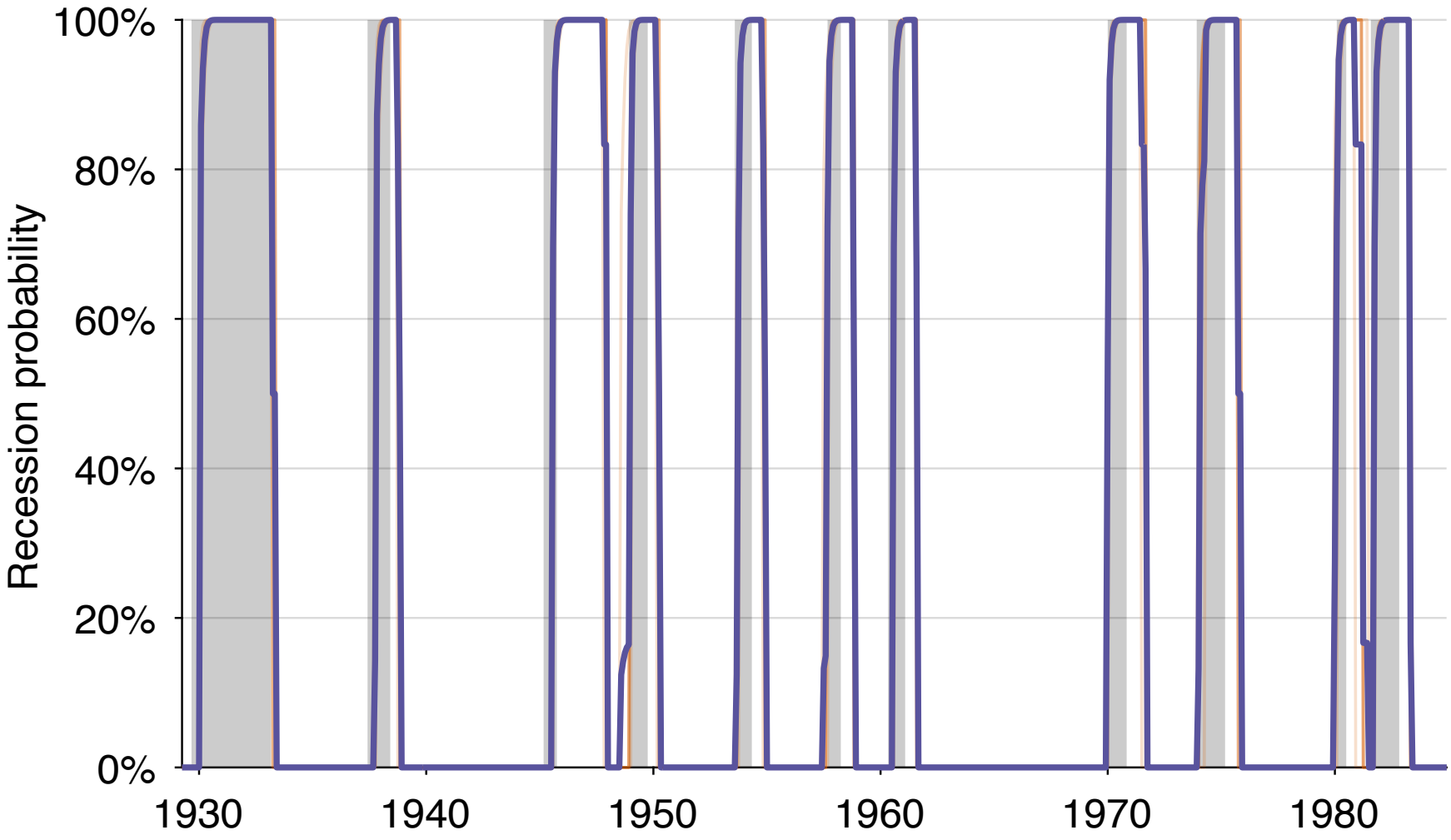
BACKTESTING TO 2004: TRAINING ON 13 RECESSIONS



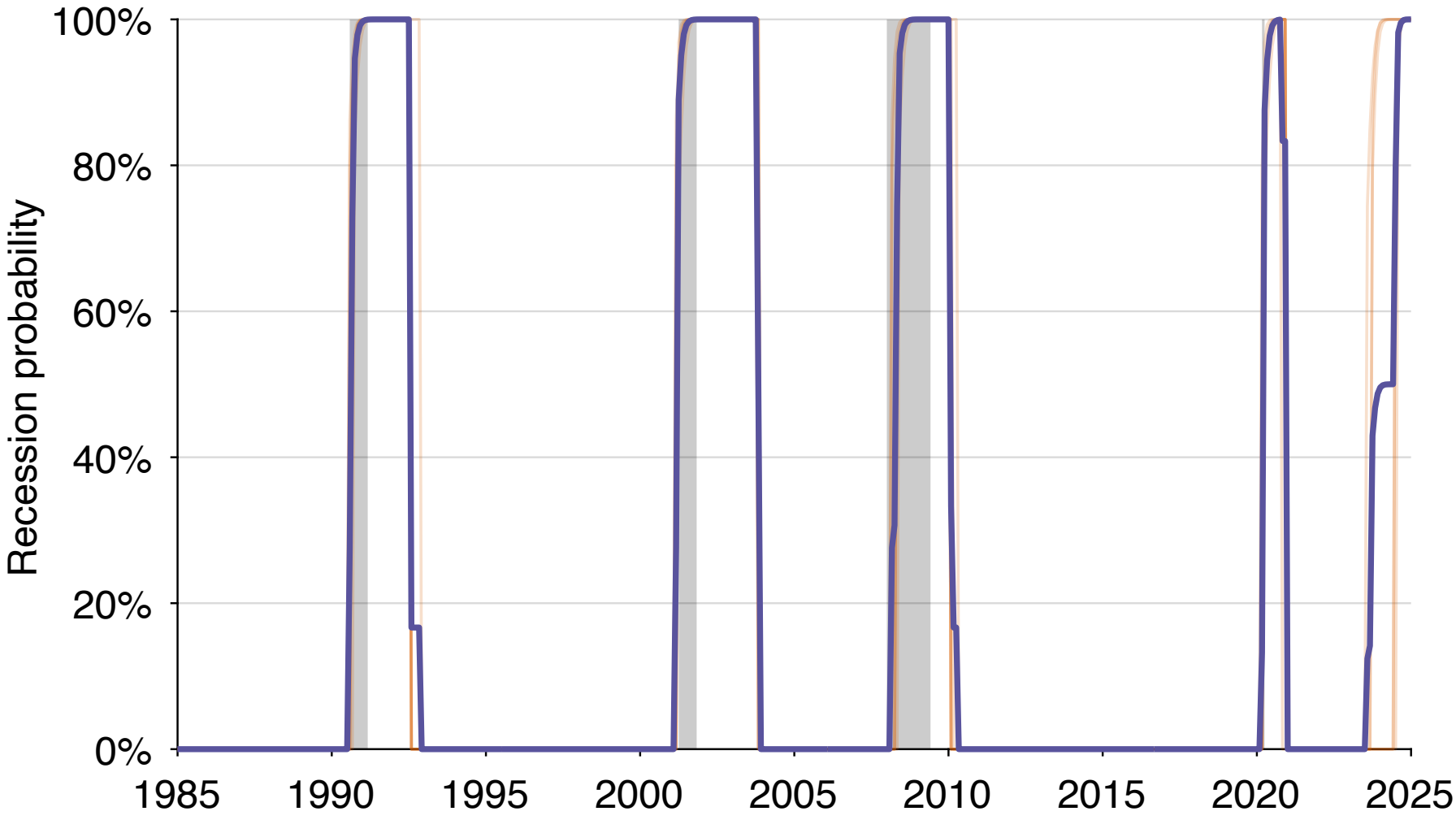
BACKTESTING TO 2004: DETECTING 2+ RECESSIONS



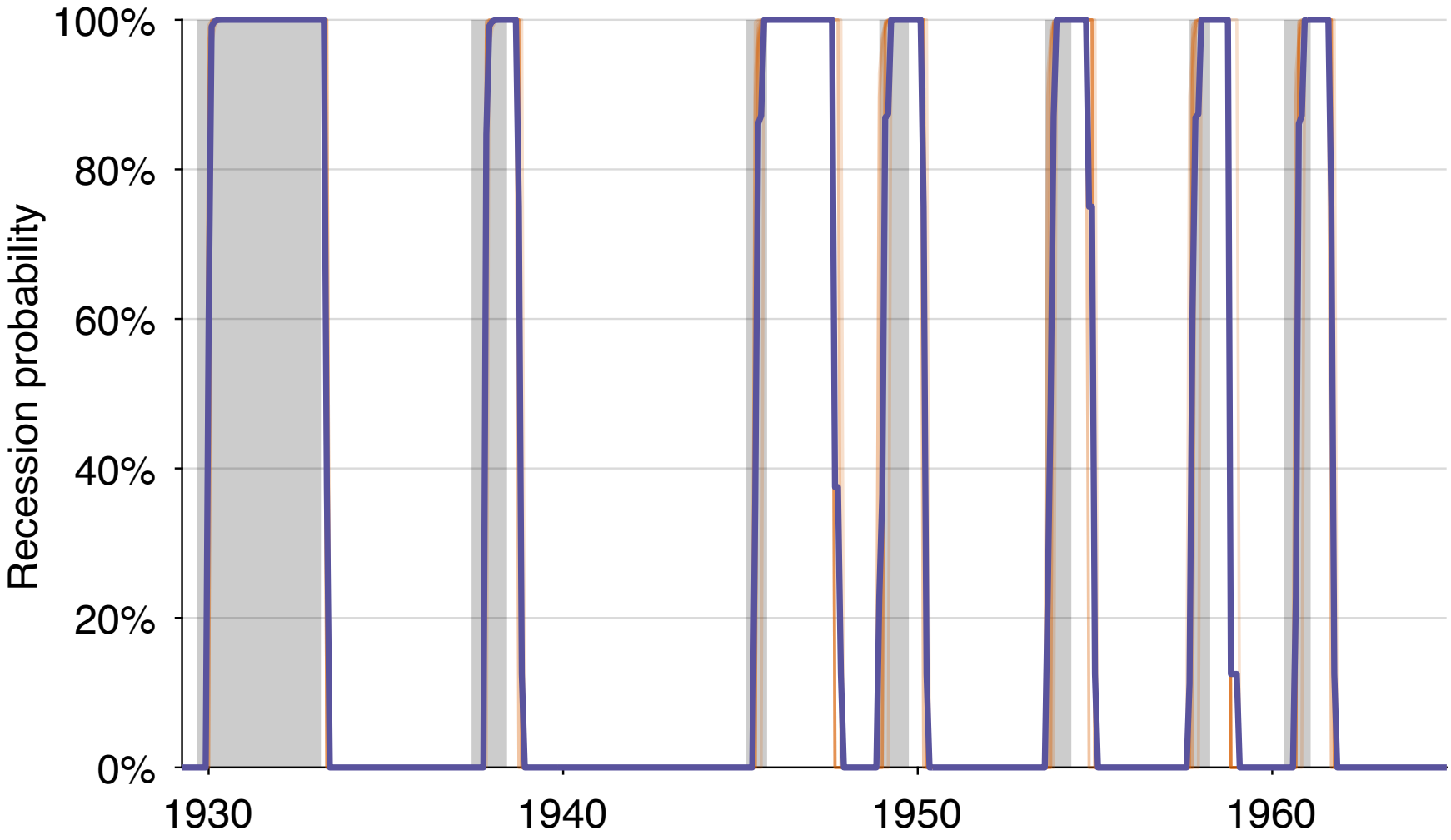
BACKTESTING TO 1984: TRAINING ON 11 RECESSIONS



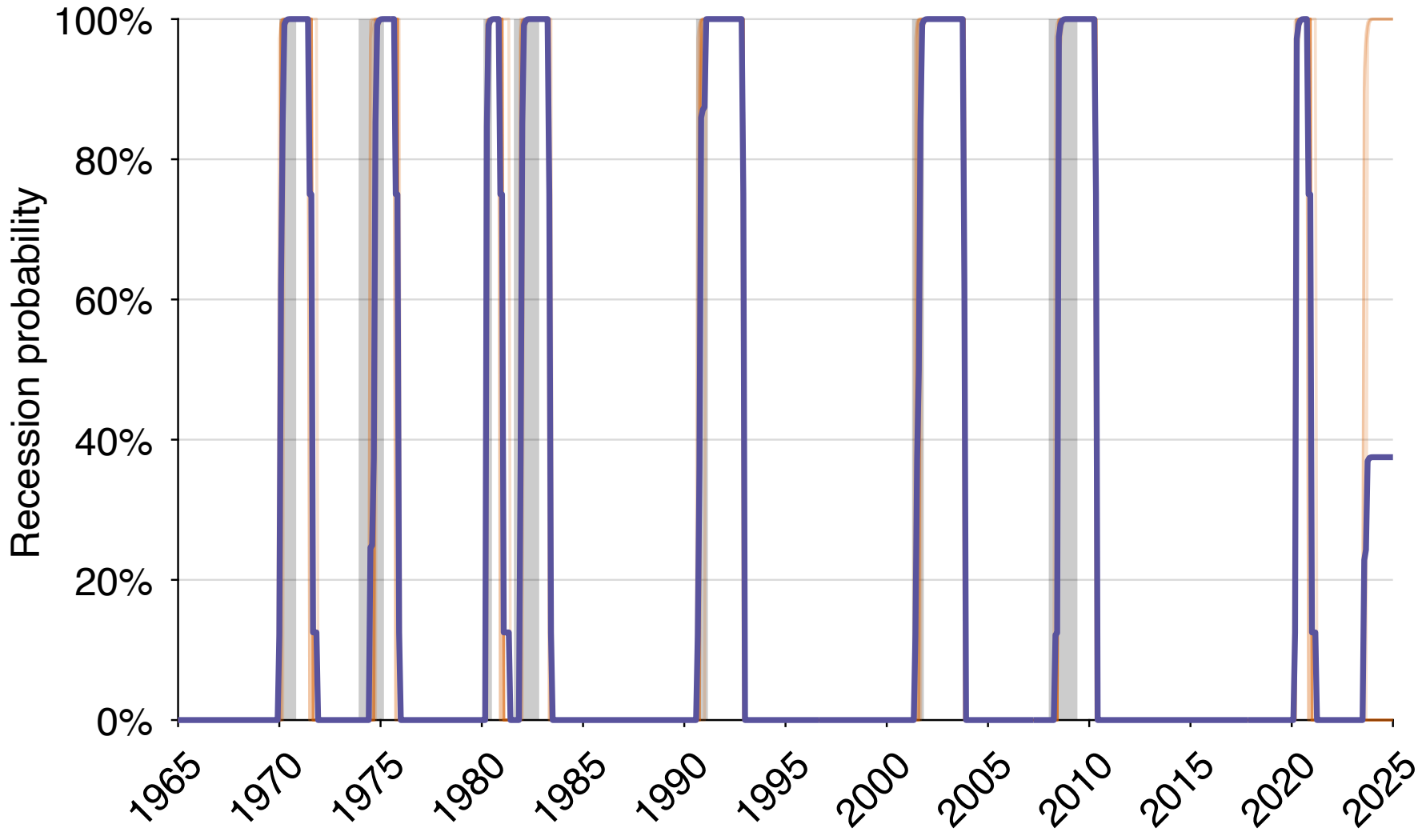
BACKTESTING TO 1984: DETECTING 4+ RECESSIONS



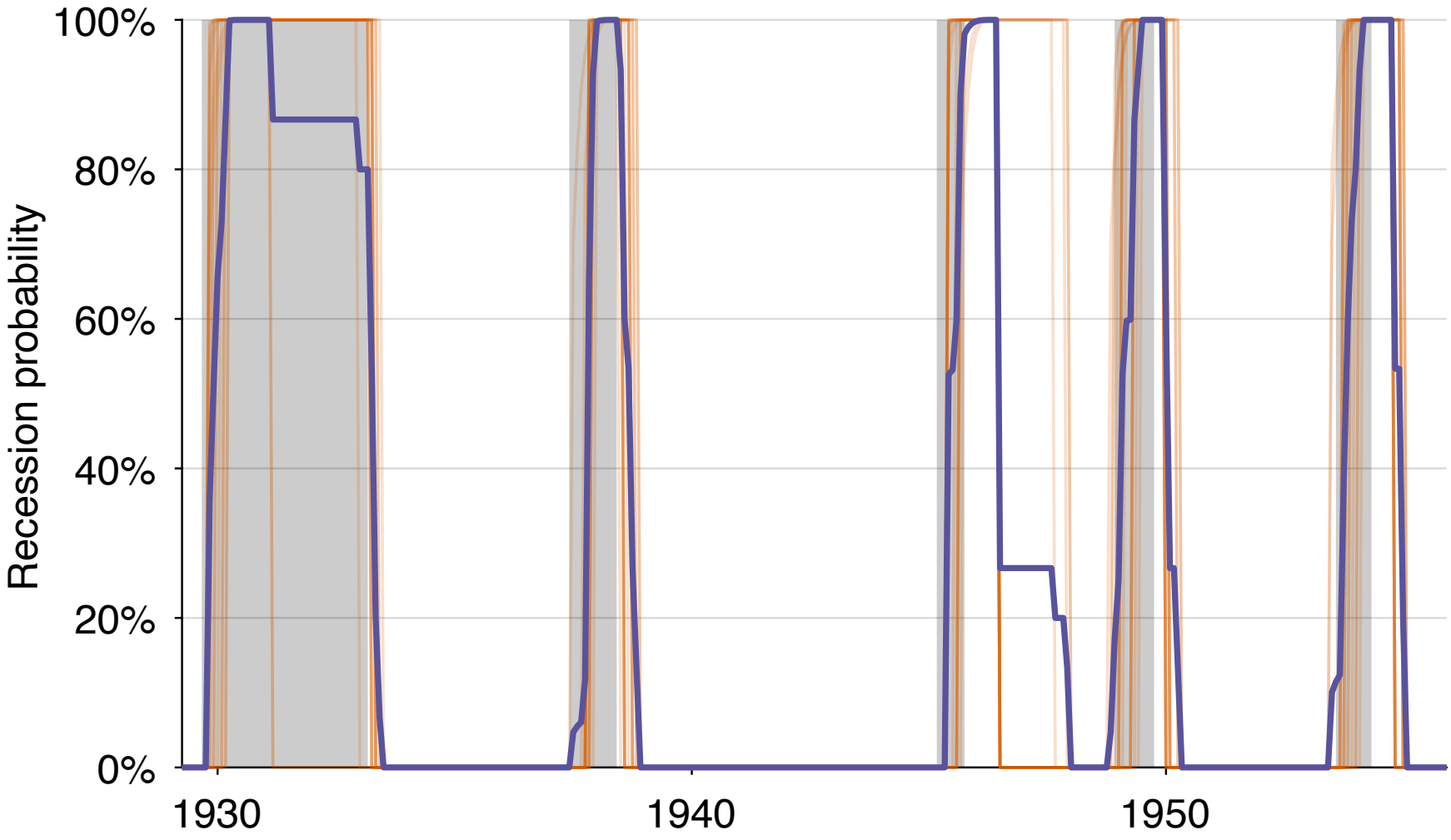
BACKTESTING TO 1964: TRAINING ON 7 RECESSIONS



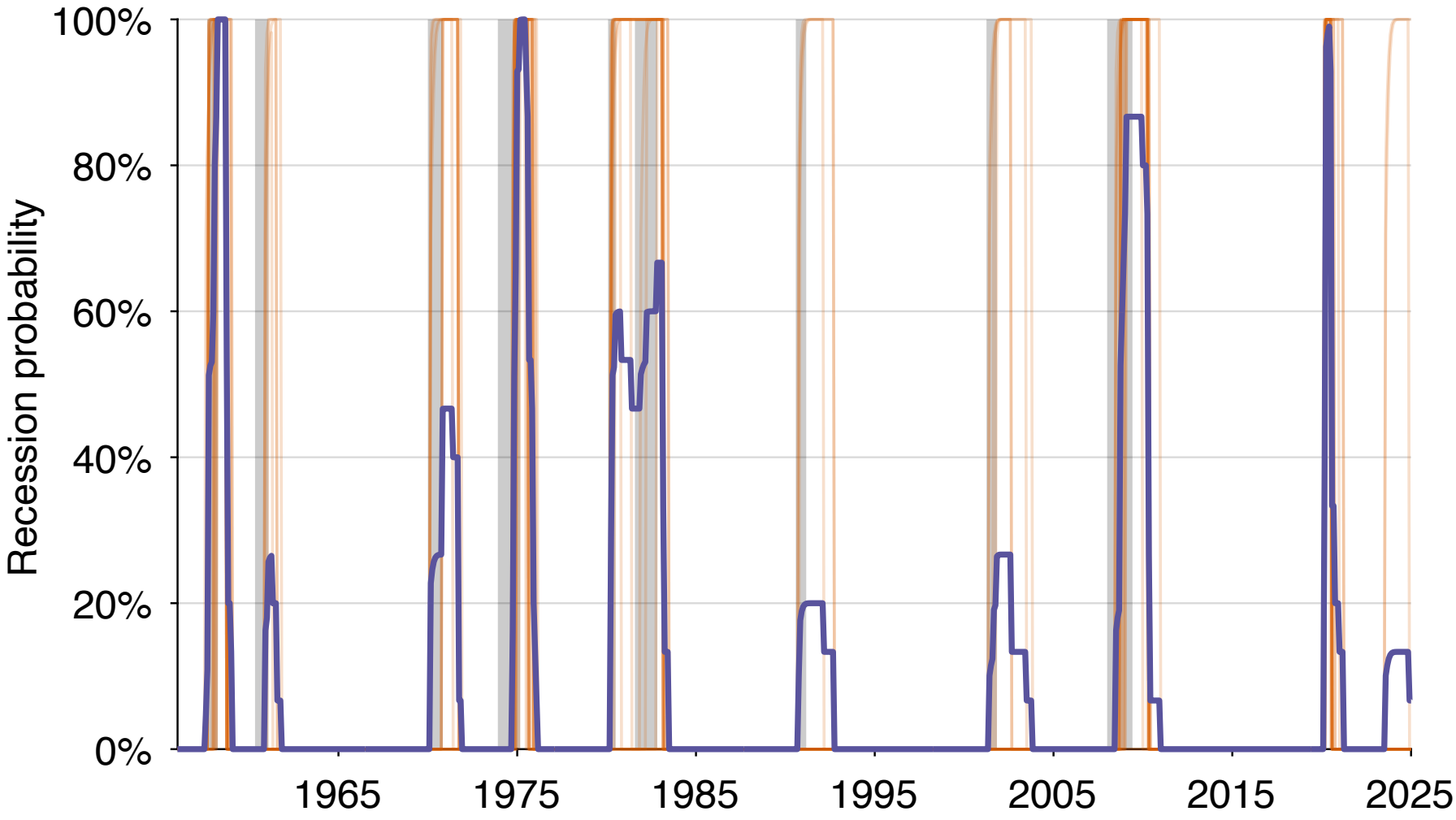
BACKTESTING TO 1964: DETECTING 8+ RECESSIONS



BACKTESTING TO 1955: TRAINING ON 5 RECESSIONS

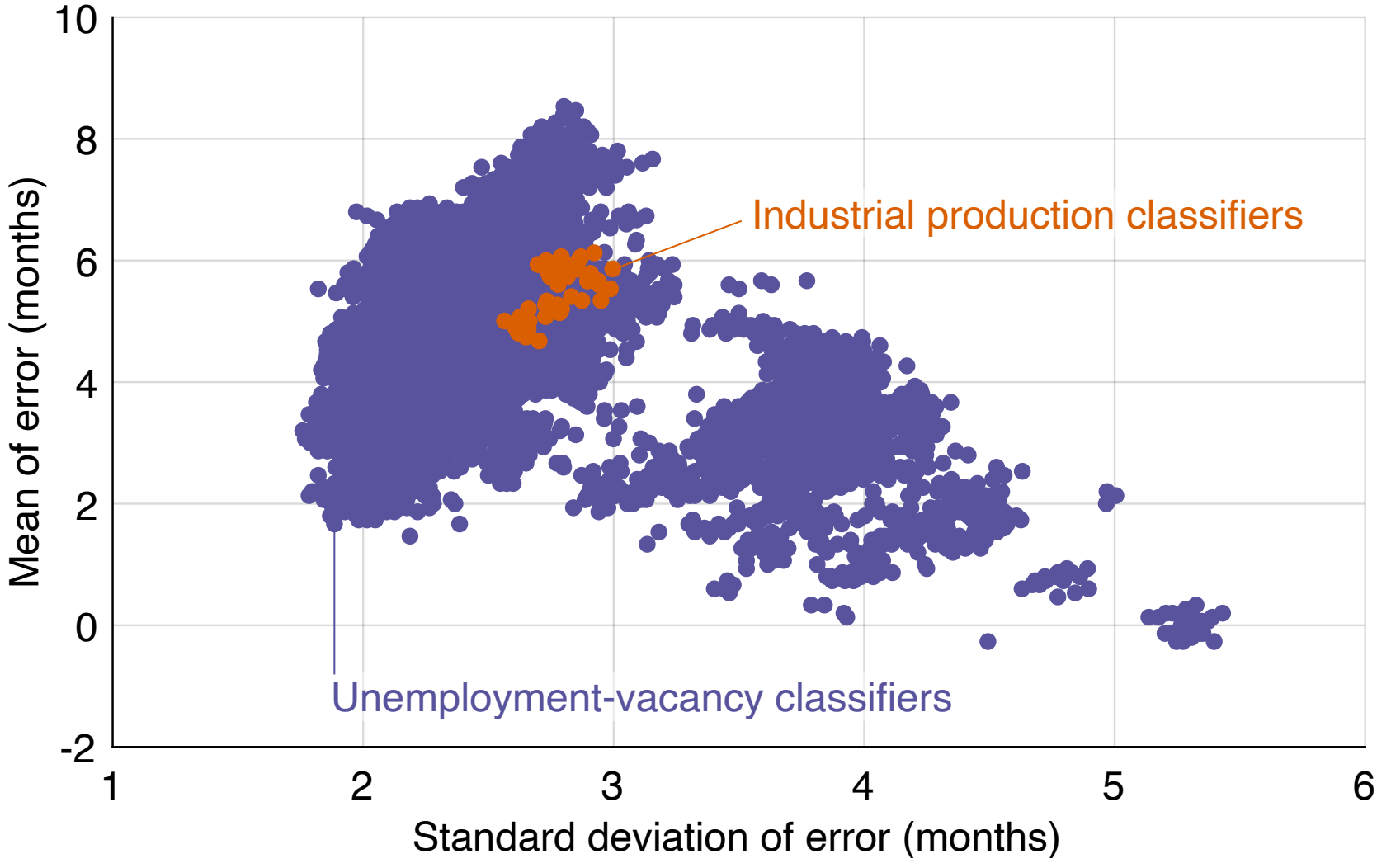


BACKTESTING TO 1955: DETECTING 10+ RECESSIONS



ARE PRODUCT MARKET DATA REALLY SUPERIOR TO LABOR MARKET DATA FOR DETECTING RECESSIONS?

INDUSTRIAL PRODUCTION CLASSIFIERS ARE INFERIOR TO LABOR MARKET CLASSIFIERS



INDUSTRIAL PRODUCTION CLASSIFIERS ARE INFERIOR TO LABOR MARKET CLASSIFIERS