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 WITH LABOR MARKET DATA

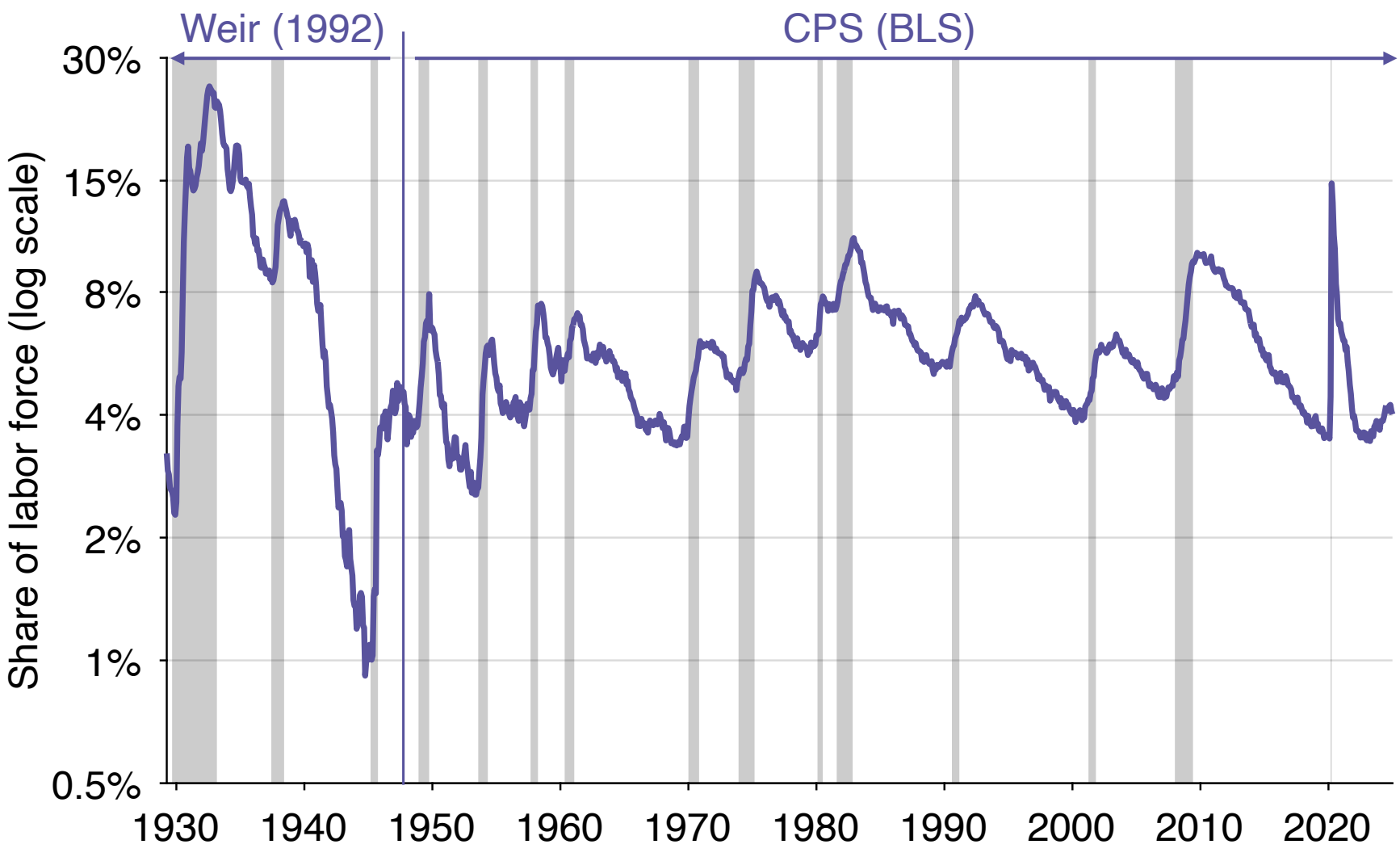
- Recessions announced by NBER with lag of 7.3 months
- Many algorithms to identify recessions systematically
  - But fewer to detect recessions in real time
- Crump, Giannone, Lucca (2020): labor market data + threshold is the most reliable method to detect recessions
  - Fewer false positives
  - Less sensitive to data revisions
  - Popular (Sahm 2019), used by policymakers (Bernanke 2006), and used in industry (Goldman Sachs 2000)
  - But the rules are arbitrary and thus suboptimal

⇝ Develop best possible recession classifier from labor market data

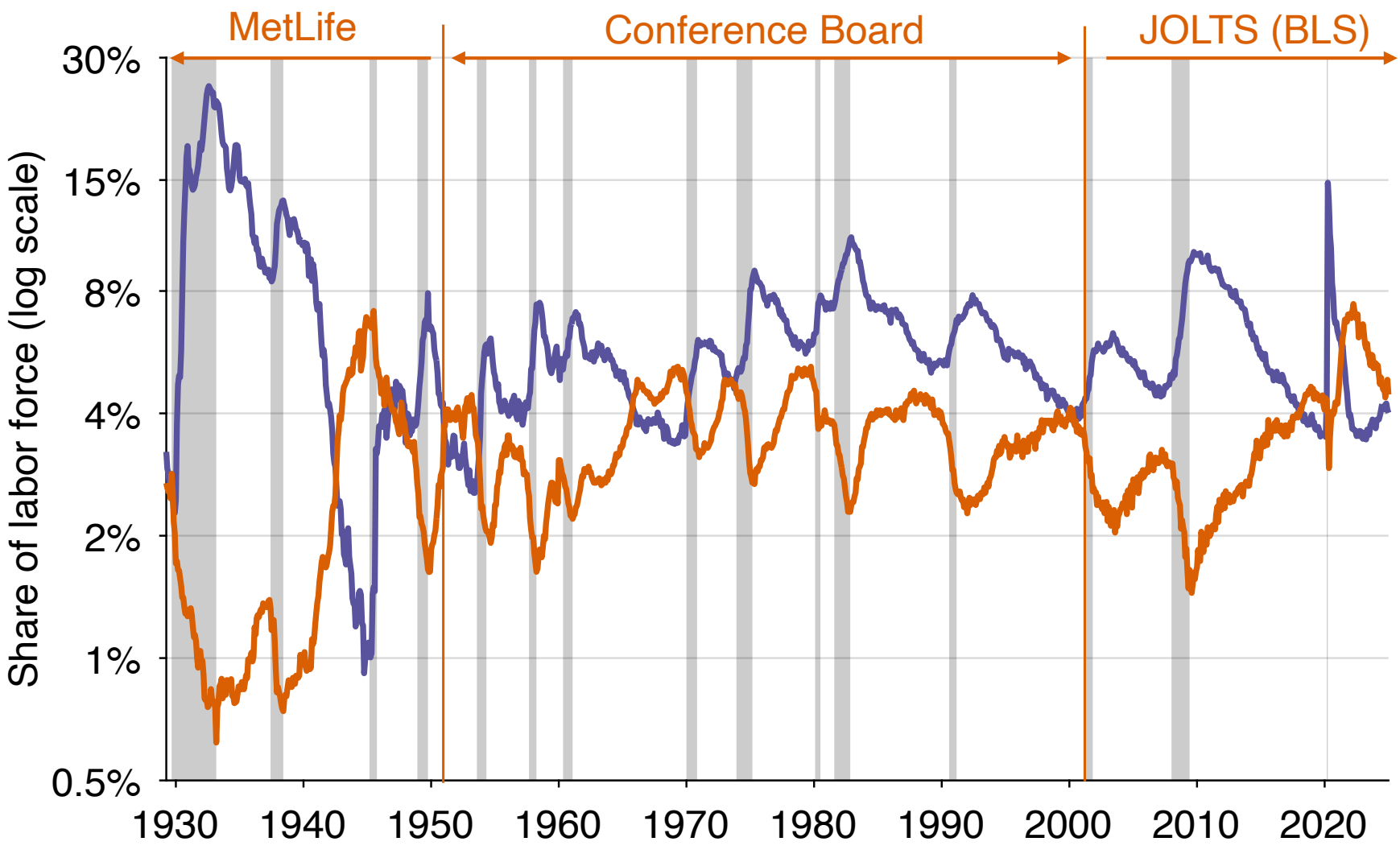
⇝ Apply to current US data: has the recession started?

UNEMPLOYMENT & JOB VACANCY IN THE UNITED STATES, 1929–2025

US UNEMPLOYMENT RATE (PETROSKY-NADEAU, ZHANG 2021)



US VACANCY RATE (PETROSKY-NADEAU, ZHANG 2021)



CONSTRUCTING RECESSION INDICATORS FROM UNEMPLOYMENT & VACANCY DATA

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 ($1 \leq \beta$):

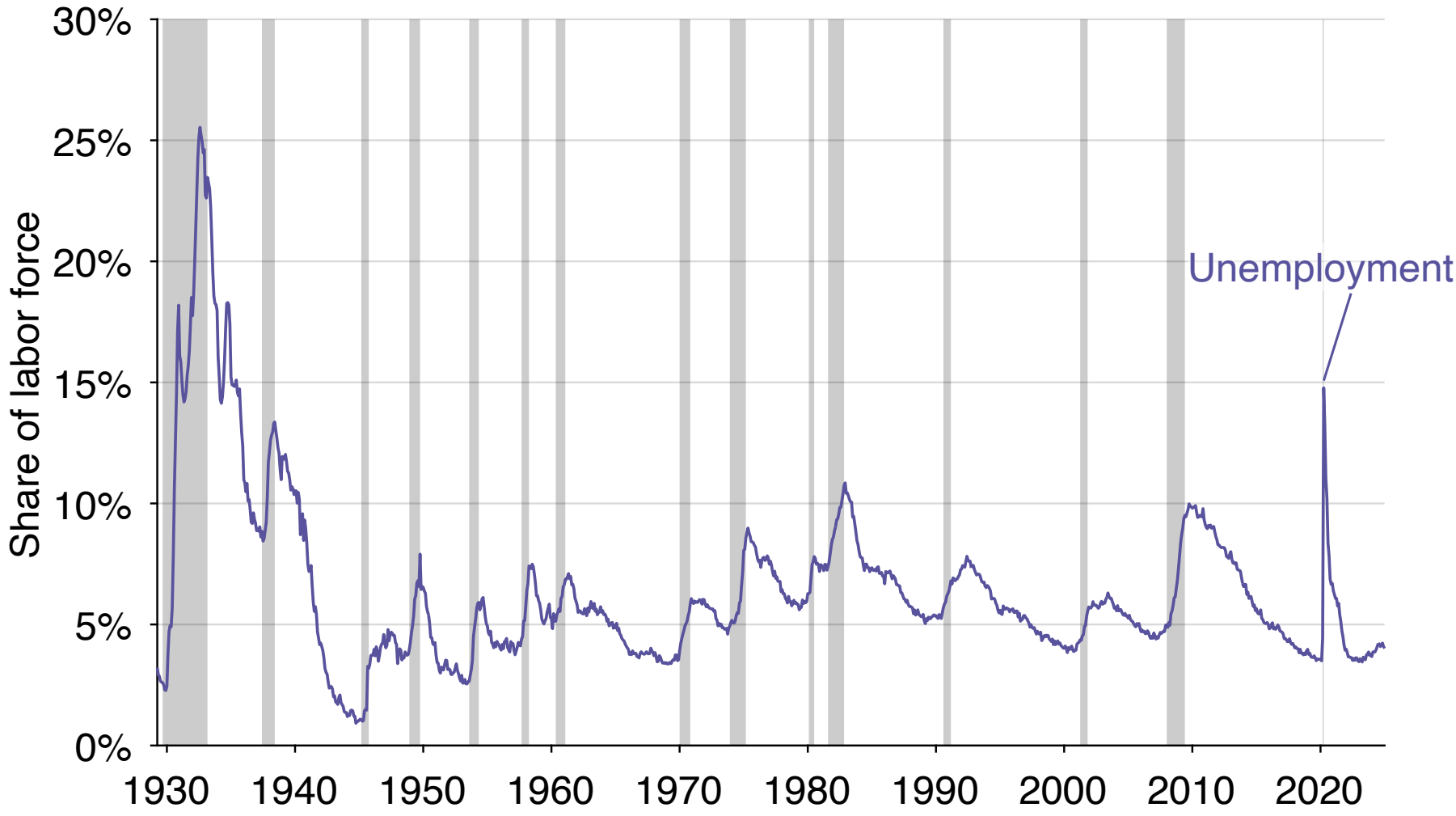
$$\tilde{u}(t) = \bar{u}(t) - \min_{0 \leq j \leq \beta} \bar{u}(t-i)$$

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



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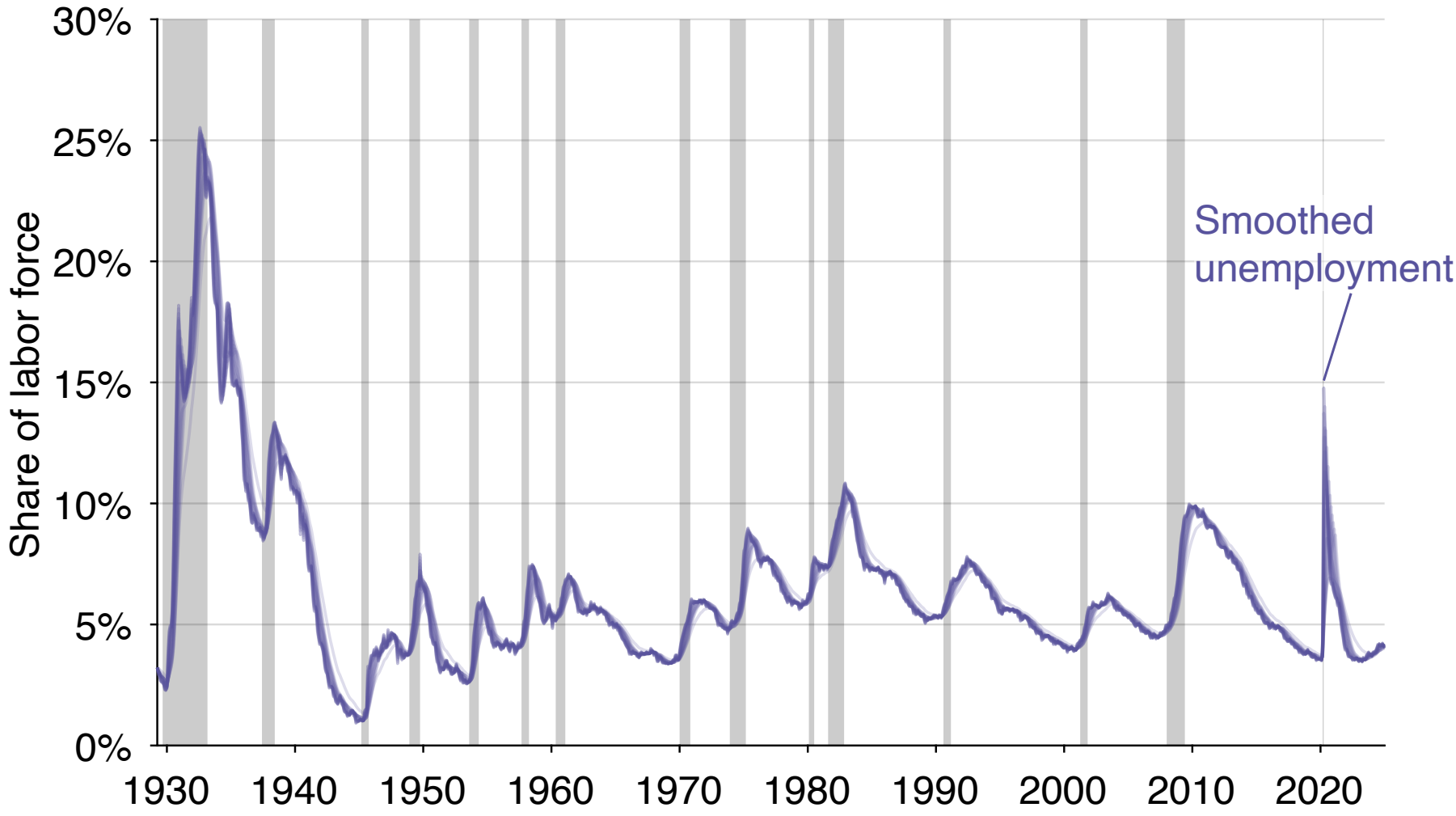
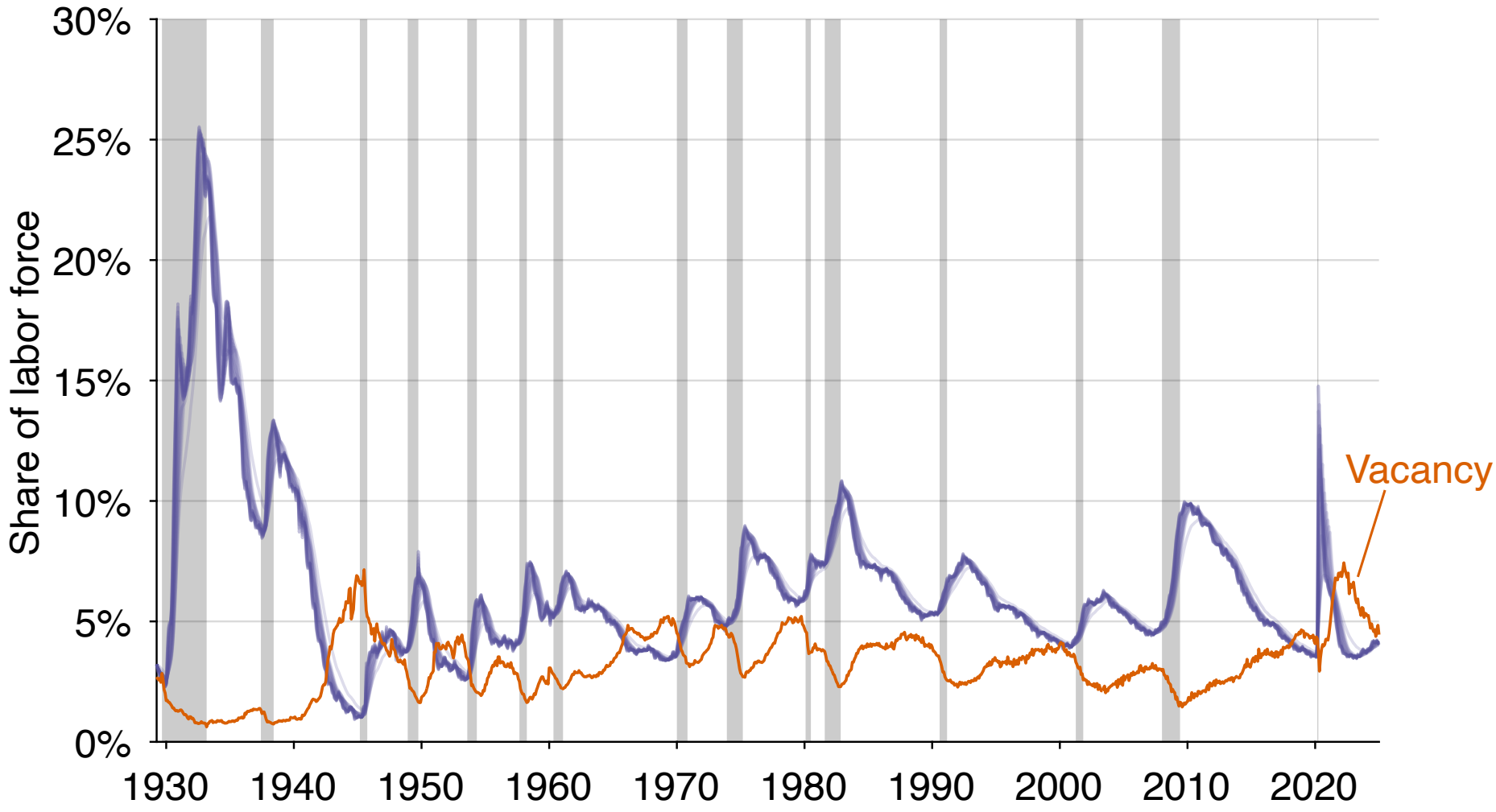
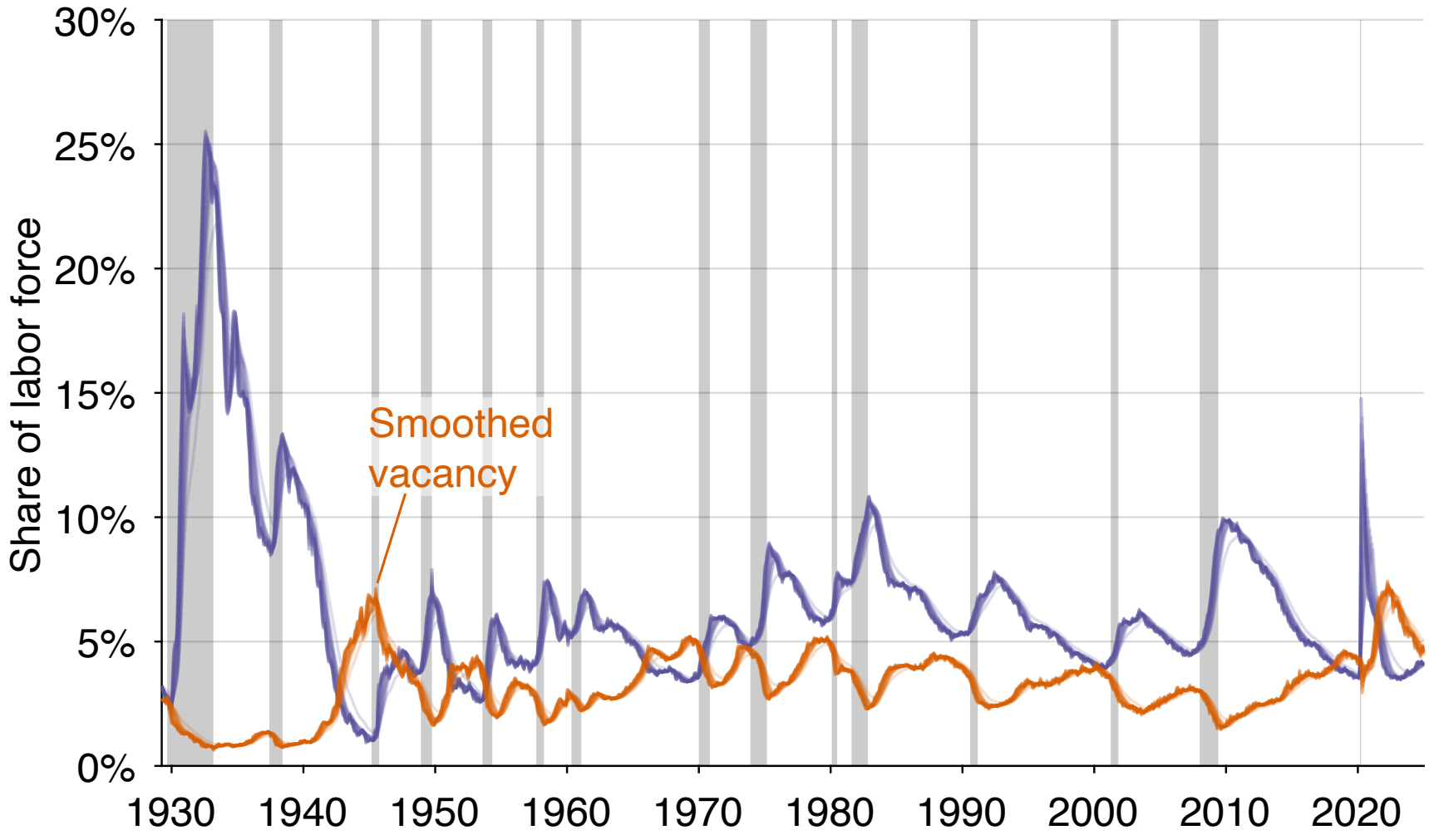


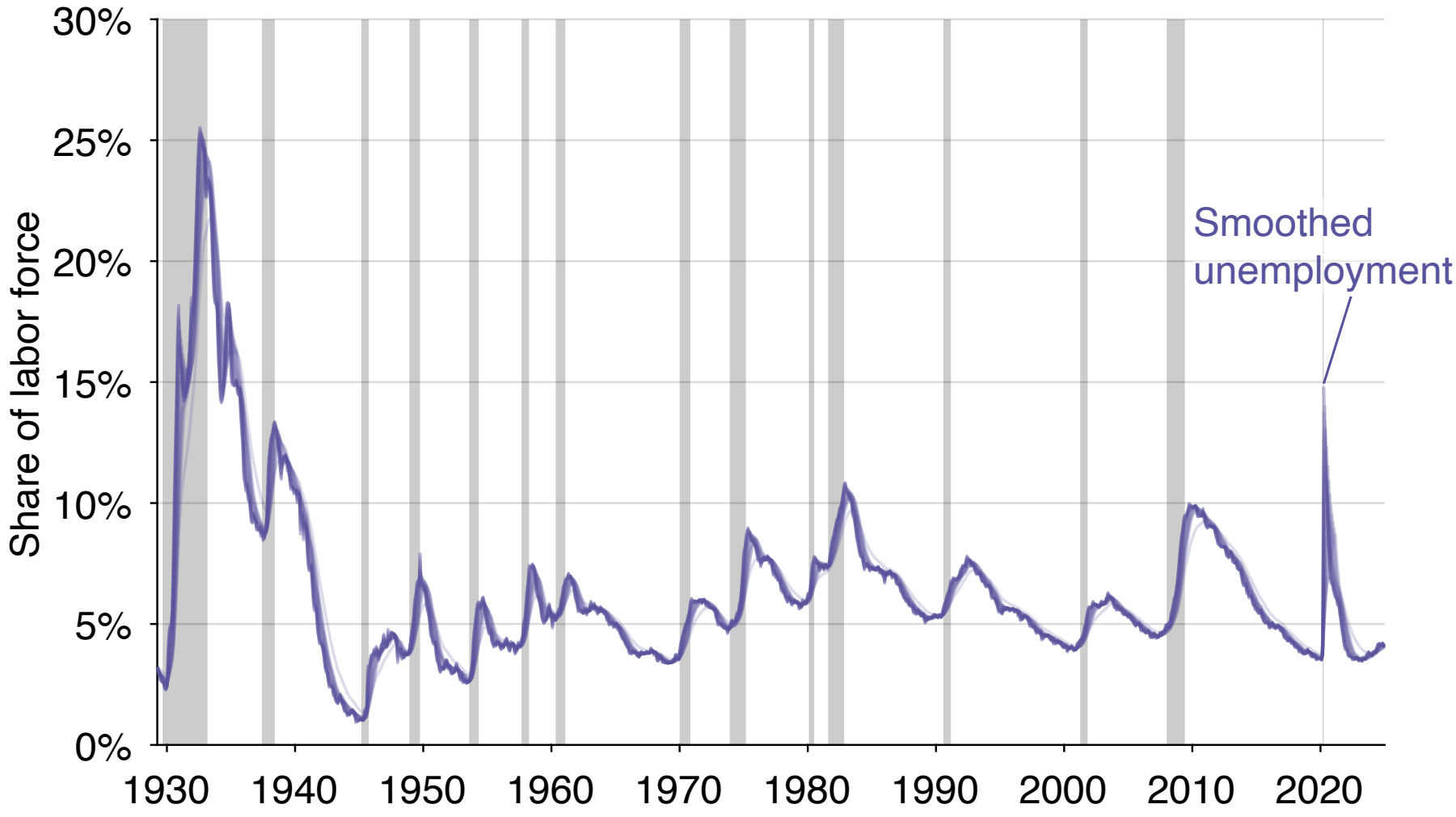
SMOOTHING VACANCY



SMOOTHING VACANCY



DETECTING UNEMPLOYMENT TURNING POINTS



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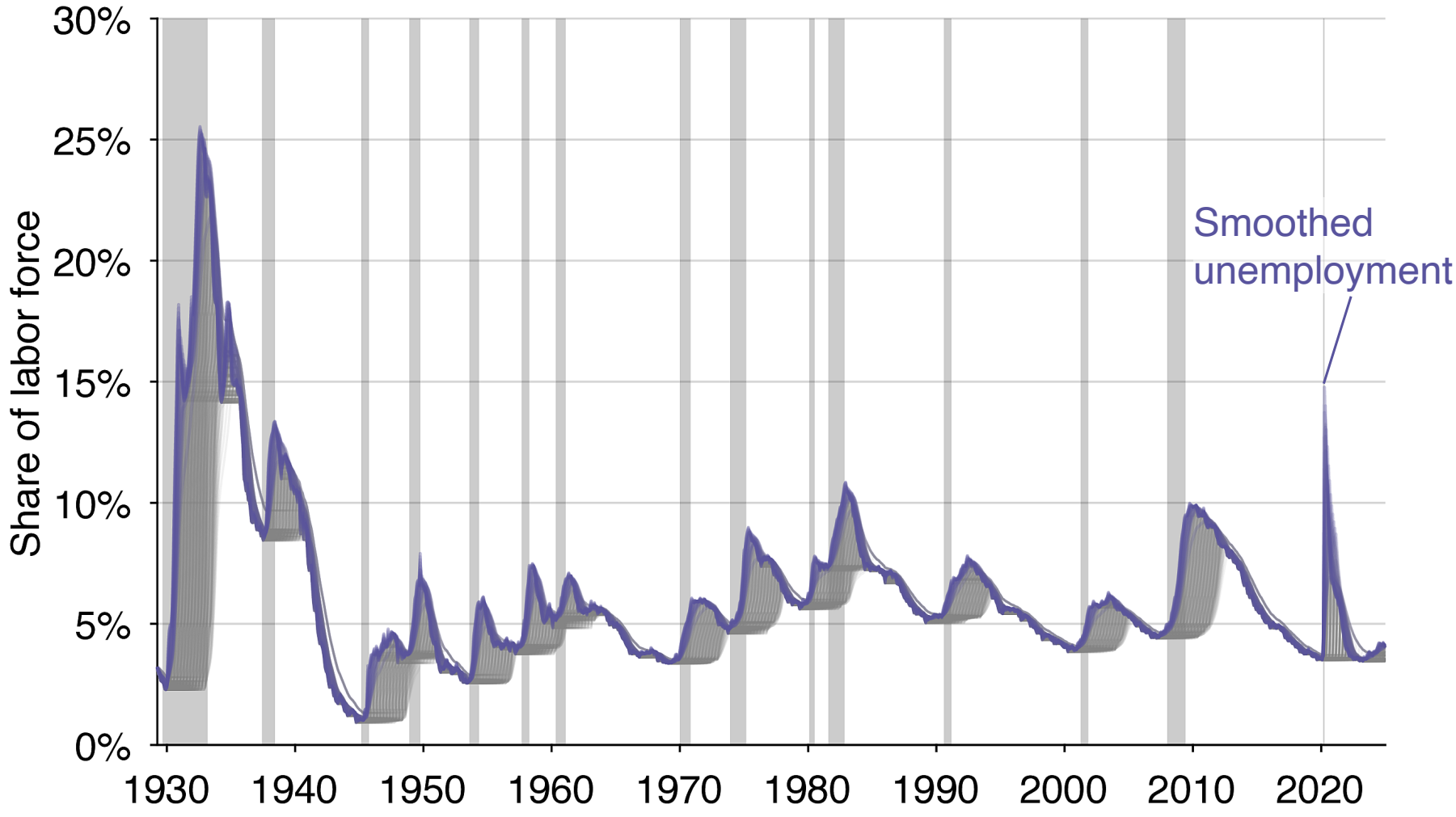

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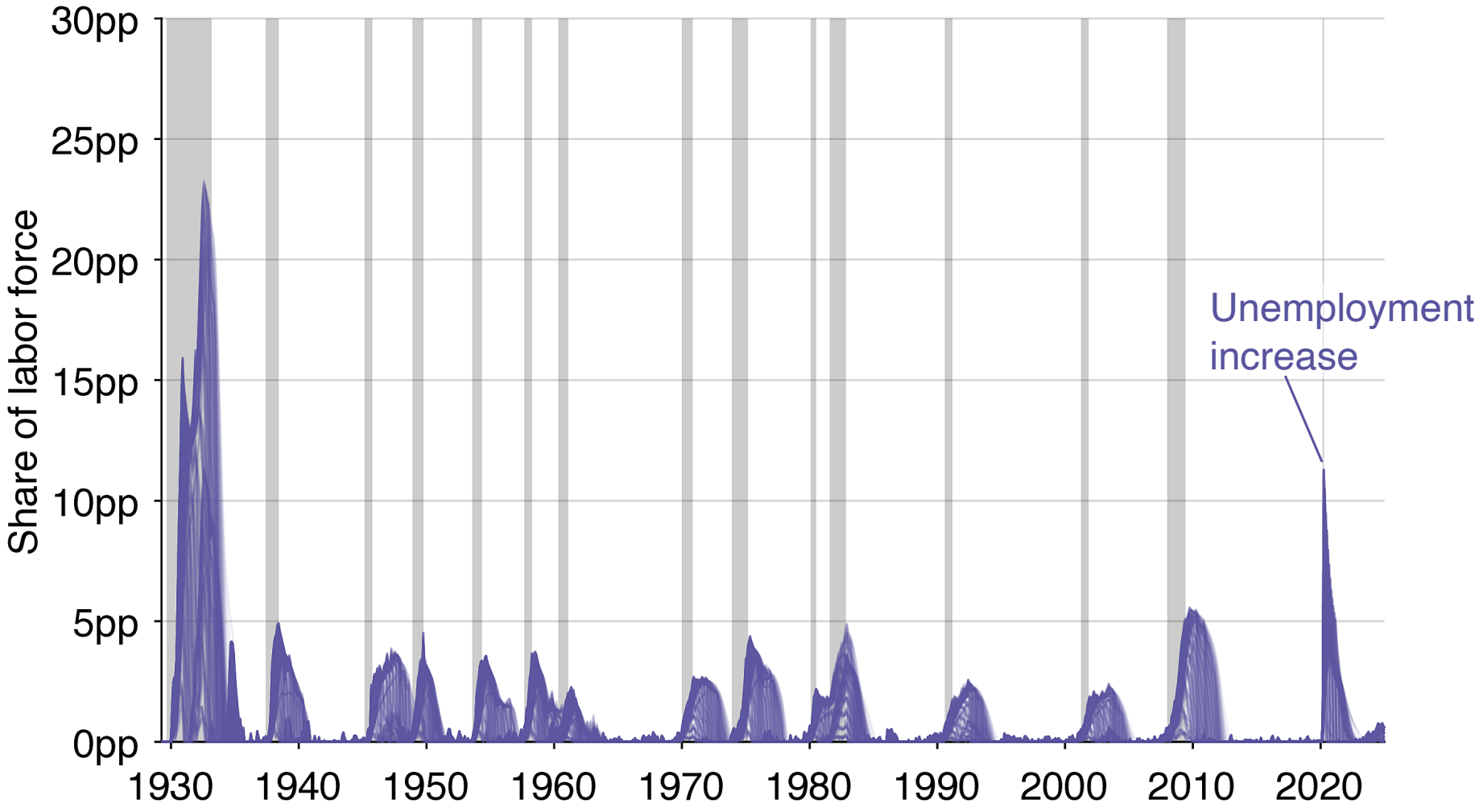

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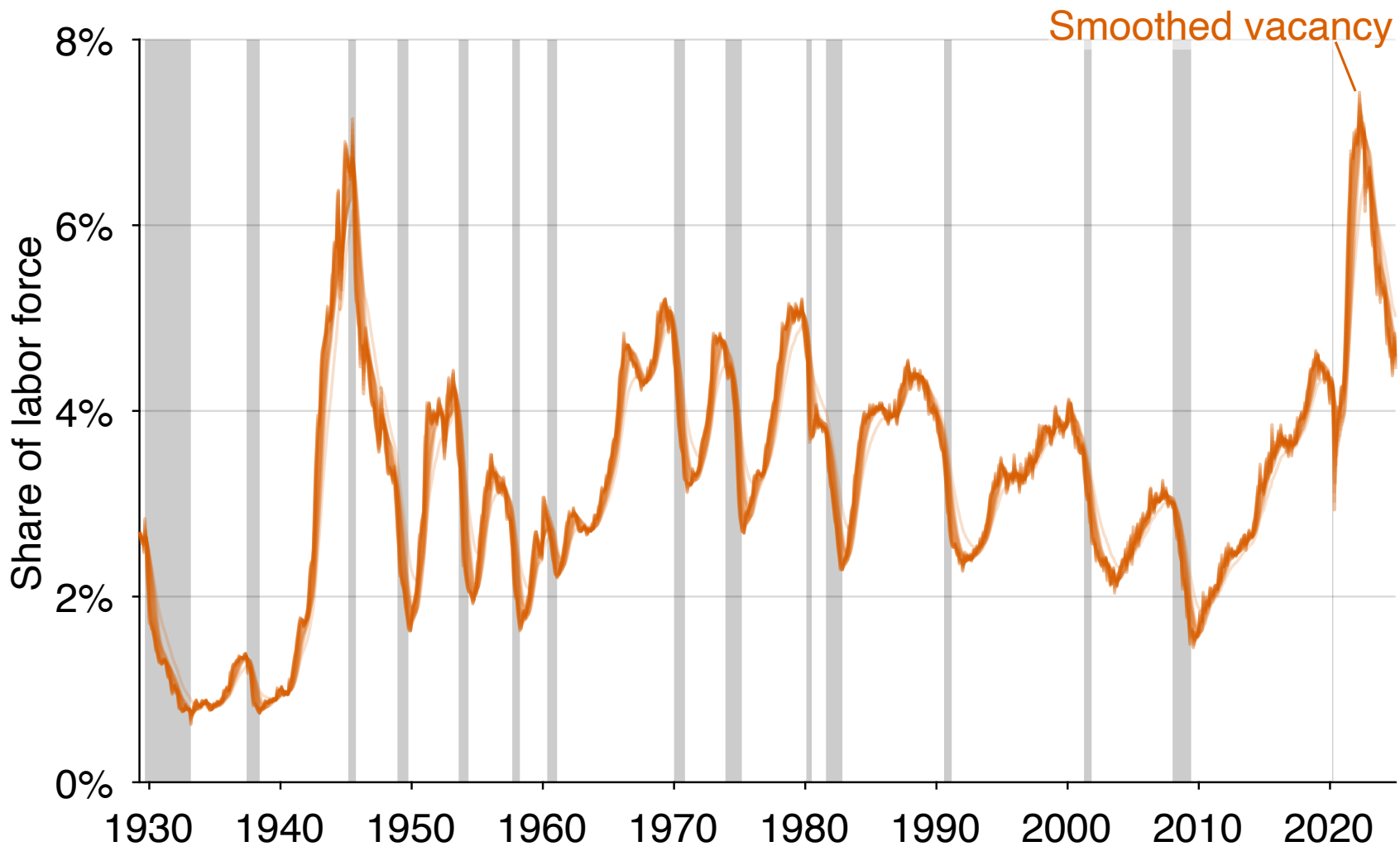

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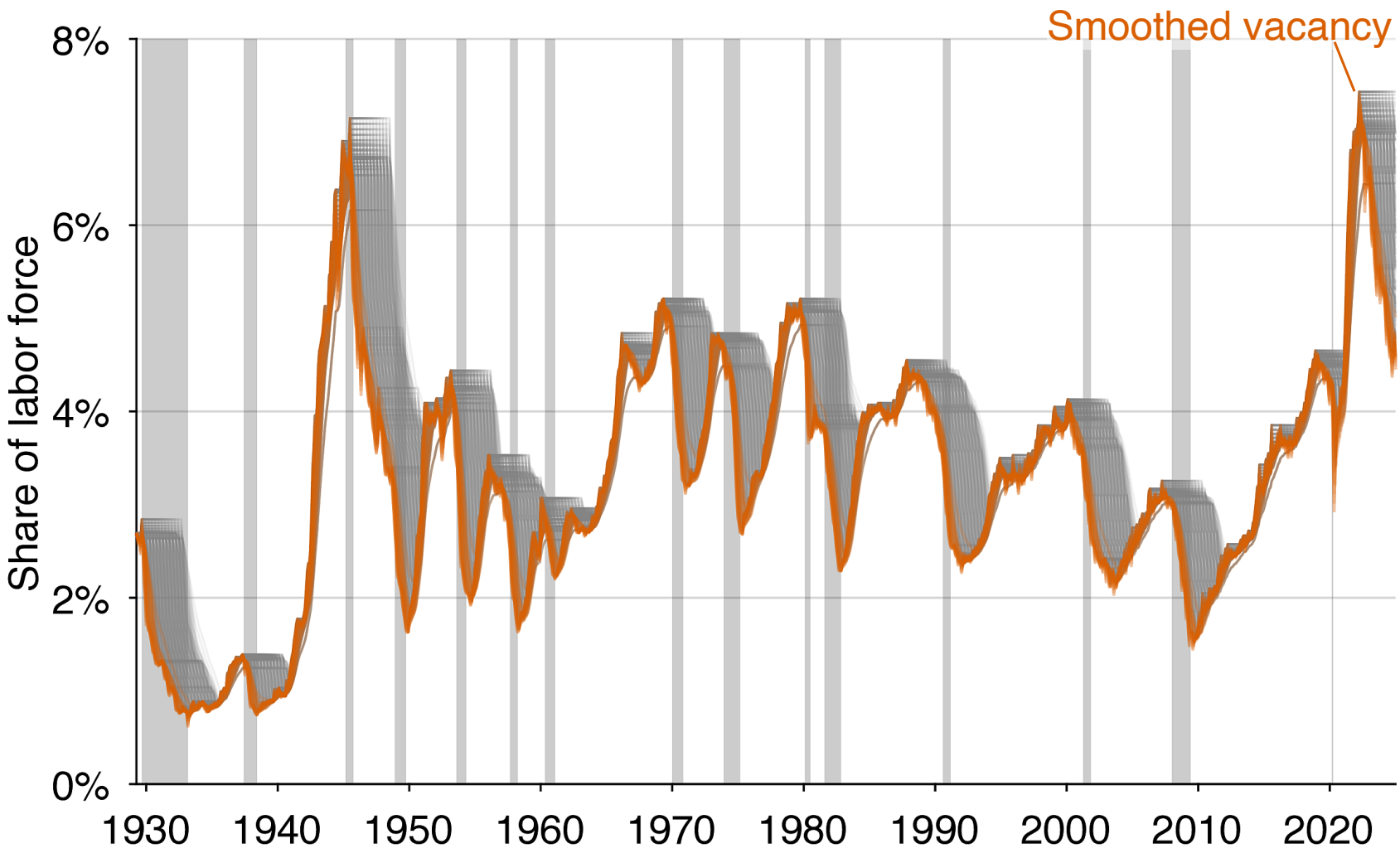

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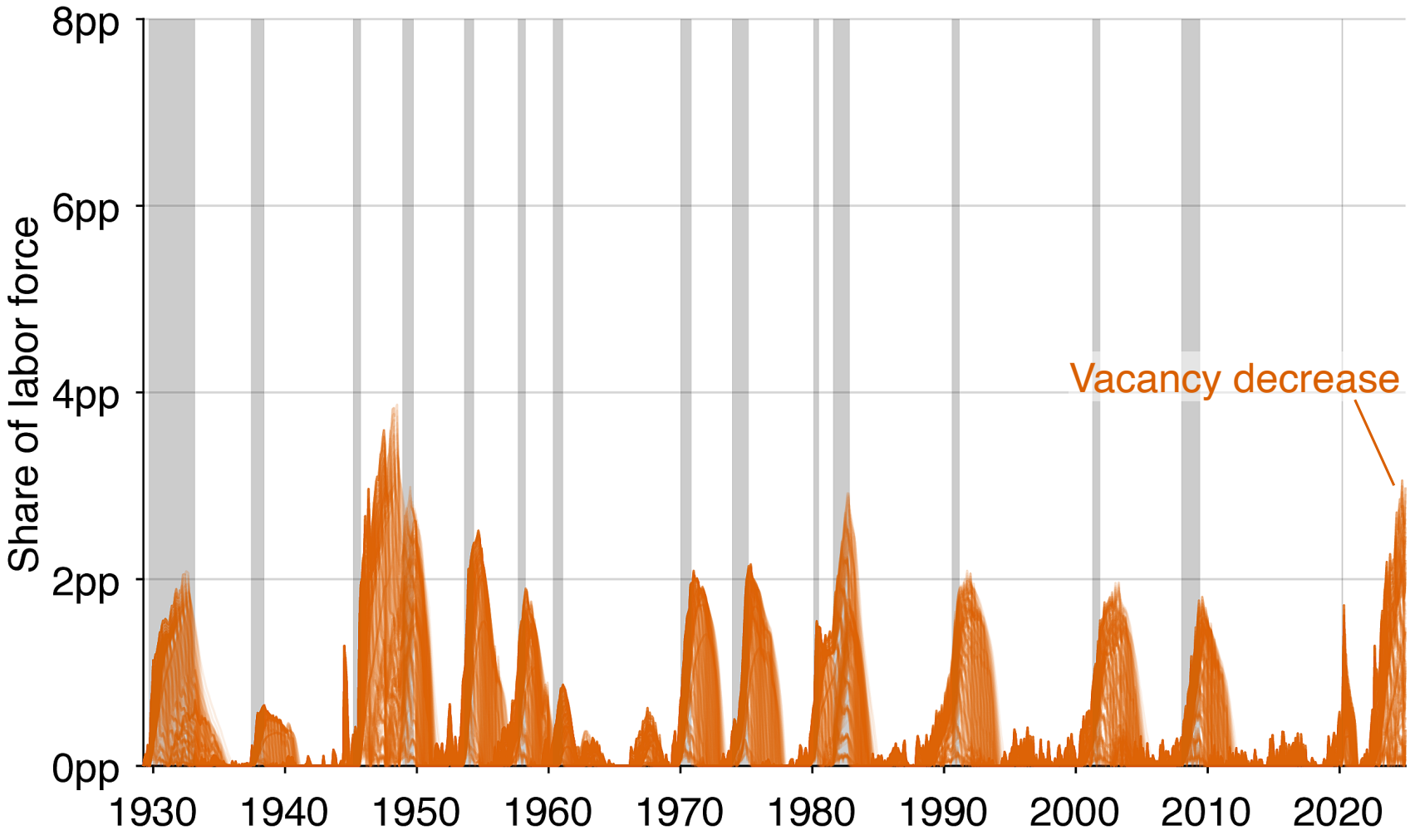
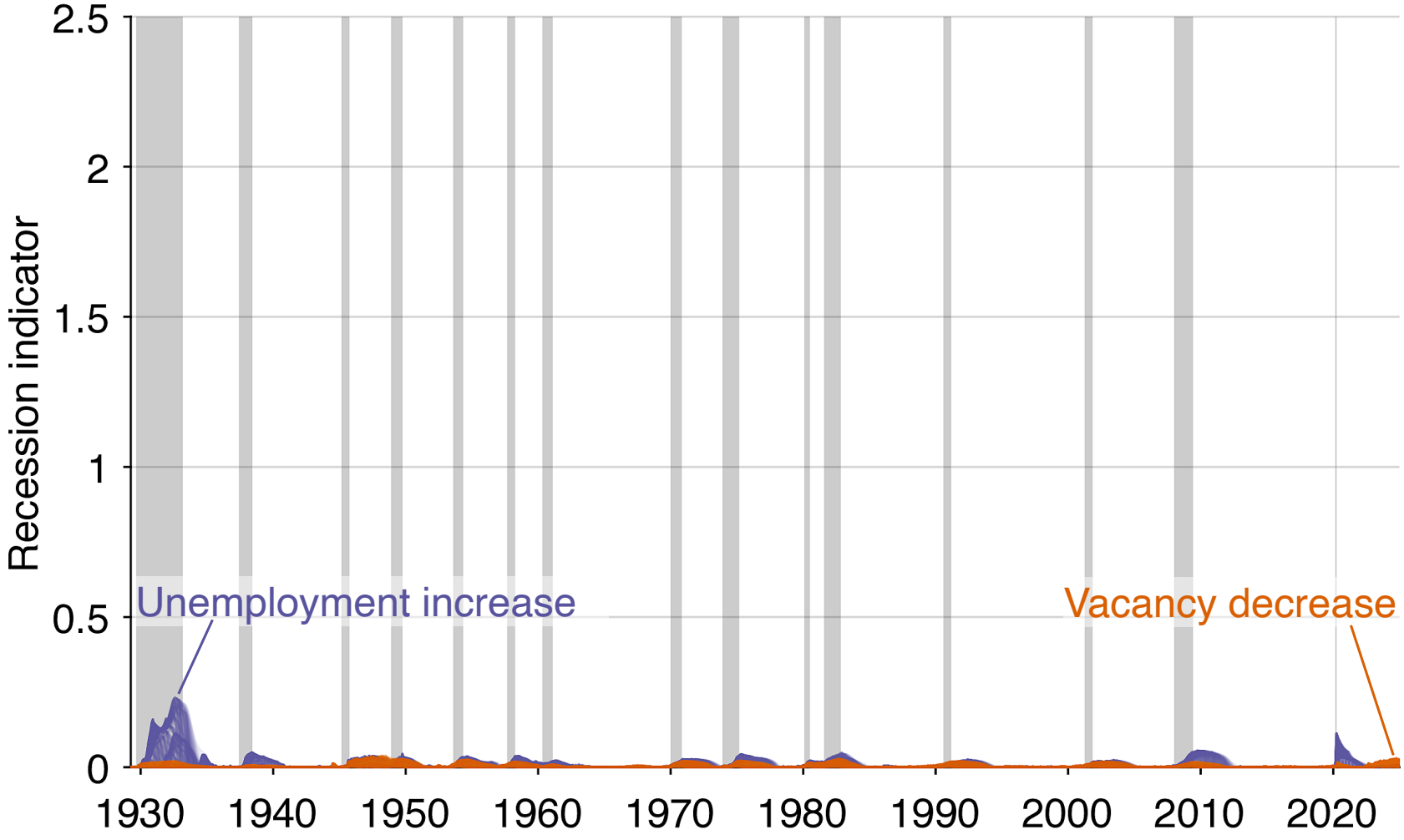


CURVING UNEMPLOYMENT & VACANCY INCREASES



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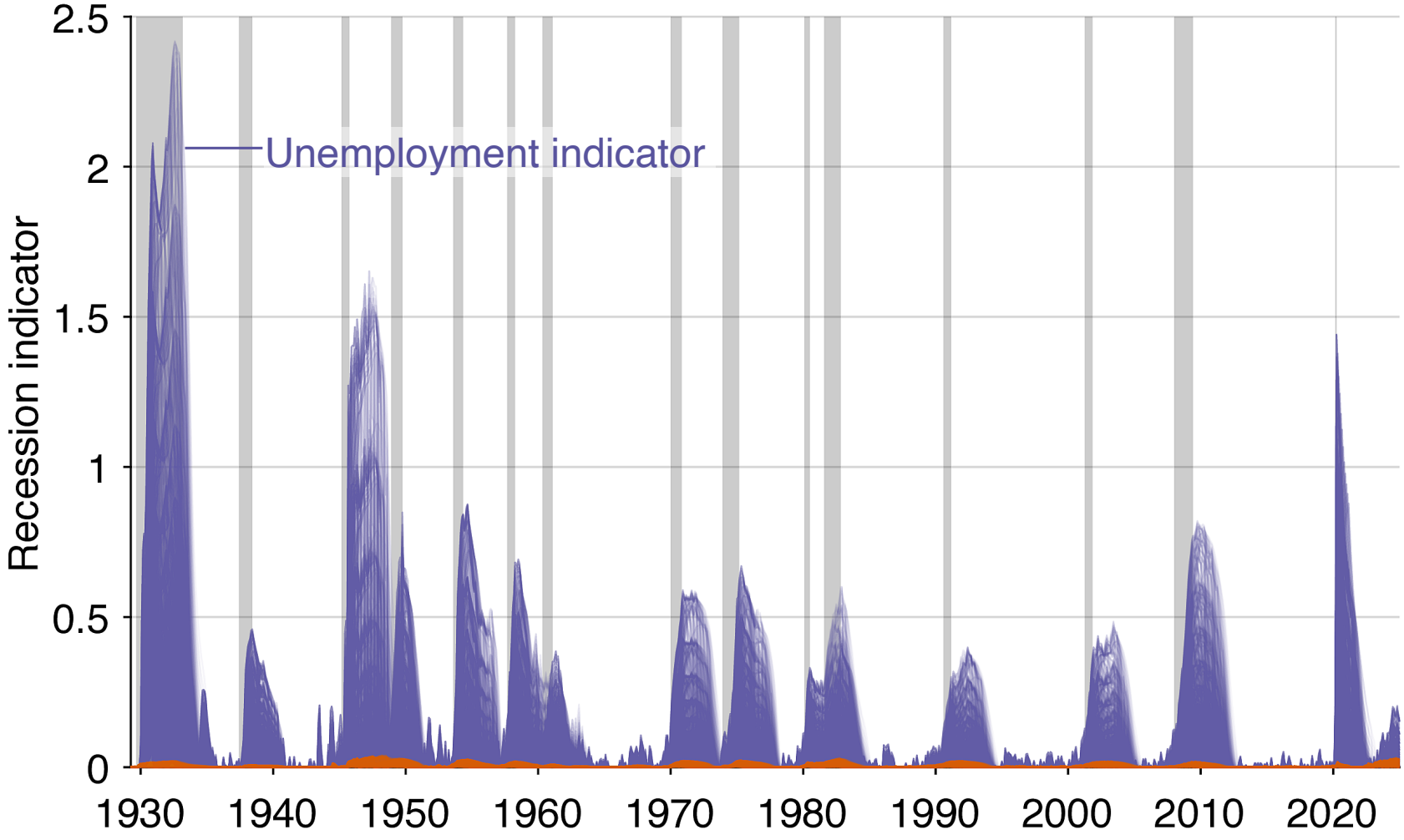

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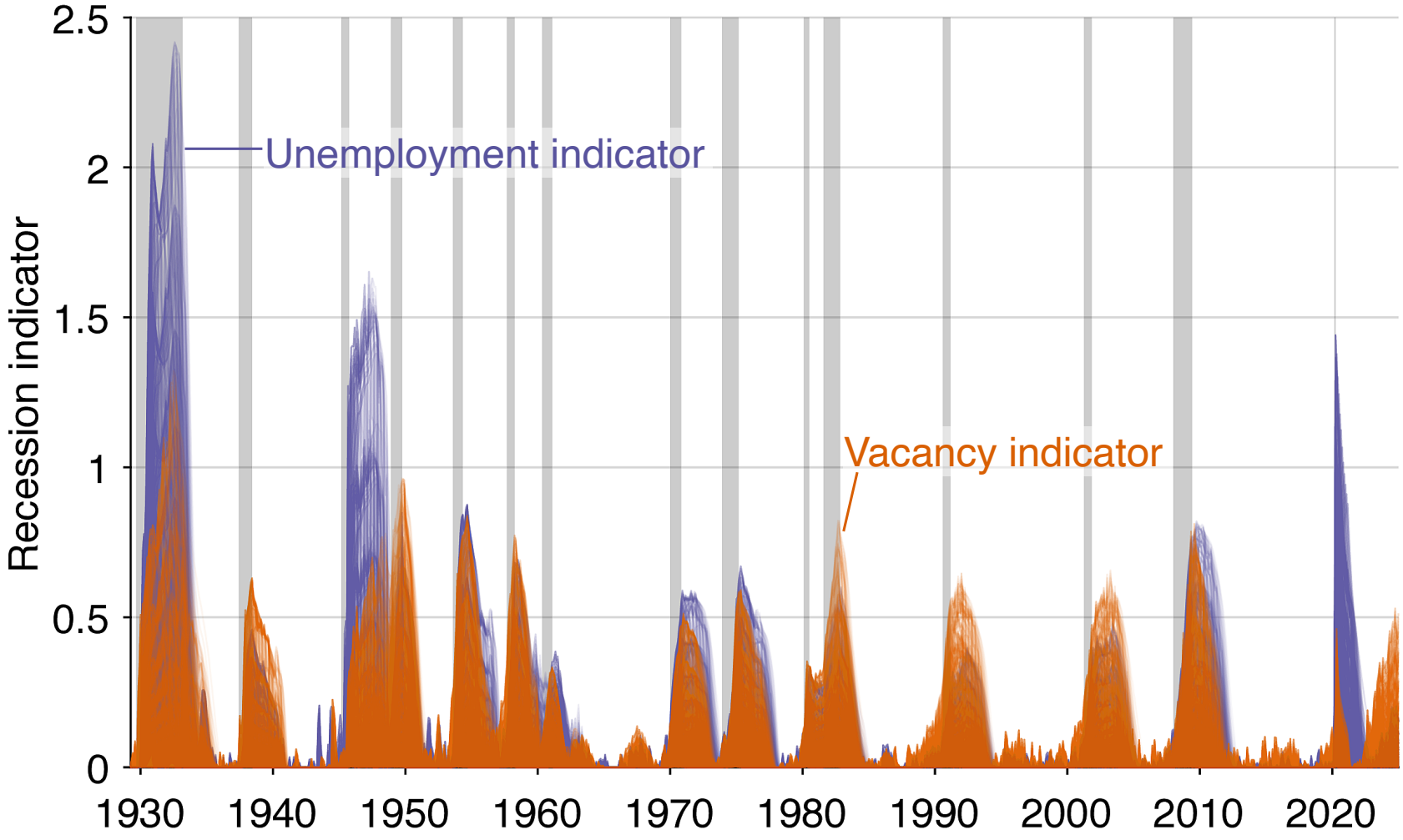
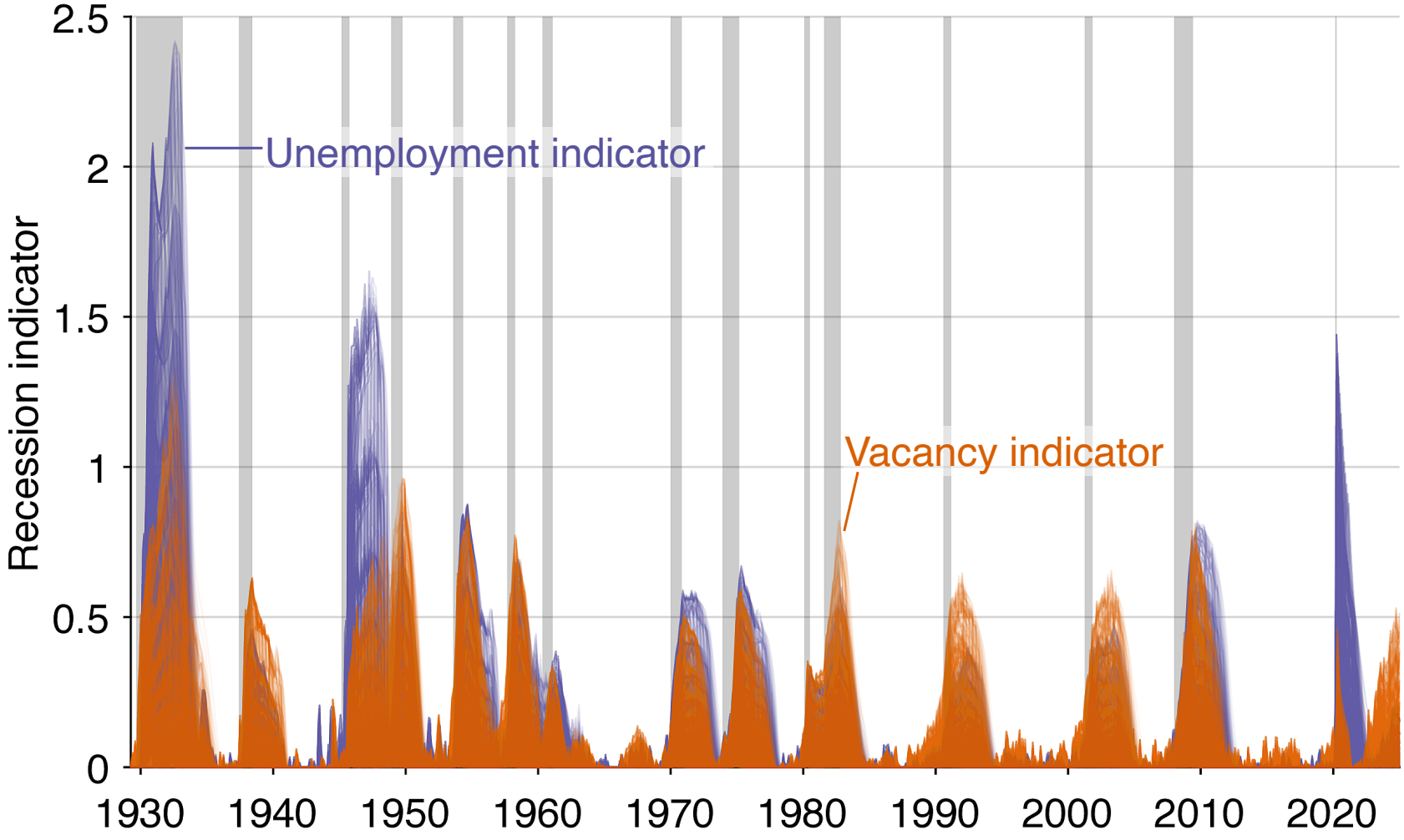


COMBINING UNEMPLOYMENT & VACANCY INDICATORS



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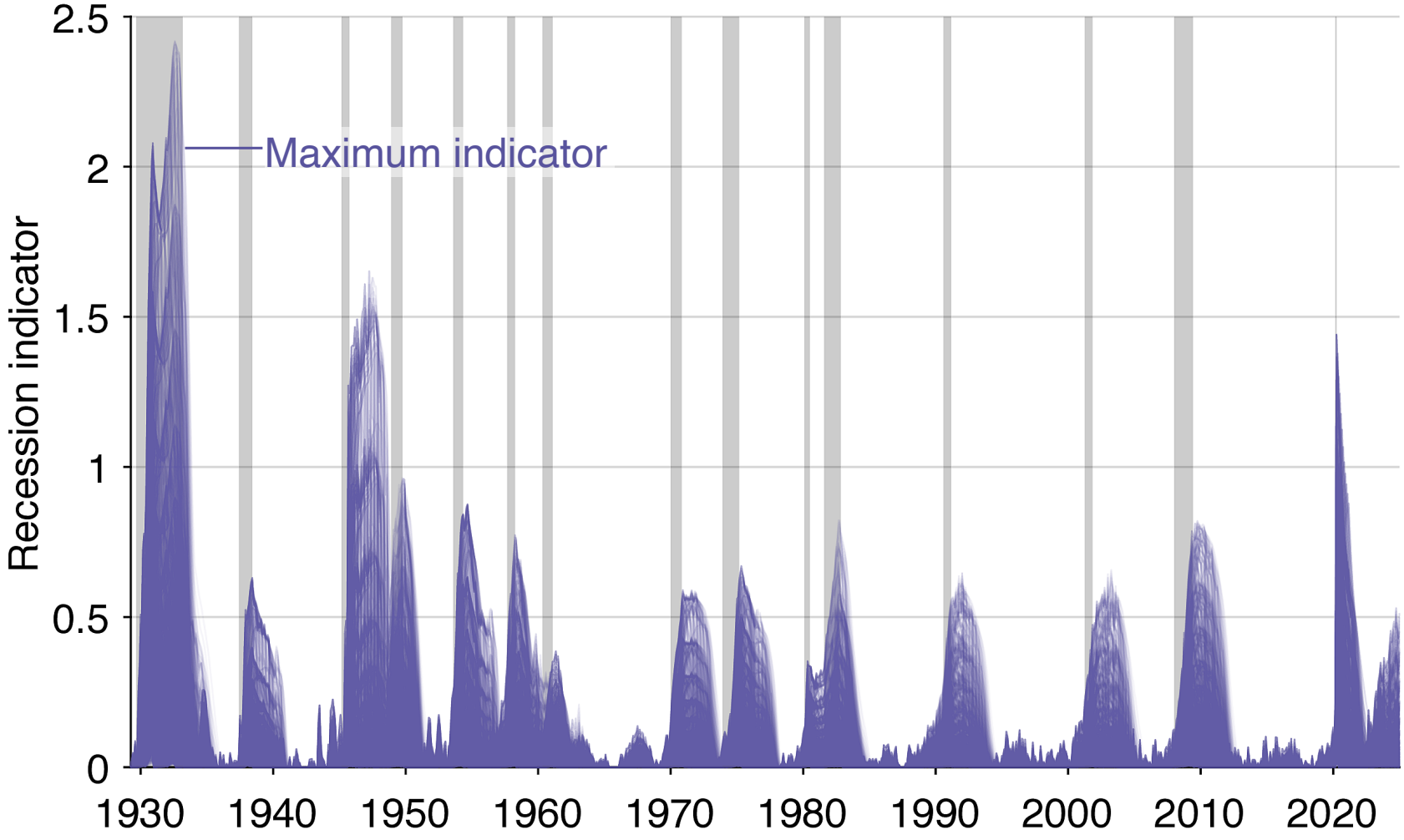

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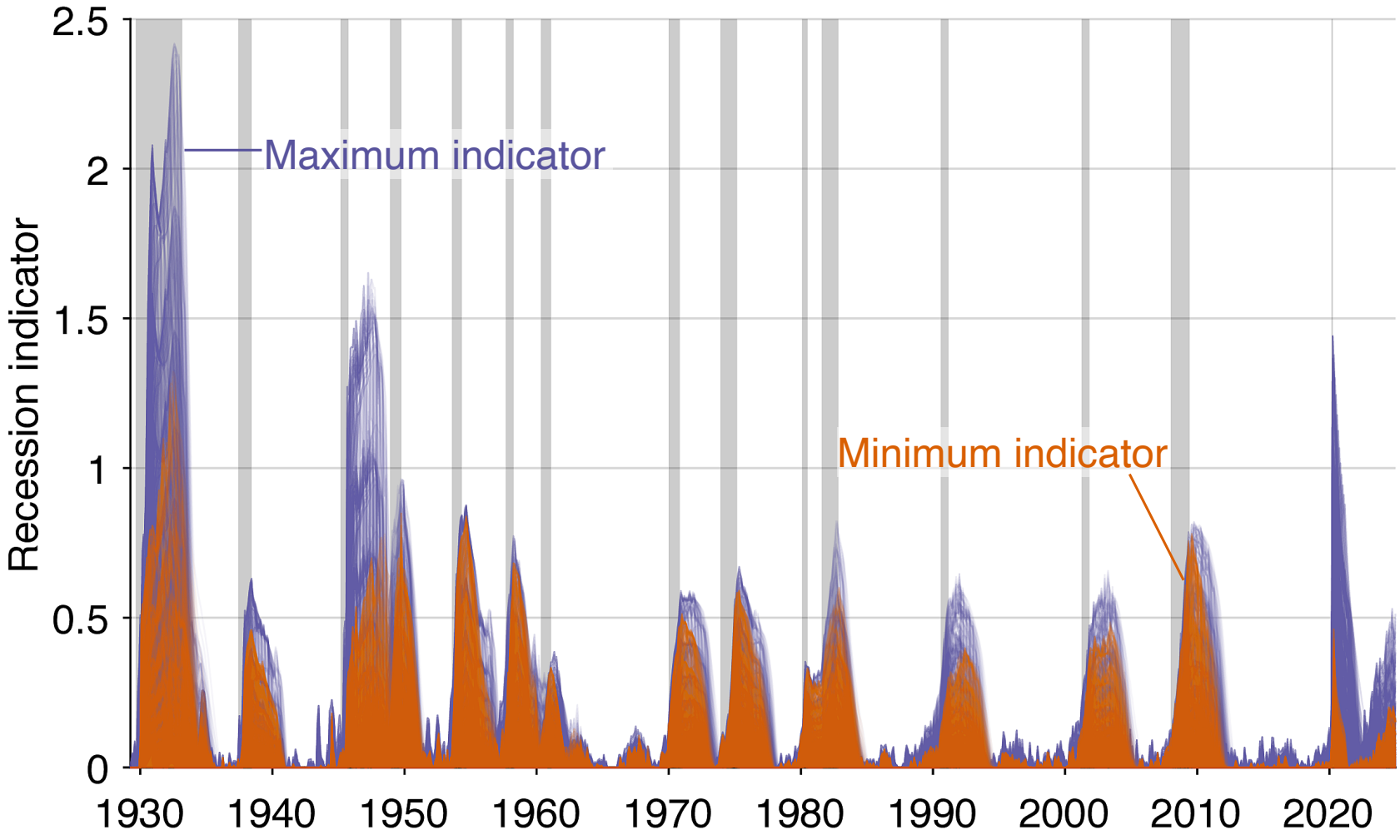
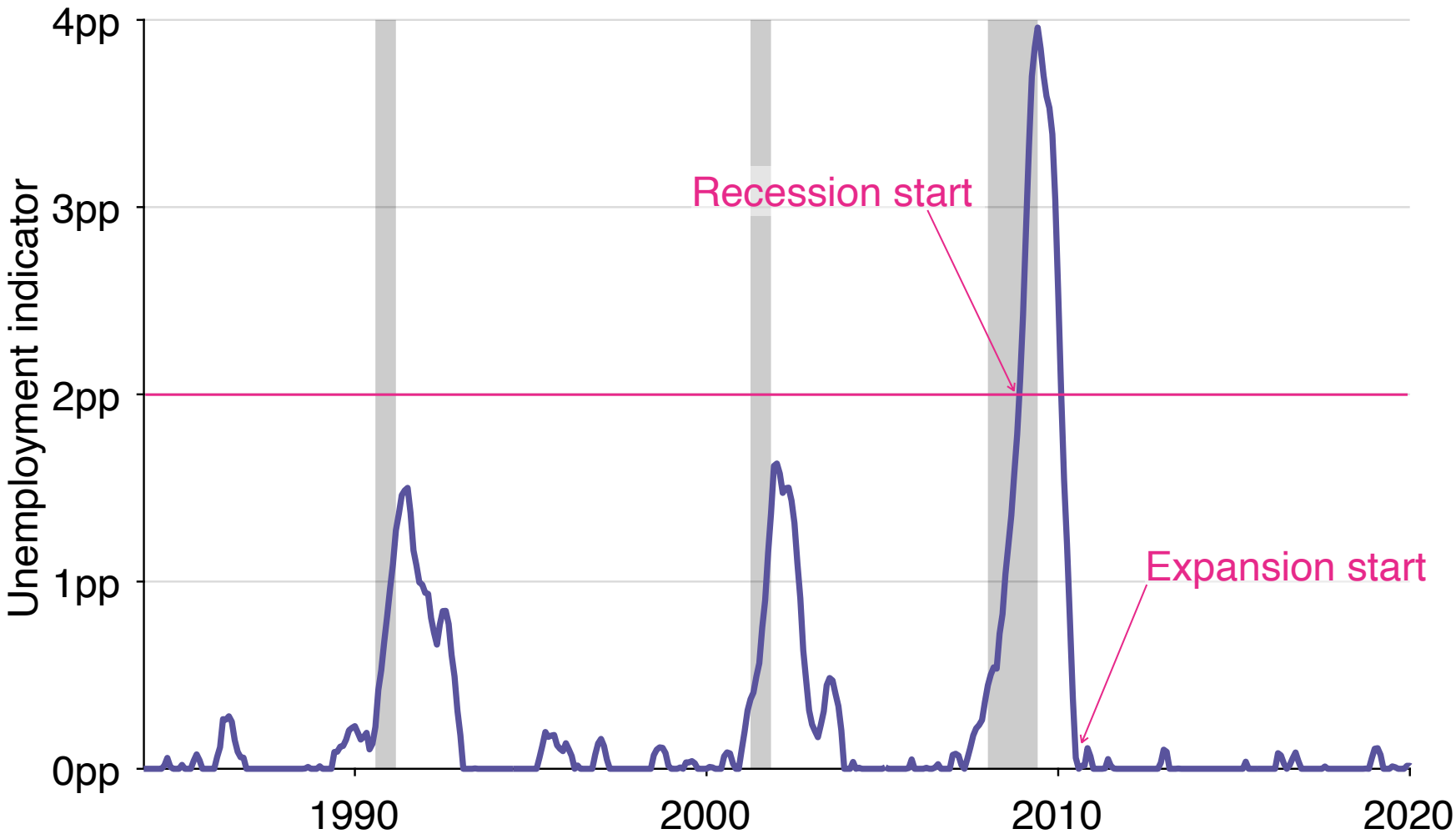
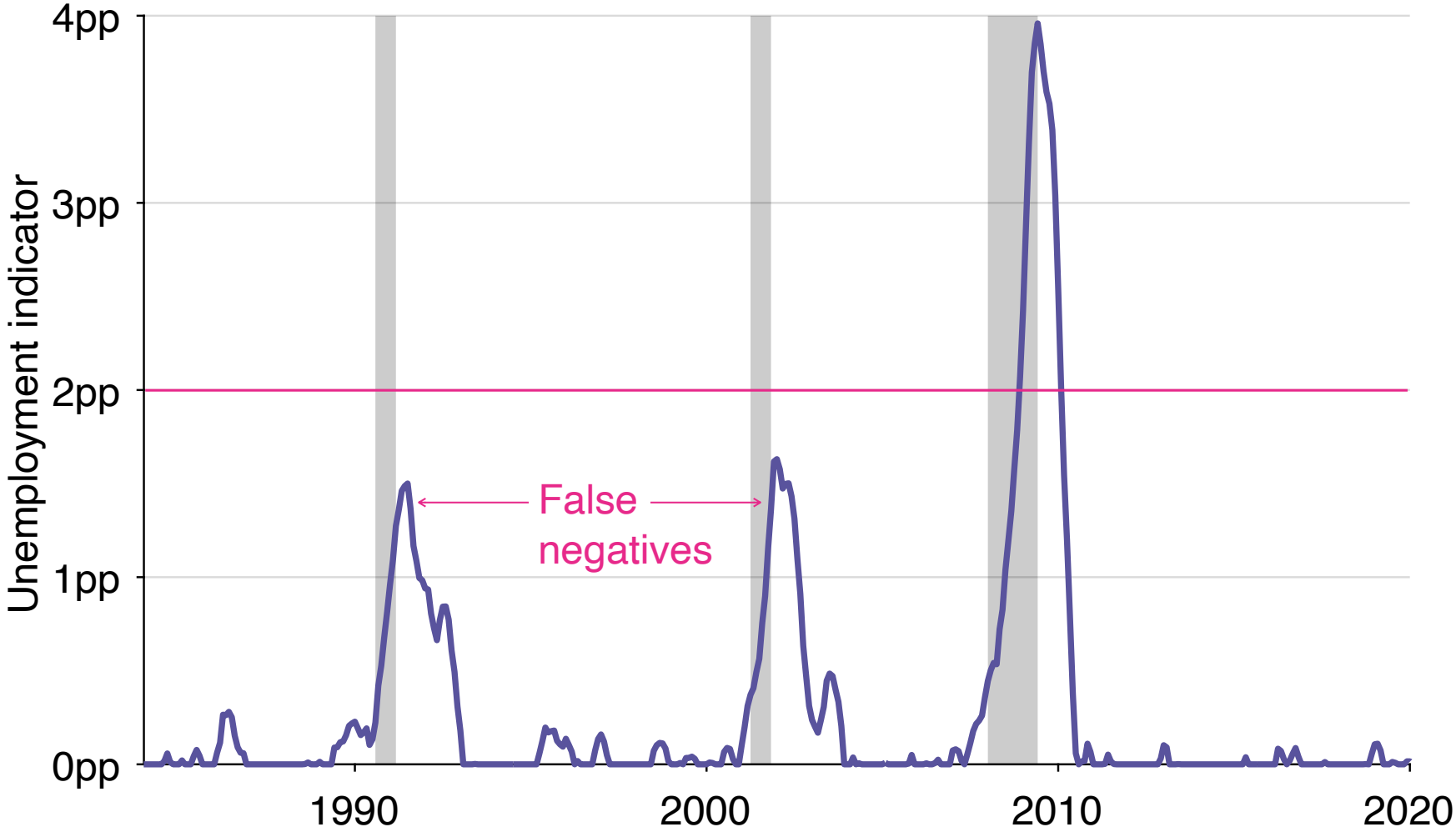


TRAINING RECESSION CLASSIFIERS

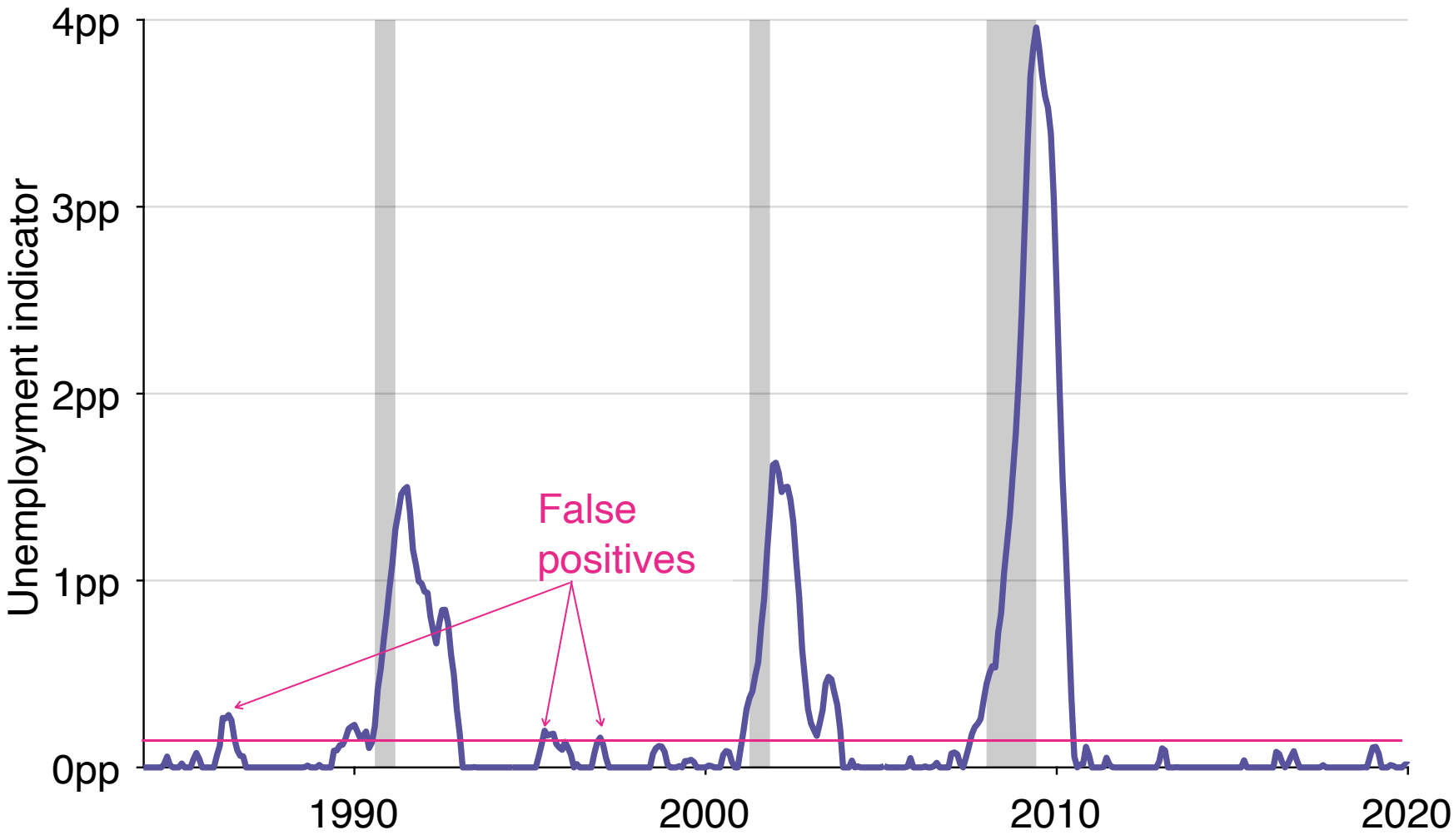
RECESSION CLASSIFIER = INDICATOR + THRESHOLD



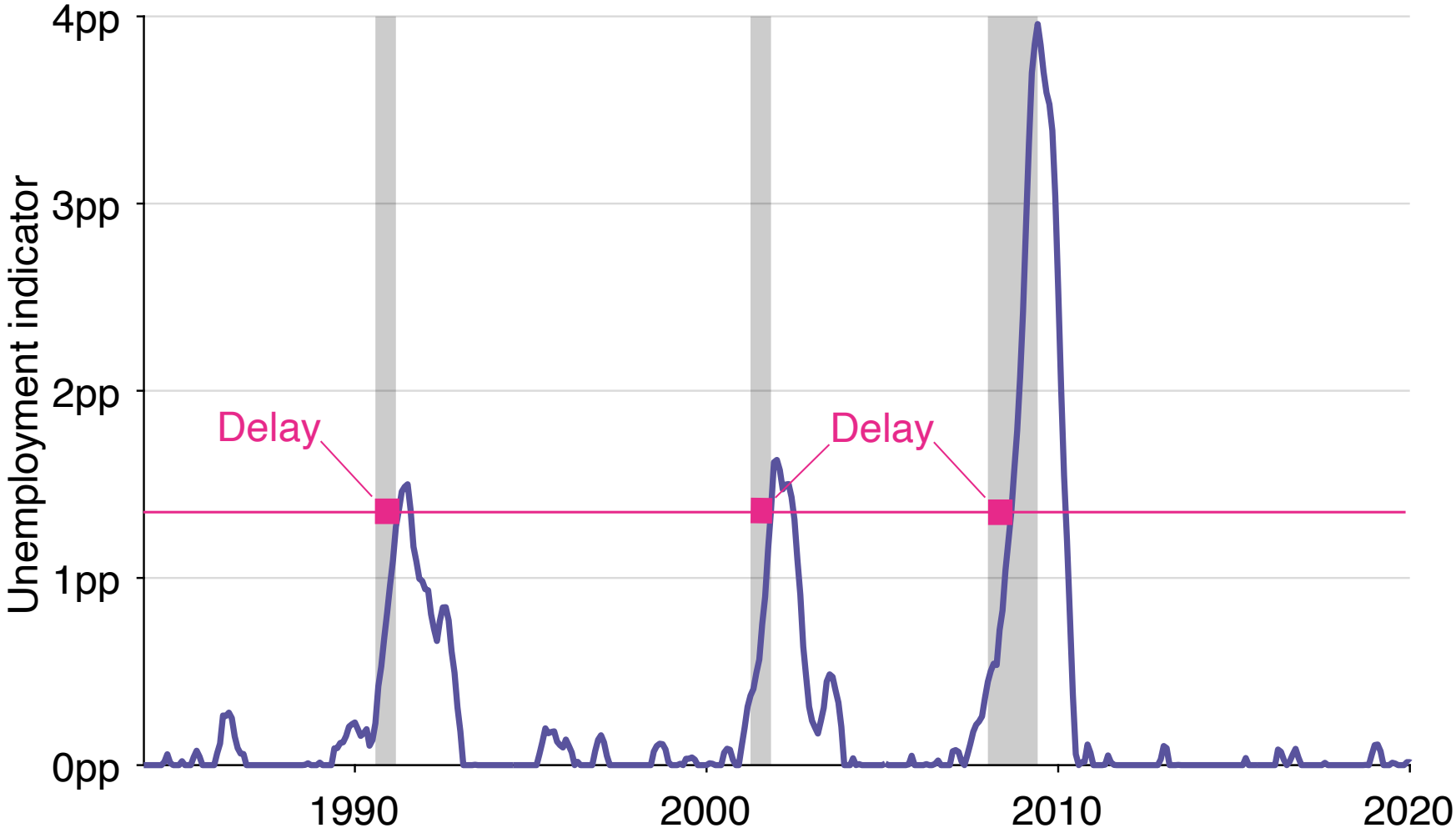
TRAINED CLASSIFIERS HAVE NO FALSE NEGATIVES...



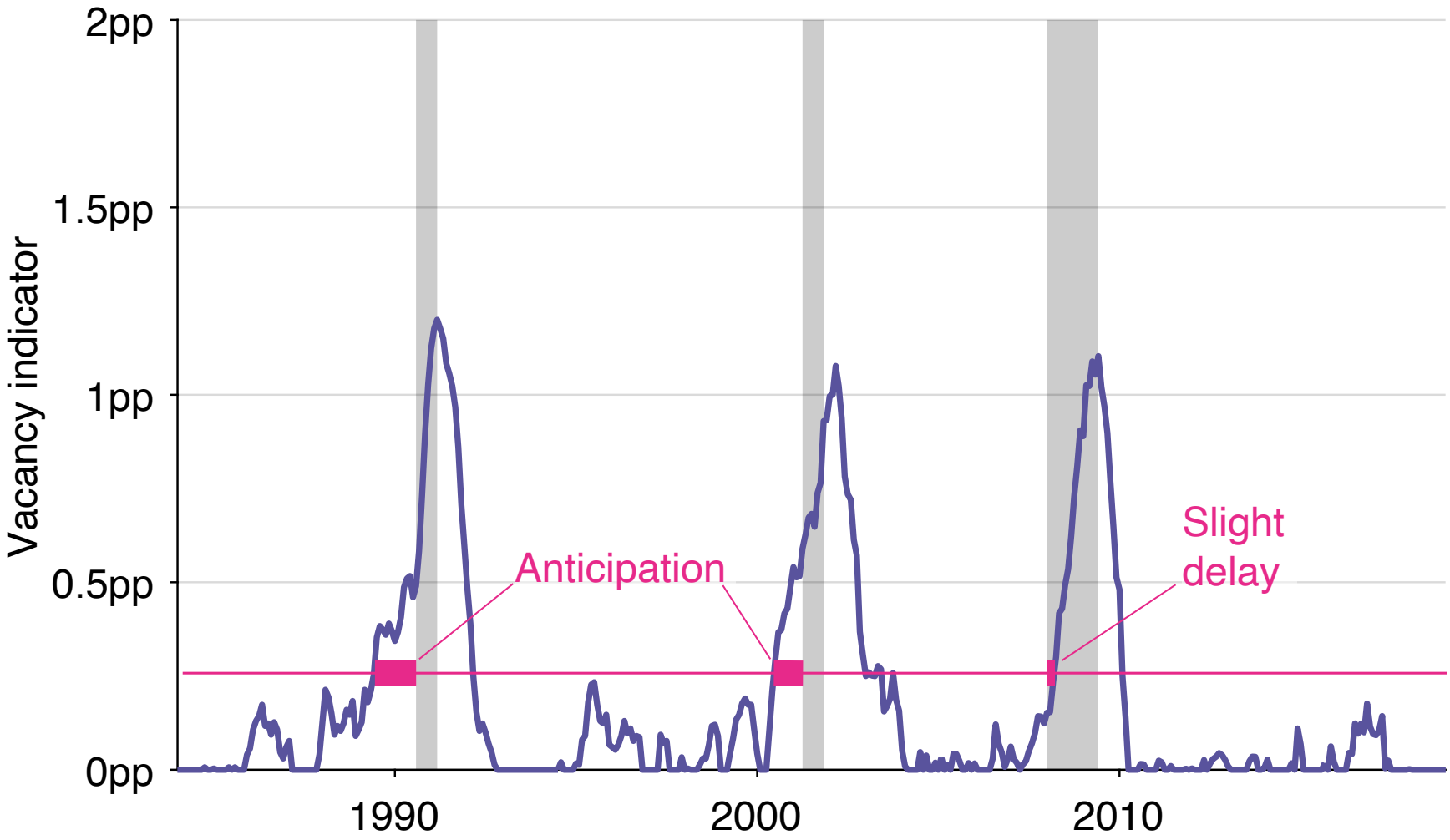
...AND NO FALSE POSITIVES



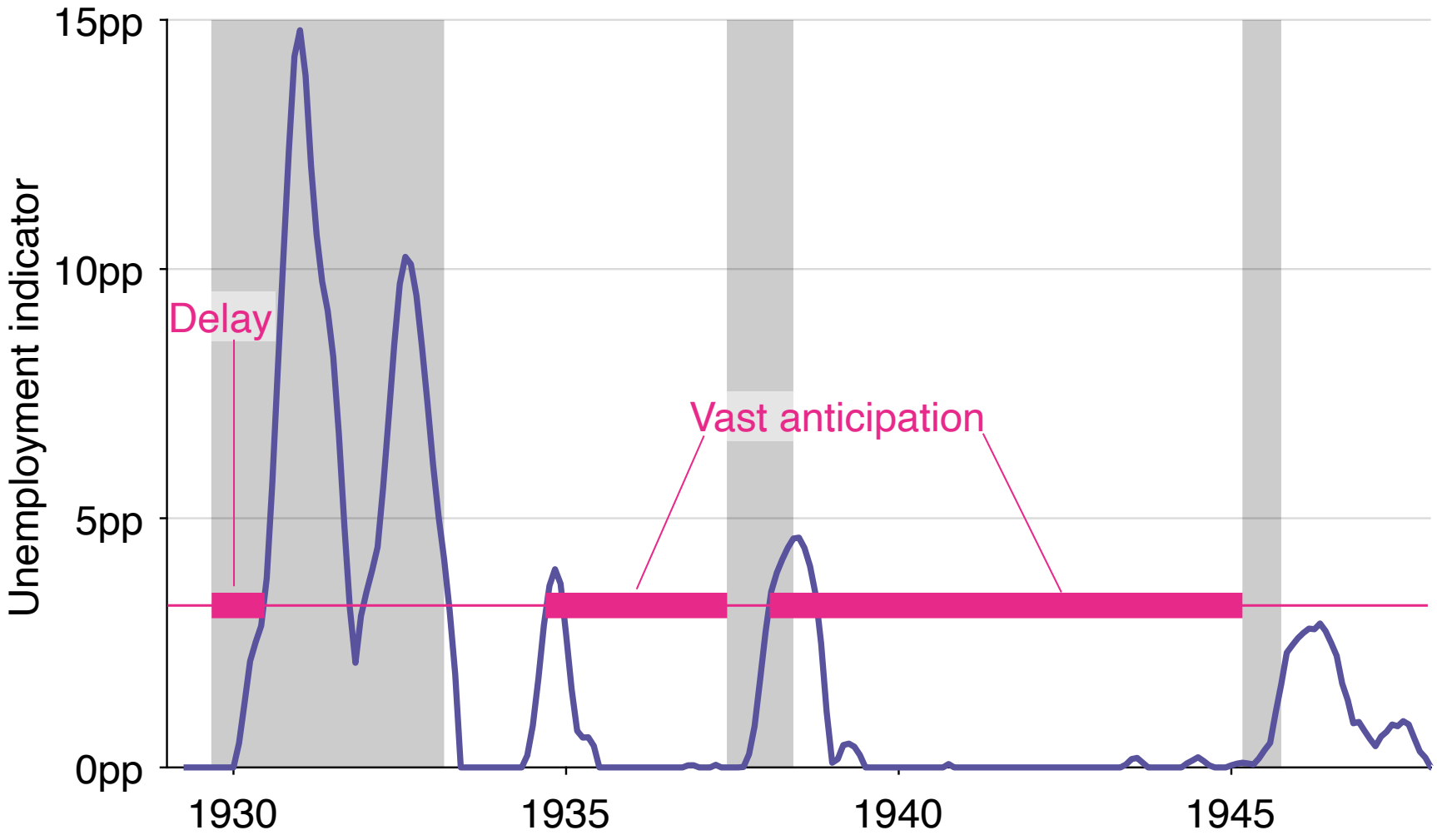
TRAINED CLASSIFIER WITH LOW ANTICIPATION (DELAY)



TRAINED CLASSIFIER WITH BETTER ANTICIPATION

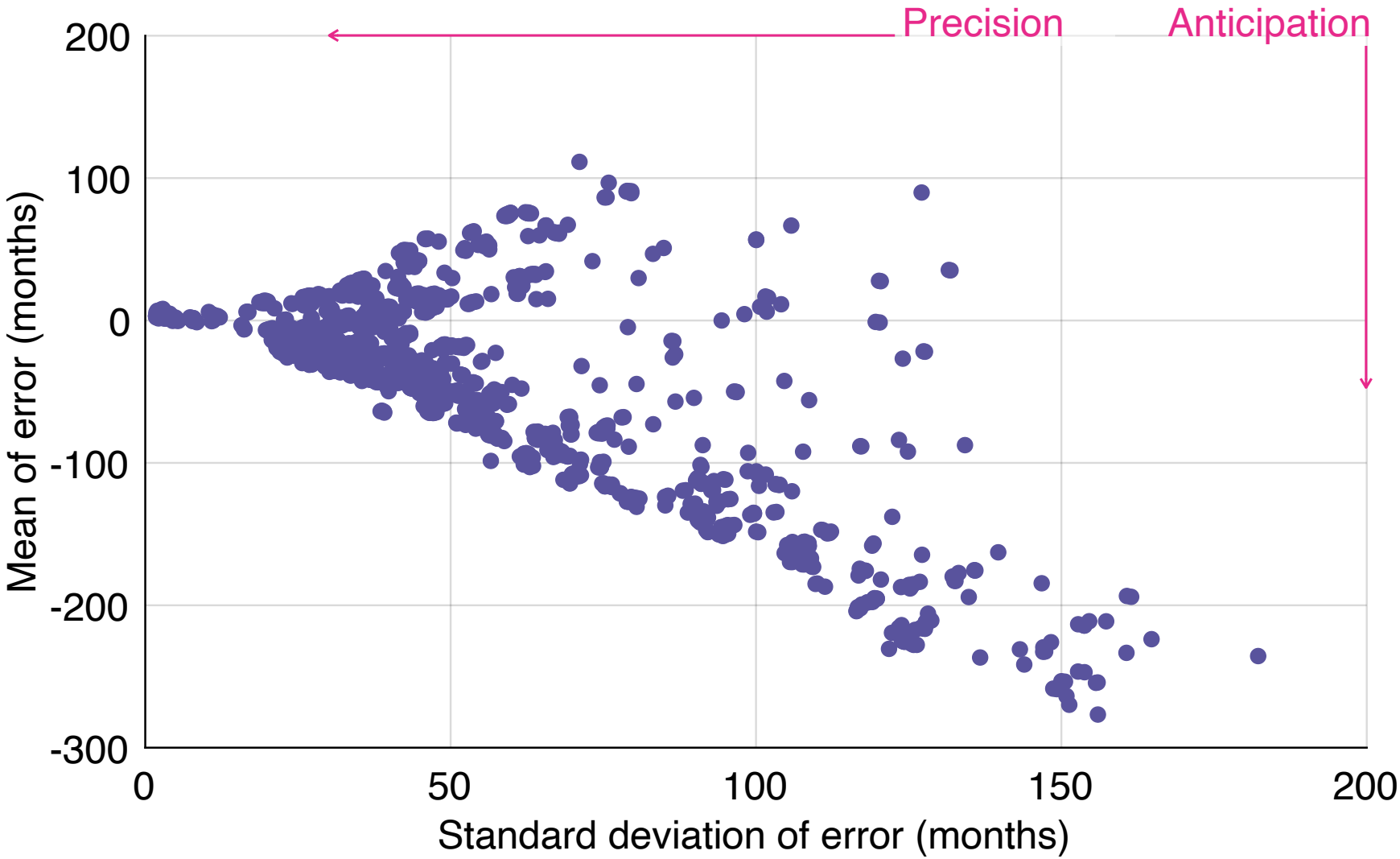


TRAINED CLASSIFIER LACKING PRECISION

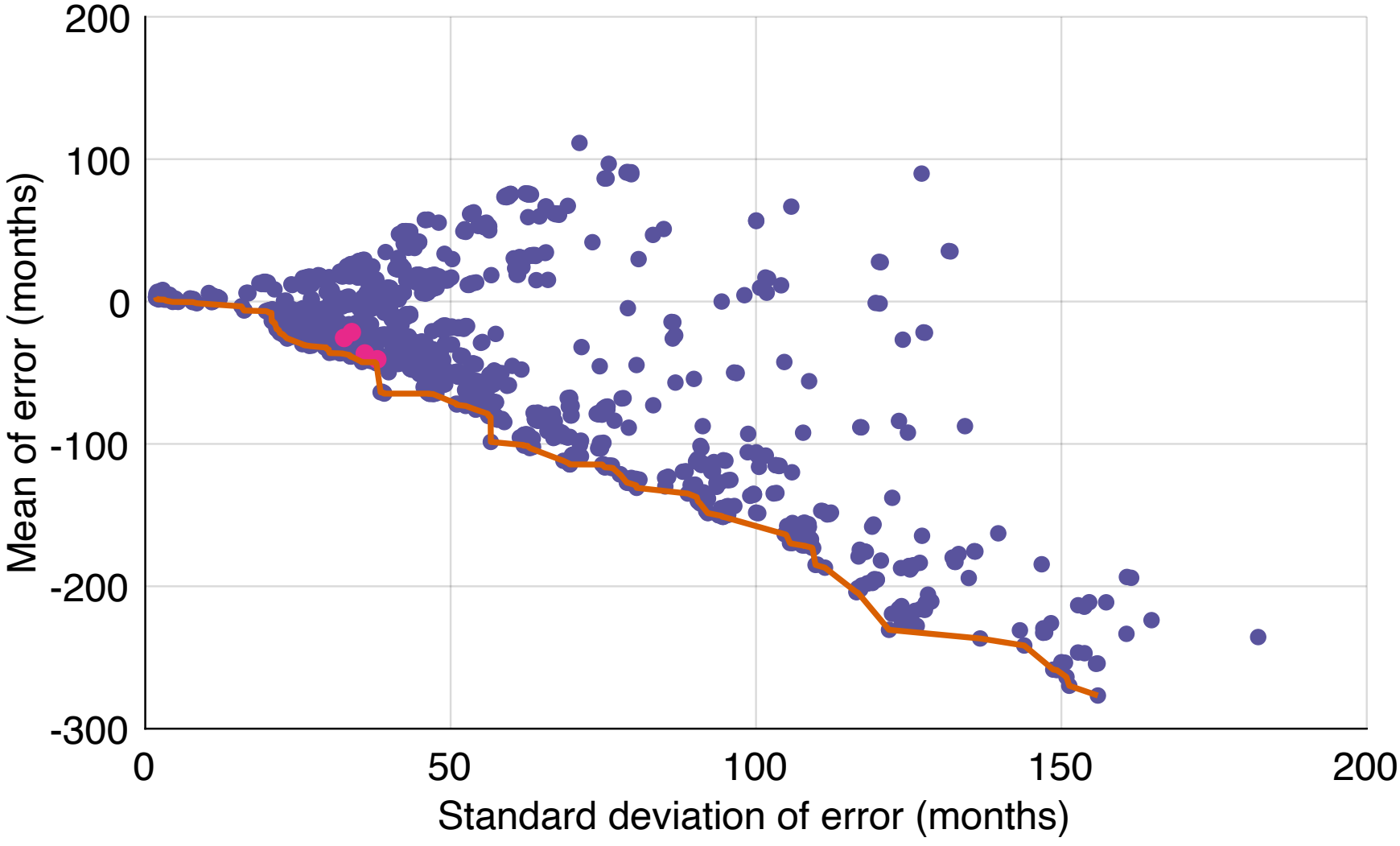


SELECTING RECESSION CLASSIFIERS

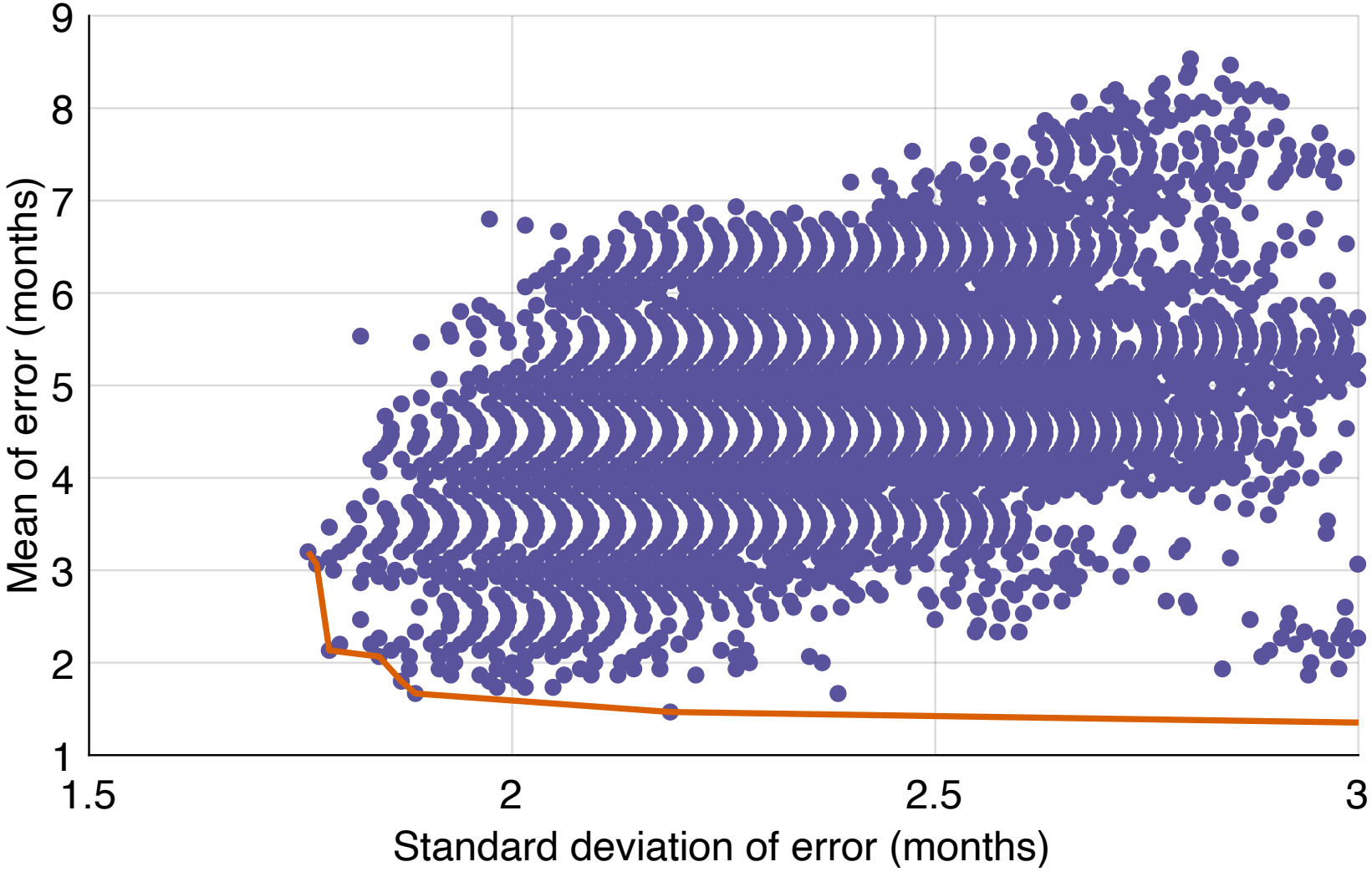
ANTICIPATION-PRECISION OF 2,343,752 CLASSIFIERS



ANTICIPATION-PRECISION FRONTIER: 210 CLASSIFIERS



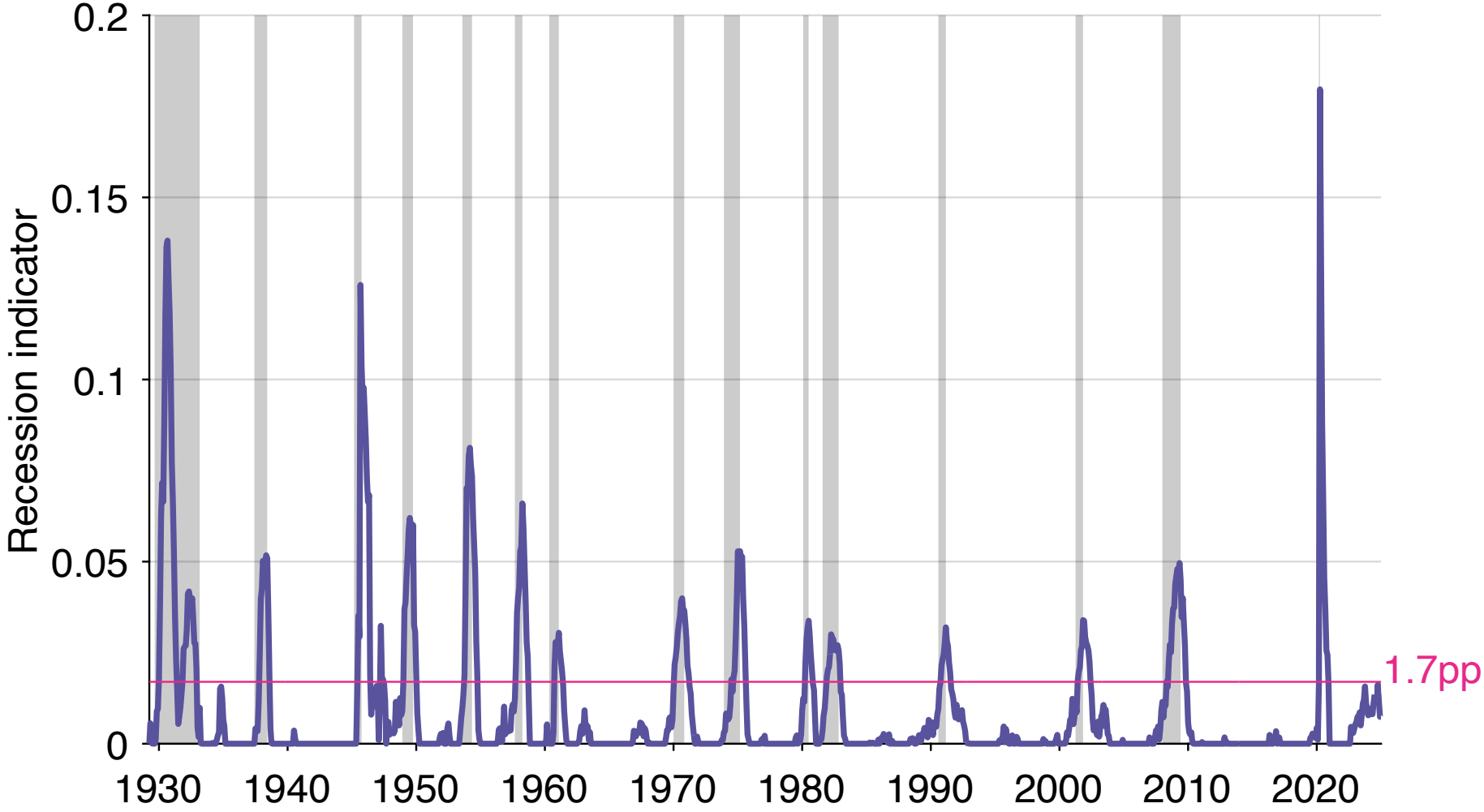
DETECT RECESSION WITHIN 1 YEAR: 7 FRONTIER CLASSIFIERS



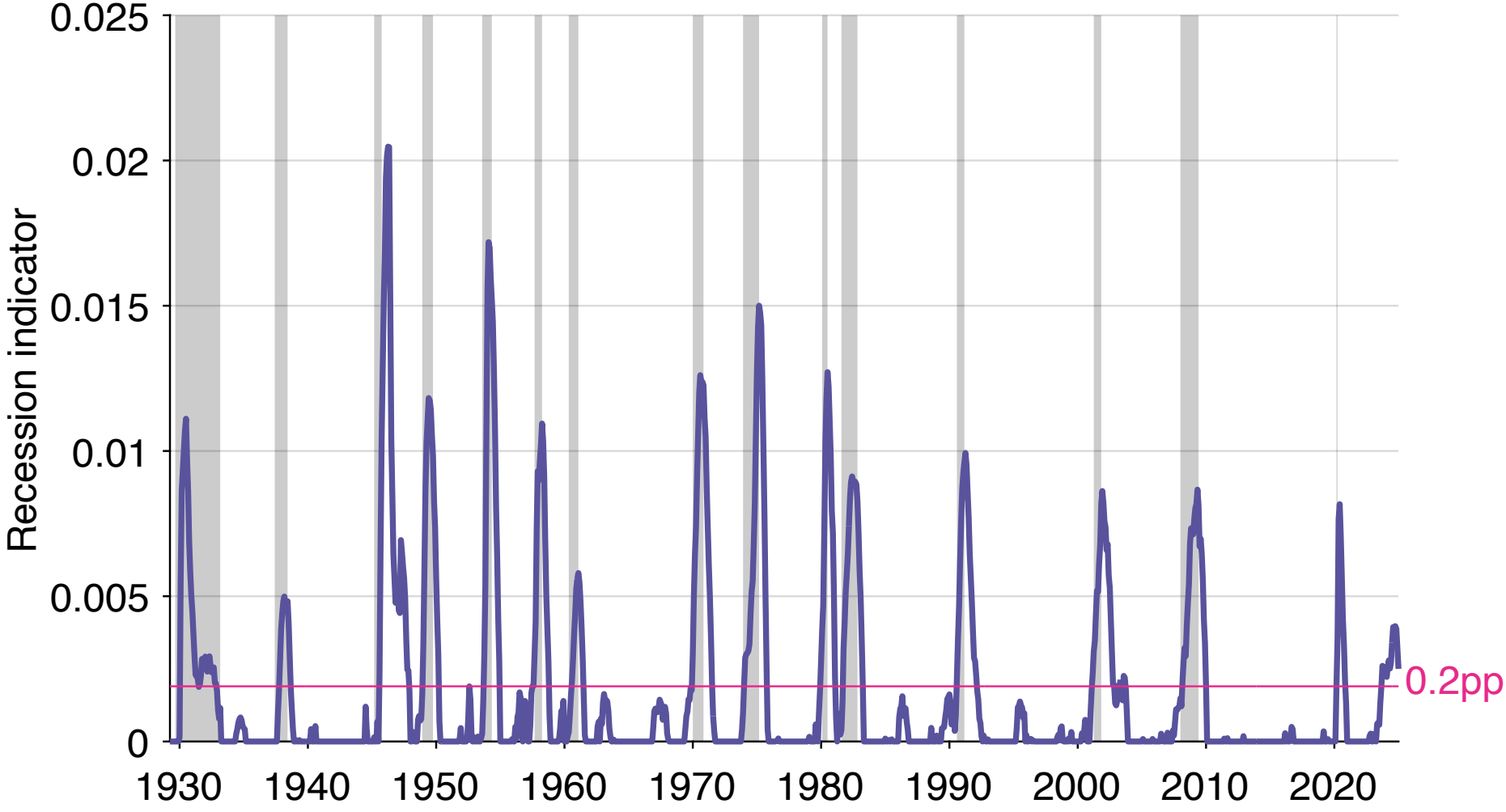
SOME CLASSIFIERS ON THE FRONTIER

	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

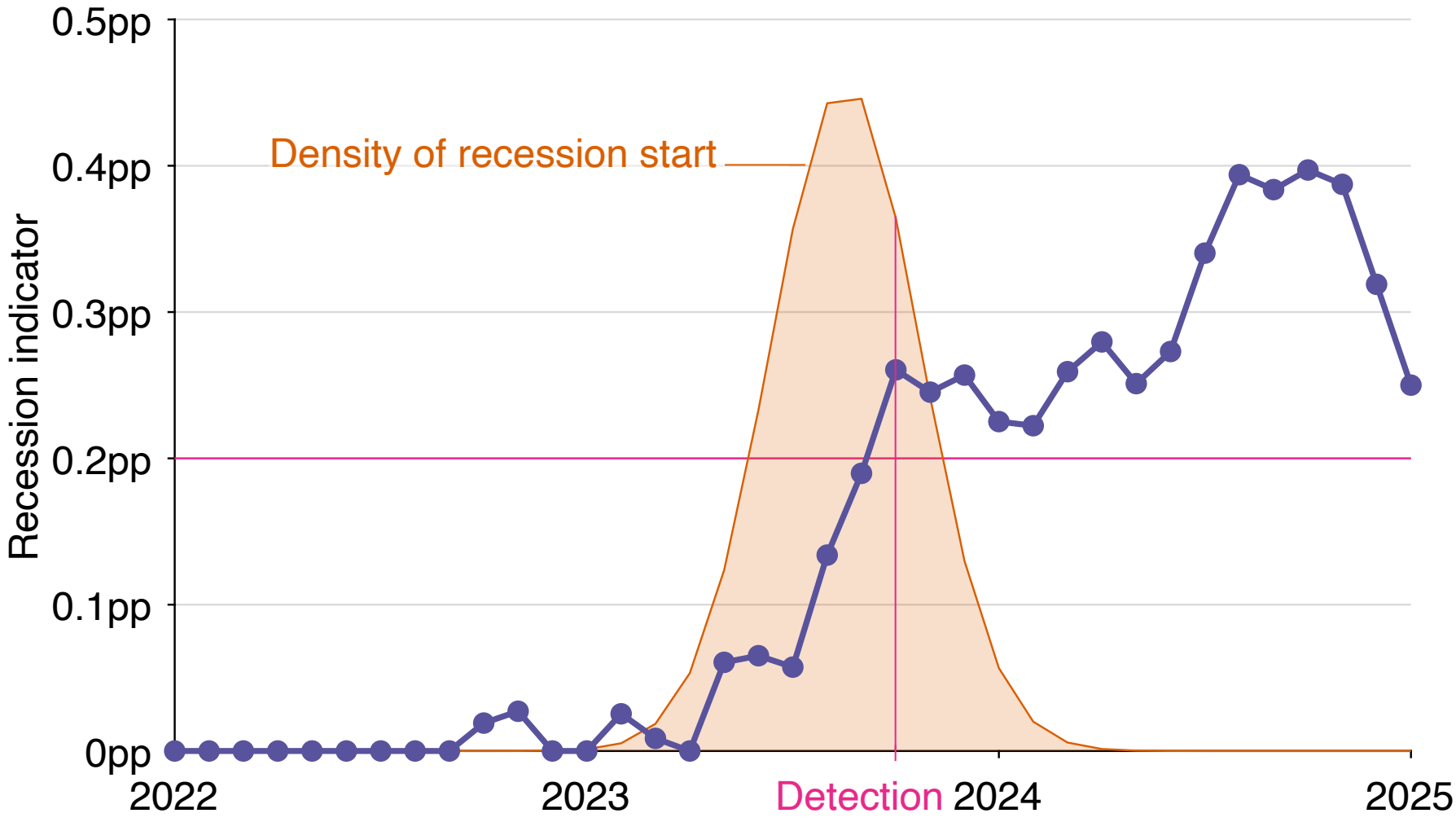


CLASSIFIER B



DETECTING RECESSIONS

CLASSIFIERS ALSO GIVE RECESSION PROBABILITIES



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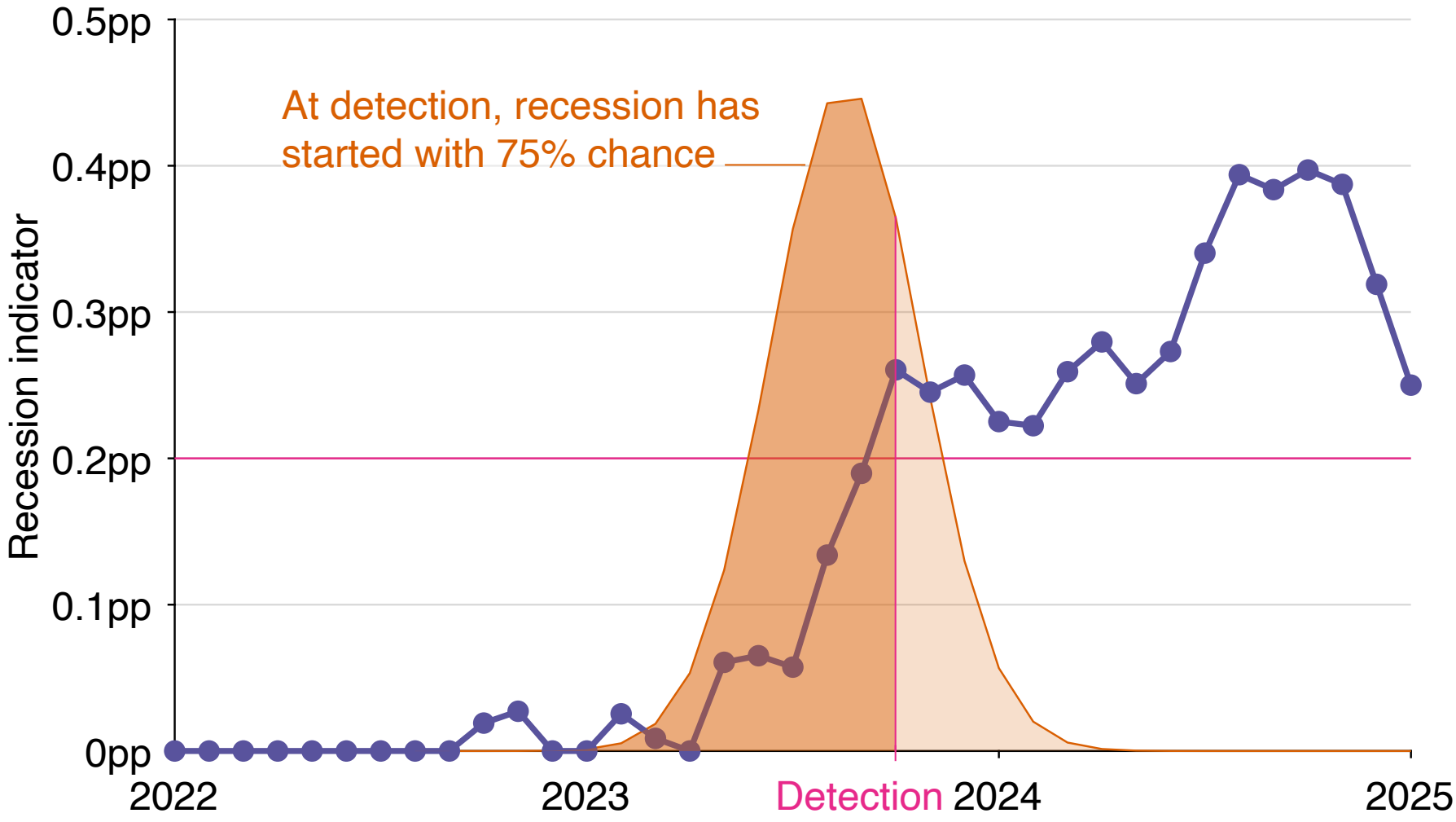
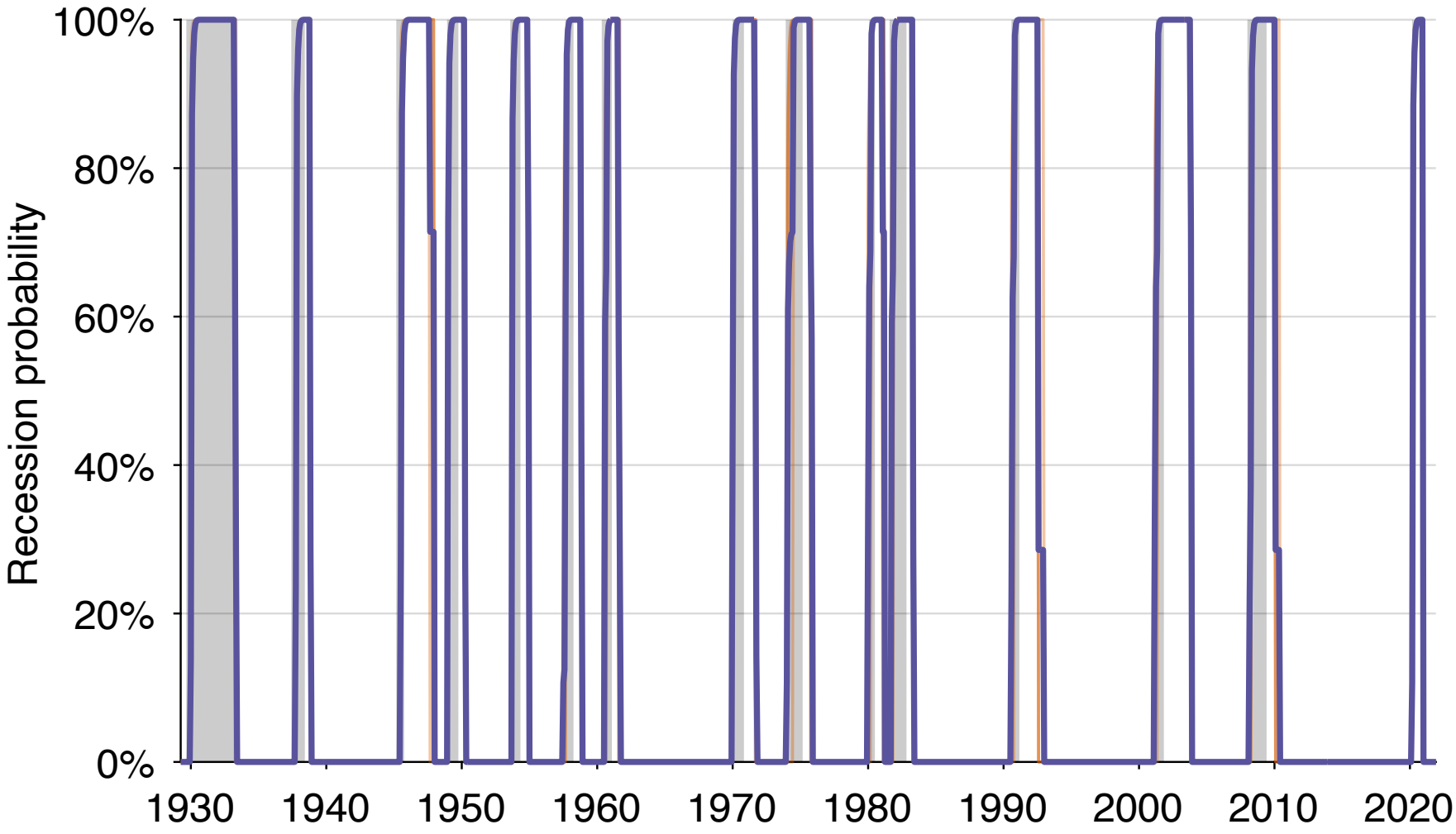
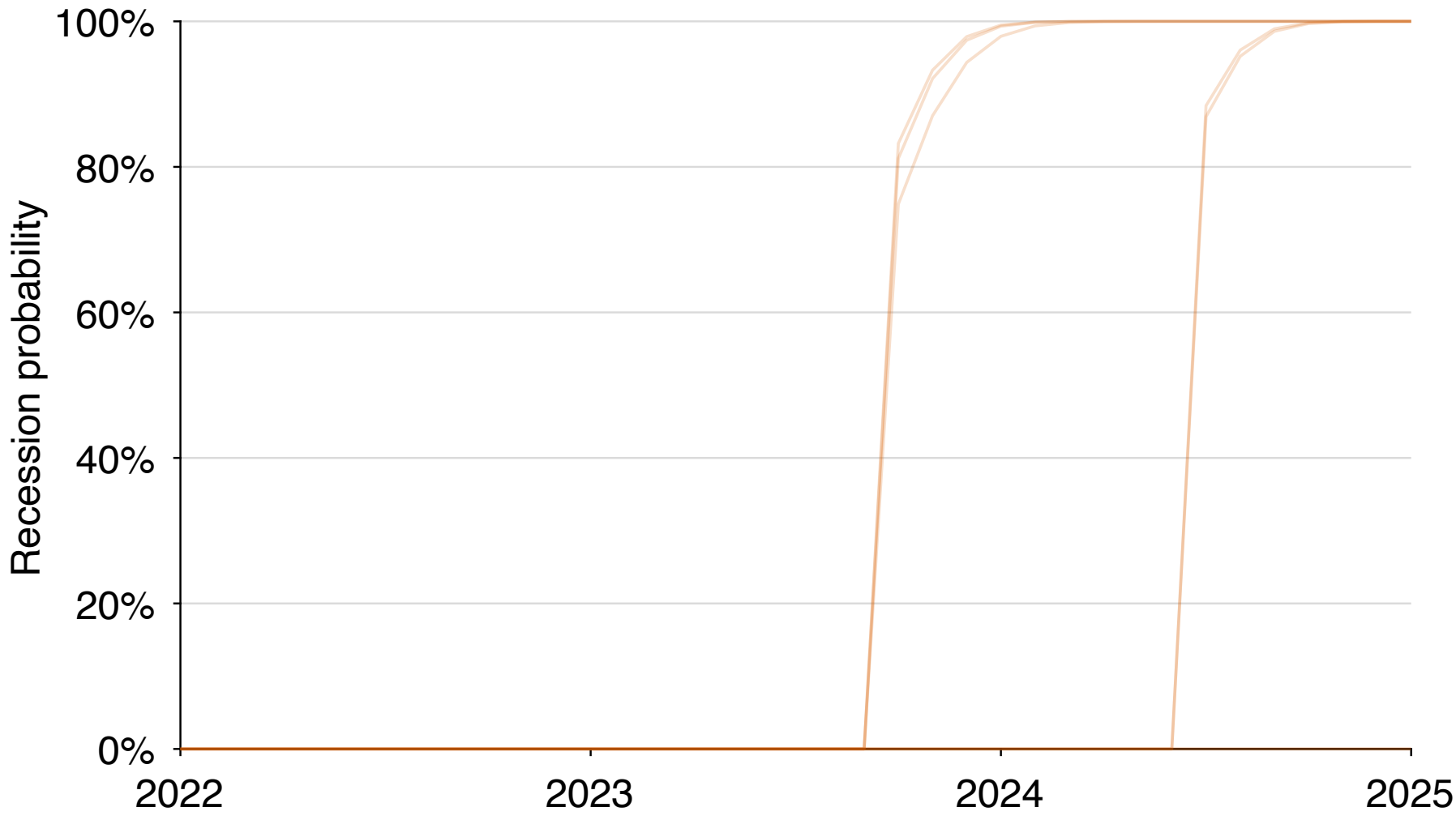


TRAINING RESULTS FOR 7 DETECTION CLASSIFIERS



HAS THE RECESSION STARTED? YES, WITH 71% PROBABILITY



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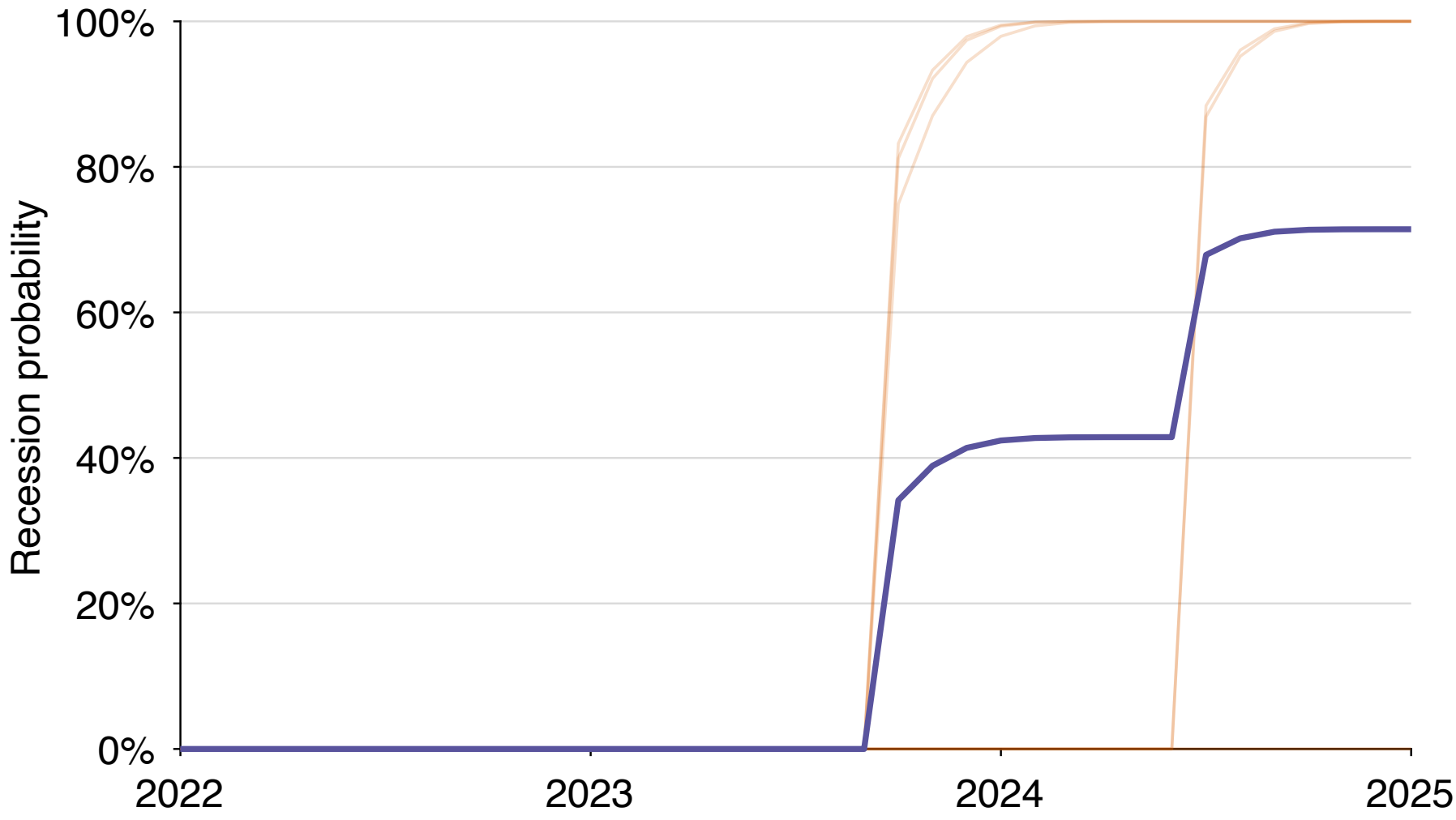
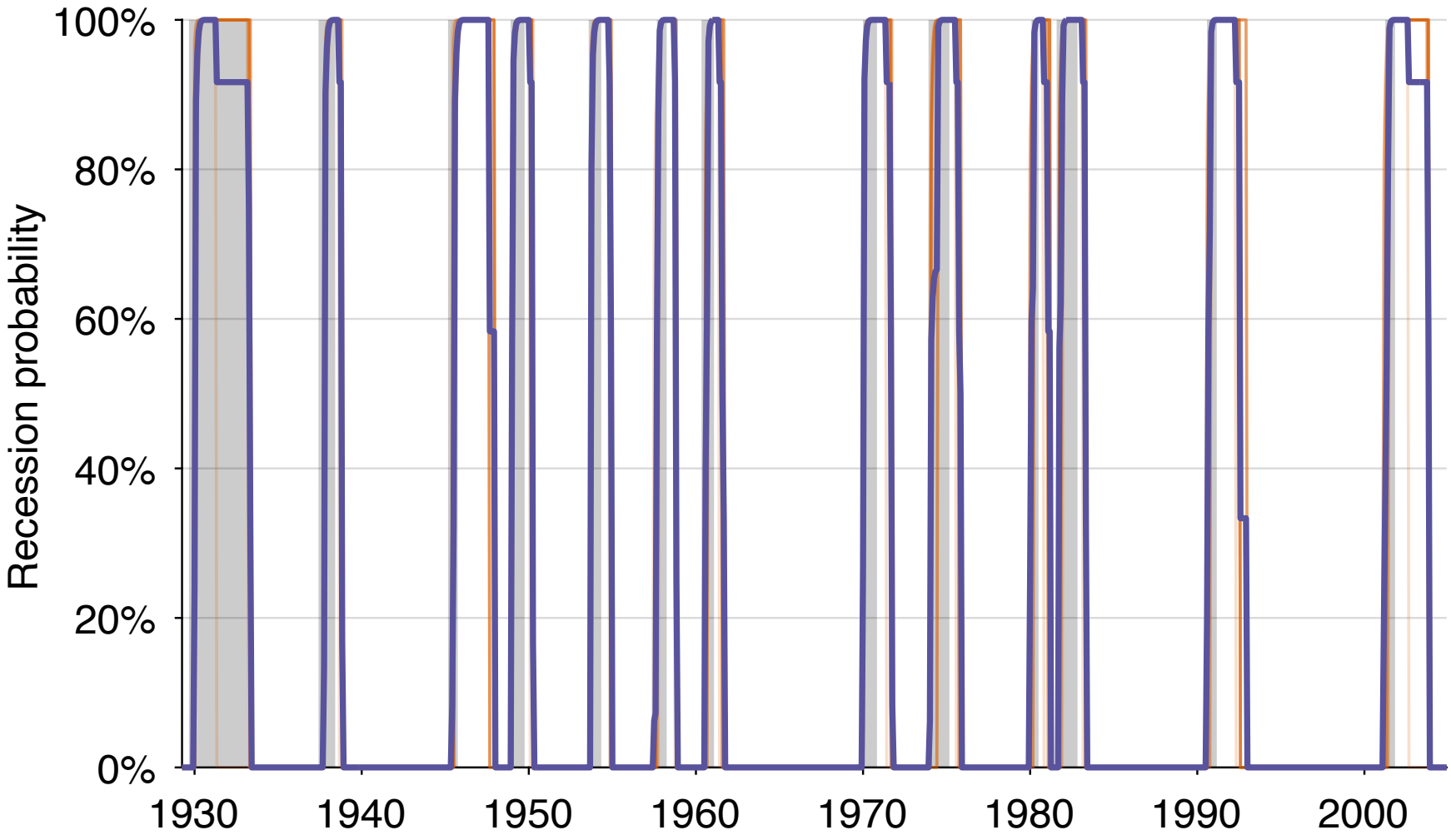
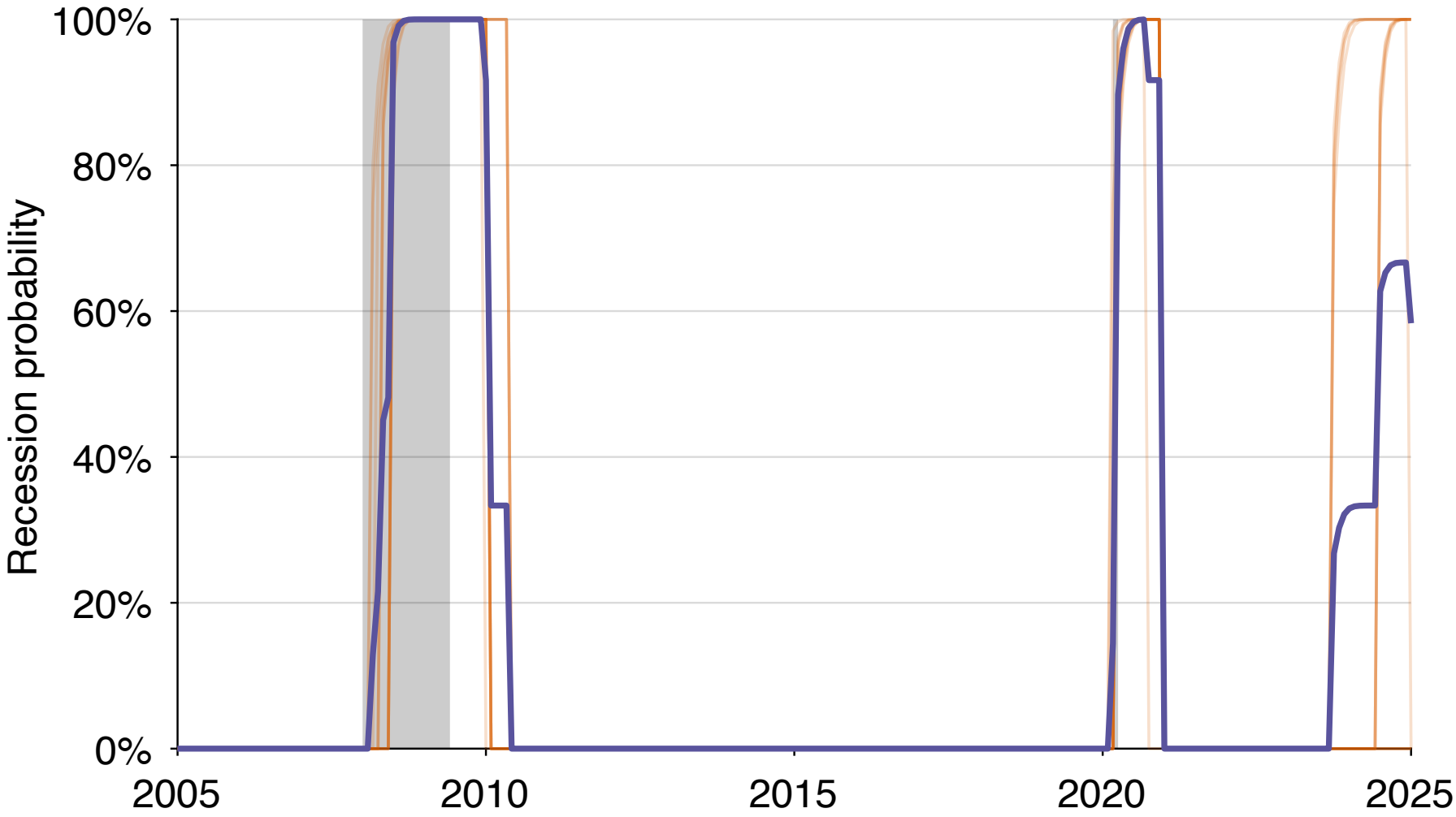


BACKTESTING THE DETECTION METHOD

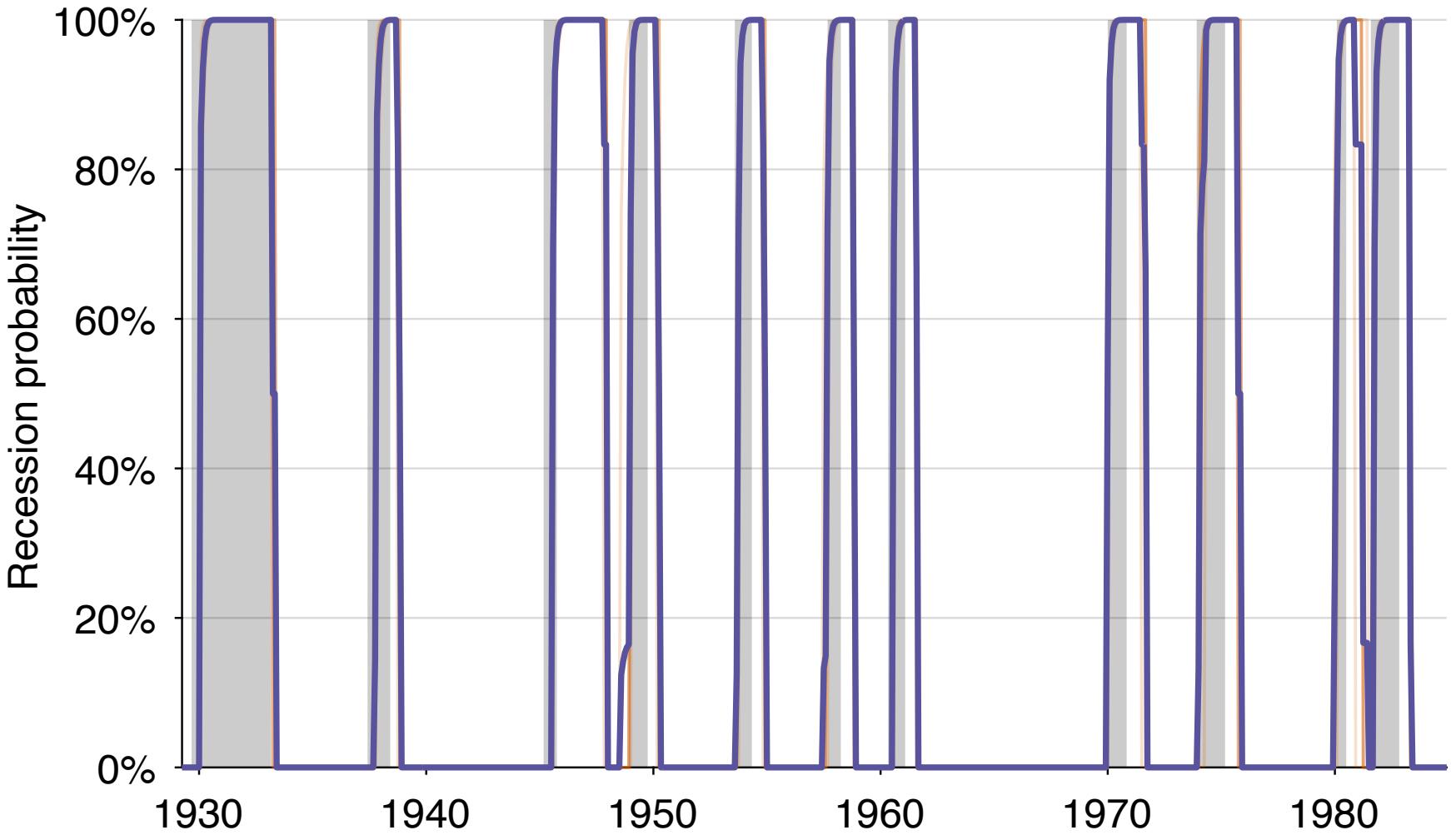
BACKTESTING TO 2005: TRAINING ON 13 RECESSIONS



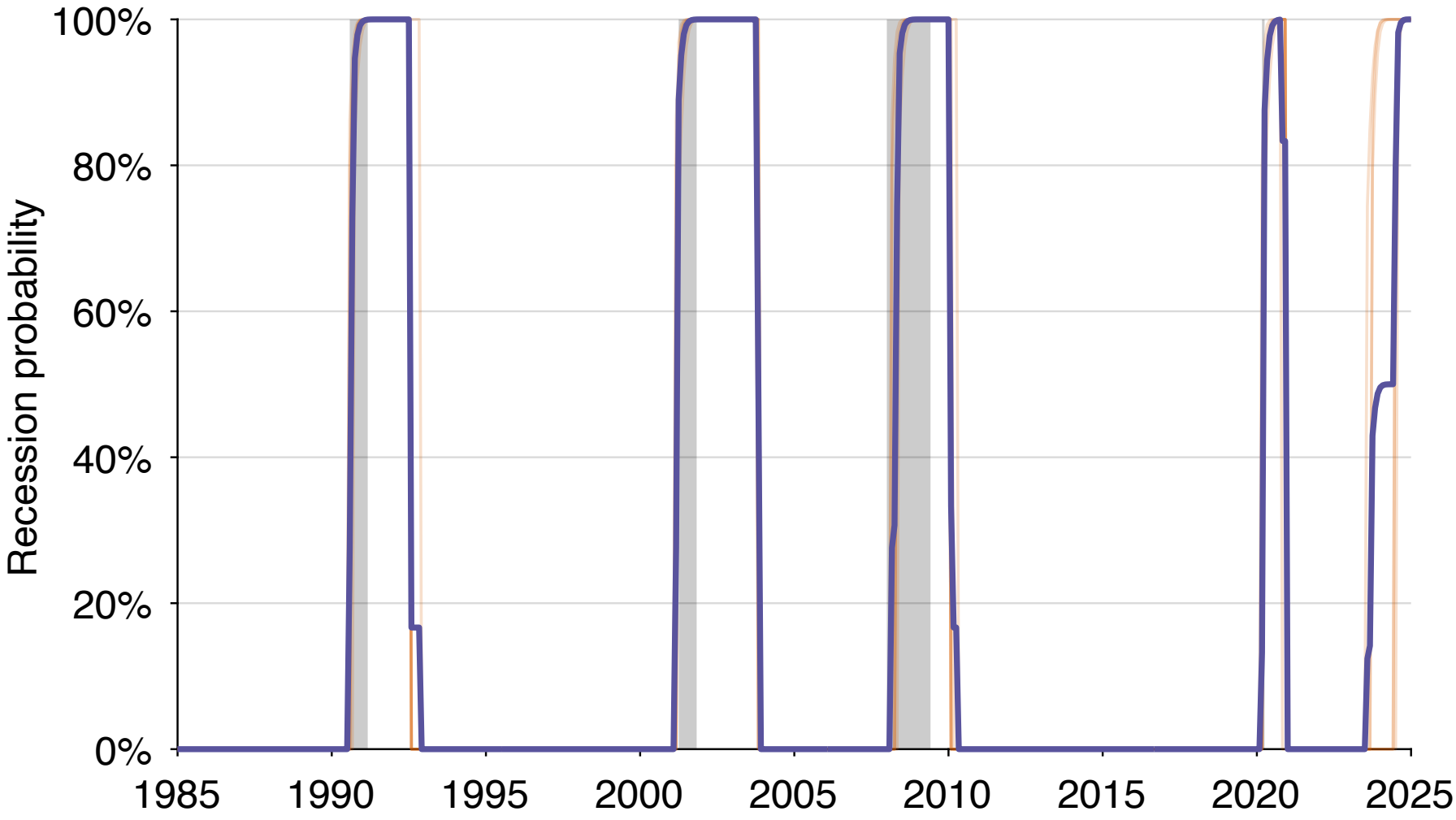
BACKTESTING TO 2005: DETECTING 2+ RECESSIONS



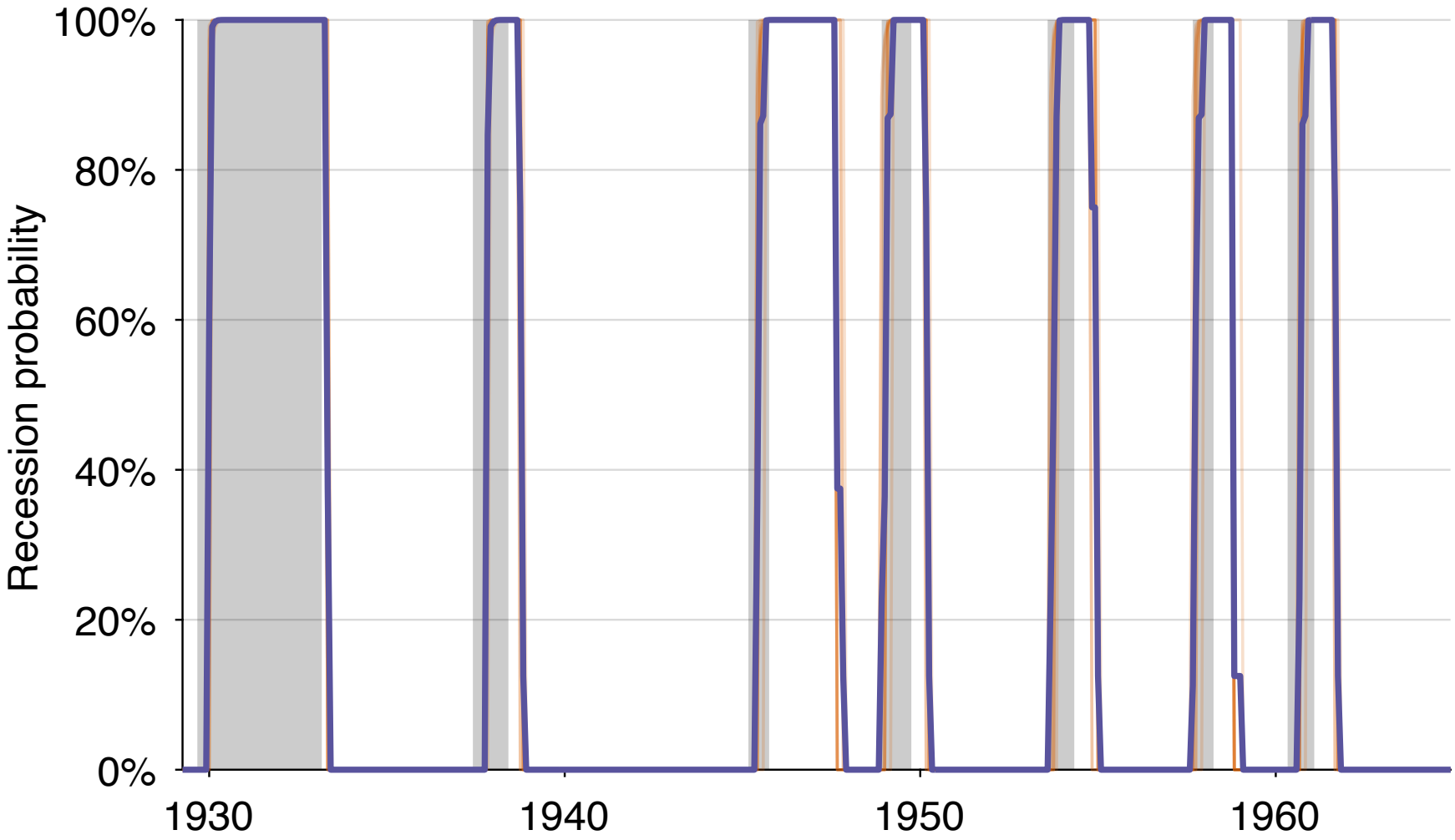
BACKTESTING TO 1985: TRAINING ON 11 RECESSIONS



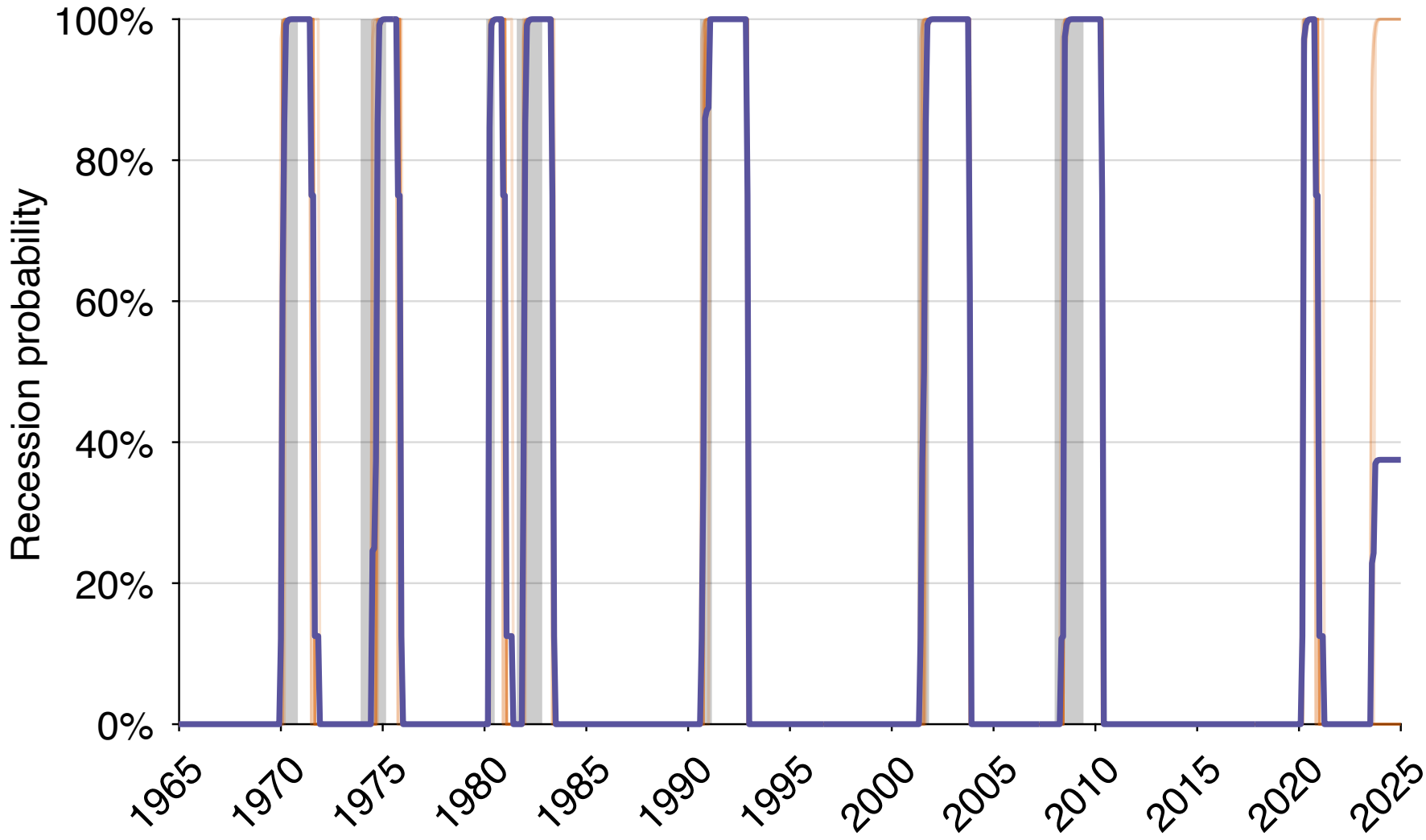
BACKTESTING TO 1985: DETECTING 4+ RECESSIONS



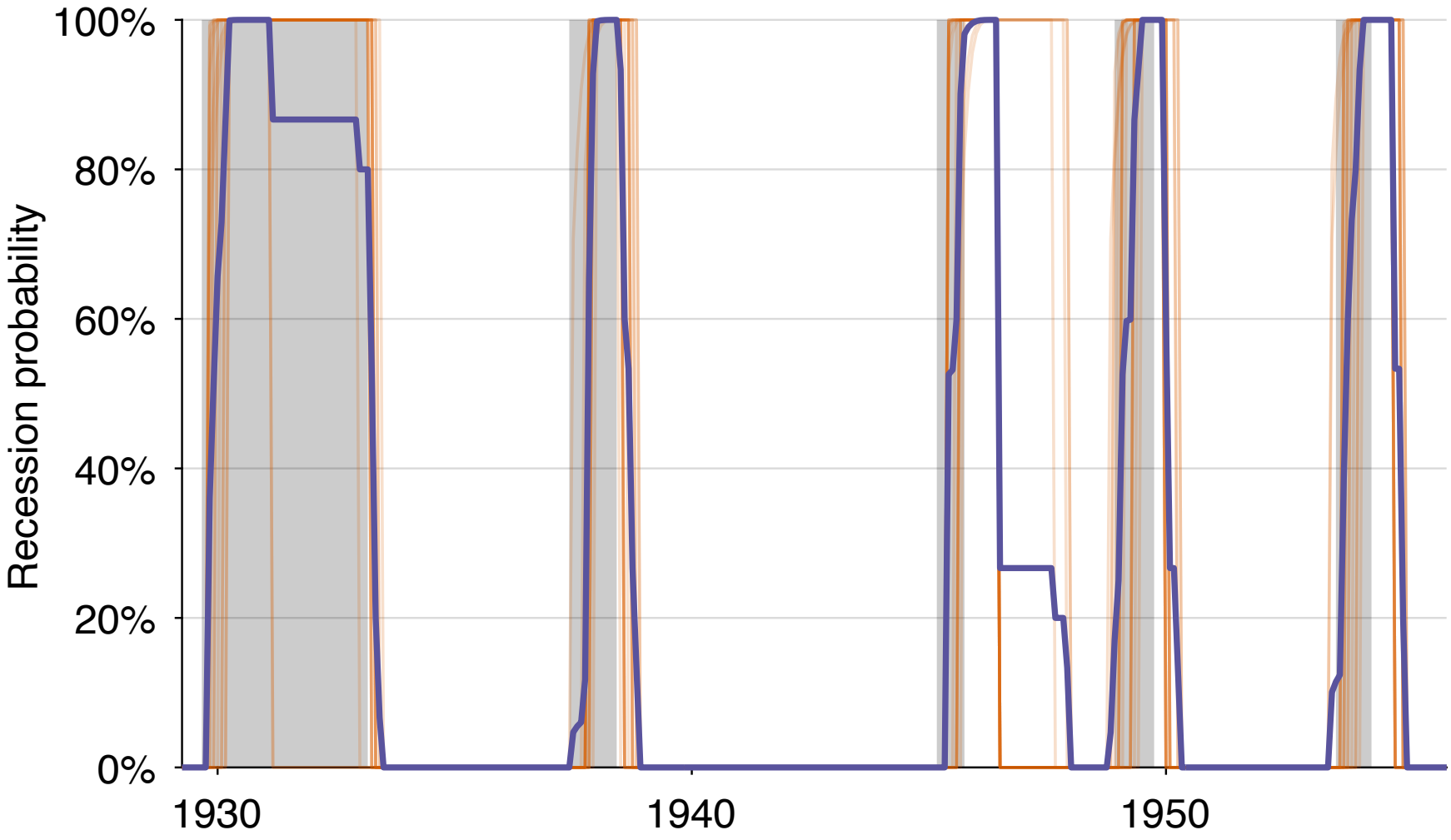
BACKTESTING TO 1965: TRAINING ON 7 RECESSIONS



BACKTESTING TO 1965: DETECTING 8+ RECESSIONS



BACKTESTING TO 1956: TRAINING ON 5 RECESSIONS



BACKTESTING TO 1956: DETECTING 10+ RECESSIONS