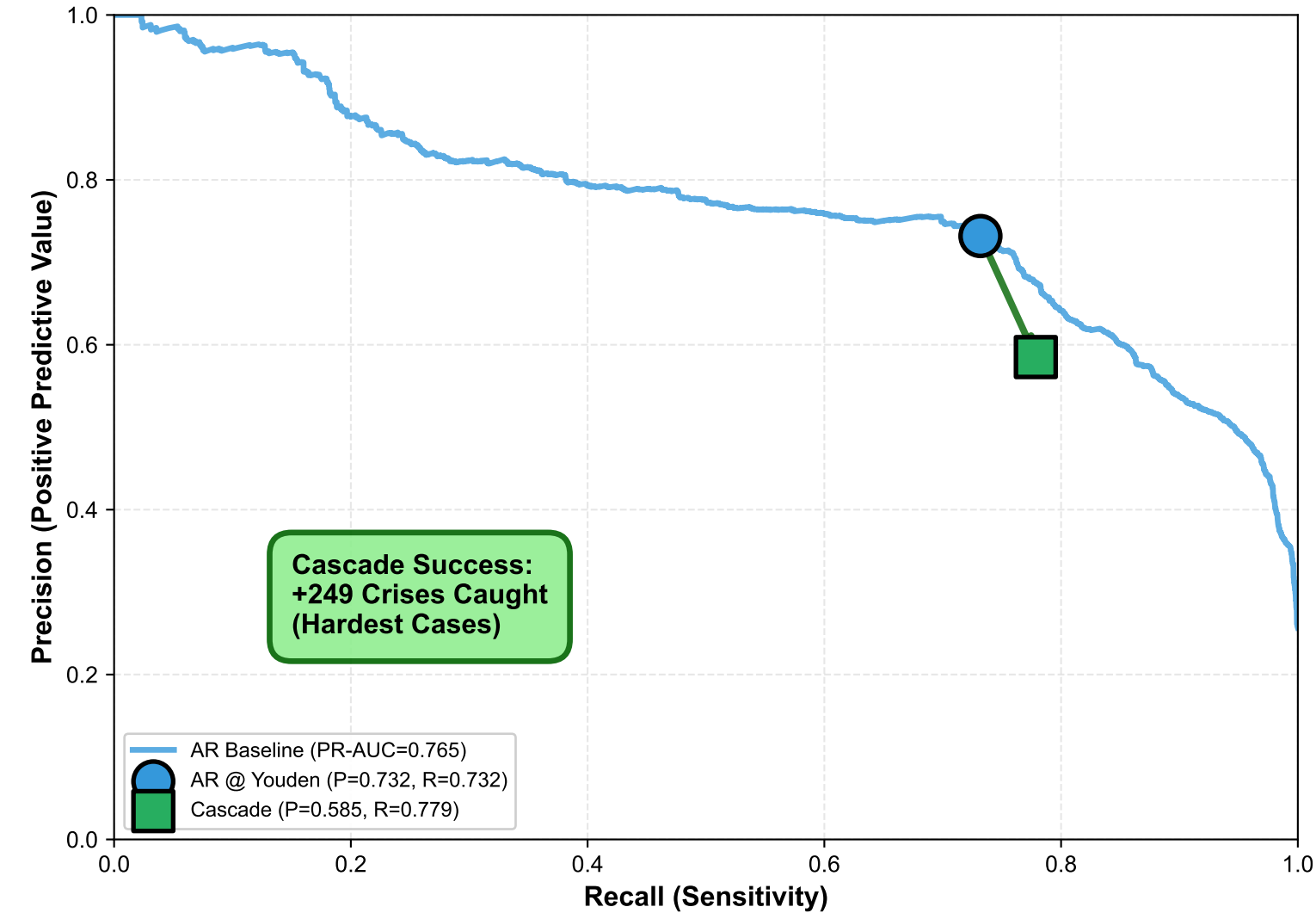
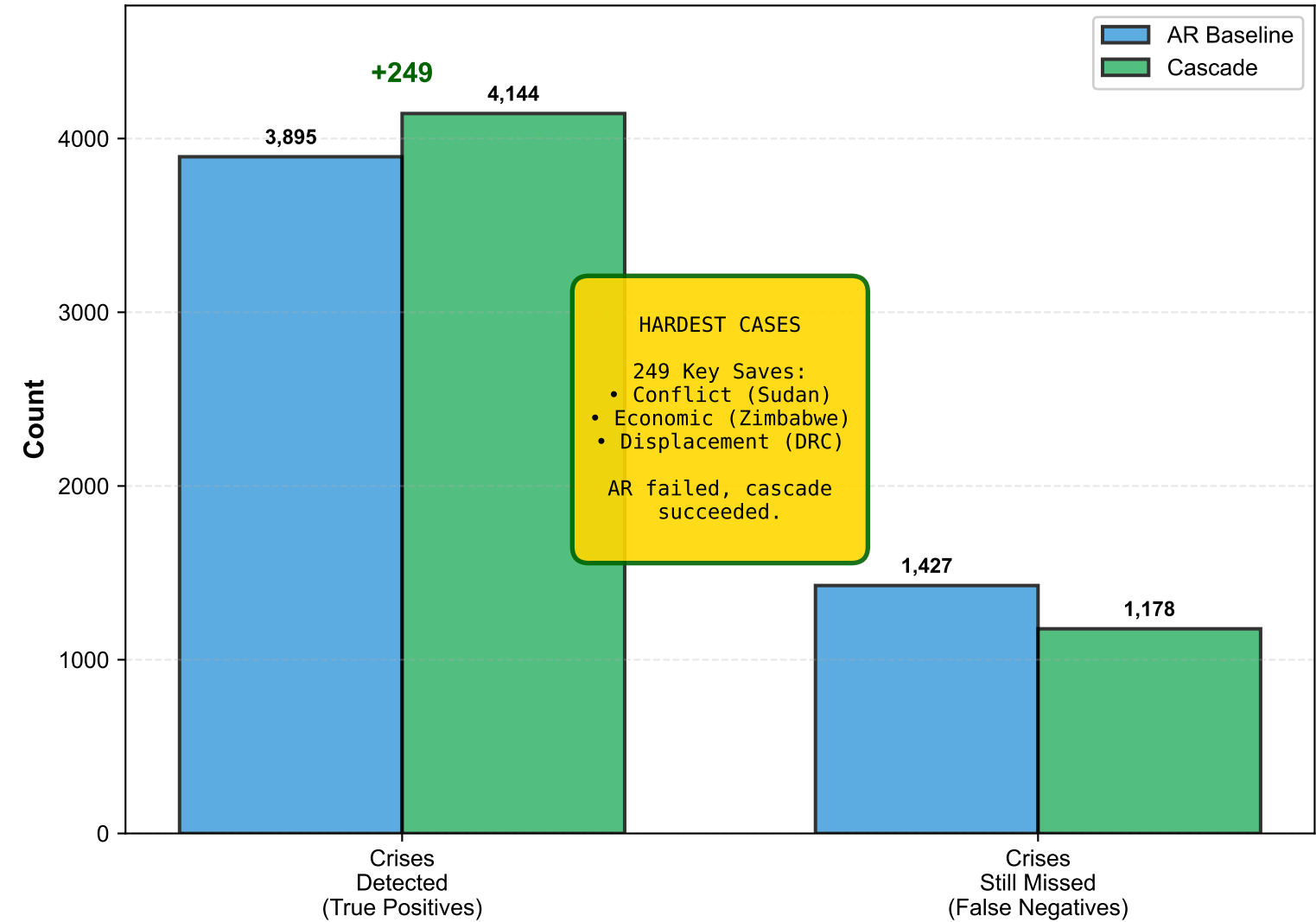


### Cascade Catches Hardest Cases: +249 Rapid-Onset Crises



### Cascade Breakthrough: 249 Hardest Crises Now Predicted



Cascade framework successfully identifies 249 additional crises (key saves) that AR baseline missed—17.4% rescue rate on AR failures. These are the hardest cases: conflict escalations (Sudan Apr 2023), economic collapses (Zimbabwe 2022-23), and displacement shocks (DRC) where temporal persistence breaks down and news-based features provide genuine early warning 8 months in advance. Panel A shows precision-recall curve for AR baseline (PR-AUC=0.765) with operating points: AR achieves perfect balance (precision=recall=0.732), while cascade prioritizes recall (0.779) to capture rapid-onset shocks. Panel B demonstrates cascade breakthrough: +249 true positives (crises detected), -249 false negatives (crises rescued). Success on precisely the cases where early warning matters most—lifesaving interventions for millions of people. Not just metric improvement, but breakthrough on humanitarian priorities: conflict, economic crisis, displacement. 5-fold stratified spatial cross-validation,  $h=8$  months,  $n=20,722$  observations.