News Themes: Resolving Contradictory Rankings Across Measurement Methods
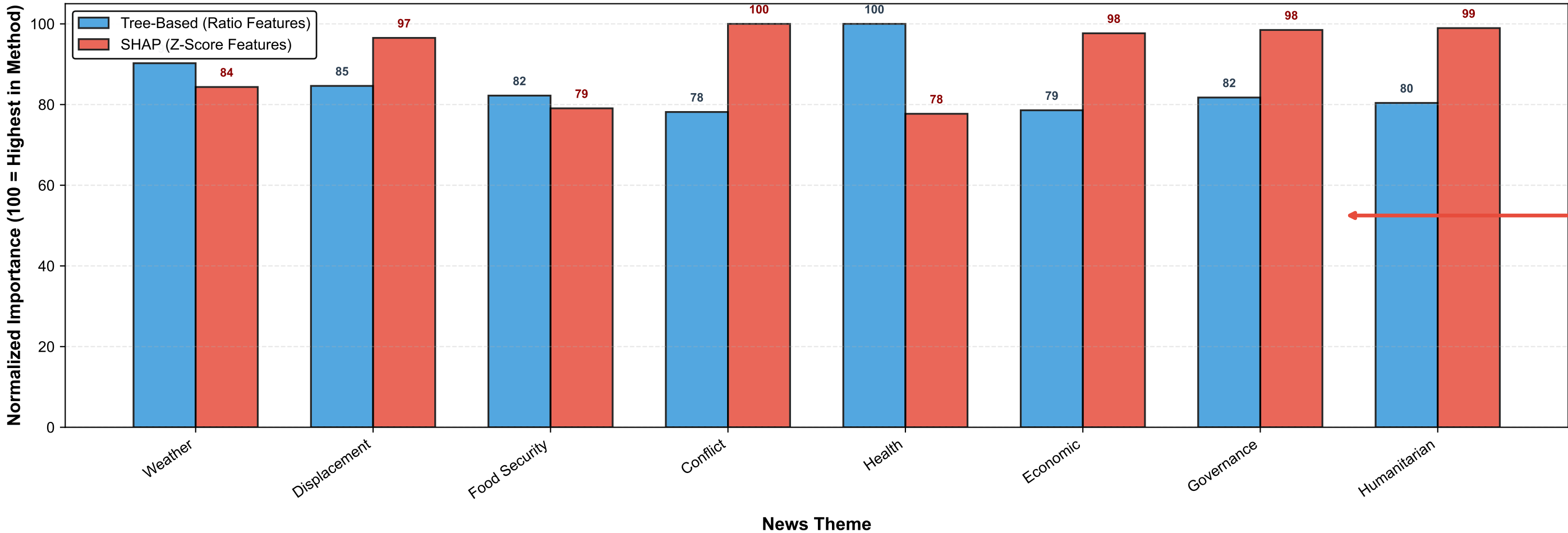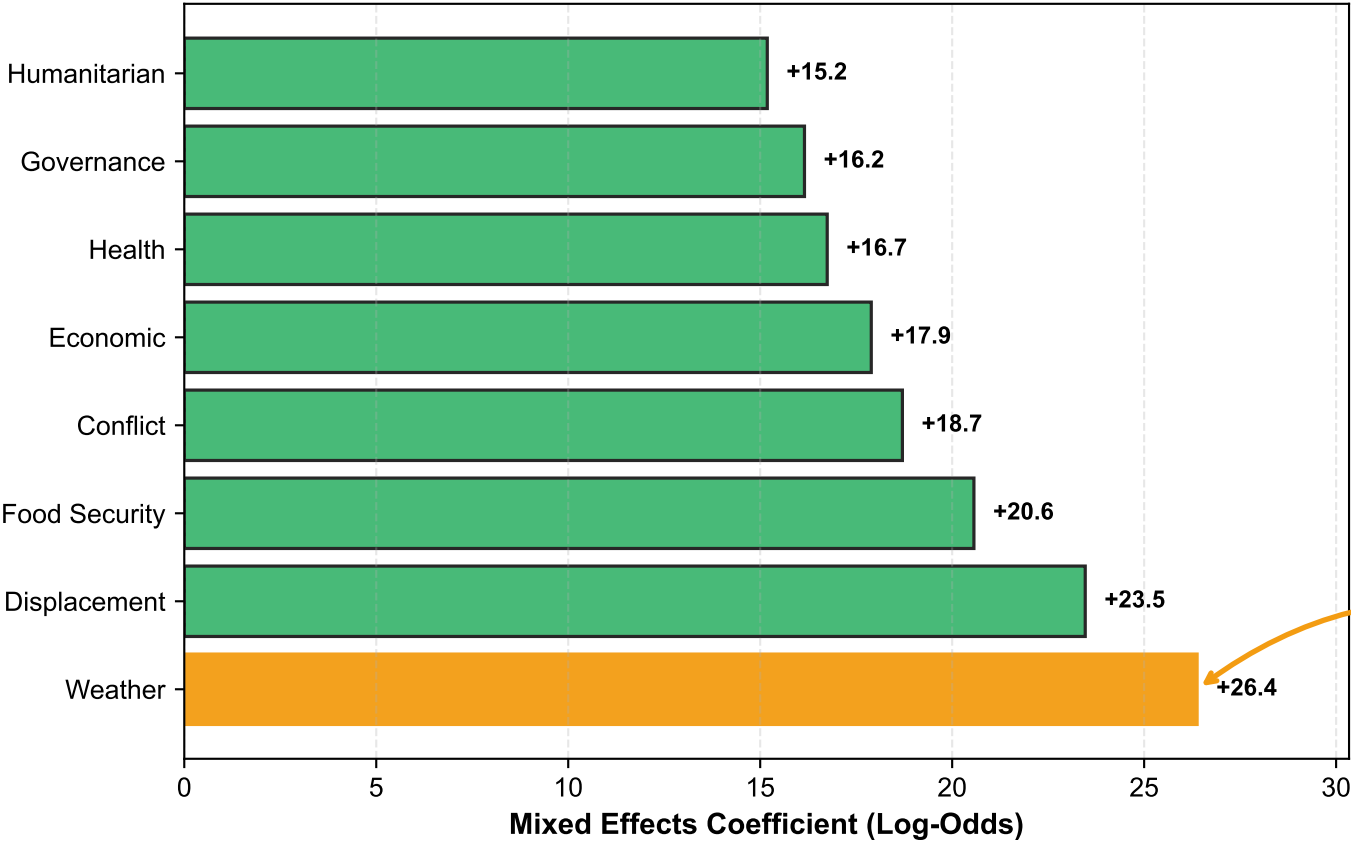
A. The SHAP Paradox: Tree-Based Importance ≠ Marginal Prediction

Legend:
- Tree-Based (Ratio Features)
- SHAP (Z-Score Features)

Y-axis: Normalized Importance (100 = Highest in Method)
X-axis: News Theme

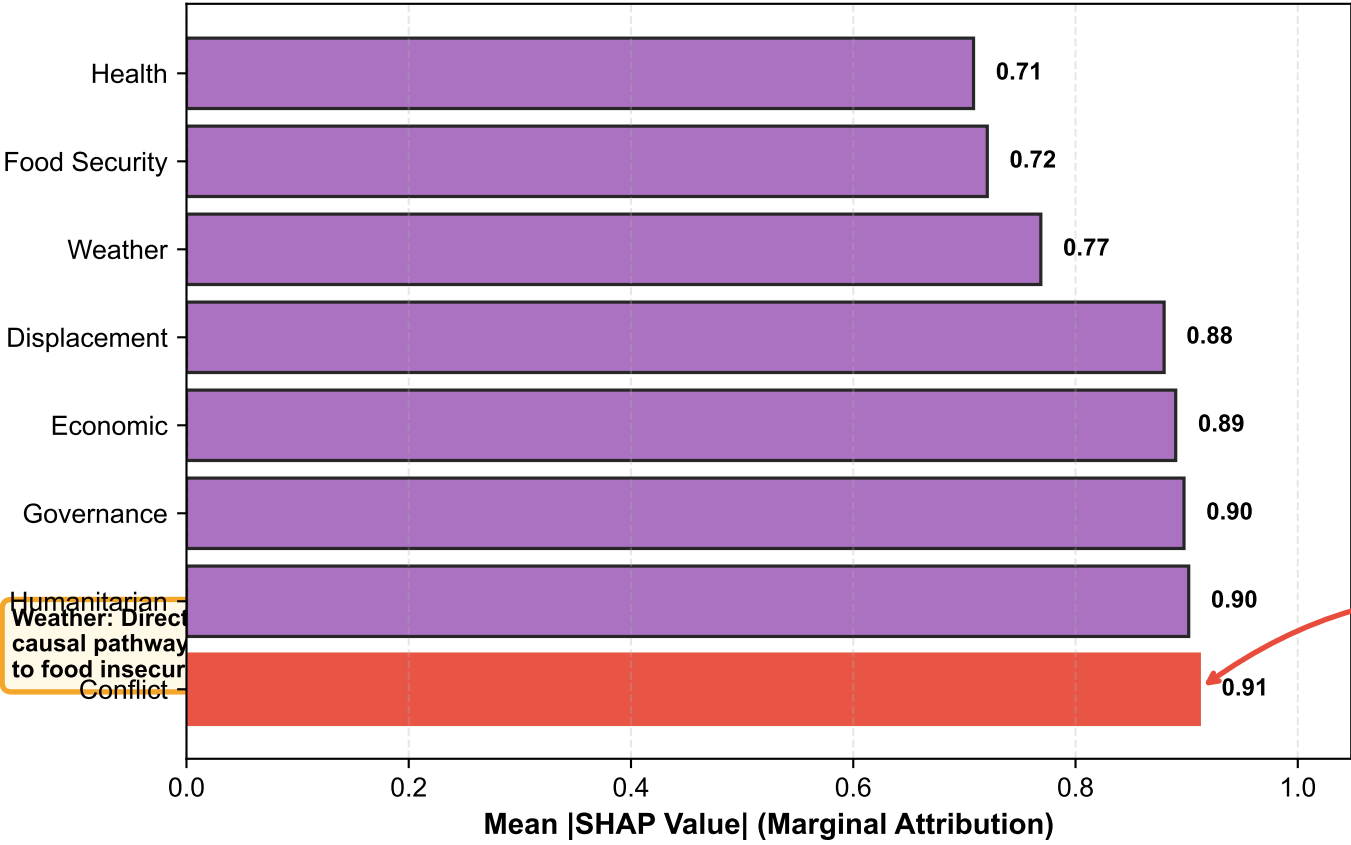| Theme	Tree-Based	SHAP
Weather	90	84
Displacement	85	97
Food Security	82	79
Conflict	78	100
Health	100	78
Economic	79	98
Governance	82	98
Humanitarian	80	99

PARADOX REVEALED:
Tree-based: Ratios split nodes (stratification utility)

SHAP: Z-scores drive predictions (74.7% marginal attribution)

Split frequency ≠ Predictive power

B. Mixed Effects: Weather Ranks #1

X-axis: Mixed Effects Coefficient (Log-Odds)

Theme	Coefficient
Humanitarian	+15.2
Governance	+16.2
Health	+16.7
Economic	+17.9
Conflict	+18.7
Food Security	+20.6
Displacement	+23.5
Weather	+26.4

Weather: Direct causal pathway to food insecurity

C. SHAP Rankings: Z-Scores Drive Predictions

X-axis: Mean |SHAP Value| (Marginal Attribution)

Theme	Mean |SHAP Value|
Health	0.71
Food Security	0.72
Weather	0.77
Displacement	0.88
Economic	0.89
Governance	0.90
Humanitarian	0.90
Conflict	0.91

Conflict #1 in SHAP (anomaly detection) vs #4 in Mixed Effects (redundant with baseline)

THE SHAP PARADOX EXPLAINED: Panel A reveals why different methods produce contradictory rankings—tree-based importance (split frequency) measures stratification utility (how often features create decision nodes), while SHAP (game-theoretic attribution) measures marginal predictive contribution (impact on individual predictions). Tree-based XGBoost: Location features dominate (29.3%), followed by ratio features (19.6%) and zscore features (18.5%). SHAP: Z-score features drive 74.7% of marginal predictions, demonstrating split frequency ≠ predictive power. Panel B (Mixed Effects): Weather ranks #1 (+26.4) - direct causal pathway (climate→agriculture→food), Conflict ranks #4 (+18.7) - redundancy with baseline risk (country_baseline_conflict 9.3%). Panel C (SHAP z-scores): Conflict #1 (0.911) for anomaly detection, Weather #6 (0.769) for sustained shifts. RESOLUTION: Measurement method determines ranking—use ratios for compositional shifts, z-scores for transient shocks.