

Bowker's Test of Symmetry

Test name: Bowker's Test of Symmetry

Dataset: D:\DATA ANALYSIS\I Chi Square and Categorical Data Tests\Bowkers Test of Symmetry\dataset.csv

Rows in original dataset: 649

Columns in original dataset: 33

Complete paired observations used: 649

Before source: G1

After source: G3

Category preparation: Fixed grade bands: Low 0-9, Medium 10-13, High 14+

Common categories: Low, Medium, High

Bowker chi-square: 62.161111

Degrees of freedom: 2

P-value: 0.00000000

Alpha: 0.05

Decision: Reject the null hypothesis of symmetry; the paired category changes are directionally asymmetric.

Simple diagonal agreement rate: 0.7519

Off-diagonal discordant count: 161

Directional asymmetry index: 0.6149

Null hypothesis: for every pair of categories i and j, $n(i,j)$ equals $n(j,i)$.

Assumption: observations are paired and the same category set is used at both measurements.

Reporting guide: report the square table, Bowker chi-square, df, p-value, category-pair contributions, and substantive direction of change.

Charts generated: 7

Bowker test summary

test	n_complete_	number_of_c	bowker_chi_s	degrees_of_f	p_value	alpha	decision	diagonal_agr	off_diagonal	simple_agree	directional_asy
Bowker's Test	649.0000	3.0000	62.1611	2.0000	0.0000	0.0500	Reject symm	488.0000	161.0000	0.7519	0.6149

Pairwise asymmetry contributions

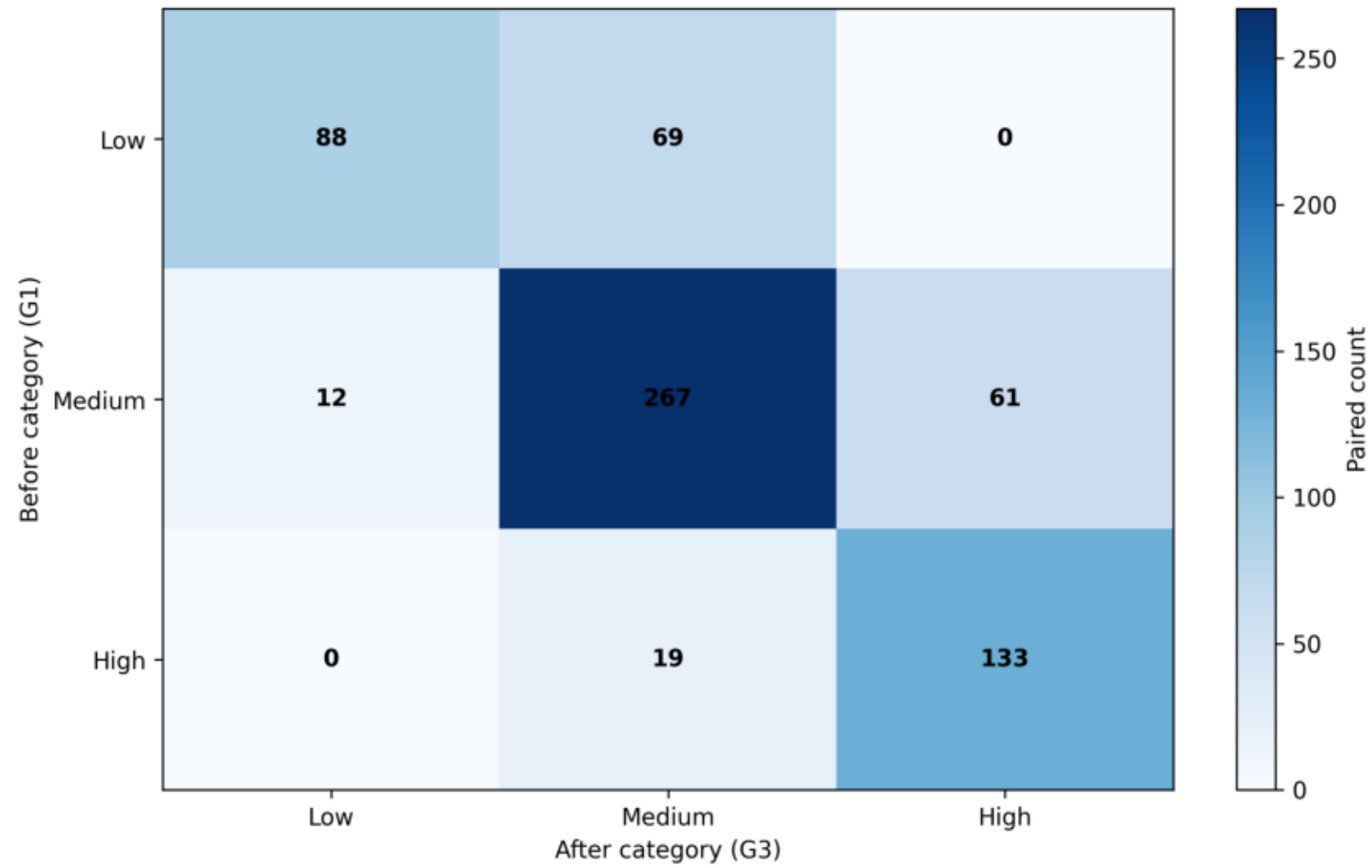
category_i	category_j	i_to_j	j_to_i	discordant_pair_total	directional_difference	bowker_contribution	pairwise_exact_mcnemar
Low	Medium	69.0000	12.0000	81.0000	57.0000	40.1111	0.0000
Low	High	0.0000	0.0000	0.0000	0.0000	0.0000	
Medium	High	61.0000	19.0000	80.0000	42.0000	22.0500	0.0000

Before and after marginal distributions

category	before_count	after_count	before_percent	after_percent	after_minus_before_count
Low	157.0000	100.0000	24.1911	15.4083	-57.0000
Medium	340.0000	355.0000	52.3883	54.6995	15.0000
High	152.0000	194.0000	23.4206	29.8921	42.0000

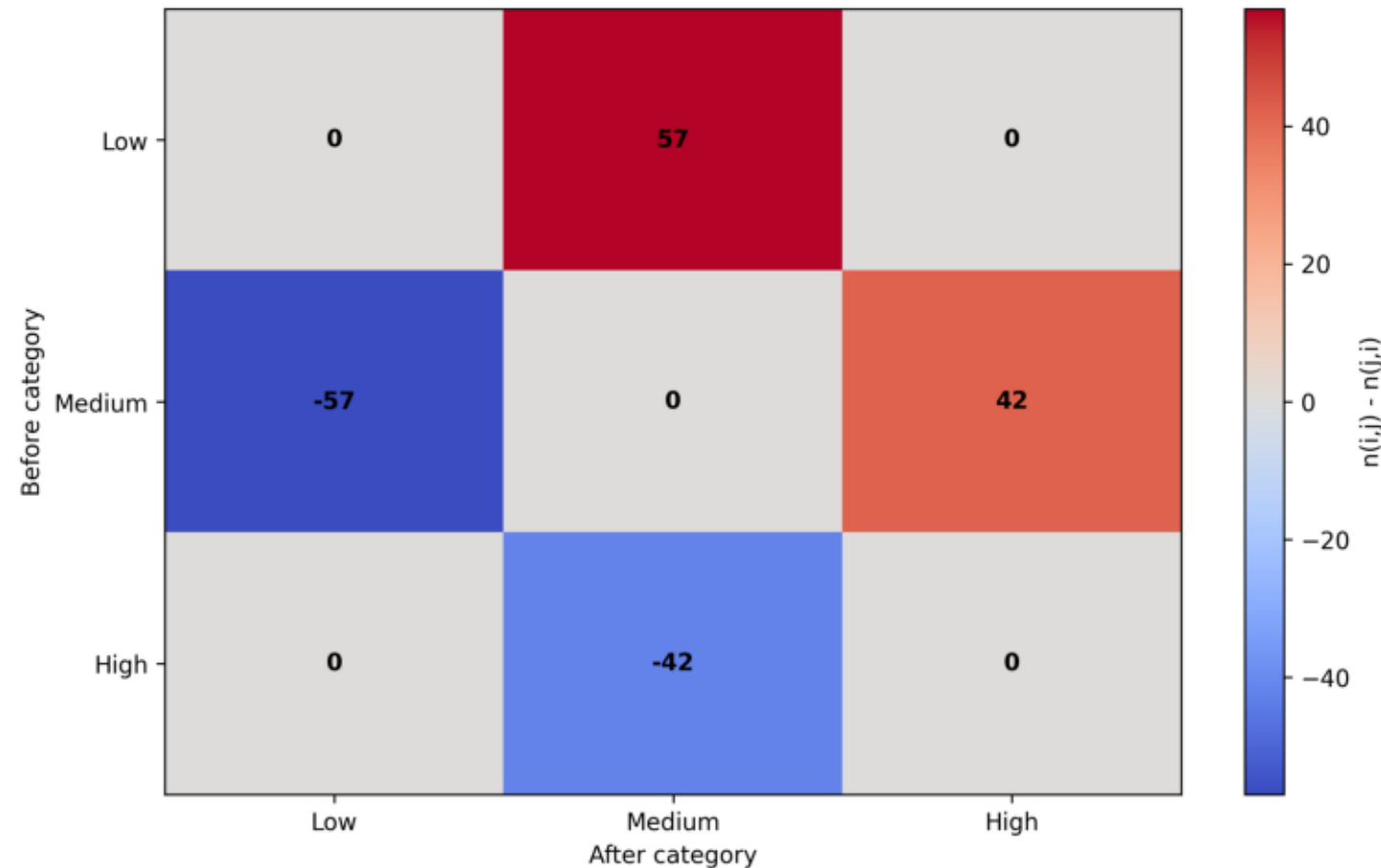
Paired square contingency table

Bowker's test compares every off-diagonal cell with its transposed reverse cell.



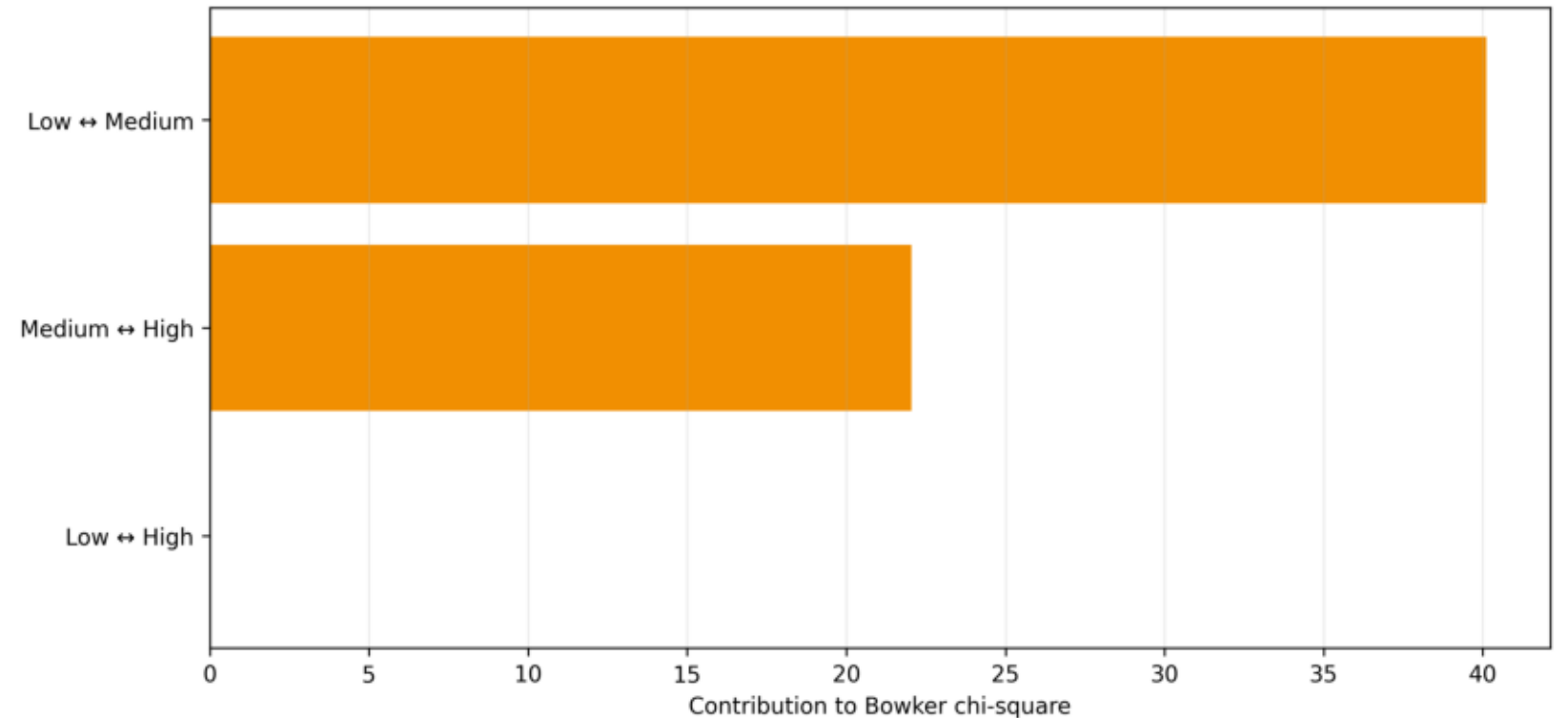
Directional asymmetry matrix

Zero indicates symmetry for a cell and its reverse; larger absolute values indicate stronger directional imbalance.



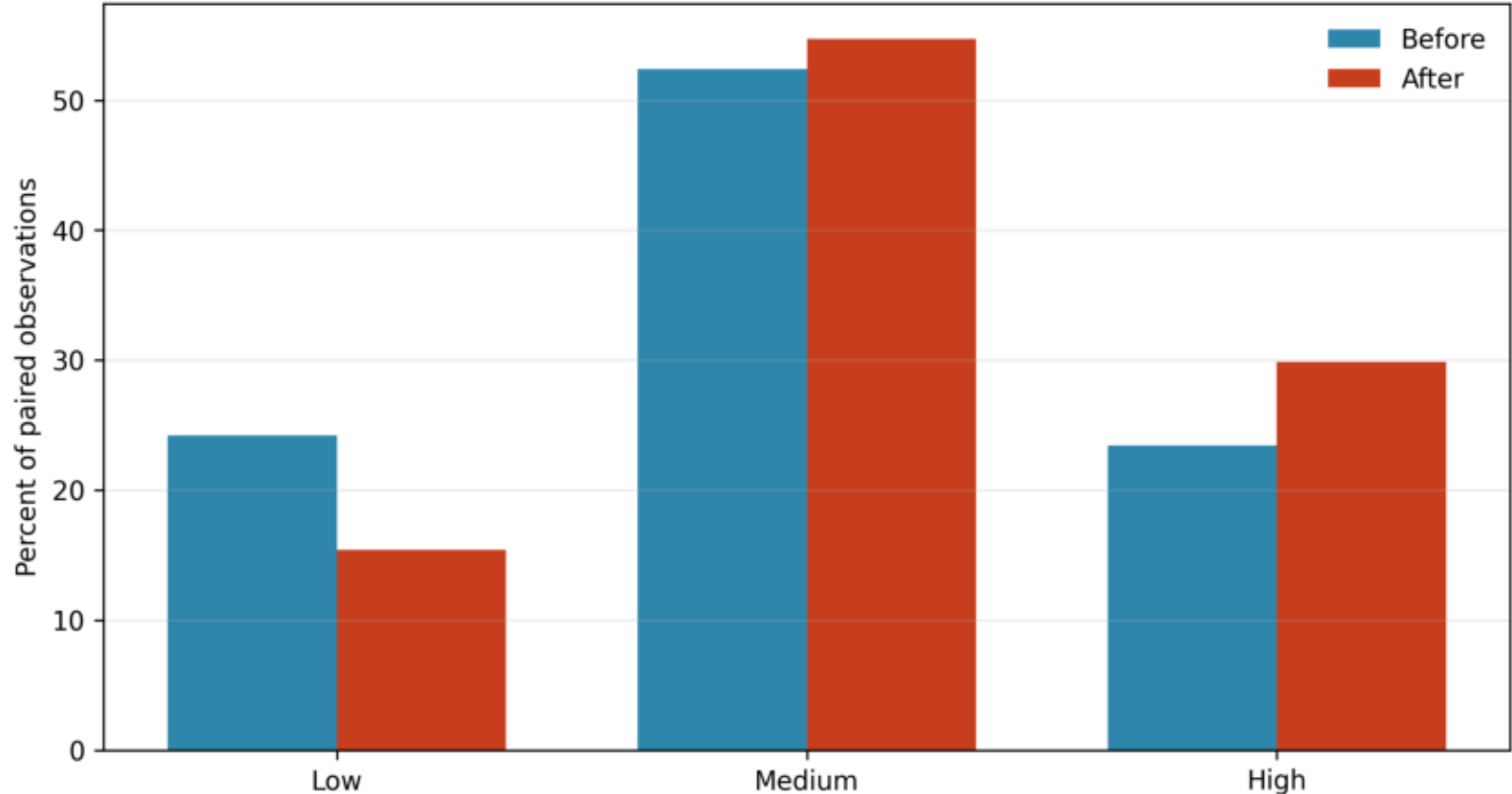
Pairwise contributions to Bowker's statistic

The largest bars identify category pairs that contribute most strongly to lack of symmetry.



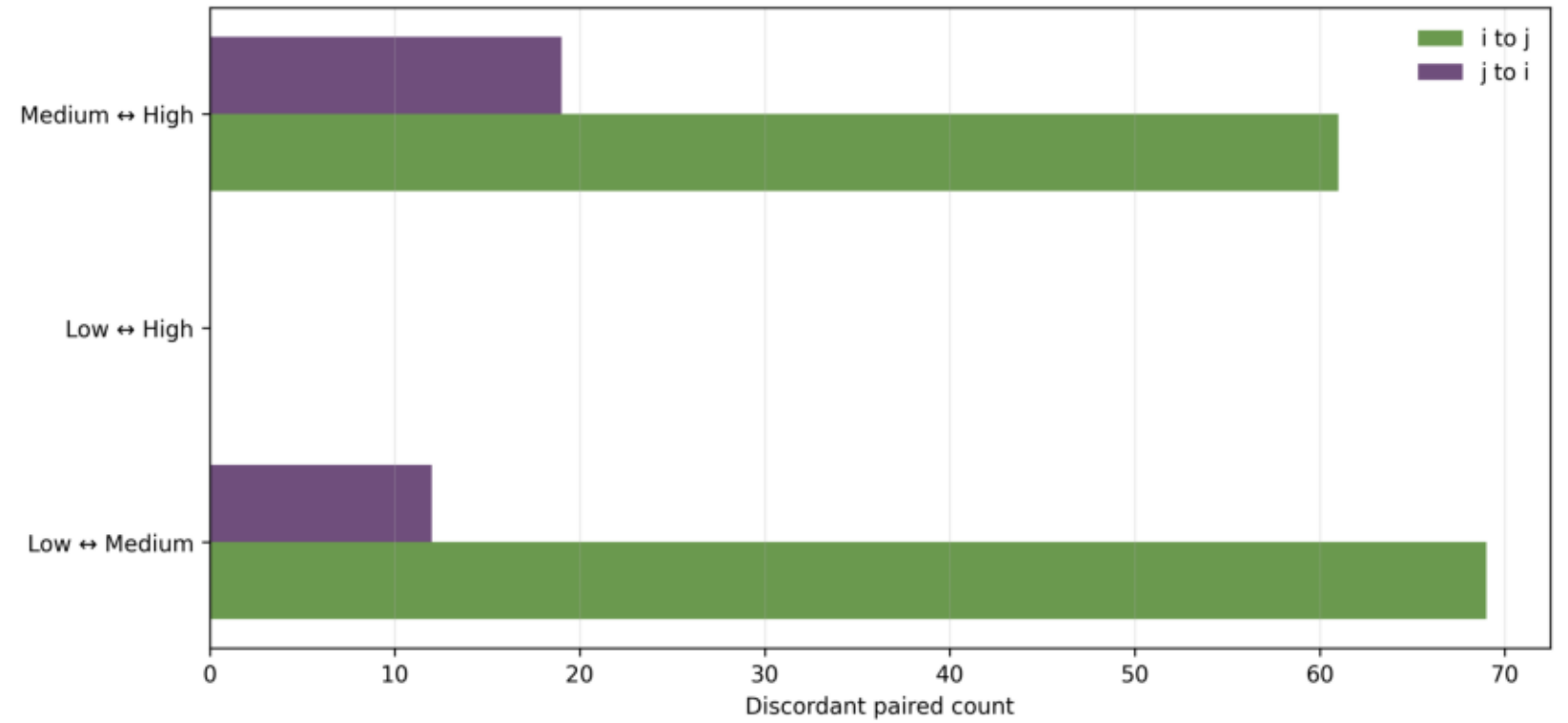
Before and after marginal distributions

Different marginal percentages provide descriptive context for directional change.



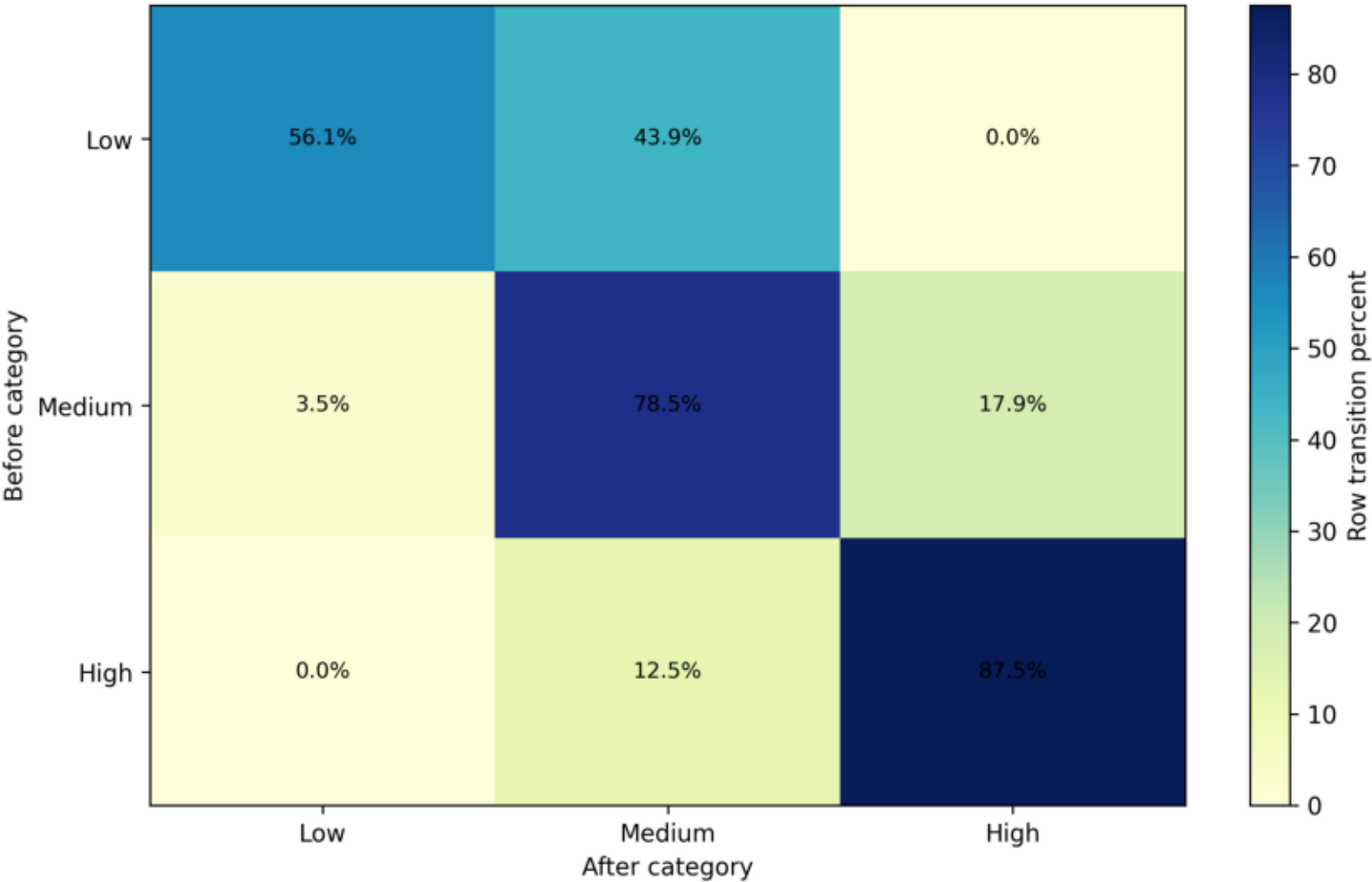
Opposing directional transition counts

Each pair compares movement in one direction with movement in the reverse direction.



Row-normalized transition percentages

Each row shows the after-category distribution among cases starting in the same before category.



Cumulative contribution to the test statistic

This chart shows how quickly the strongest asymmetric category pairs account for the overall result.

