Supplementary Information

October 7, 2025

1 PCA Results for Fig. 9

This section contains further analysis of the PCA plots from Figure 9.

1.1 Rat1

Table 1 shows the variance explained by the first two PCs for Figure 9b.

PC	Variance
PC1	0.84194896
PC2	0.05554835
PC1+PC2	0.89749731

Table 1: Variance explained by principal components

Table 2 shows the distance measures between empirical and the closest simulated probabilities for 2, 3, 4, and 5 principal components (PCs) for Figure 9b.

Agent Structure	2 PCs	3 PCs	4 PCs	5 PCs
CoACA-s	0.0695	0.4447	0.5072	0.5441
CoACA-o	0.9109	0.9825	1.0221	1.1762
DRL-s	2.1739	2.2376	2.2655	2.2684
DRL-o	1.0718	1.1627	1.1635	1.1638

Table 2: Distance measure between empirical and simulated probabilities with additional

1.2 Rat2

Table 3 shows the variance explained by the first two PCs for Figure 9c.

PC	Variance
PC1	0.72978034
PC2	0.08479583
PC1+PC2	0.8145761

Table 3: Variance explained by principal components

Table 4 shows the distance measure between empirical and the closest simulated probabilities for 2, 3, 4, and 5 principal components (PCs) for Figure 9c.

Agent Structure	2 PCs	3 PCs	4 PCs	5 PCs
CoACA-s	2.670764	2.888813	3.082539	3.177543
CoACA-o	1.143358	1.229383	1.586999	1.686261
QL-s	1.285550	1.344878	1.458344	1.556424
QL-o	2.674506	2.726789	2.737811	2.749402

Table 4: Matrix data associated with PCs

PC	Variance
PC1	0.72818029
PC2	0.08916401
PC1+PC2	0.81734430

Table 5: Variance explained by principal components

1.3 Rat3

Table 5 shows the variance explained by the first two PCs for Figure 9c.

Table 6 shows the distance measure between empirical and the closest simulated probabilities for 2, 3, 4, and 5 principal components (PCs) for Figure 9c.

Agent Structure	2 PCs	3 PCs	4 PCs	5 PCs
CoACA-s	0.5307206	1.364800	1.499499	1.945110
CoACA-o	4.3016536	4.851513	4.862410	5.220251
QL-s	3.5083734	4.816536	4.818083	4.818377
QL-o	2.5334779	2.588493	2.591636	2.630468

Table 6: Matrix data associated with PCs

2 PCA Results for Fig. 10

Table 5 shows the variance explained by the first two PCs for Figure 10.

PC	Variance
PC1	0.9089774
PC2	0.0727909
PC1+PC2	0.9817683

Table 7: Variance explained by principal components