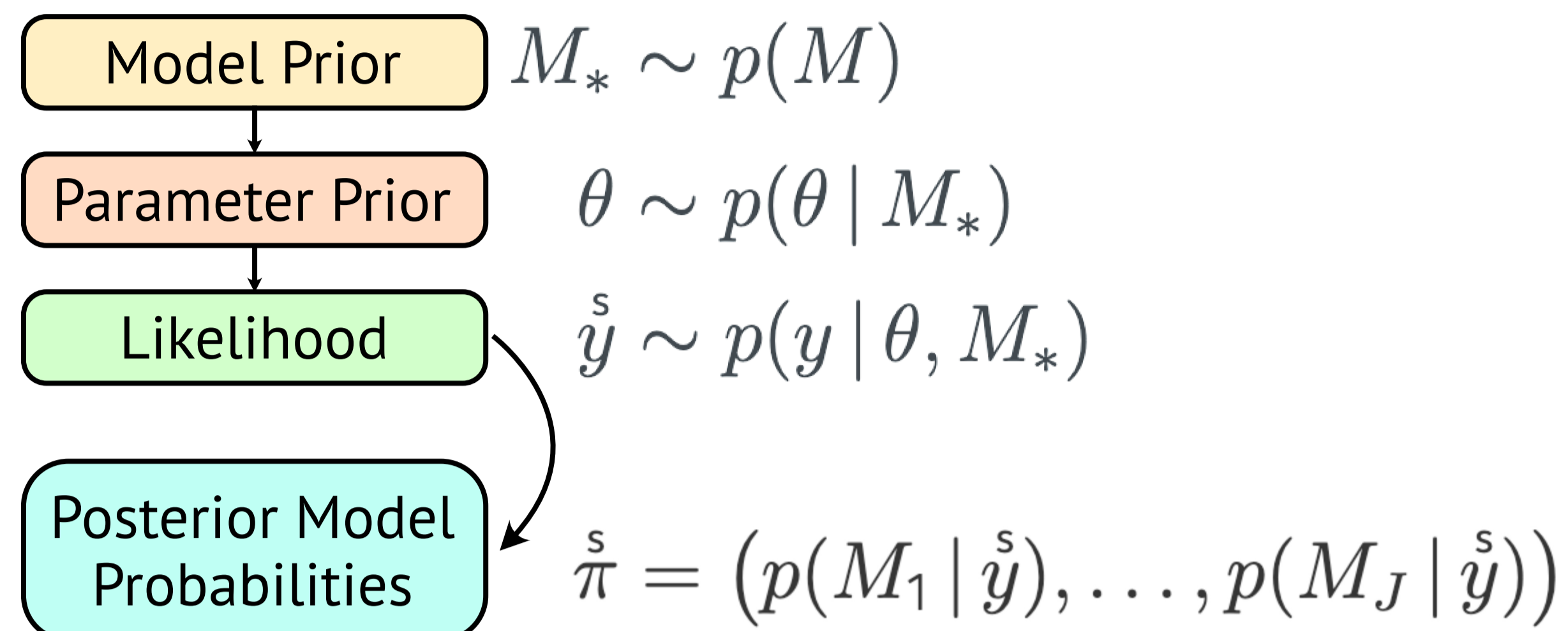


# Meta-Uncertainty in Bayesian Model Comparison



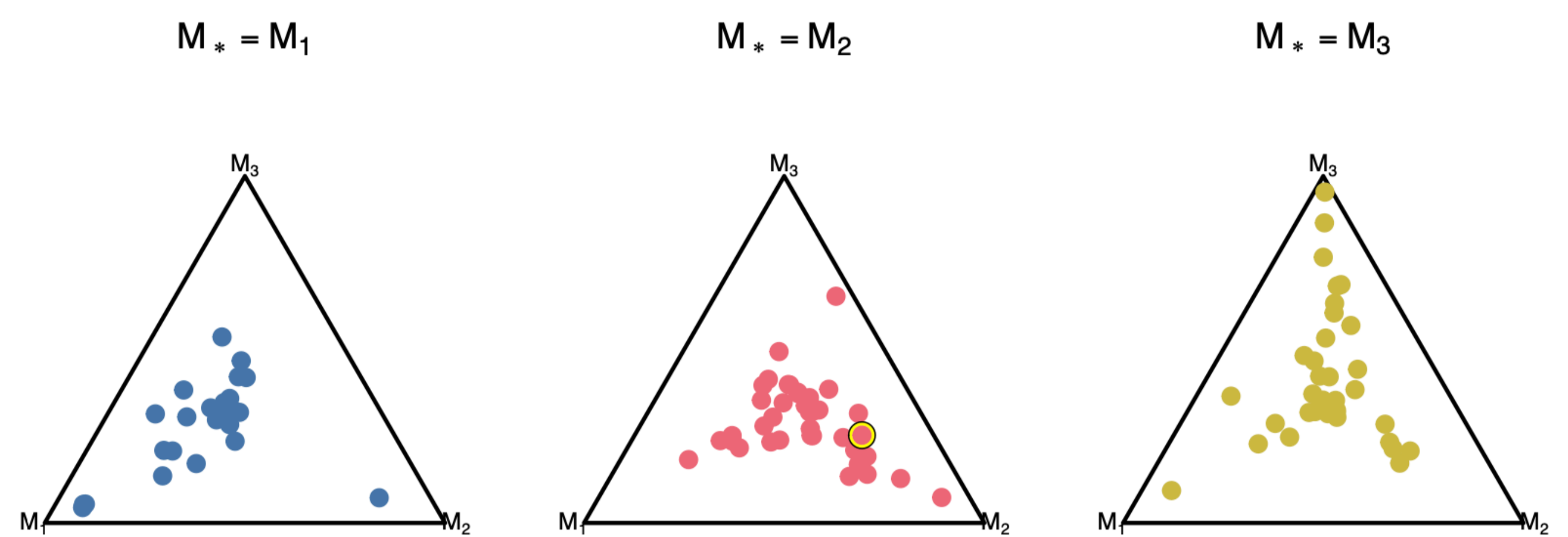
Marvin Schmitt, Stefan T. Radev, Paul-Christian Bürkner

## Level 1



## Level 2

Model-implied PMP distributions from simulated data



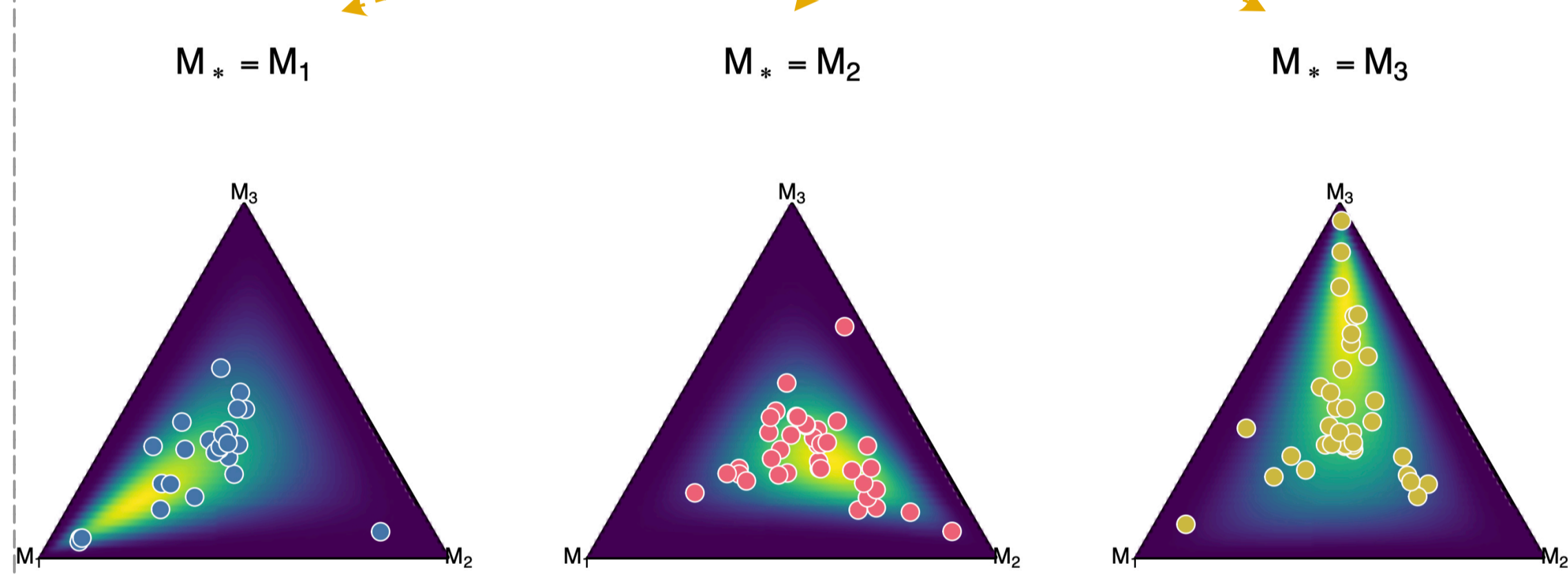
## Level 3

### Meta models

Data: Level 2 PMPs  $p_j(\tau_j | \{\tilde{\pi}_j\})$

Posterior:  $p_j(\tau_j | \{\tilde{\pi}_j\})$

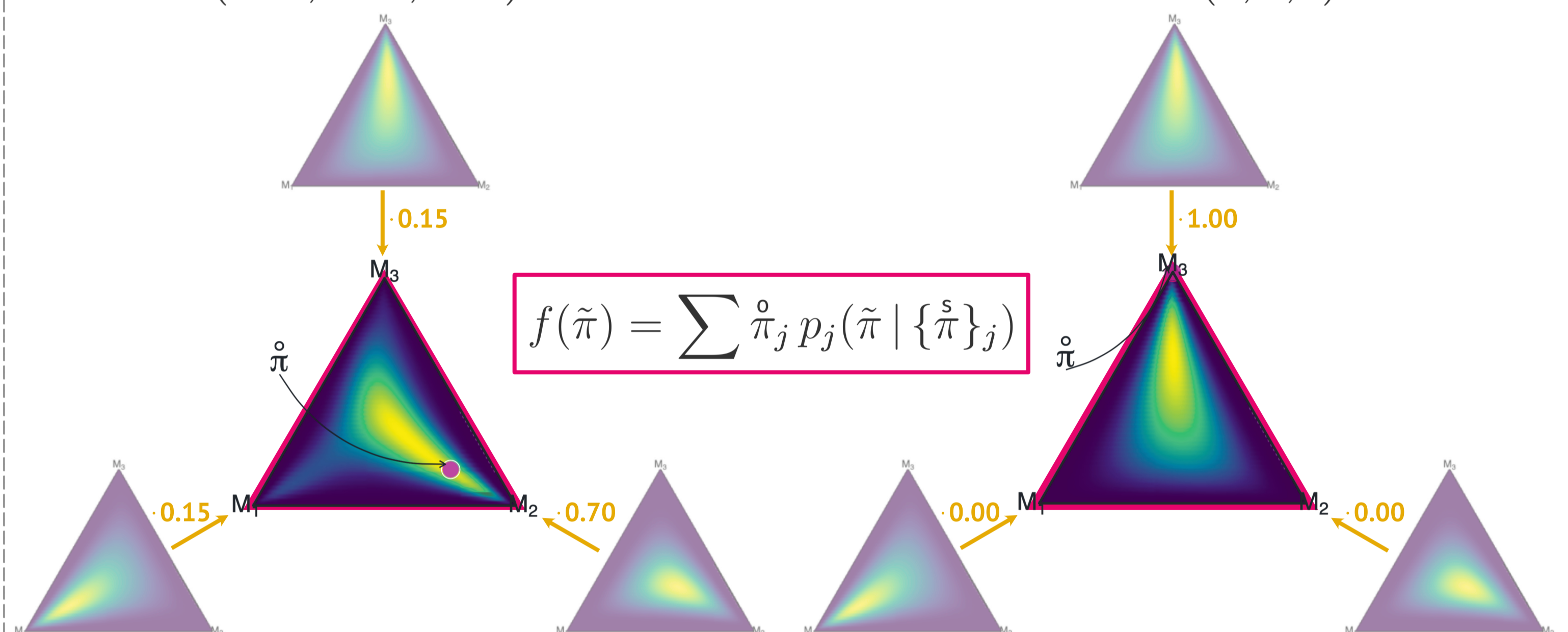
Posterior predictive:  $p_j(\tilde{\pi} | \{\tilde{\pi}_j\})$



### Predictive mixture

Example 1: moderate PMPs  $\tilde{\pi} = (0.15, 0.70, 0.15)$

Example 2: extreme PMPs  $\tilde{\pi} \approx (0, 0, 1)$



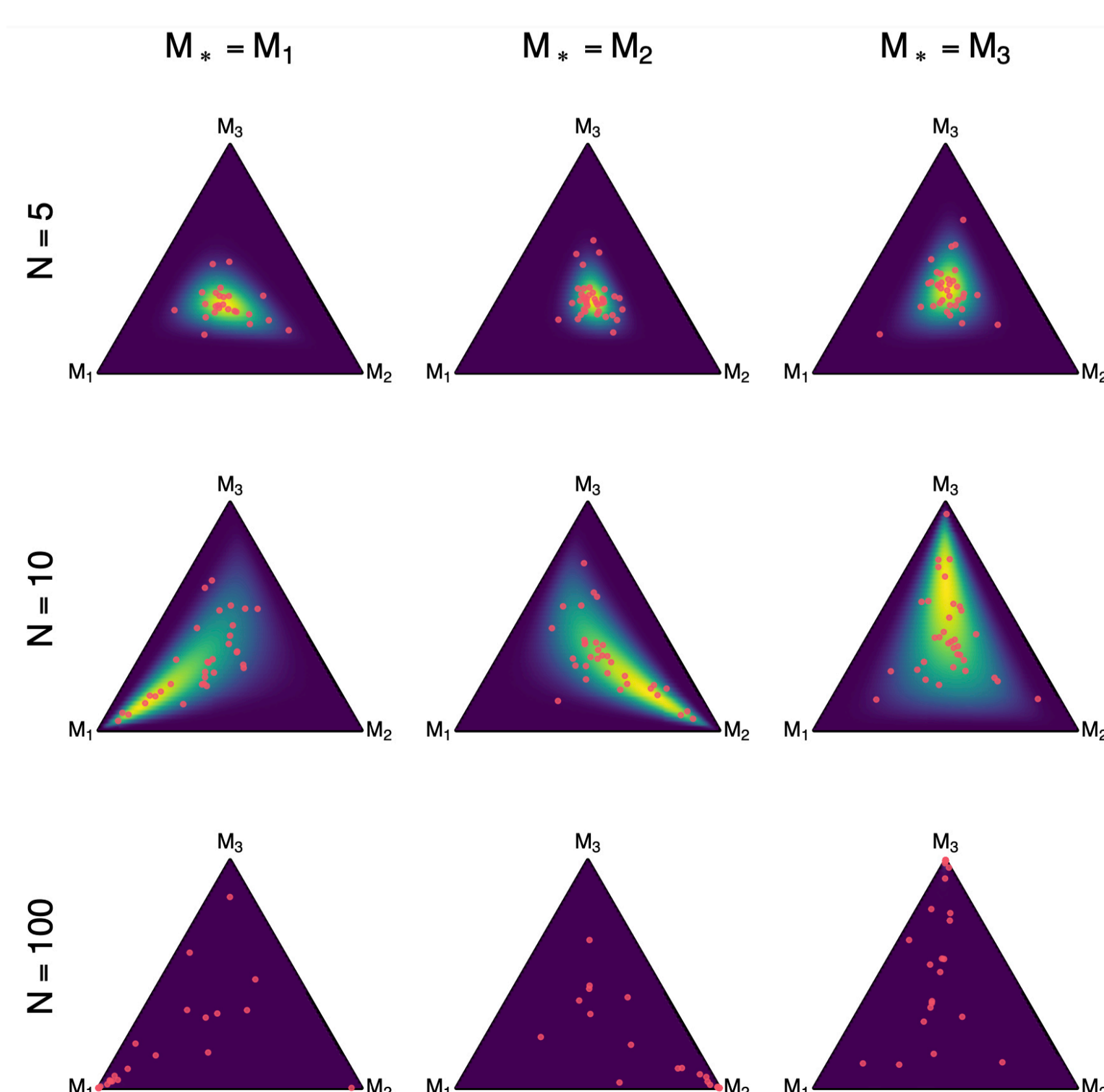
Posterior model probabilities are **measures of uncertainty** but they are also **uncertain** themselves.



## Experiments

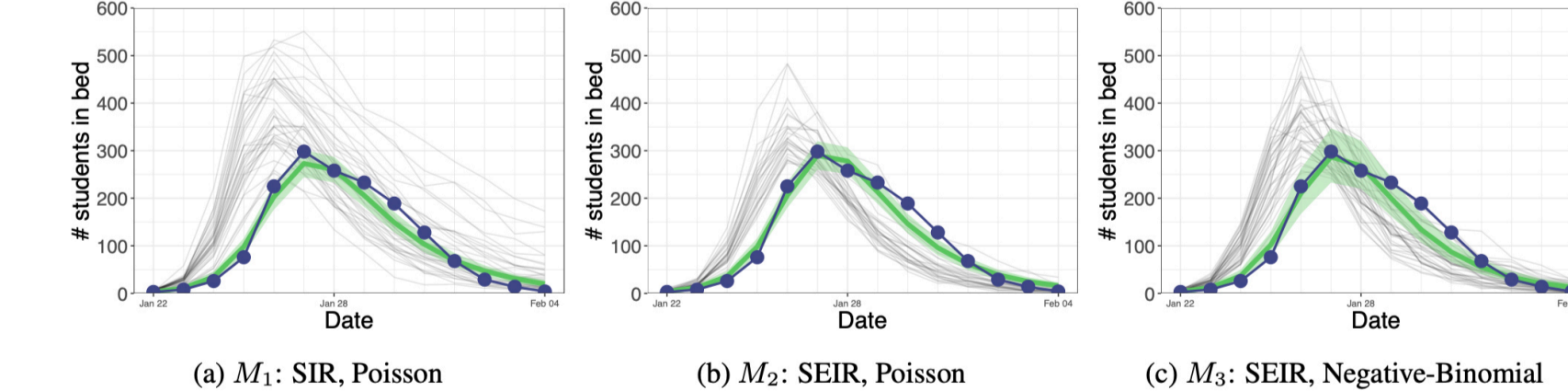
### Toy Conjugate

Bayesian linear regression

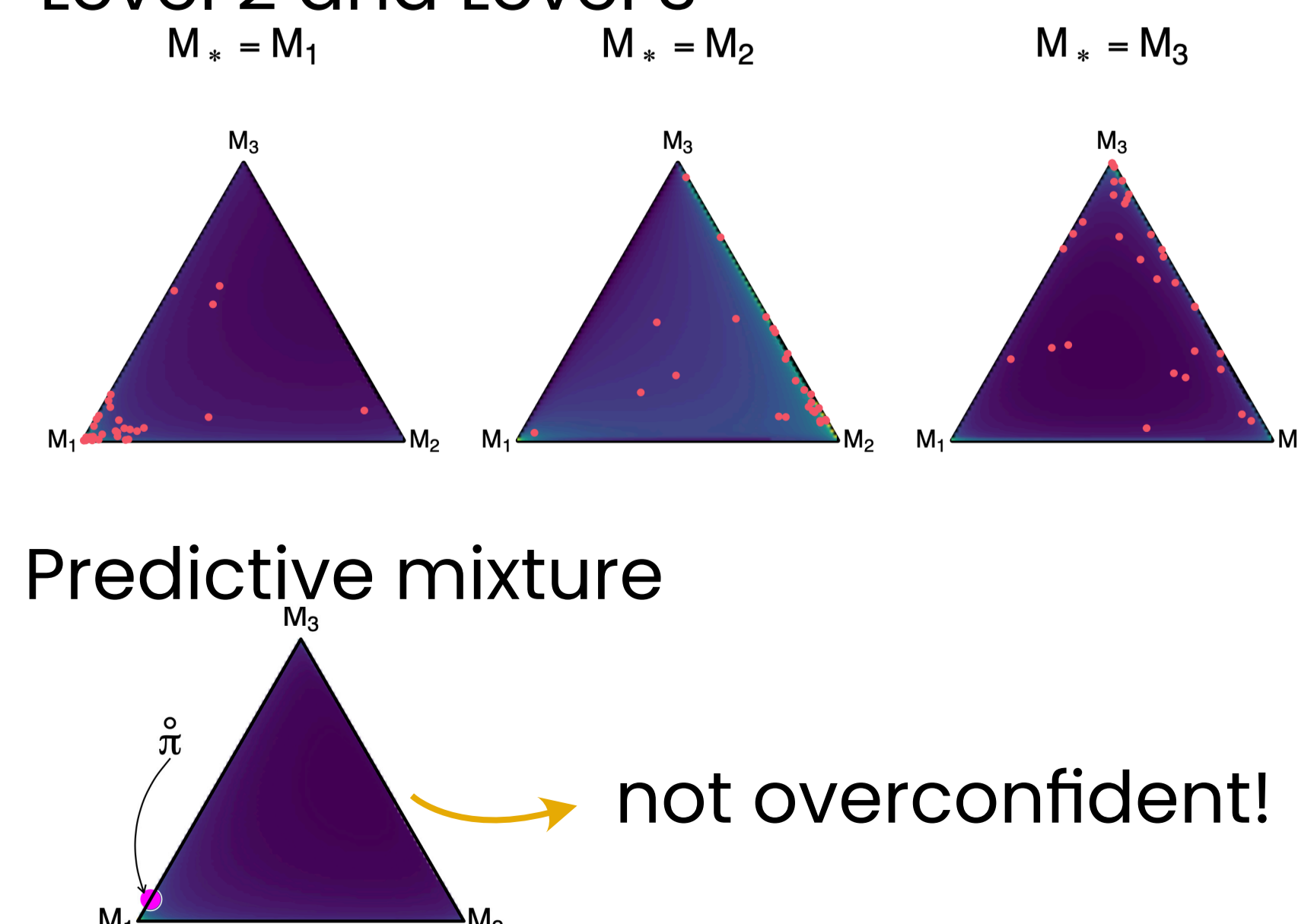


### Likelihood-based

Data, prior & posterior predictive



Level 2 and Level 3



### Simulation-based

Hodgkin-Huxley model: neural activity

Level 2 and Level 3

