TWO-METHOD PLANNED MISSING DESIGNS FOR LONGITUDINAL RESEARCH

Mauricio Garnier-Villarreal, Mijke Rhemtulla, & Todd D. Little

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OUTLINE

- Two-method planned missing designs.
- Purpose
- Method
- Results
- Future research

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TWO-METHOD PLANNED MISSING DESIGNS

- Allow more and higher-quality data collection
- Increase power and reliability
- Two measures:
  - "Gold standard" measure
  - Biased measure
- You don't have to choose

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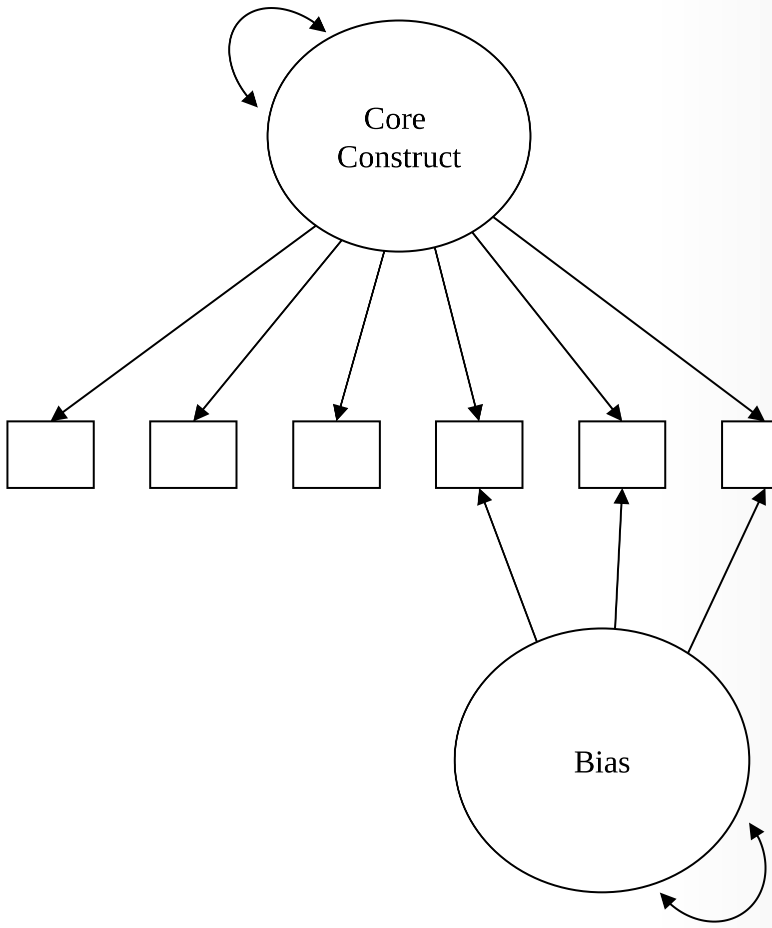
TWO-METHOD PLANNED MISSING DESIGNS



PURPOSE

- How can 2-method design be extended to longitudinal research?
- How might changing bias over time affect the usefulness of the 2-method design?
- How many time points should include the gold standard measure?
- Which constraints are better?
- Is it require to have overlap subjects in the gold standard measure?

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METHOD

- simsem R package
- 4 time point panel model
- 2 constraints: factorial invariance (FI), and factorial invariance with equality of bias (FB)
- N = 500
- Equal cost (200 subjects GM)
- 5% MCAR
- 3 kinds of bias: equal, random, and increasing across time

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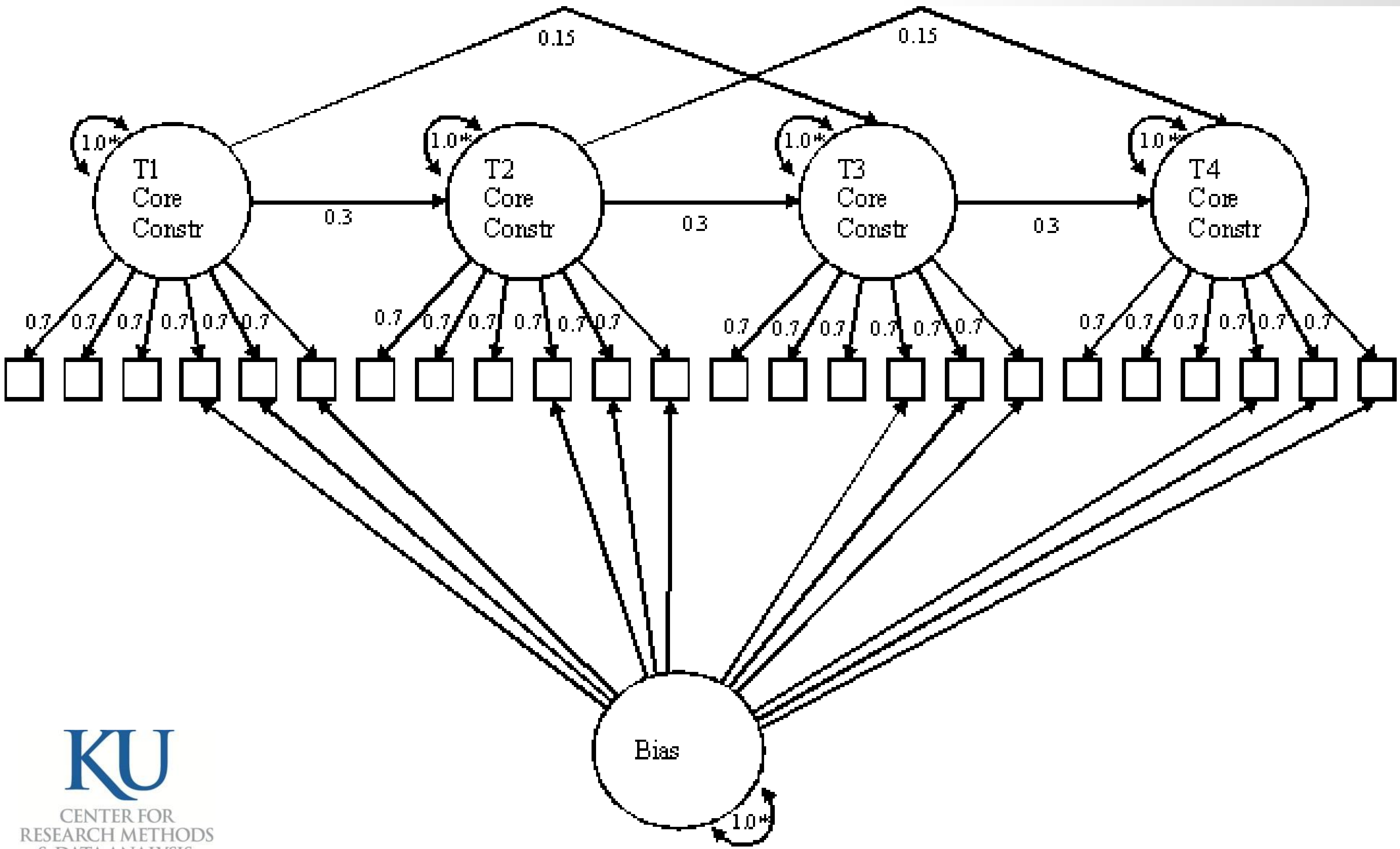
DATA GENERATION MODEL



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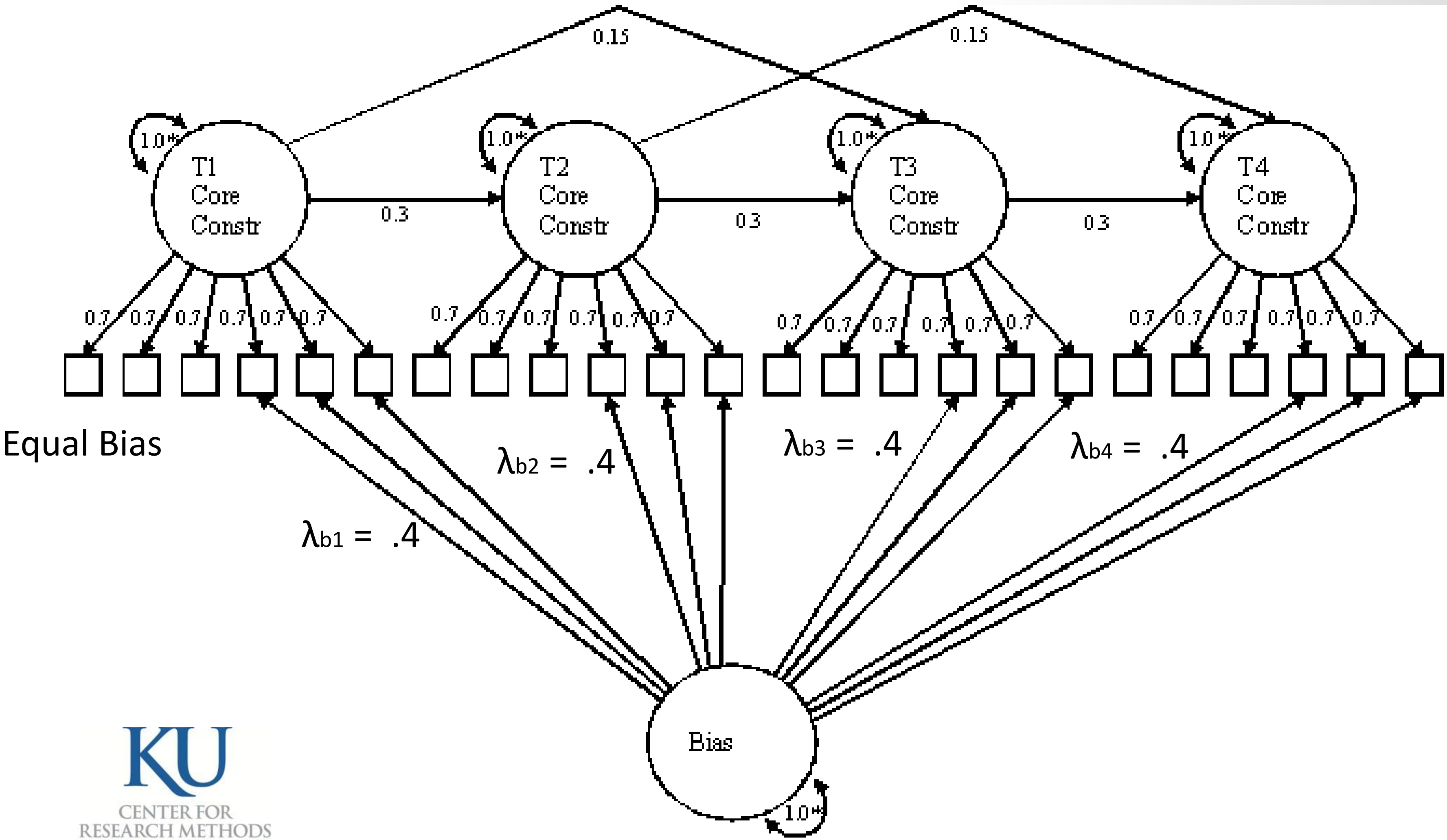

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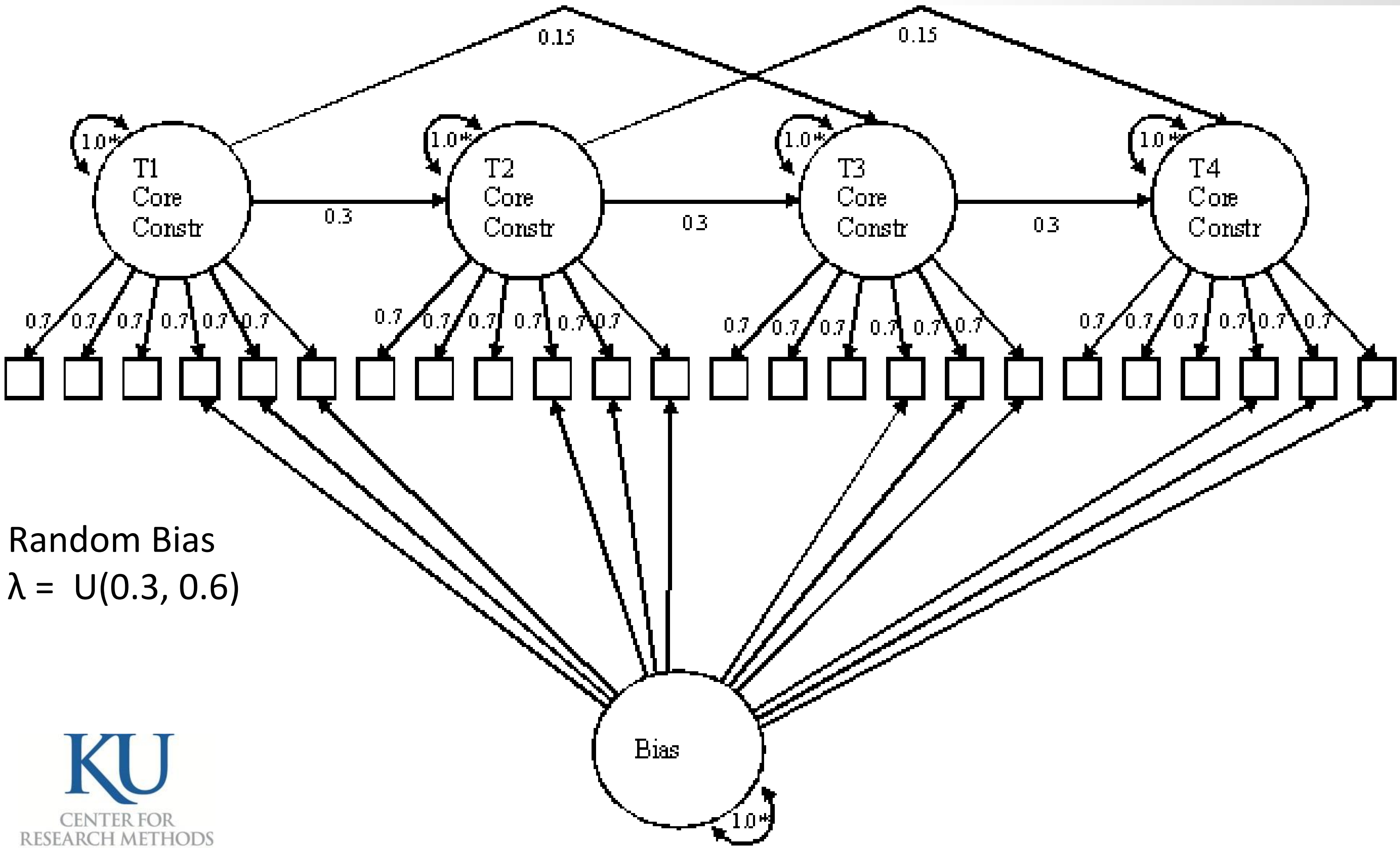
DATA GENERATION MODEL



Random Bias
λ = U(0.3, 0.6)

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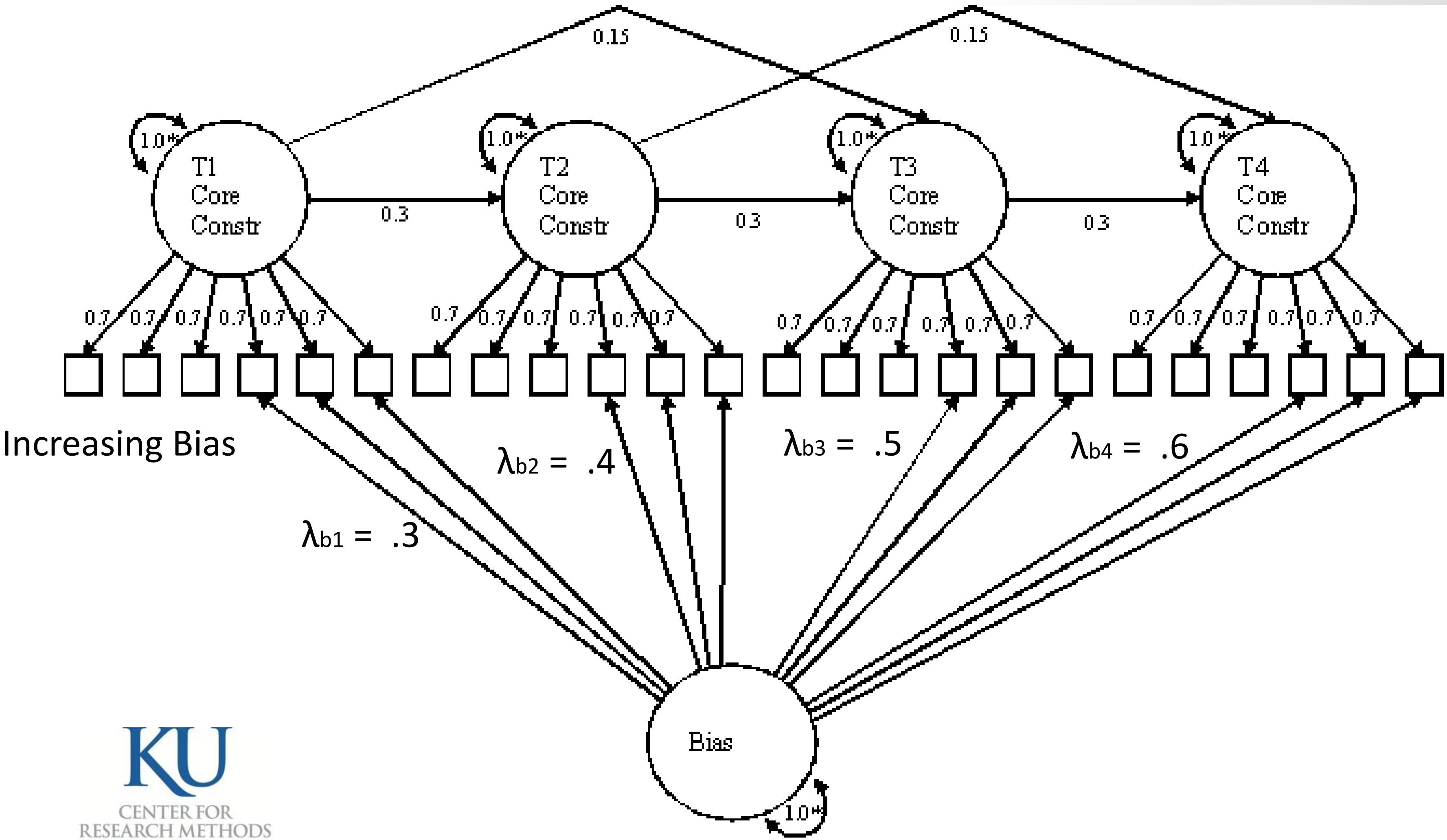
DATA GENERATION MODEL



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MISSING DATA DESIGNS

Design	Gold Standard Occasions	Subsample	Gold Standard N at each occasion	% Overlapping Gold Standard
GM all	1, 2, 3, 4	10%	50	100%
GM 1	1	40%	200	100%
GM 1-4	1, 4	20%	100	100%
GM 1-4 HO	1, 4	20%	100	50%
GM 1-4 NO	1, 4	20%	100	0%

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GM = gold-standard measure, 1-4 indicates the occasions at which the gold standard measure was administered, HO = half of the gold-standard subsample overlaps across occasions, NO = none of the gold-standard subsample overlaps across occasions.

OUTCOMES

- Convergence
- Absolute value of the Relative Bias
  - $ARB_{\theta} = \left|\frac{\hat{\theta}-\theta}{\theta}\right| * 100$
- Relative Efficiency
  - $RE = \frac{ESEcomplete^2}{ESEmissing^2} * 100$

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RESULTS

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CONVERGENCE

- With FB constraints have 100% convergence
- With FI constraint convergence rates ranged from 76.2 % to 98.4%
- More improper solutions than non-convergence

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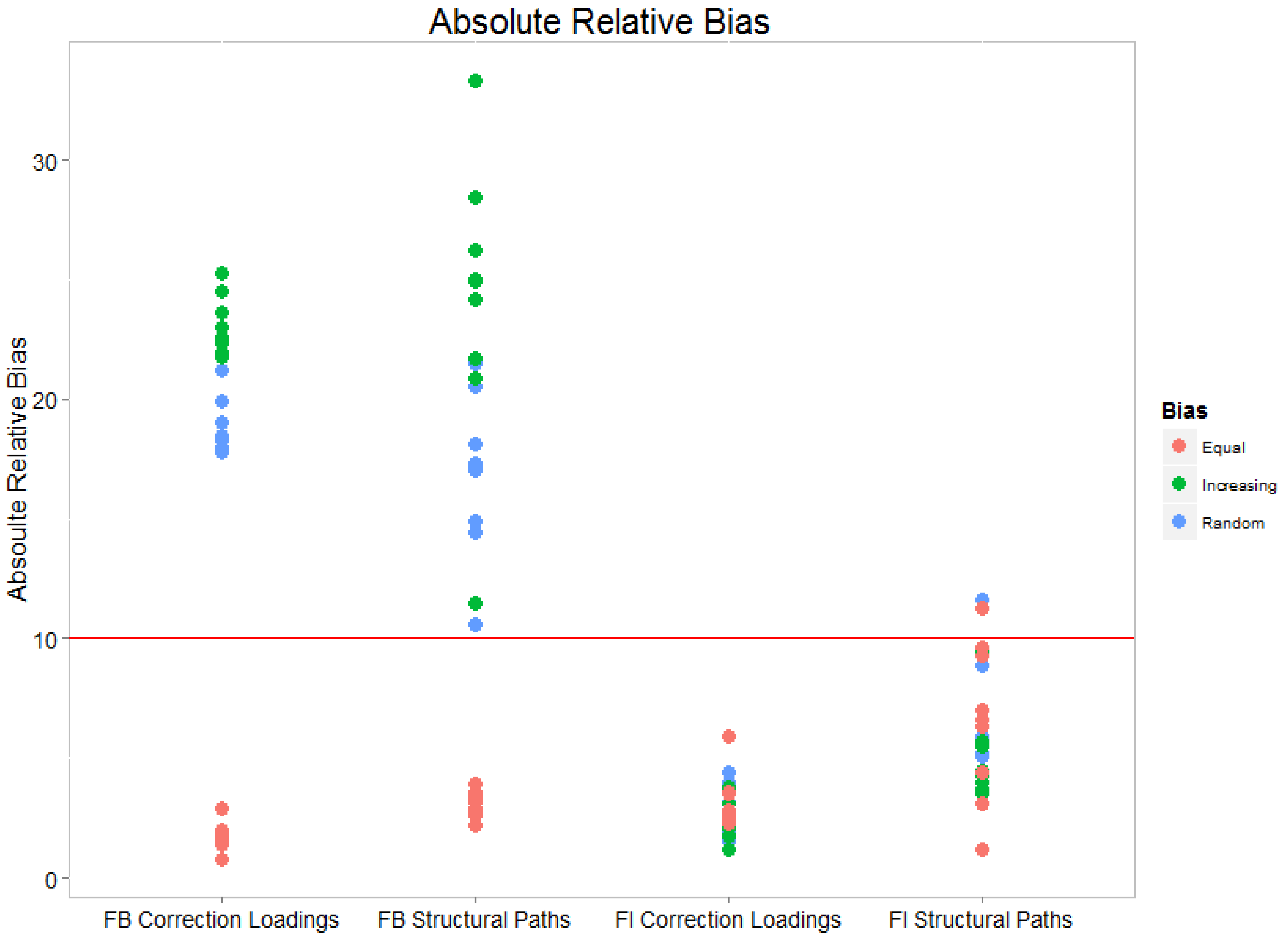
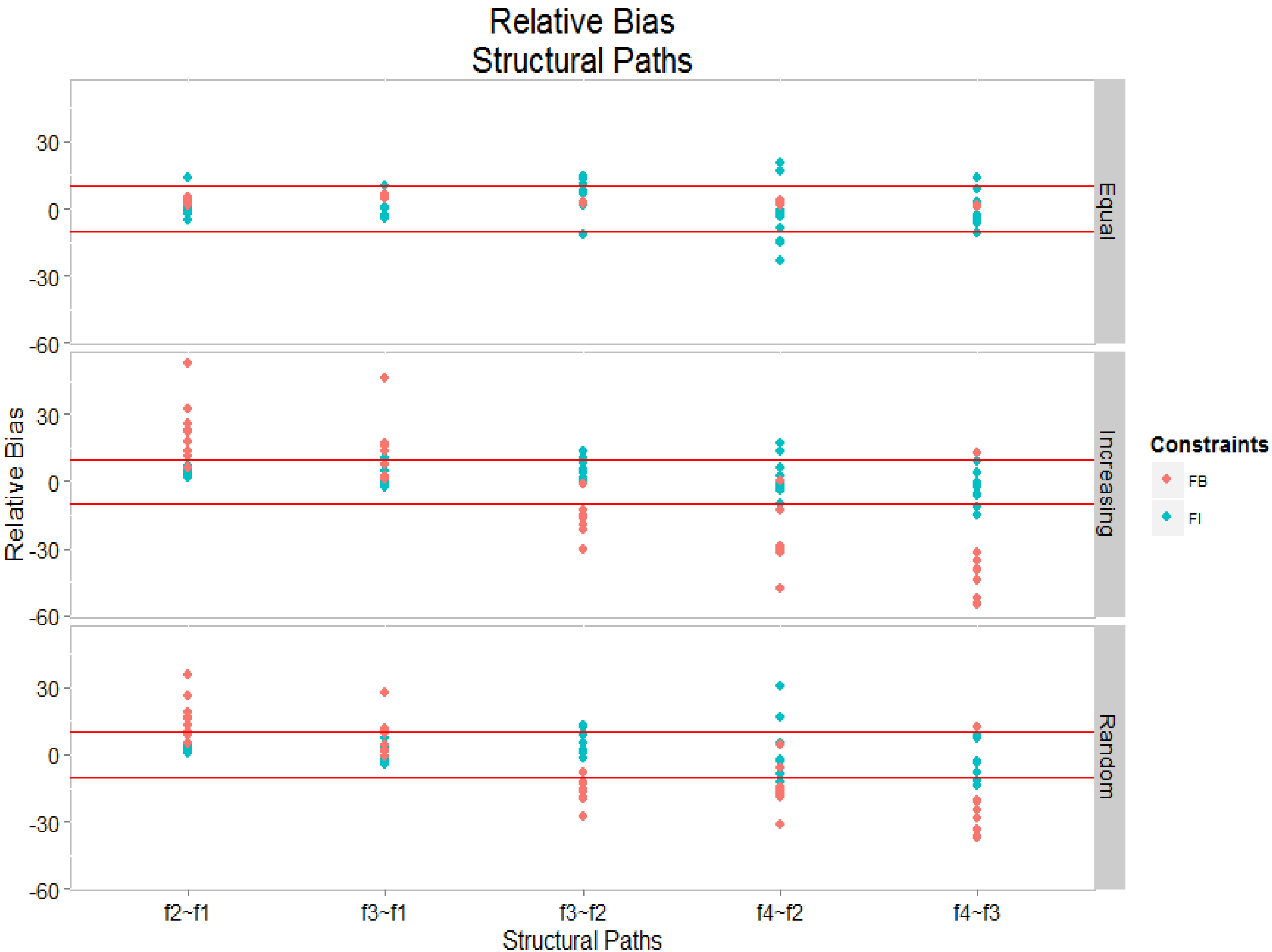
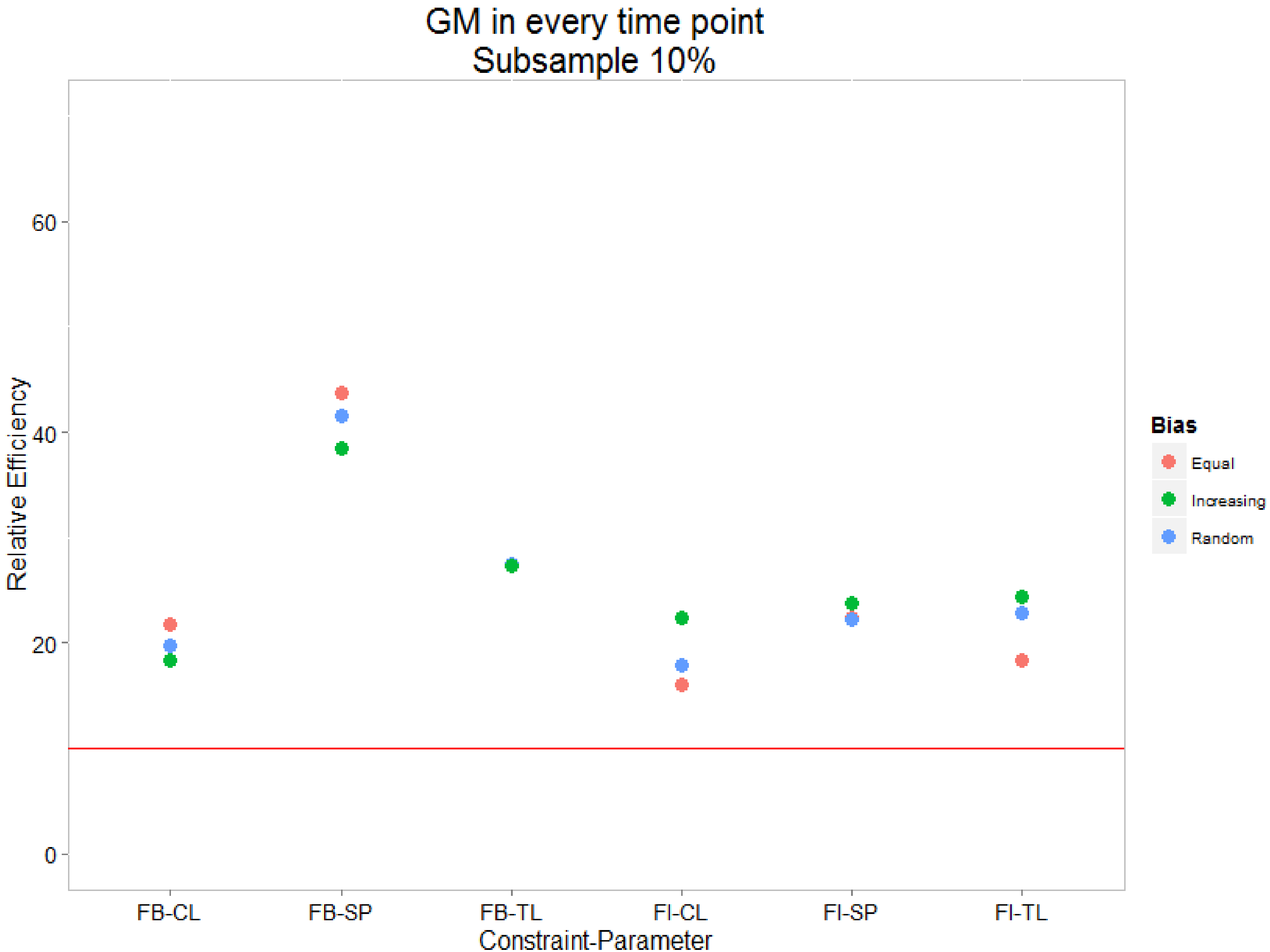

Absolute Relative Bias
Absoulte Relative Bias
0
10
20
30
FB Correction Loadings
FB Structural Paths
FI Correction Loadings
FI Structural Paths
Bias
Equal
Increasing
Random

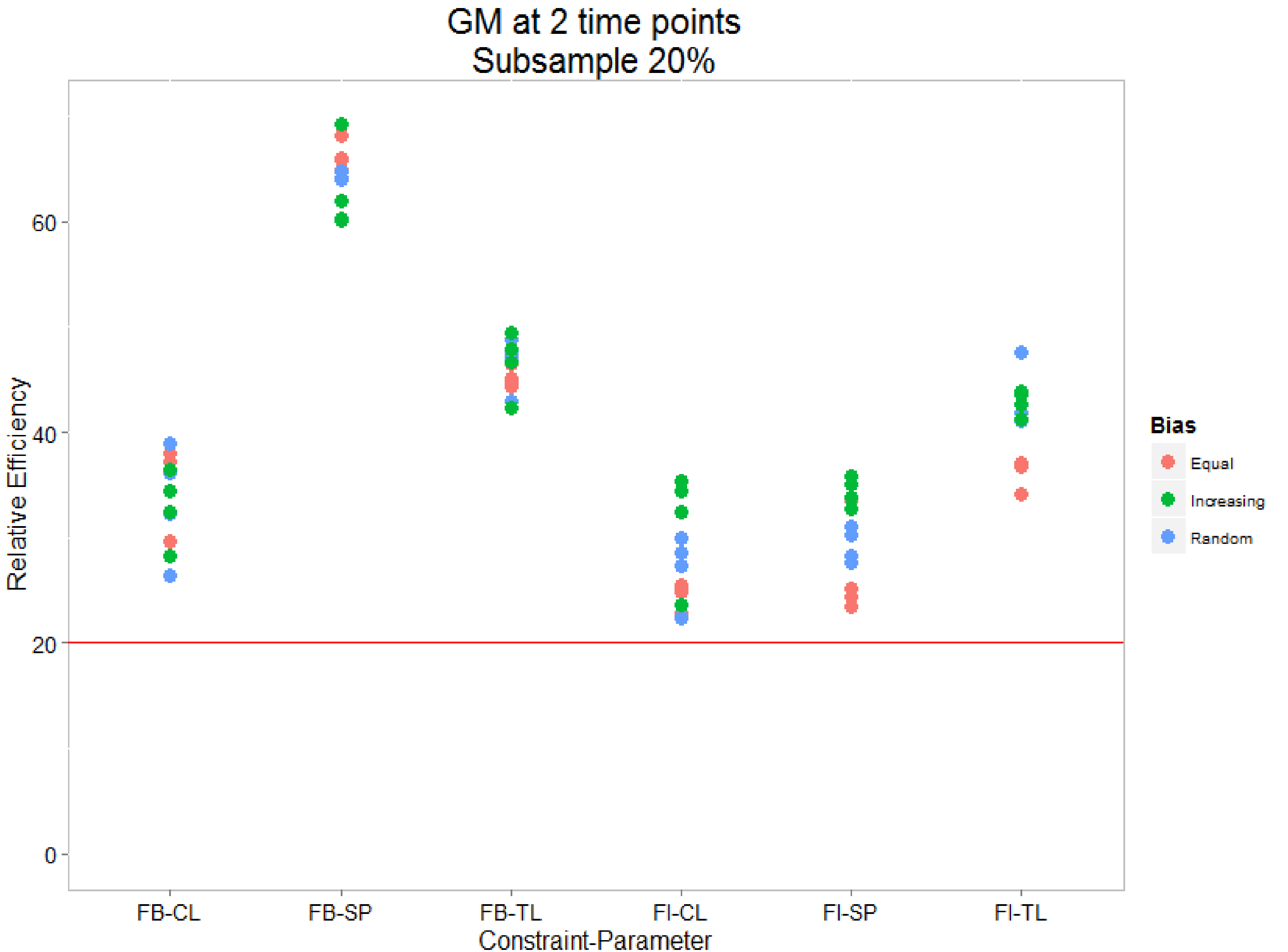

Relative Bias
Structural Paths
Relative Bias
30
0
-30
-60
Equal
Increasing
Random
Constraints
FB
FI
f2~f1
f3~f1
f3~f2
f4~f2
f4~f3
Structural Paths

RELATIVE EFFICIENCY

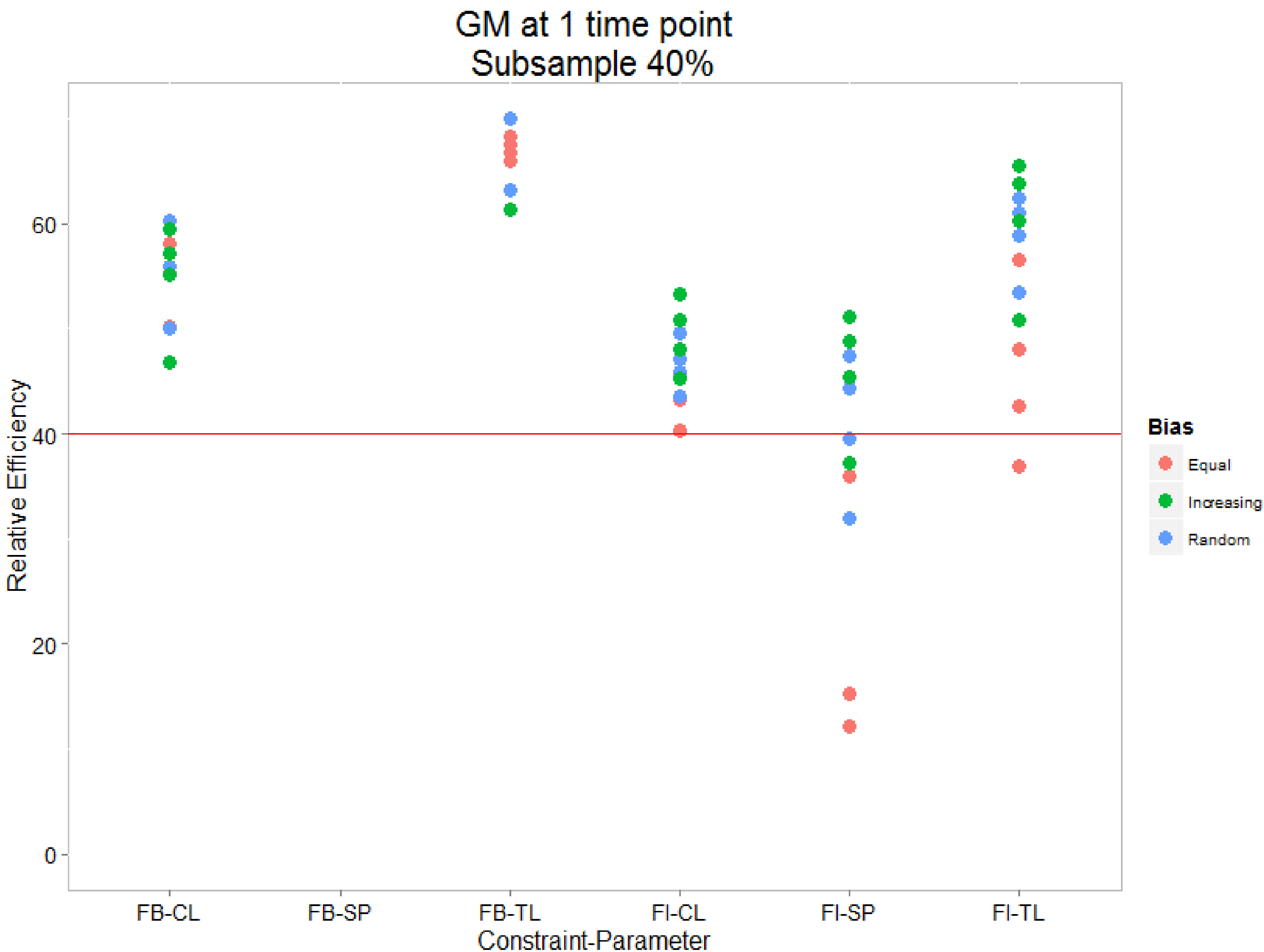
- RE measures the degree to which information is lost as a result of missing data.
- We compare the RE to the percentage of observations that are missing (subsample)
- RE values higher than subsample represents “savings” in terms of efficiency-per-observation.



GM in every time point
Subsample 10%
Relative Efficiency
0
20
40
60
FB-CL
FB-SP
FB-TL
FI-CL
FI-SP
FI-TL
Constraint-Parameter
Bias
Equal
Increasing
Random



GM at 2 time points
Subsample 20%
Relative Efficiency
60
40
20
0
FB-CL
FB-SP
FB-TL
FI-CL
FI-SP
FI-TL
Constraint-Parameter
Bias
Equal
Increasing
Random


GM at 1 time point
Subsample 40%
Relative Efficiency
60
40
20
0
FB-CL
FB-SP
FB-TL
FI-CL
FI-SP
FI-TL
Constraint-Parameter
Bias
Equal
Increasing
Random

FUTURE RESEARCH

- Different bias structures
- Different number of indicators
- Attrition
- Varying sample size, and percent of subjects receiving the gold standard measure

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THANK YOU

Questions?

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