Validate Power: d2.1

April 08, 2022

Design: Blocked RCT, with 2 levels, and randomization done at level 1 (individual level).

Models: Constant treatment effects, fixed treatment effects, and random treatment effects.

d_m codes: `d2.1_m2fc`, `d2.1_m2ff`, `d2.1_m2fr`

Note: we expect a discrepancy when ICC is not zero between powerup and pump.

Default parameters:

- M = 3
- J = 20
- $\rho = 0.5$
- MDES = 0.125, 0.125, 0.125
- $R_1^2 = 0.1, 0.1, 0.1$
- $\text{ICC}_2 = 0.2, 0.2, 0.2$

Parameters by model type:

- Omega: $\omega_2 = 0$ for constant effects, $\omega_2 = 0.1, 0.1, 0.1$ for fixed and random

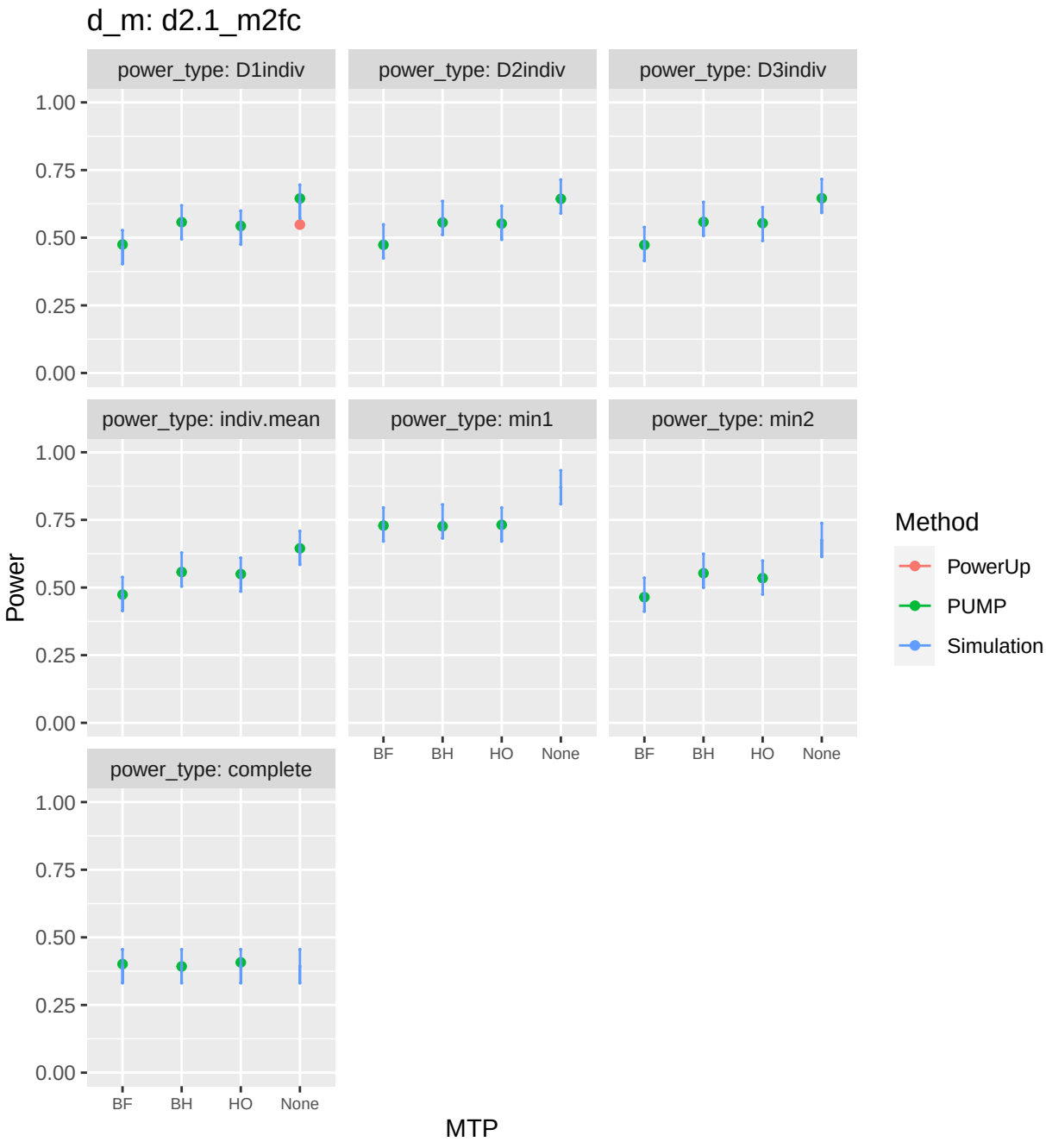
Assumptions:

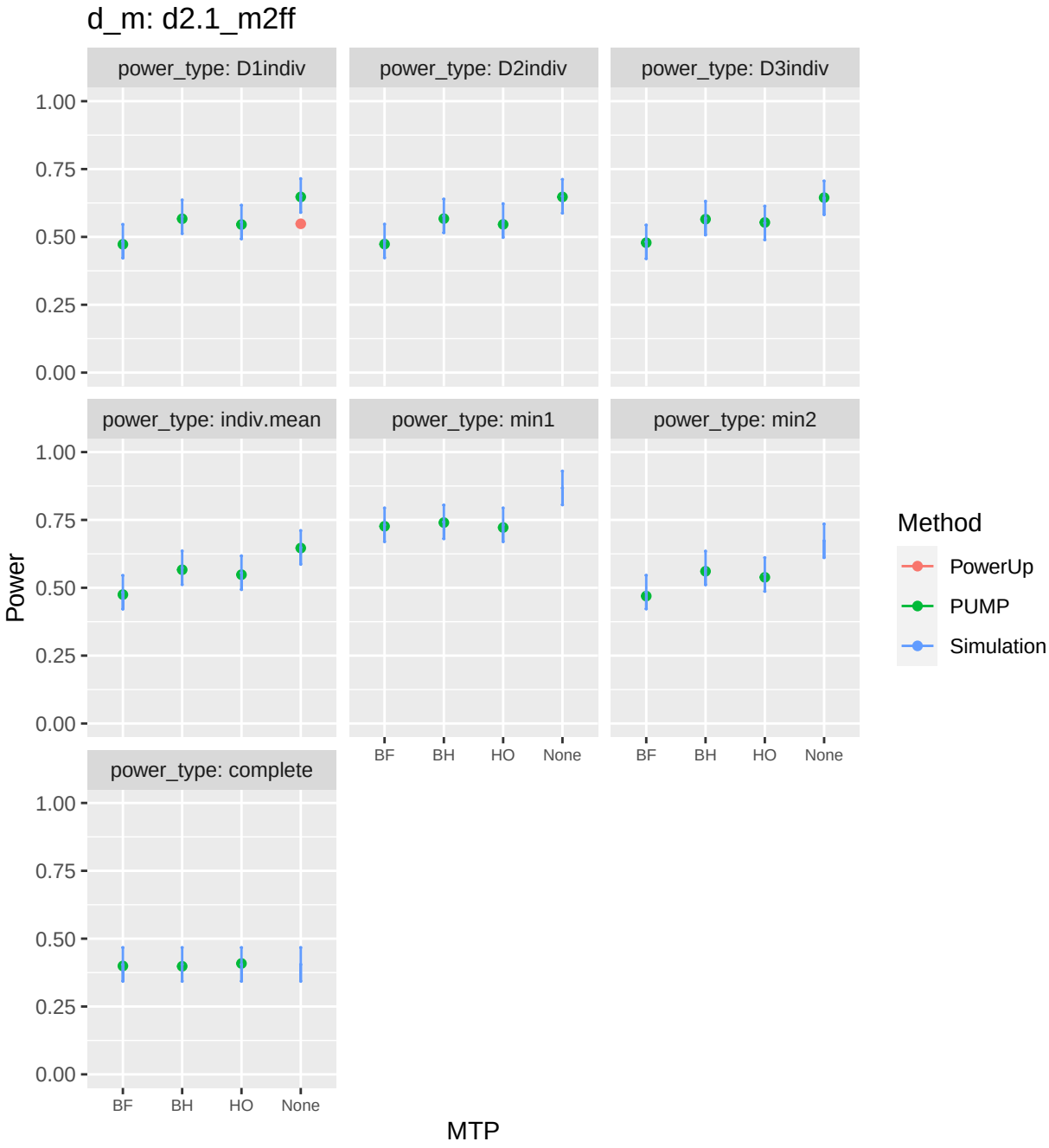
- Two-level design: $\text{ICC}_3 = 0$, $\omega_3 = 0$, $K = 1$

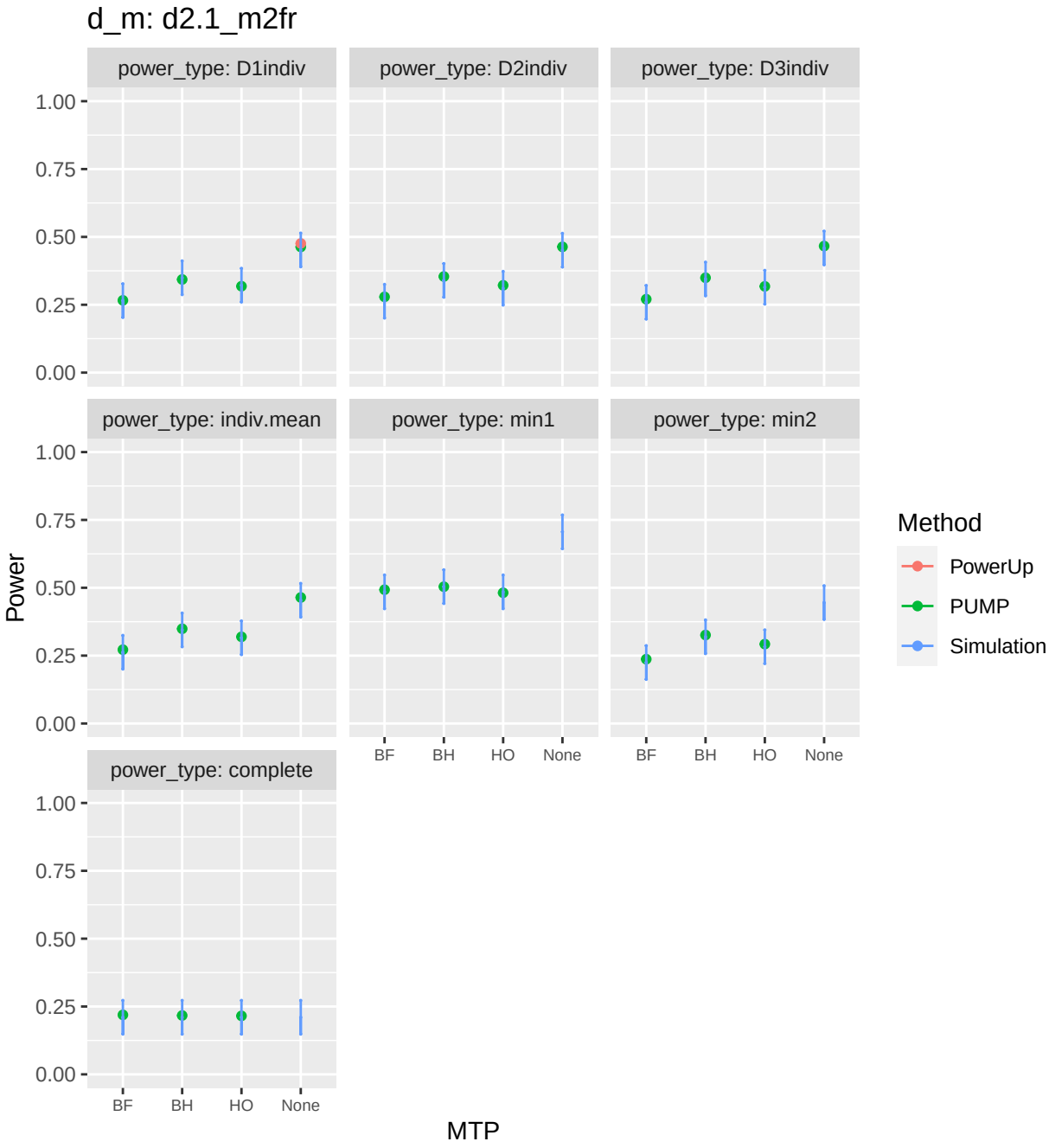
Remark. For all $d2.1_m2fc$ and $d2.1_m2ff$ designs and models, PowerUpR! assumes $ICC.2 = 0$, but we do not make that assumption here. Thus, we expect to see a discrepancy between PUMP and Powerup except for the setting when we assume $ICC.2 = 0$ for these designs and models. PowerUpR! does allow for a non-zero `ICC.2` for $d2.1_m2fr$.

Power Validation

Base case

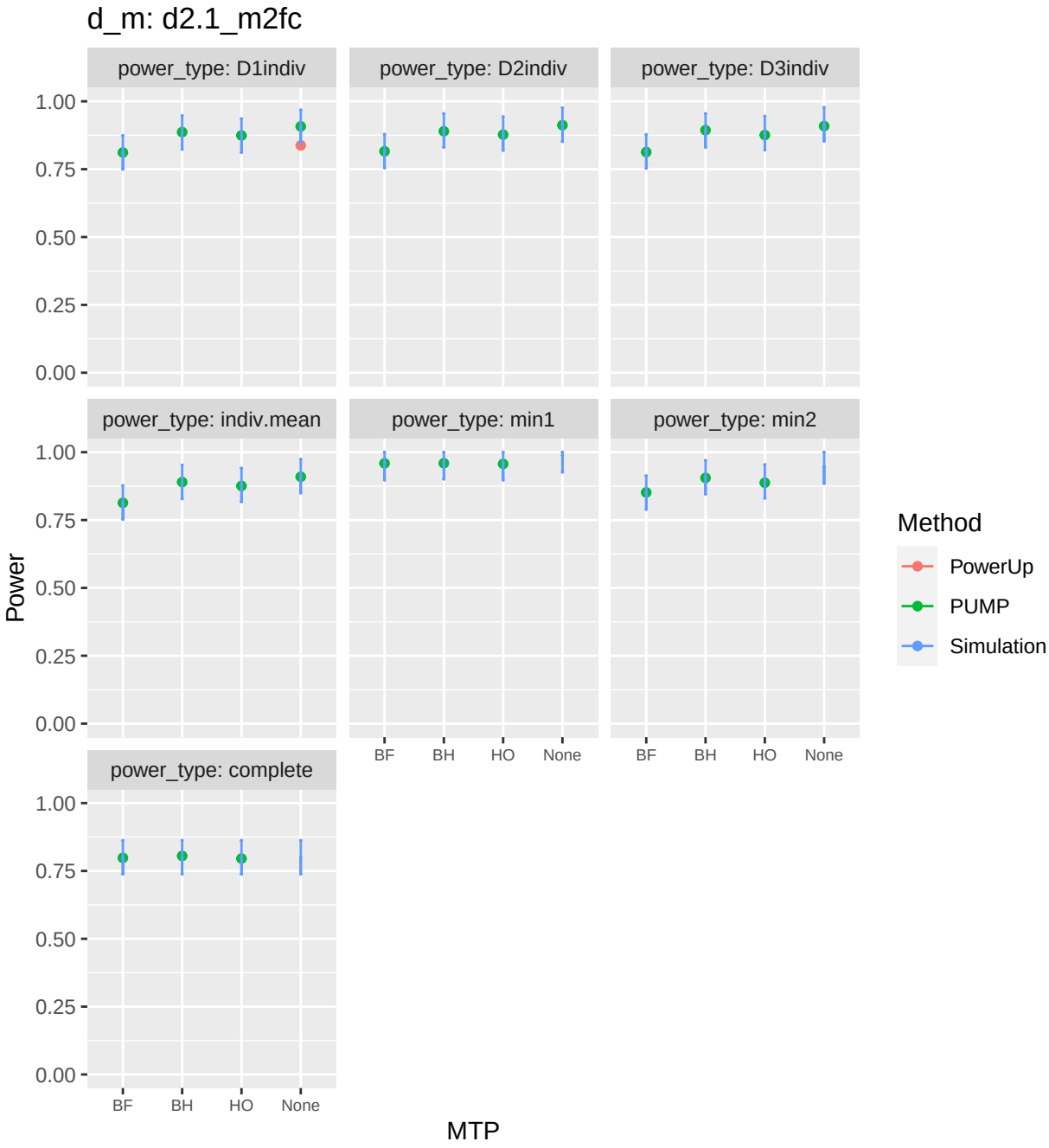


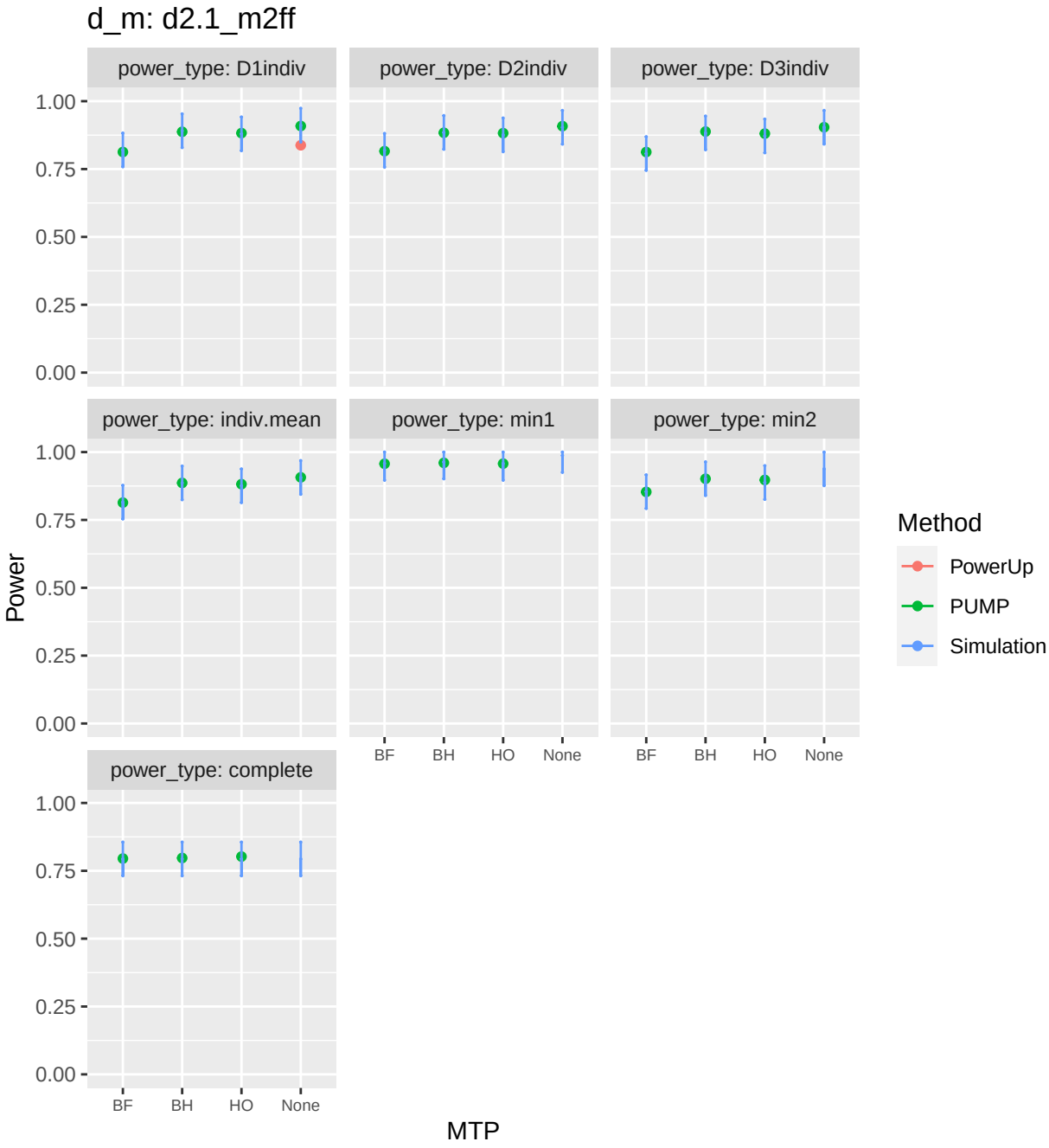

d_m: d2.1_m2ff
power_type: D1indiv
power_type: D2indiv
power_type: D3indiv
power_type: indiv.mean
power_type: min1
power_type: min2
power_type: complete
Power
1.00
0.75
0.50
0.25
0.00
BF
BH
HO
None
MTP
Method
PowerUp
PUMP
Simulation

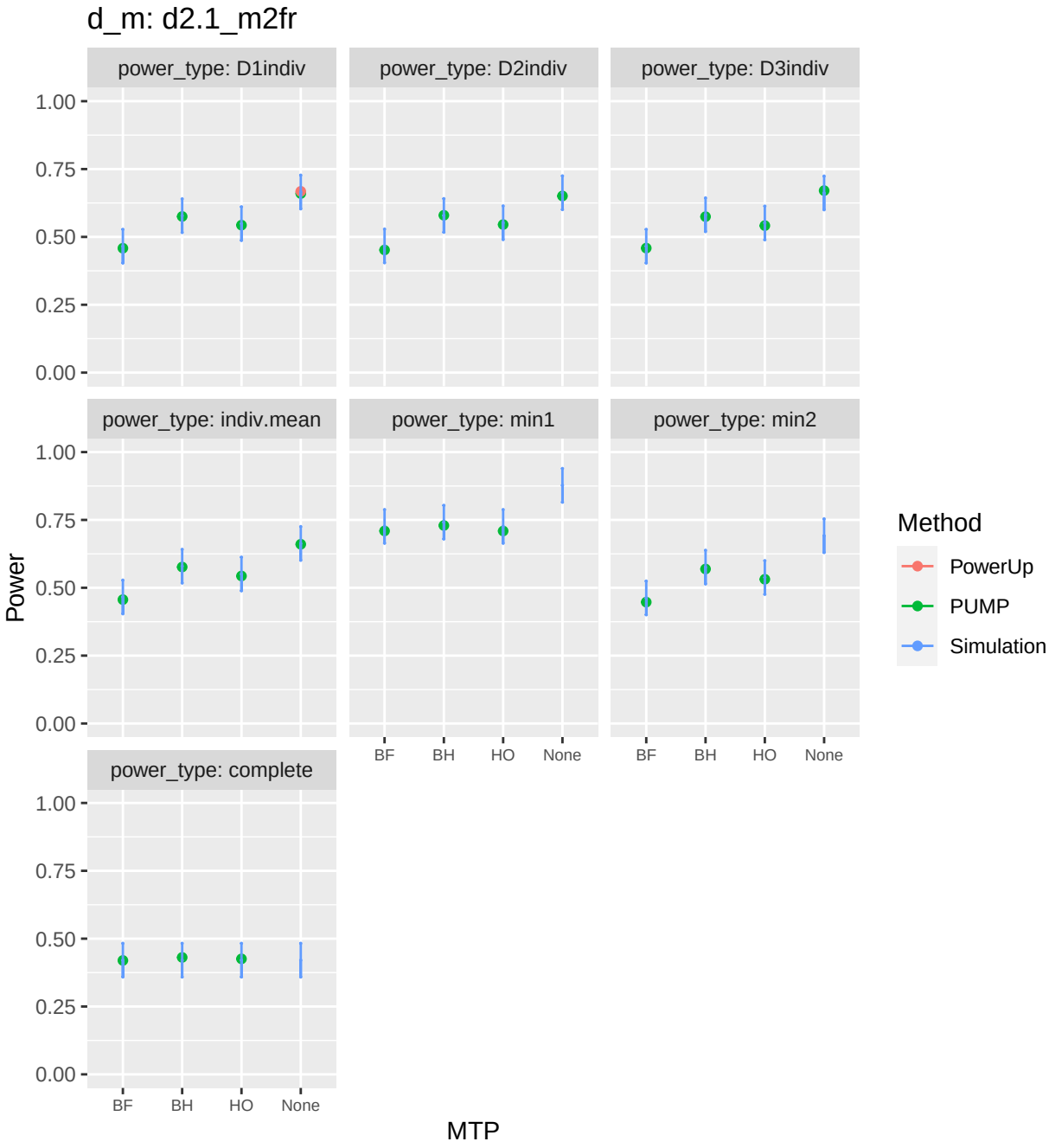

d_m: d2.1_m2fr
power_type: D1indiv
power_type: D2indiv
power_type: D3indiv
power_type: indiv.mean
power_type: min1
power_type: min2
power_type: complete
Power
1.00
0.75
0.50
0.25
0.00
BF
BH
HO
None
MTP
Method
PowerUp
PUMP
Simulation

Varying school size

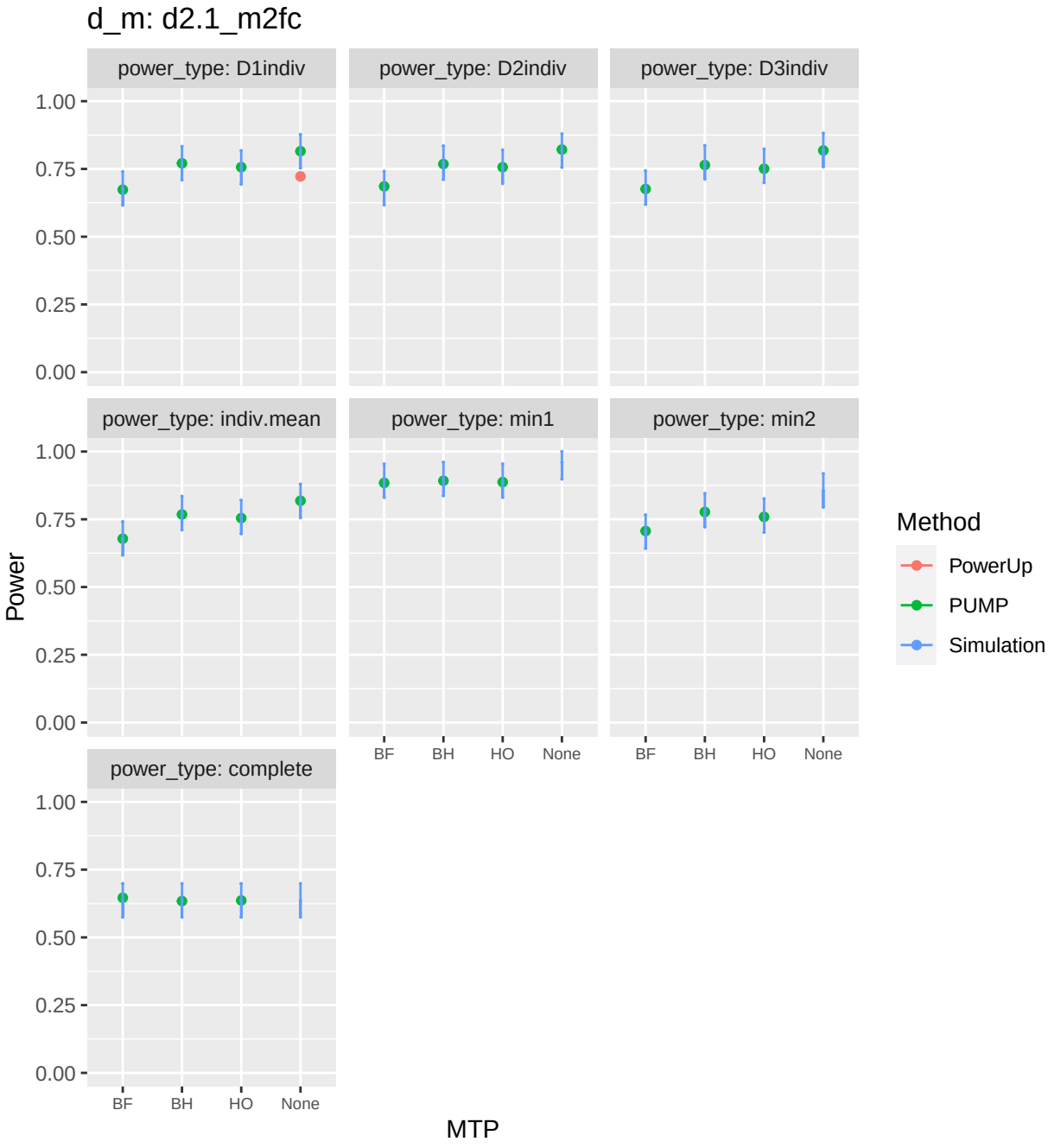
$\bar{n} = 100$

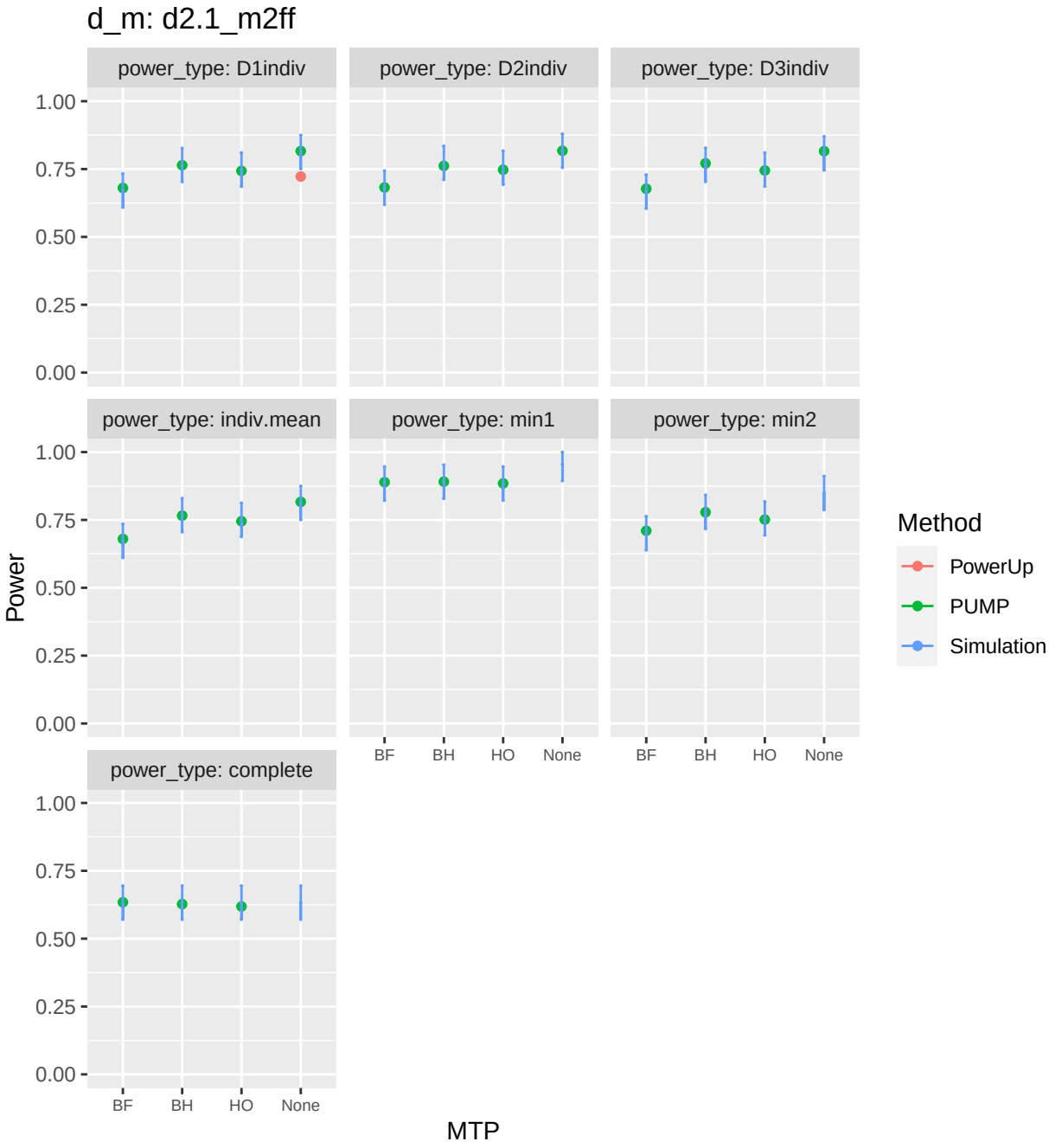


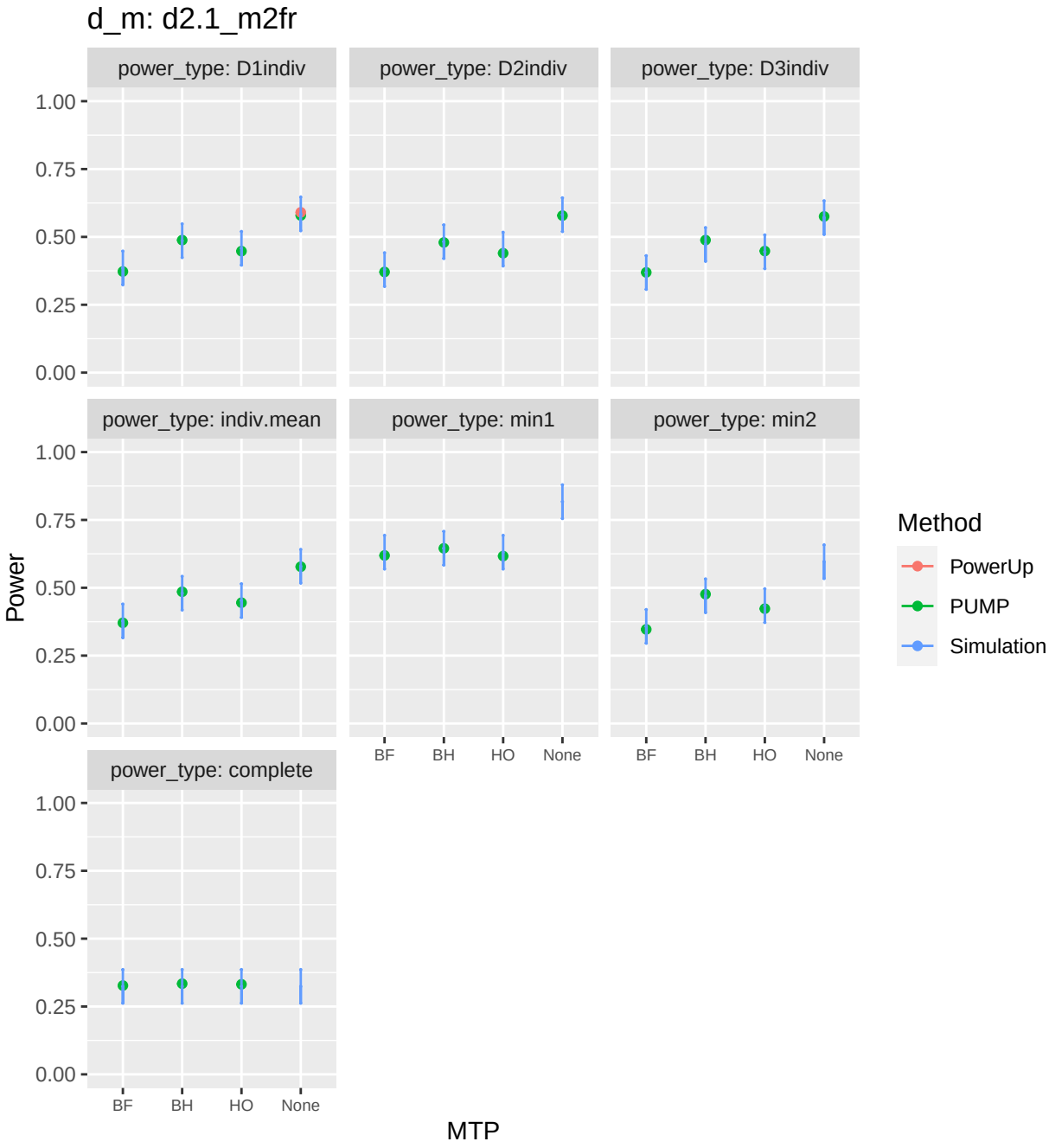

d_m: d2.1_m2ff
power_type: D1indiv
power_type: D2indiv
power_type: D3indiv
power_type: indiv.mean
power_type: min1
power_type: min2
power_type: complete
Power
1.00
0.75
0.50
0.25
0.00
BF
BH
HO
None
MTP
Method
PowerUp
PUMP
Simulation


d_m: d2.1_m2fr
power_type: D1indiv
power_type: D2indiv
power_type: D3indiv
power_type: indiv.mean
power_type: min1
power_type: min2
power_type: complete
Power
1.00
0.75
0.50
0.25
0.00
BF
BH
HO
None
MTP
Method
PowerUp
PUMP
Simulation

$\bar{n} = 75$

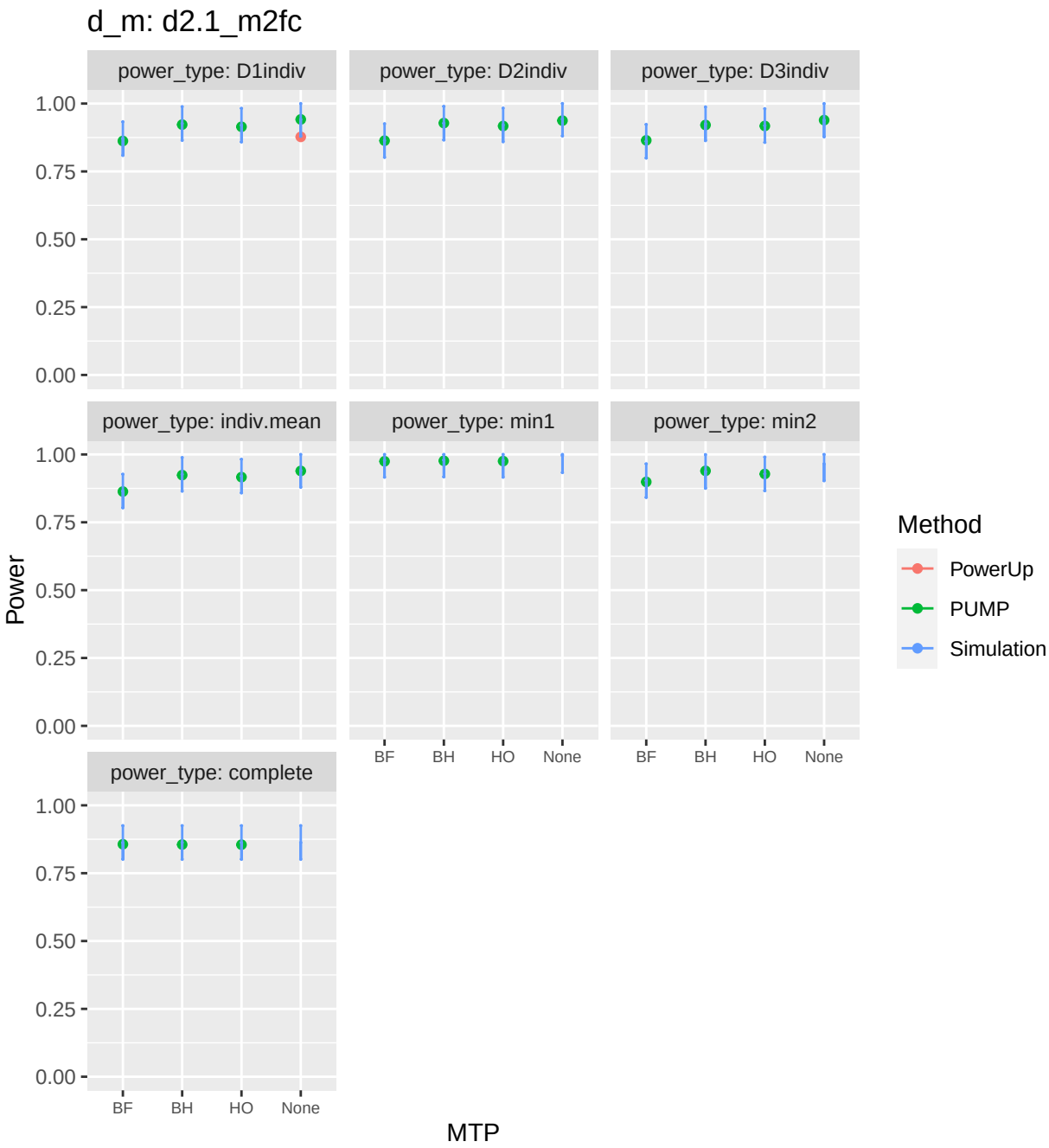

d_m: d2.1_m2fc
power_type: D1indiv
power_type: D2indiv
power_type: D3indiv
power_type: indiv.mean
power_type: min1
power_type: min2
power_type: complete
1.00
0.75
0.50
0.25
0.00
Power
BF
BH
HO
None
MTP
Method
PowerUp
PUMP
Simulation


d_m: d2.1_m2ff
power_type: D1indiv
power_type: D2indiv
power_type: D3indiv
power_type: indiv.mean
power_type: min1
power_type: min2
power_type: complete
Power
1.00
0.75
0.50
0.25
0.00
BF
BH
HO
None
MTP
Method
PowerUp
PUMP
Simulation

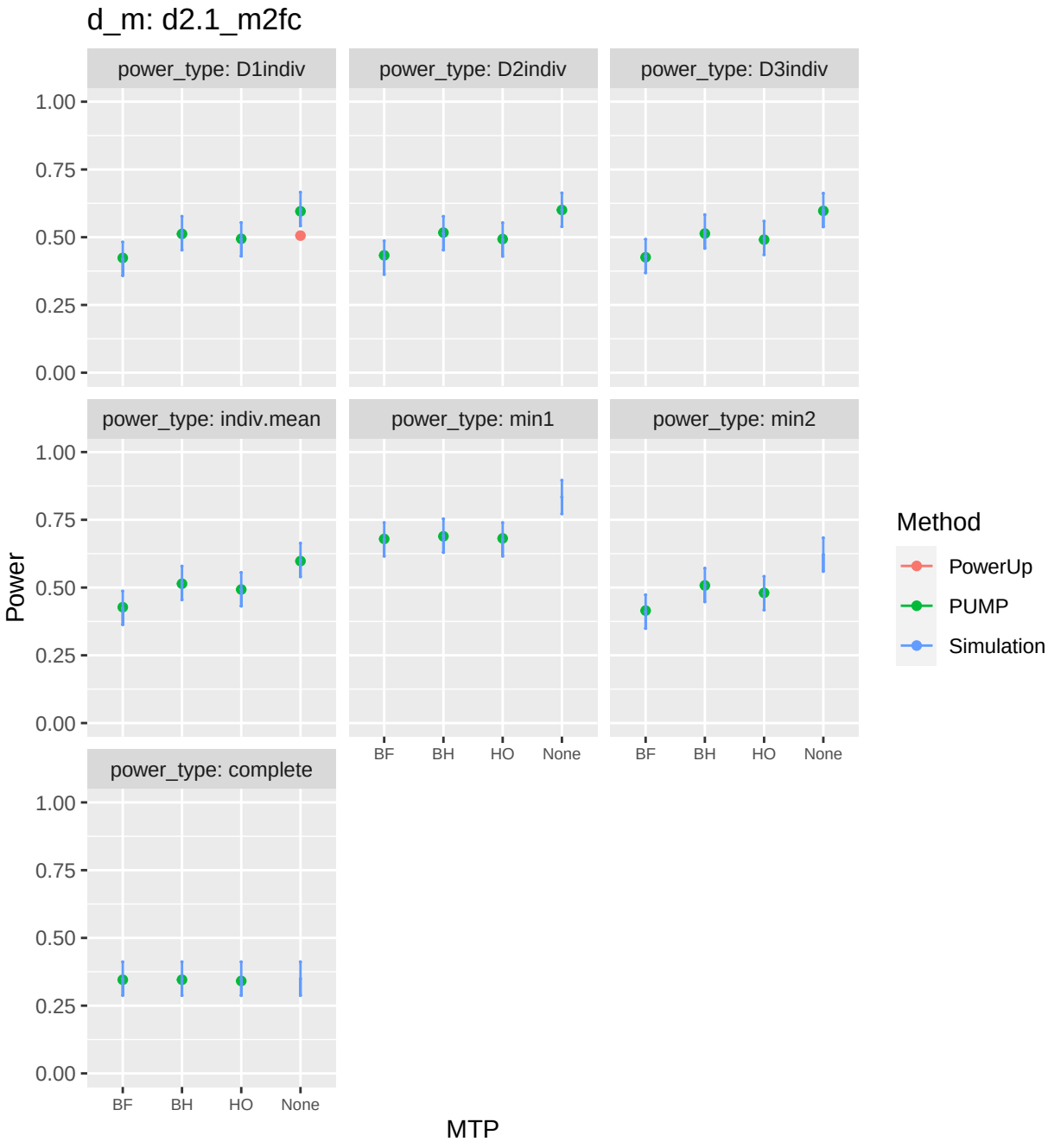

d_m: d2.1_m2fr
power_type: D1indiv
power_type: D2indiv
power_type: D3indiv
power_type: indiv.mean
power_type: min1
power_type: min2
power_type: complete
Power
1.00
0.75
0.50
0.25
0.00
BF
BH
HO
None
MTP
Method
PowerUp
PUMP
Simulation

Varying R2

$R_1^2 = 0.6, 0.6, 0.6$

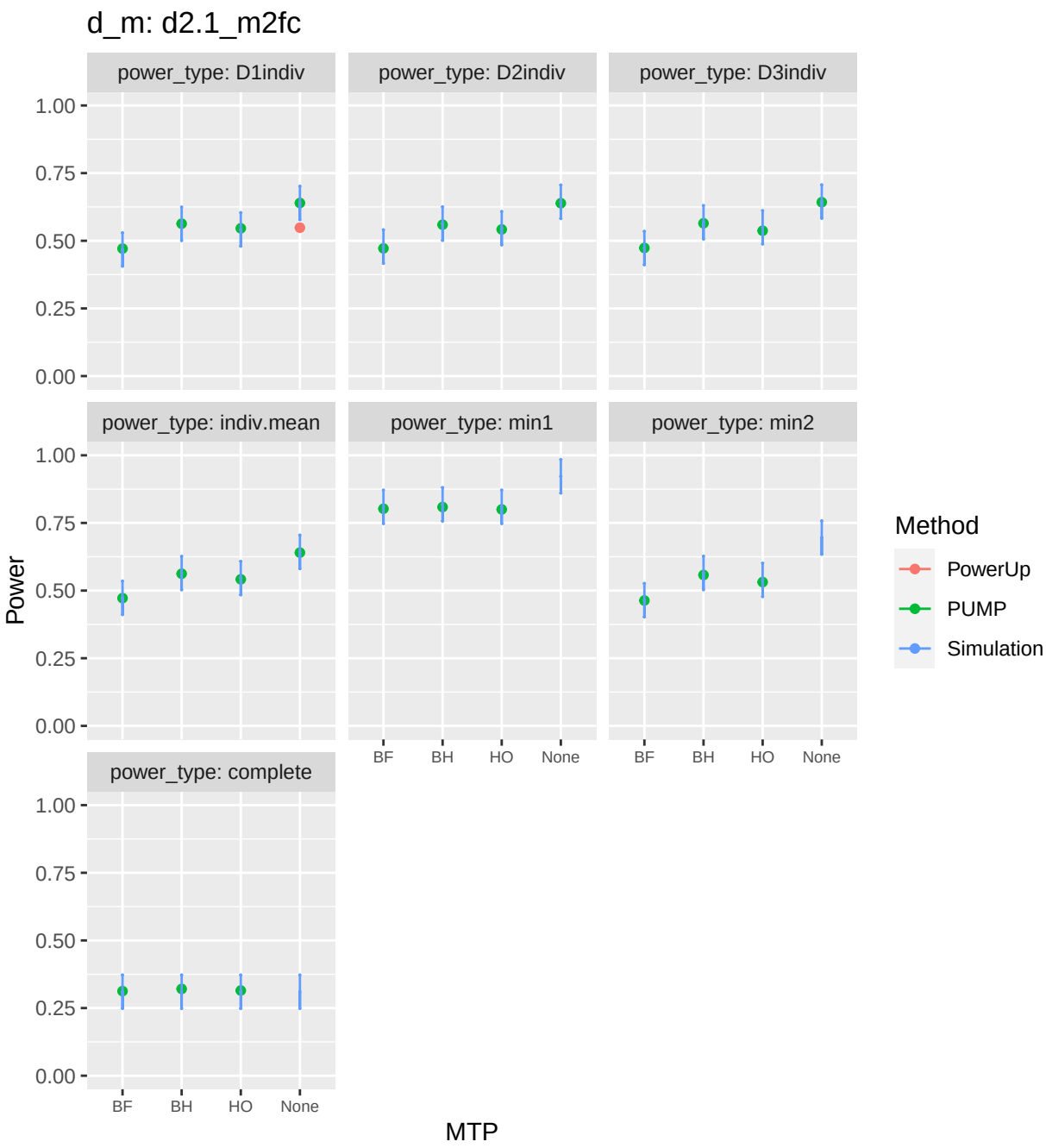


$R_1^2 = 0,\ 0,\ 0$

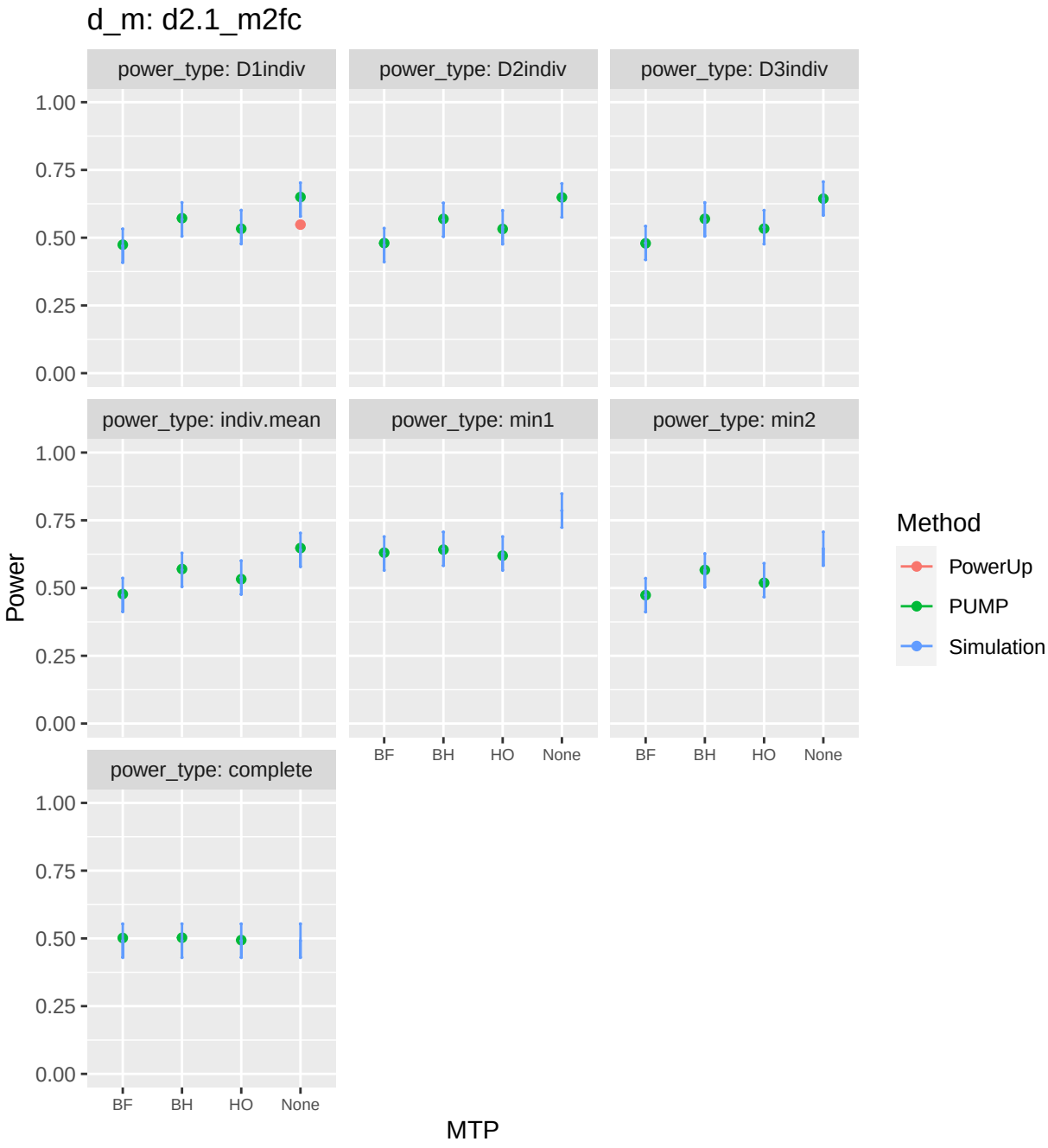

d_m: d2.1_m2fc
power_type: D1indiv
power_type: D2indiv
power_type: D3indiv
power_type: indiv.mean
power_type: min1
power_type: min2
power_type: complete
1.00
0.75
0.50
0.25
0.00
Power
BF
BH
HO
None
MTP
Method
PowerUp
PUMP
Simulation

Varying rho

$\rho = 0.2$

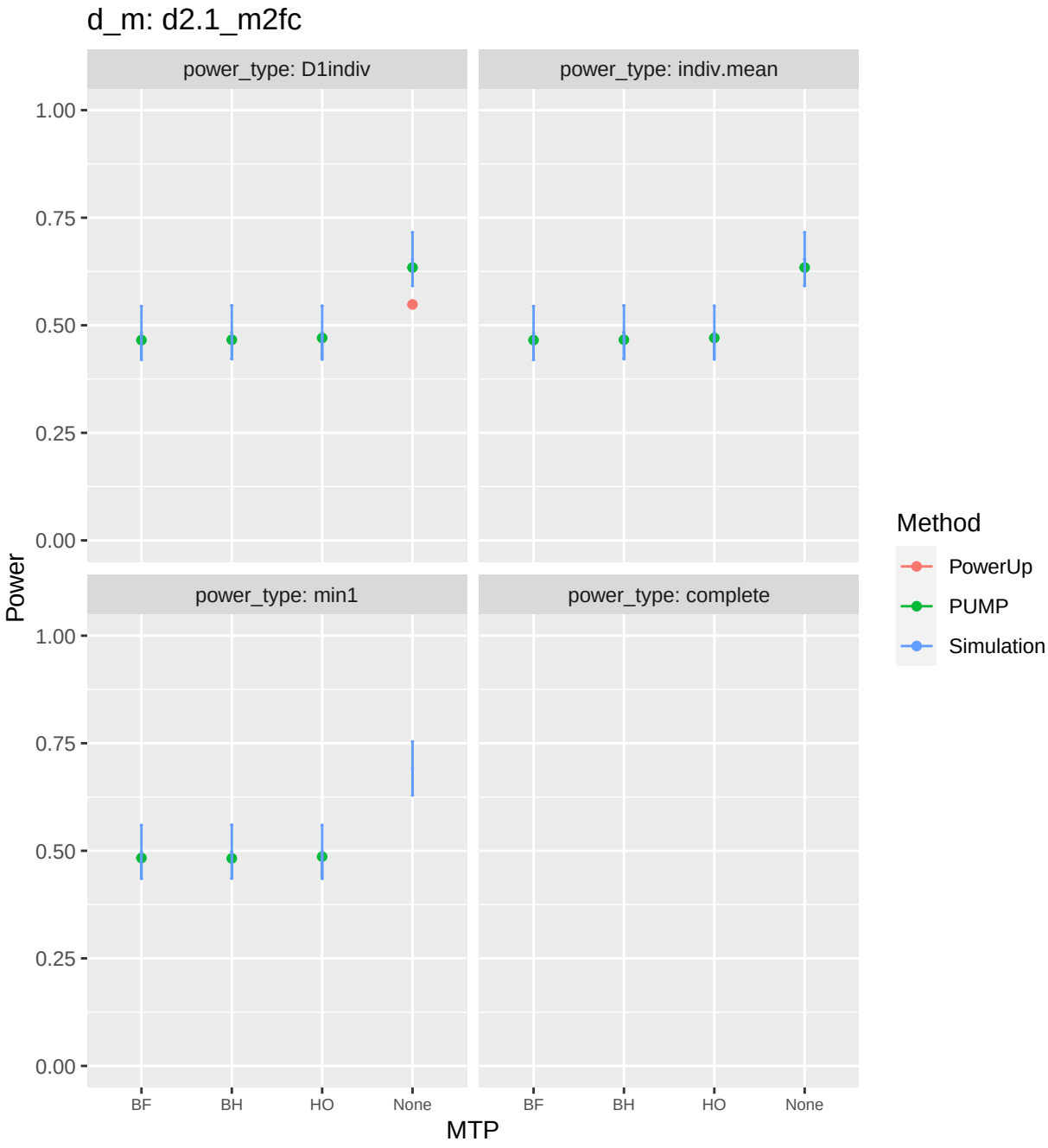


$\rho = 0.8$


d_m: d2.1_m2fc
power_type: D1indiv
power_type: D2indiv
power_type: D3indiv
power_type: indiv.mean
power_type: min1
power_type: min2
power_type: complete
1.00
0.75
0.50
0.25
0.00
Power
BF
BH
HO
None
MTP
Method
PowerUp
PUMP
Simulation

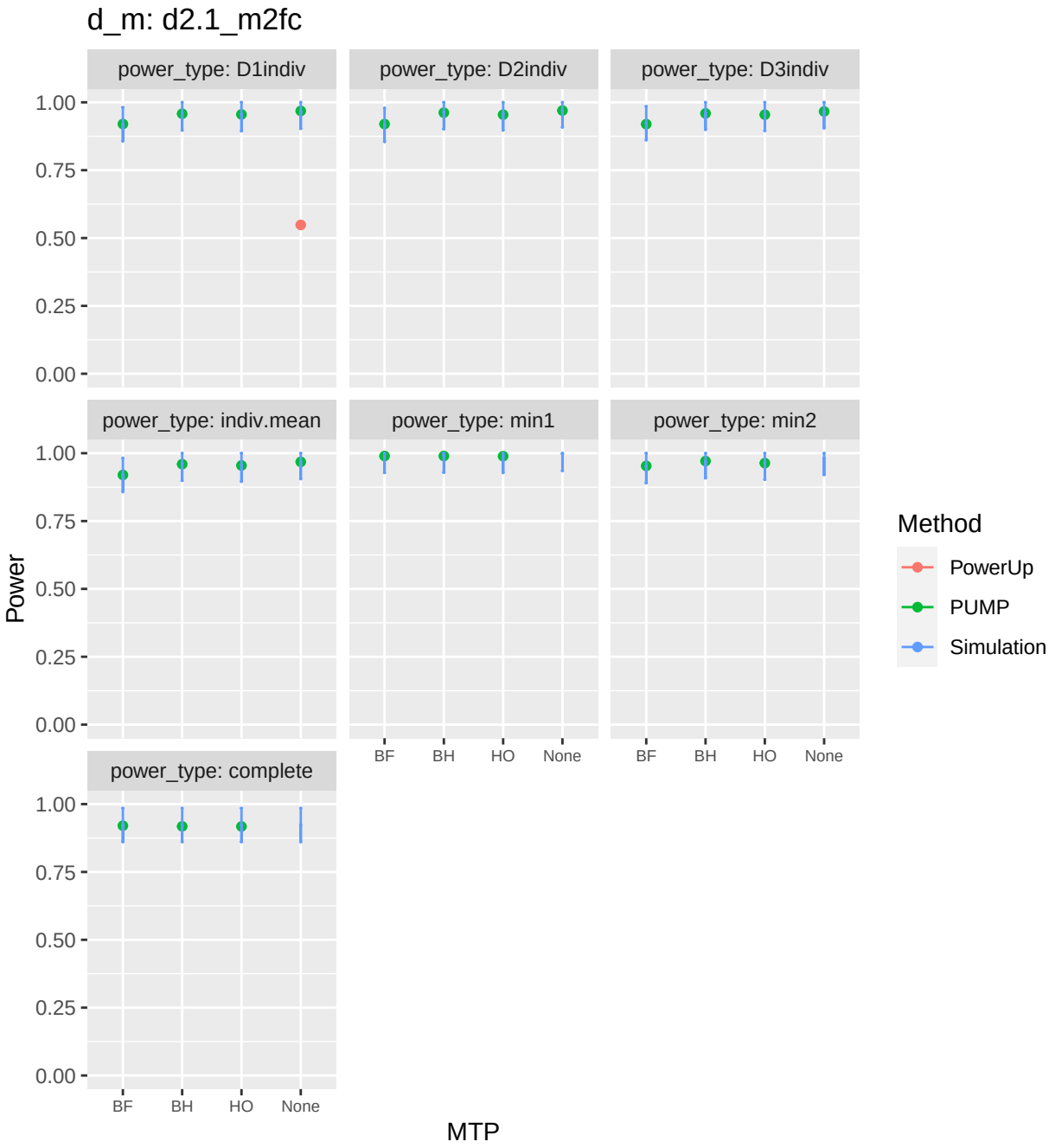
Varying true positives

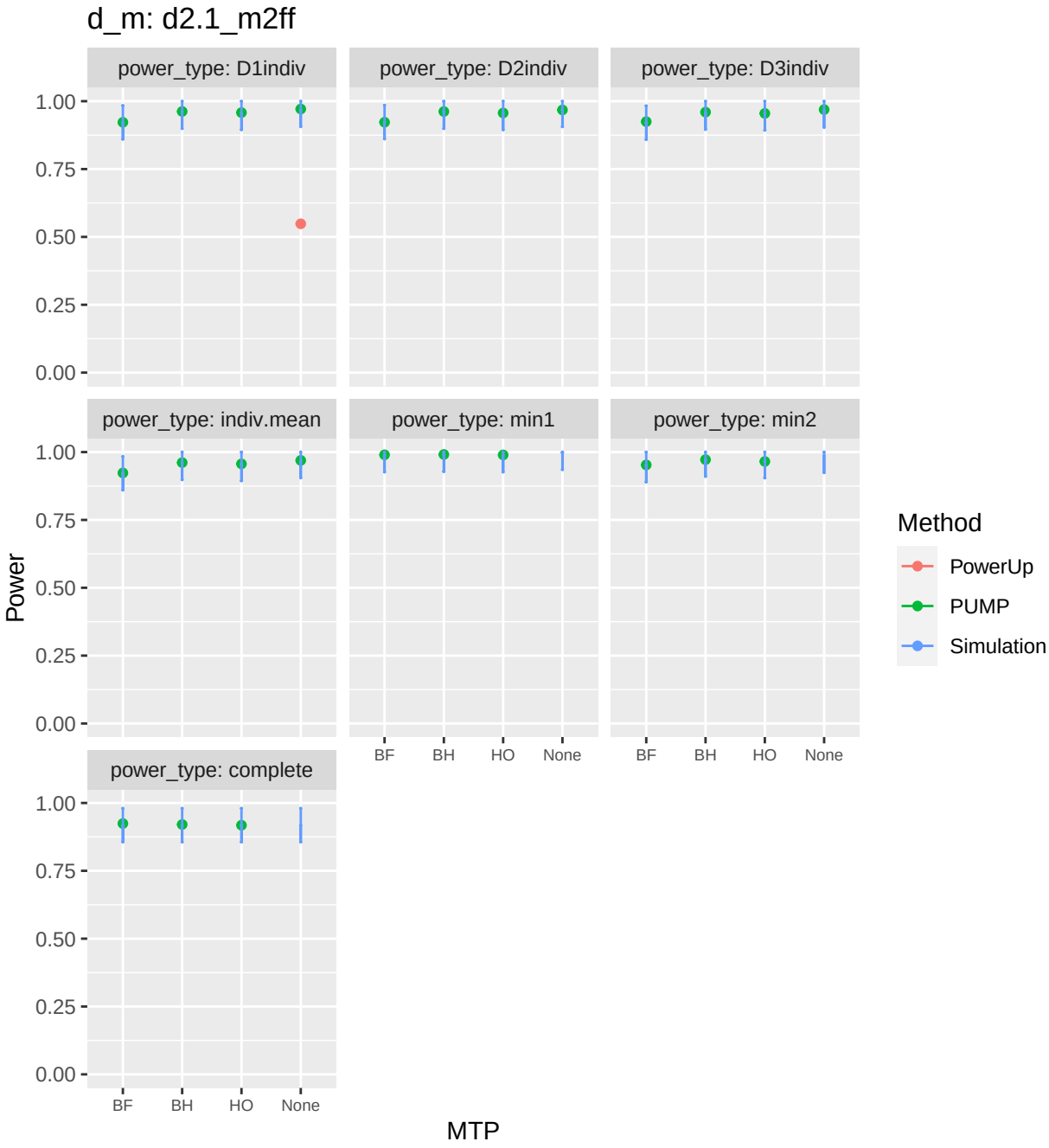
MDES = 0.125, 0, 0

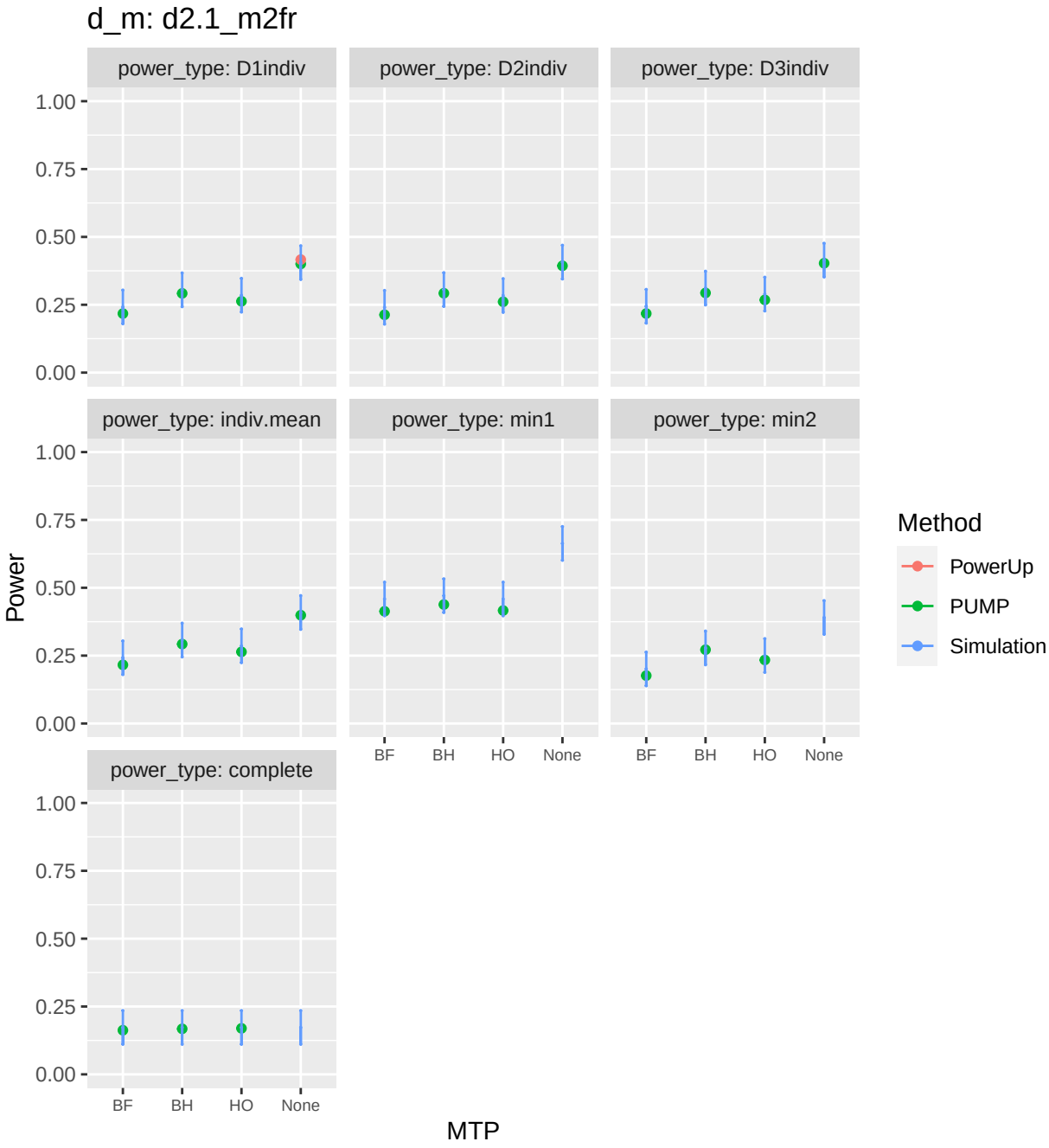


Varying ICC

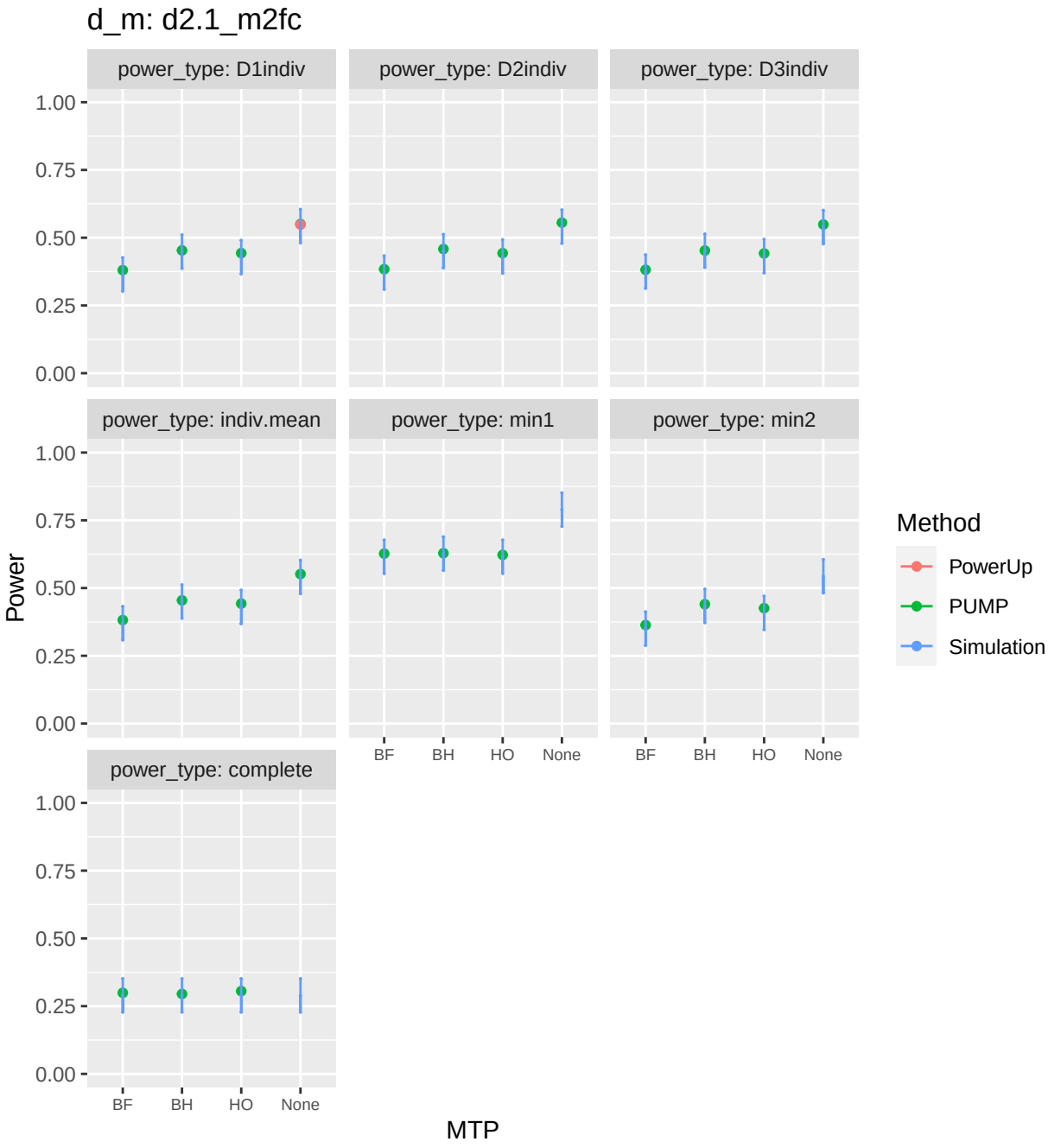
$\text{ICC}_2 = 0.7, 0.7, 0.7$

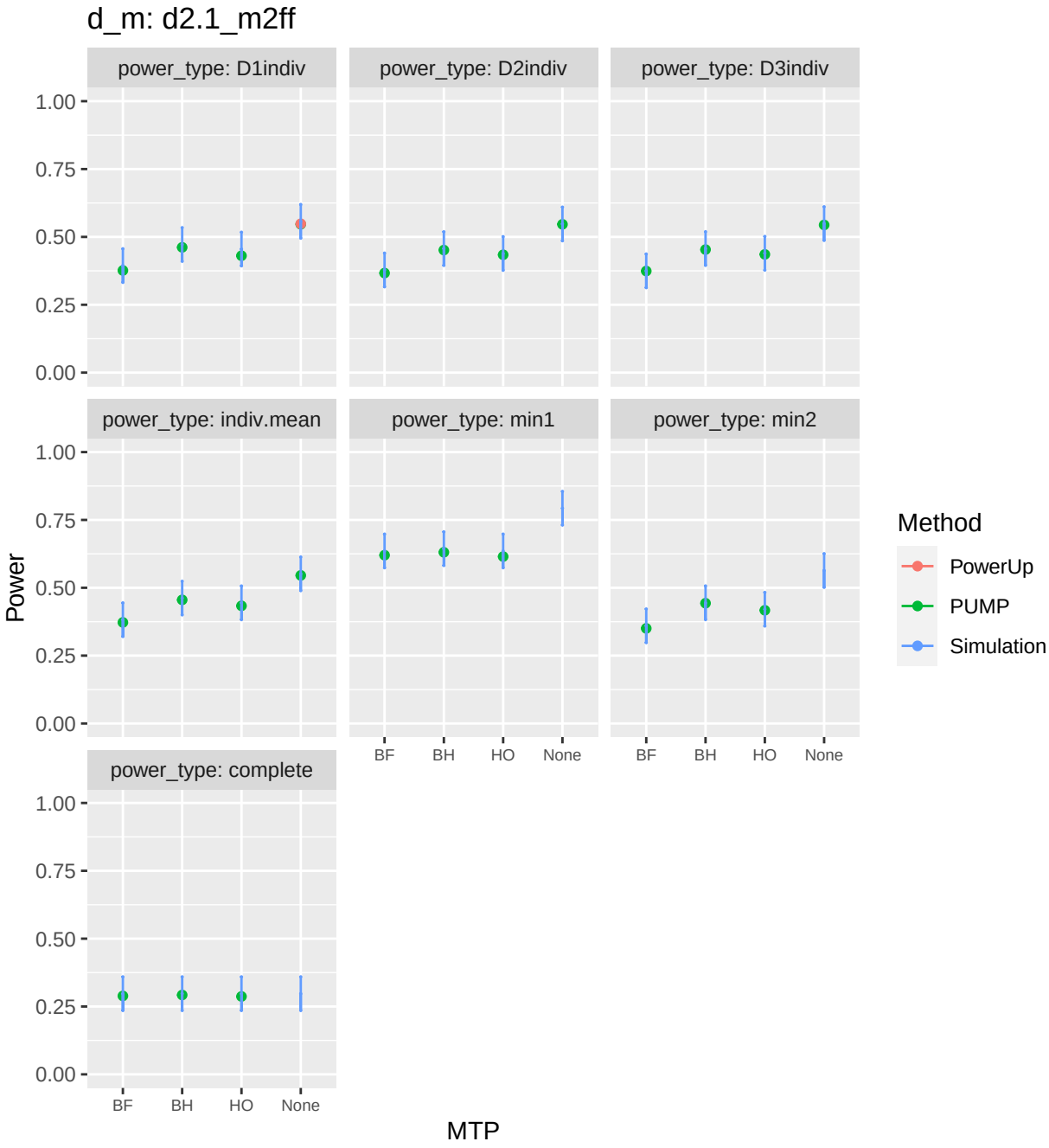


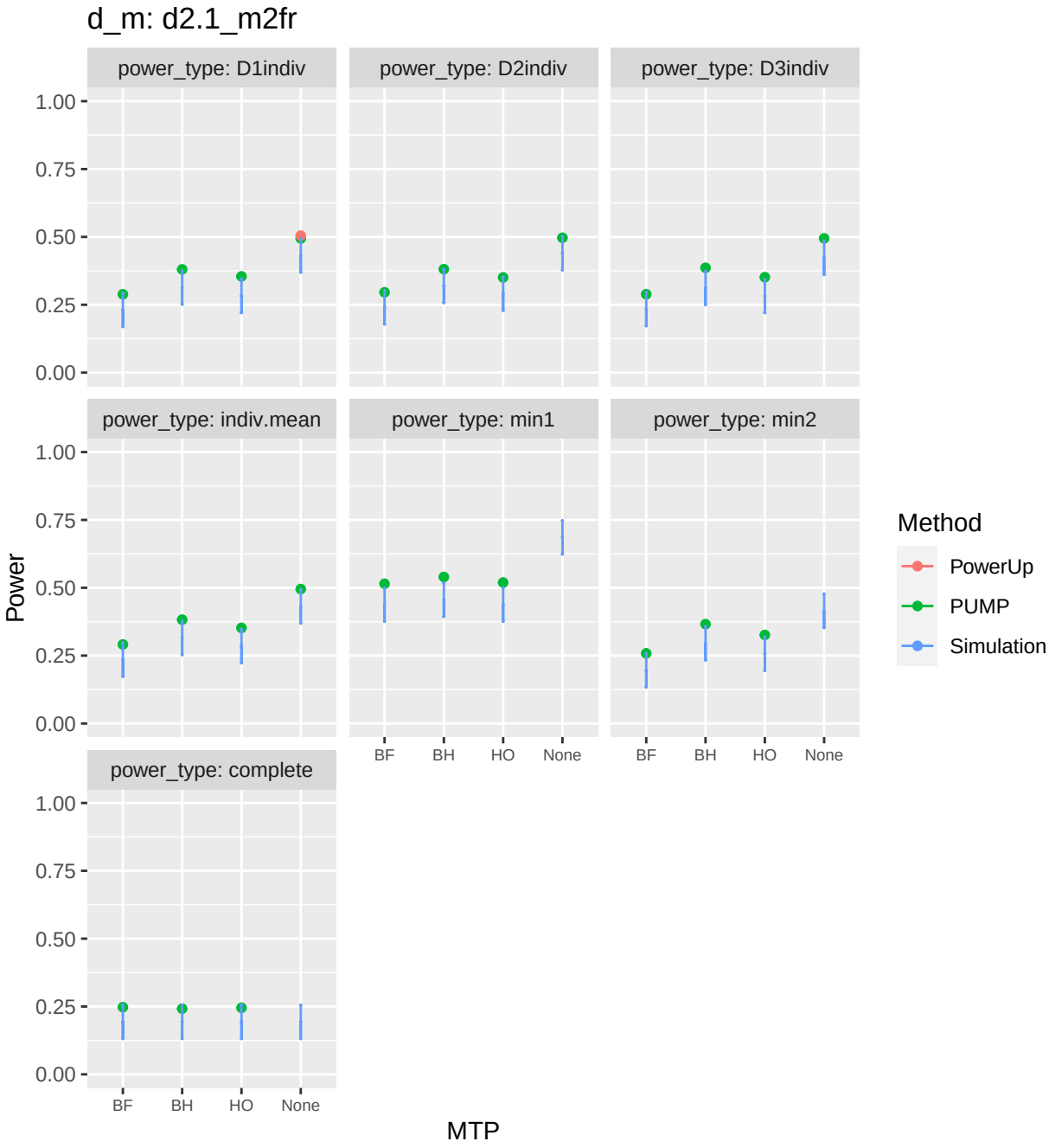

d_m: d2.1_m2ff
power_type: D1indiv
power_type: D2indiv
power_type: D3indiv
power_type: indiv.mean
power_type: min1
power_type: min2
power_type: complete
Power
1.00
0.75
0.50
0.25
0.00
BF
BH
HO
None
MTP
Method
PowerUp
PUMP
Simulation


d_m: d2.1_m2fr
power_type: D1indiv
power_type: D2indiv
power_type: D3indiv
power_type: indiv.mean
power_type: min1
power_type: min2
power_type: complete
Power
1.00
0.75
0.50
0.25
0.00
BF
BH
HO
None
MTP
Method
PowerUp
PUMP
Simulation

$\text{ICC}_2 = 0, 0, 0$

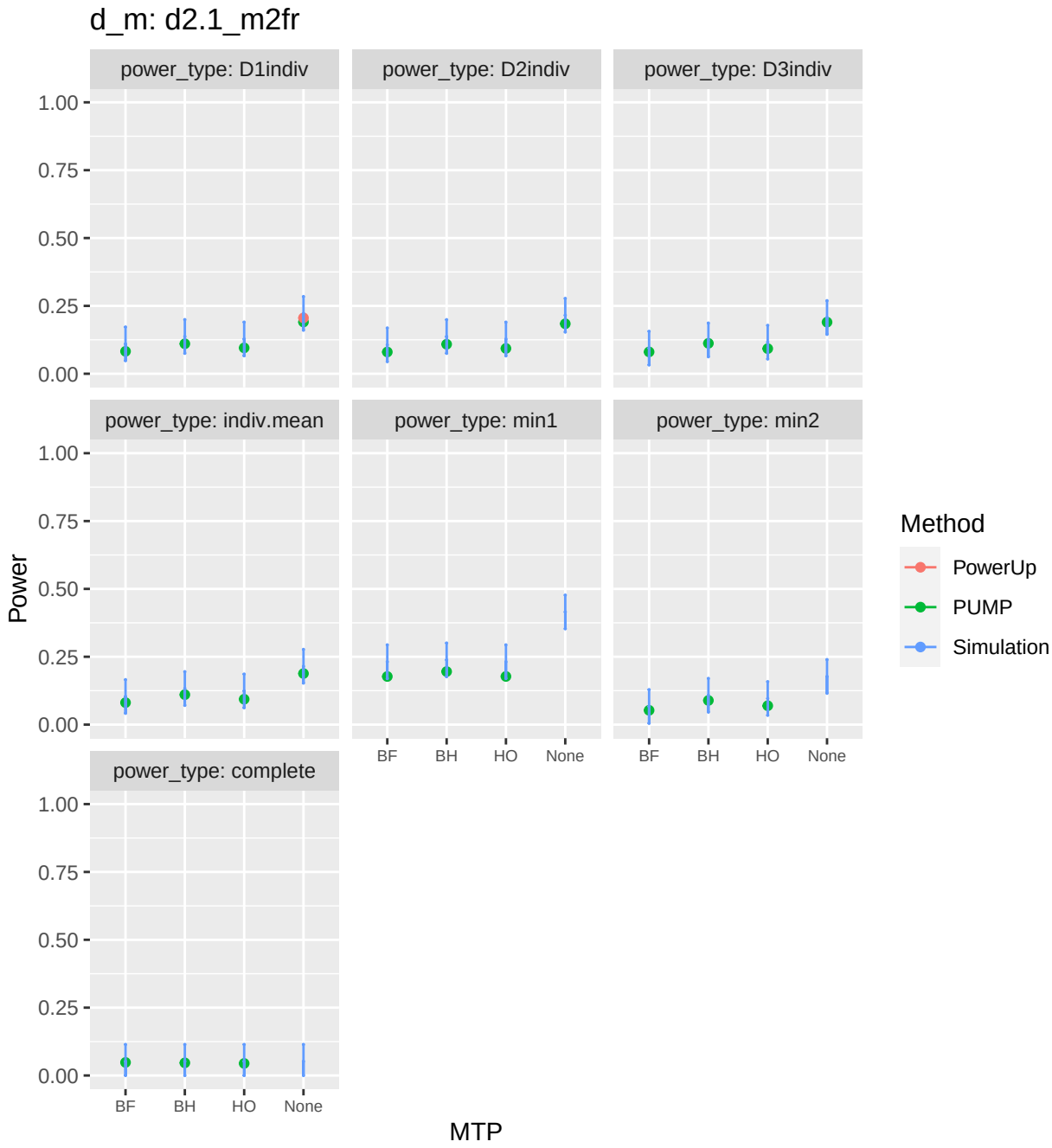



d_m: d2.1_m2ff
power_type: D1indiv
power_type: D2indiv
power_type: D3indiv
power_type: indiv.mean
power_type: min1
power_type: min2
power_type: complete
Power
1.00
0.75
0.50
0.25
0.00
BF
BH
HO
None
MTP
Method
PowerUp
PUMP
Simulation

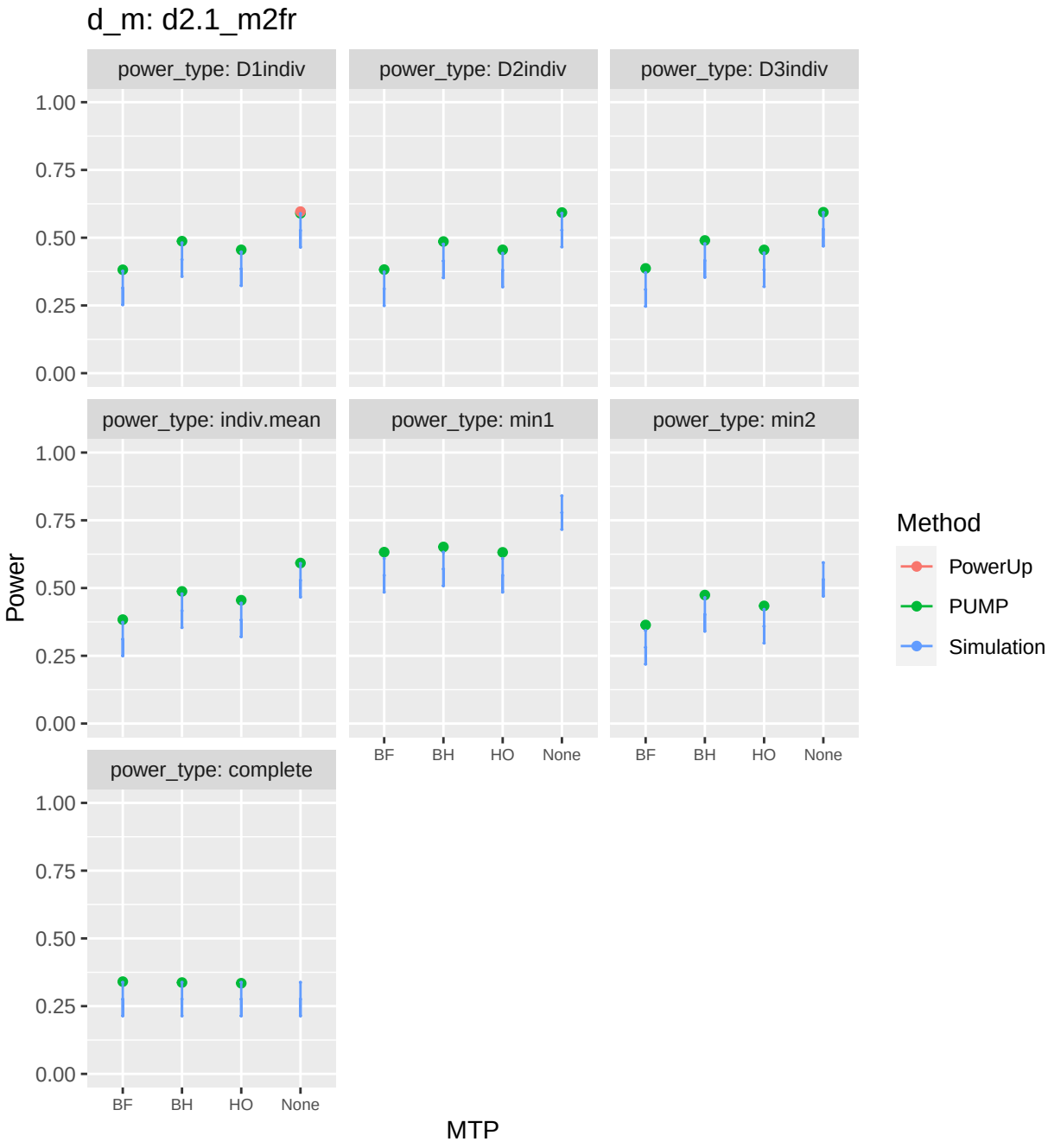

d_m: d2.1_m2fr
power_type: D1indiv
power_type: D2indiv
power_type: D3indiv
power_type: indiv.mean
power_type: min1
power_type: min2
power_type: complete
1.00
0.75
0.50
0.25
0.00
Power
BF
BH
HO
None
MTP
Method
PowerUp
PUMP
Simulation

Varying Omega

$\omega_2 = 0.8, 0.8, 0.8$



$\omega_2 = 0, 0, 0$


d_m: d2.1_m2fr
power_type: D1indiv
power_type: D2indiv
power_type: D3indiv
power_type: indiv.mean
power_type: min1
power_type: min2
power_type: complete
1.00
0.75
0.50
0.25
0.00
Power
BF
BH
HO
None
MTP
Method
PowerUp
PUMP
Simulation

MDES validation

Target value: 0.125

```
##
##
## +-----+---------------+---------------+-------------+
## | MTP | Adjusted MDES | D1indiv Power | Target MDES |
## +=====+===============+===============+=============+
## | BF  |     0.125     |     0.475     |    0.125    |
## +-----+---------------+---------------+-------------+
## | BH  |     0.124     |     0.557     |    0.125    |
## +-----+---------------+---------------+-------------+
## | HO  |     0.126     |     0.552     |    0.125    |
## +-----+---------------+---------------+-------------+
##
## Table: d2.1_m2fc
```

```
##
##
## +-----+---------------+---------------+-------------+
## | MTP | Adjusted MDES | D1indiv Power | Target MDES |
## +=====+===============+===============+=============+
## | BF  |     0.125     |     0.473     |    0.125    |
## +-----+---------------+---------------+-------------+
## | BH  |     0.125     |     0.567     |    0.125    |
## +-----+---------------+---------------+-------------+
## | HO  |     0.126     |     0.555     |    0.125    |
## +-----+---------------+---------------+-------------+
##
## Table: d2.1_m2ff
```

```
##
##
## +-----+---------------+---------------+-------------+
## | MTP | Adjusted MDES | D1indiv Power | Target MDES |
## +=====+===============+===============+=============+
## | BF  |     0.125     |     0.266     |    0.125    |
## +-----+---------------+---------------+-------------+
## | BH  |     0.125     |     0.351     |    0.125    |
## +-----+---------------+---------------+-------------+
## | HO  |     0.124     |     0.318     |    0.125    |
## +-----+---------------+---------------+-------------+
##
## Table: d2.1_m2fr
```

Sample size validation

Target values:

- J = 20
- K = 1
- nbar = 50

```
##
##
## +-----+-------------+-------------+---------------+
## | MTP | Sample.type | Sample.size | D1indiv.power |
## +=====+=============+=============+===============+
## | BF  |      J      |     20      |     0.475     |
## +-----+-------------+-------------+---------------+
## | BH  |      J      |     20      |     0.557     |
## +-----+-------------+-------------+---------------+
## | HO  |      J      |     20      |     0.537     |
## +-----+-------------+-------------+---------------+
##
## Table: d2.1_m2fc
```

```
##
##
## +-----+-------------+-------------+---------------+
## | MTP | Sample.type | Sample.size | D1indiv.power |
## +=====+=============+=============+===============+
## | BF  |    nbar     |    51.07    |     0.475     |
## +-----+-------------+-------------+---------------+
## | BH  |    nbar     |     50      |     0.563     |
## +-----+-------------+-------------+---------------+
## | HO  |    nbar     |     50      |     0.536     |
## +-----+-------------+-------------+---------------+
##
## Table: d2.1_m2fc
```

```
##
##
## +-----+-------------+-------------+---------------+
## | MTP | Sample.type | Sample.size | D1indiv.power |
## +=====+=============+=============+===============+
## | BF  |      J      |     20      |     0.473     |
## +-----+-------------+-------------+---------------+
## | BH  |      J      |     21      |     0.565     |
## +-----+-------------+-------------+---------------+
## | HO  |      J      |     21      |     0.552     |
## +-----+-------------+-------------+---------------+
##
## Table: d2.1_m2ff
```

Target value: 50

```
##
##
## +-----+-------------+-------------+---------------+
## | MTP | Sample.type | Sample.size | D1indiv.power |
## +=====+=============+=============+===============+
```

```
## | BF  |      J      |     20      |     0.266     |
## +-----+-------------+-------------+---------------+
## | BH  |      J      |     20      |     0.352     |
## +-----+-------------+-------------+---------------+
## | HO  |      J      |     20      |     0.316     |
## +-----+-------------+-------------+---------------+
##
## Table: d2.1_m2fr
```

```
##
##
## +-----+-------------+-------------+---------------+
## | MTP | Sample.type | Sample.size | D1indiv.power |
## +=====+=============+=============+===============+
## | BF  |      J      |     20      |     0.266     |
## +-----+-------------+-------------+---------------+
## | BH  |      J      |     20      |     0.352     |
## +-----+-------------+-------------+---------------+
## | HO  |      J      |     20      |     0.316     |
## +-----+-------------+-------------+---------------+
##
## Table: d2.1_m2fr
```