

Validate Power: d2.1

December 29, 2021

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

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

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

Default parameters:

- $M = 3$
- $J = 20$
- $\rho = 0.5$
- $MDES = 0.125, 0.125, 0.125$
- $R_1^2 = 0.1, 0.1, 0.1$
- $ICC_2 = 0.2, 0.2, 0.2$

Parameters by model type:

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

Assumptions:

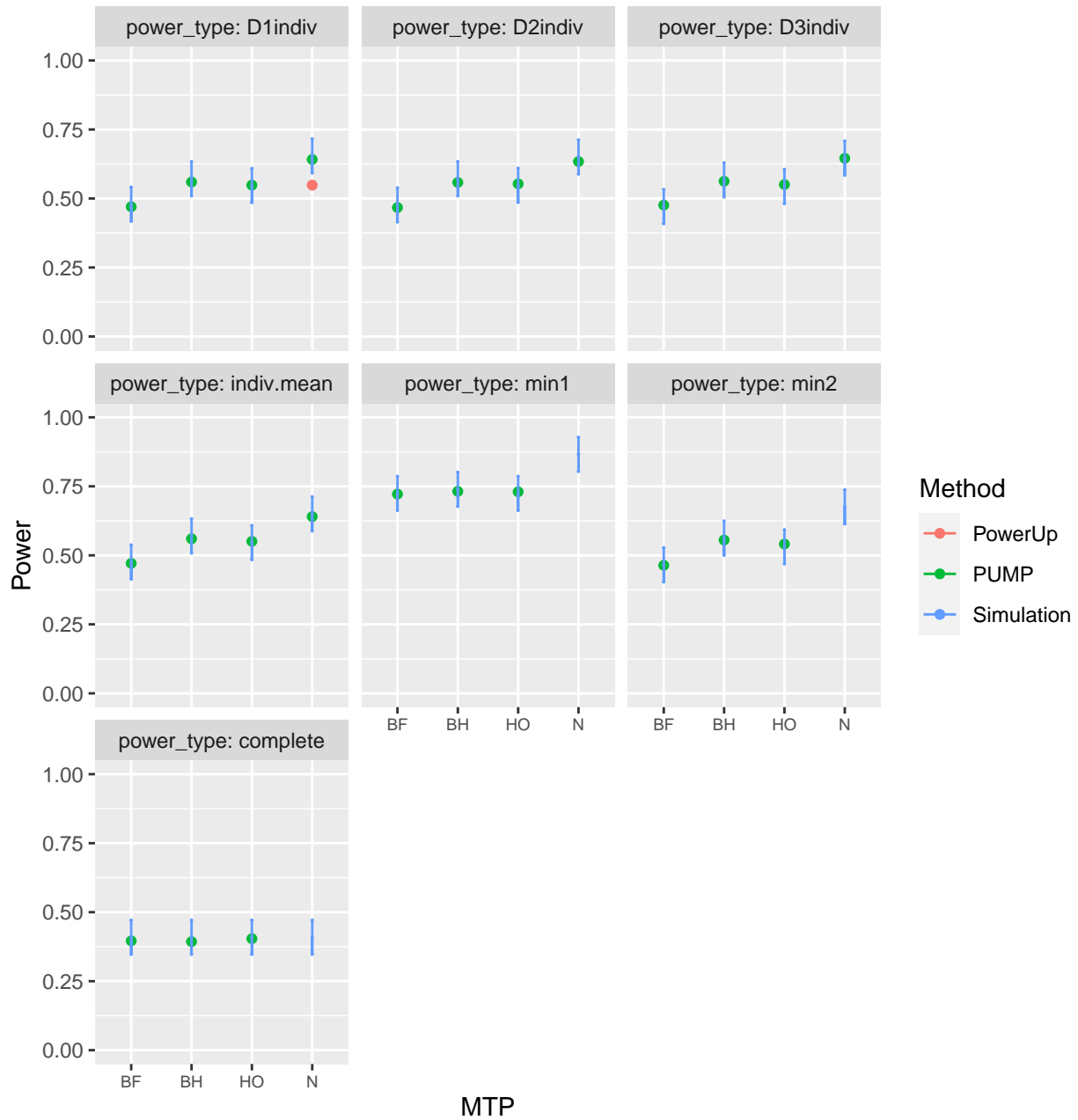
- Two-level design: $ICC_3 = 0, \omega_3 = 0, K = 1$

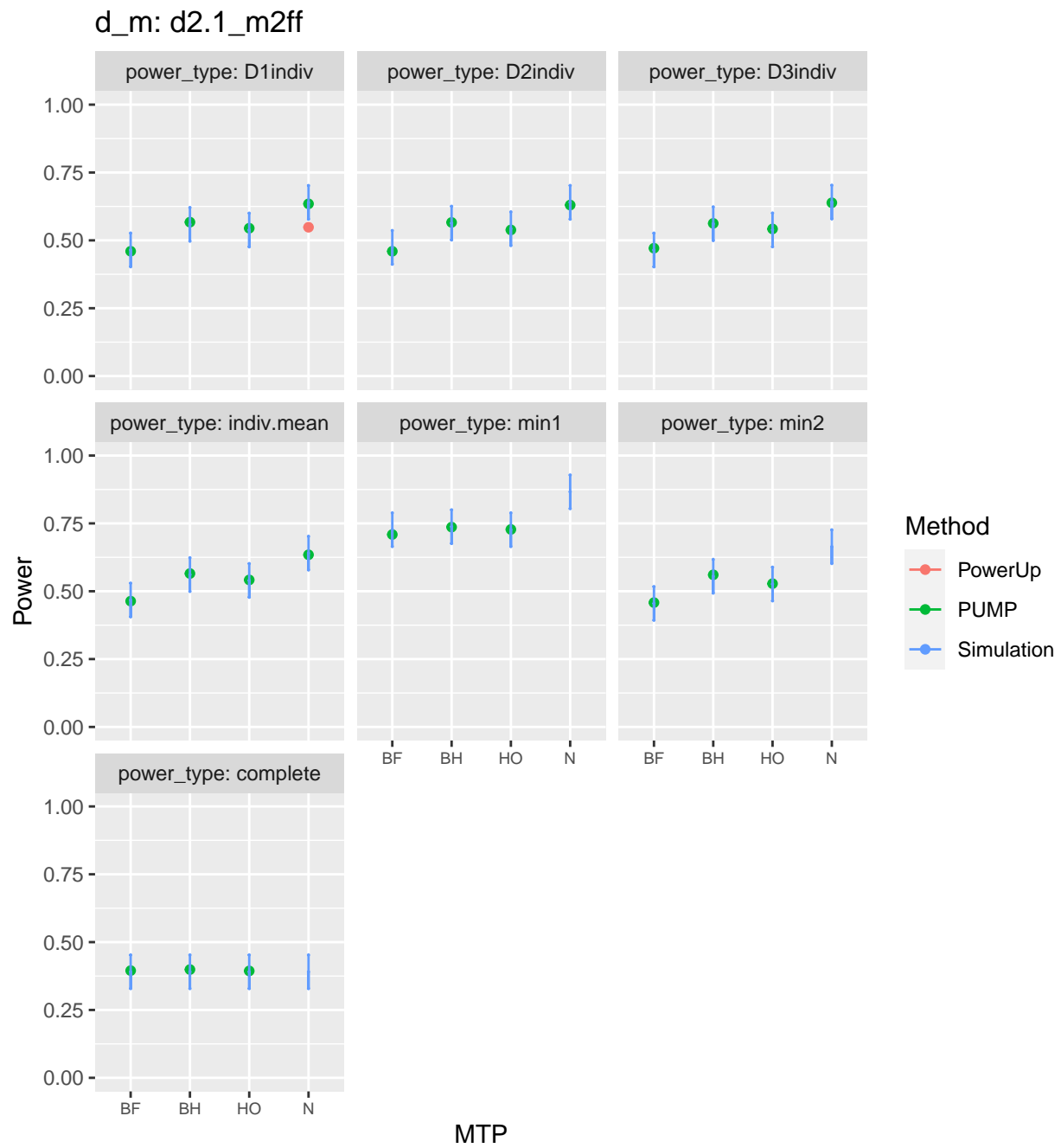
Remark. For all d2.1 designs and models, PowerUpR! assumes $ICC.2 = 0$, but we do not make that assumption here. Thus, we expect to see a discrepancy between PUMP and Powerup except for the setting when we assume $ICC.2 = 0$.

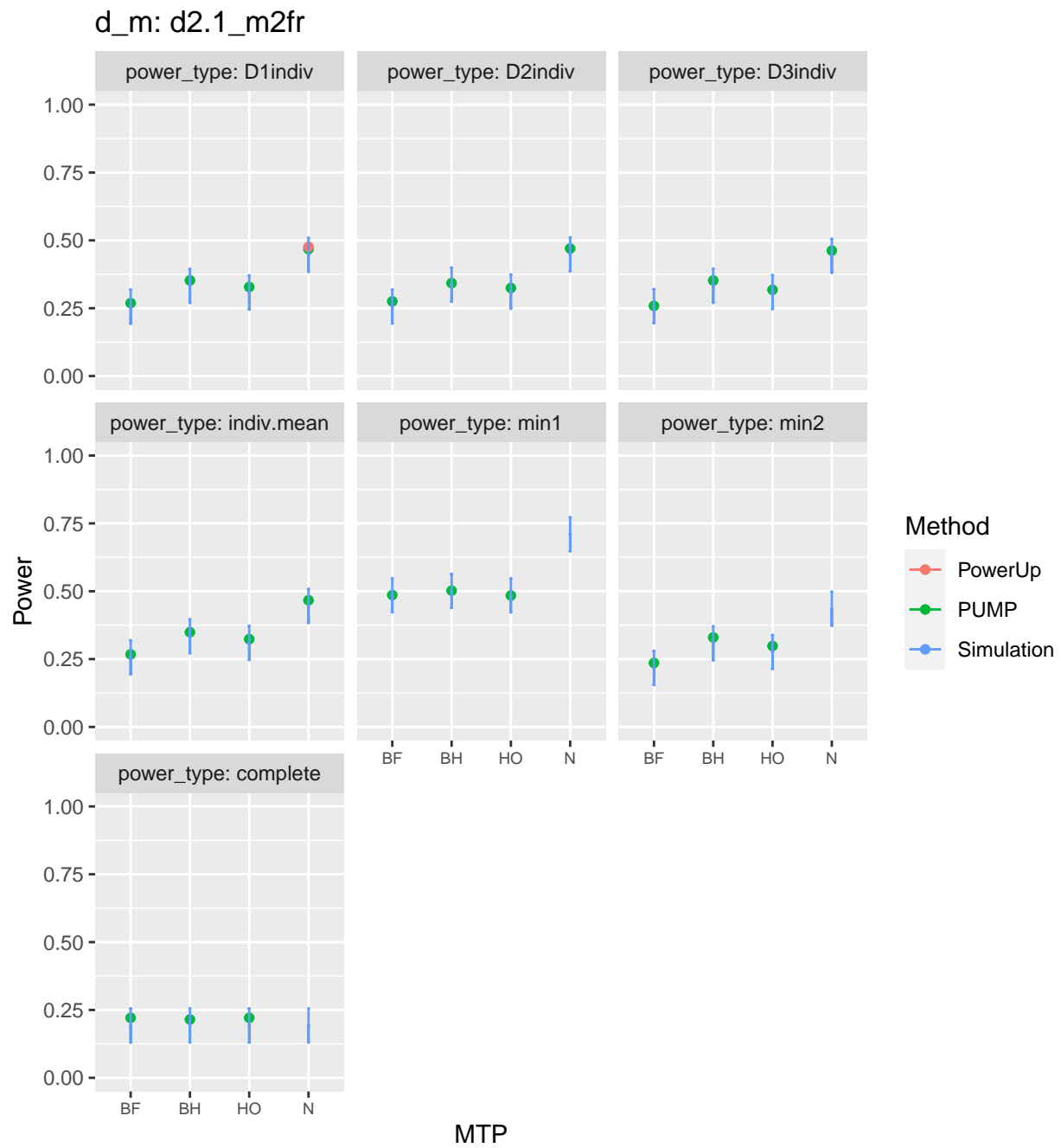
Power Validation

Base case

d_m: d2.1_m2fc



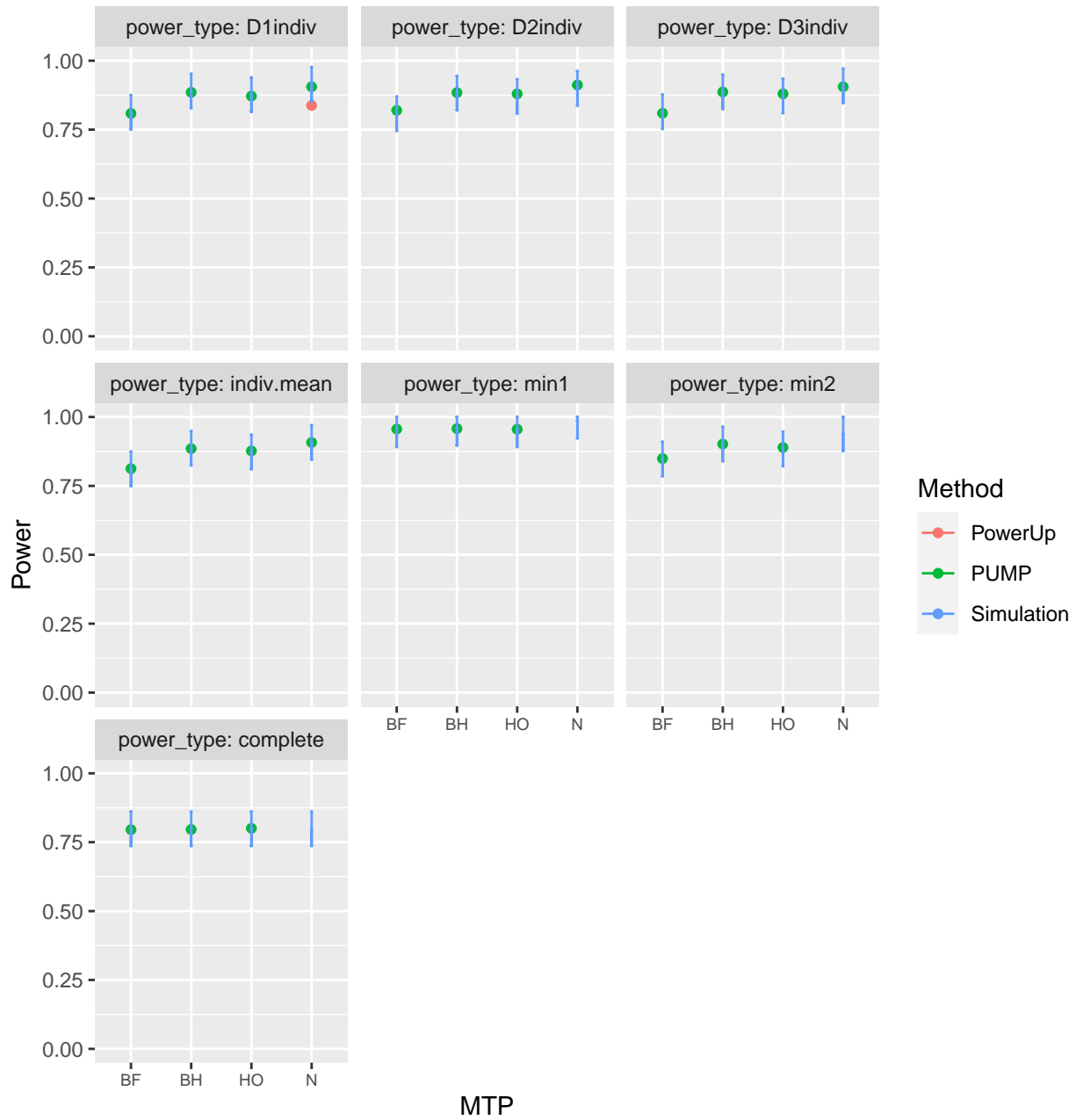


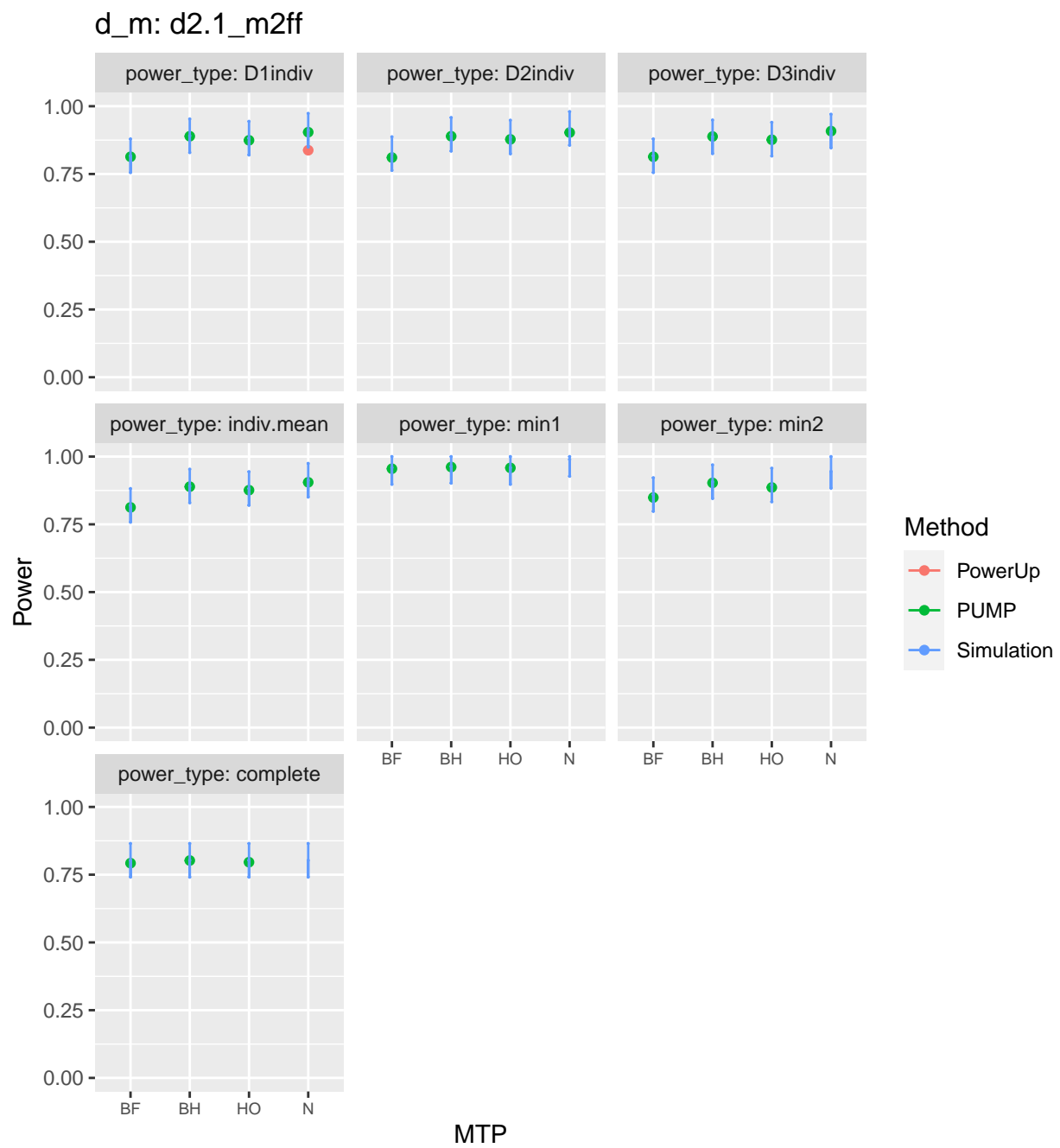


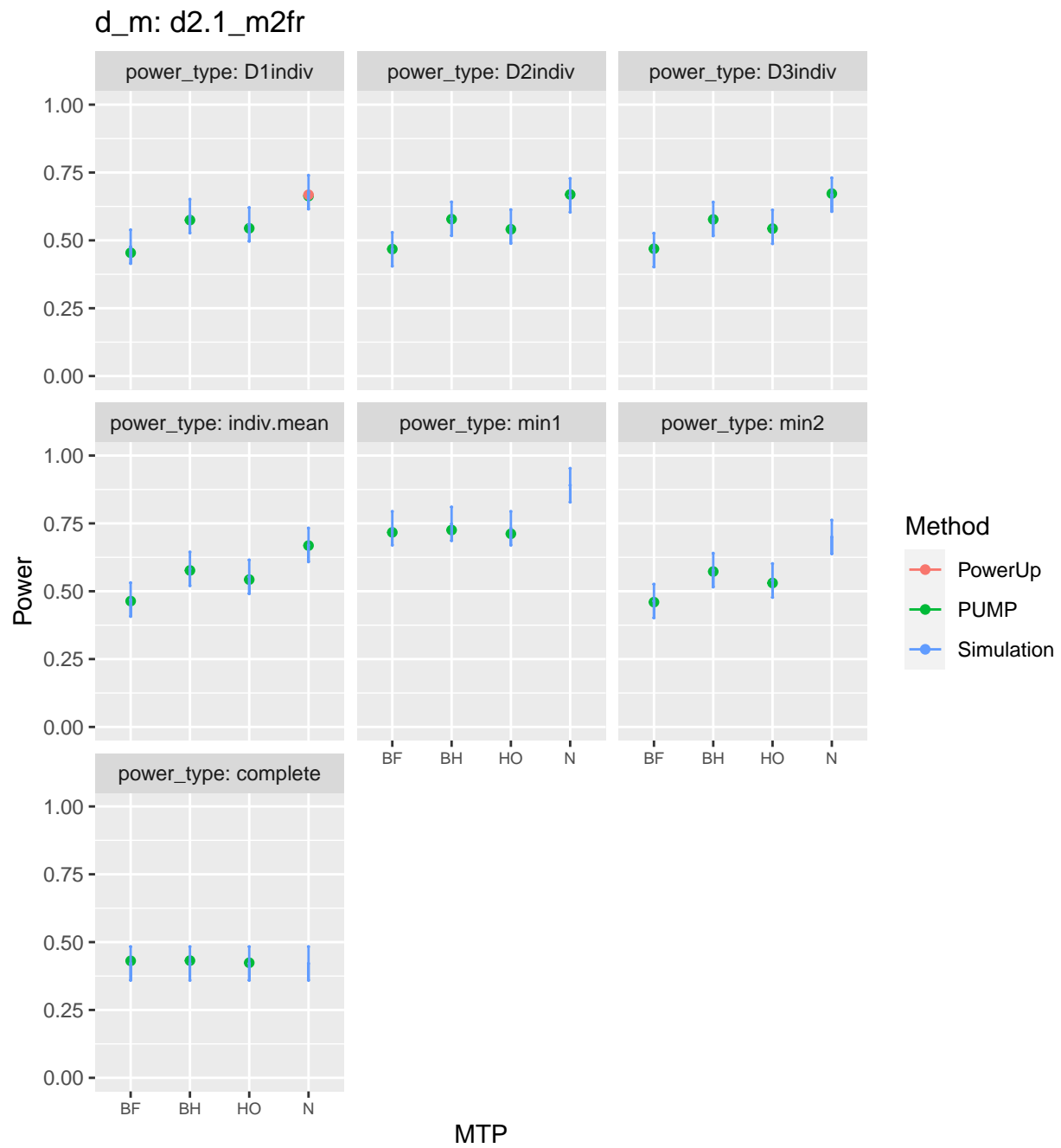
Varying school size

$\bar{n} = 100$

d_m: d2.1_m2fc

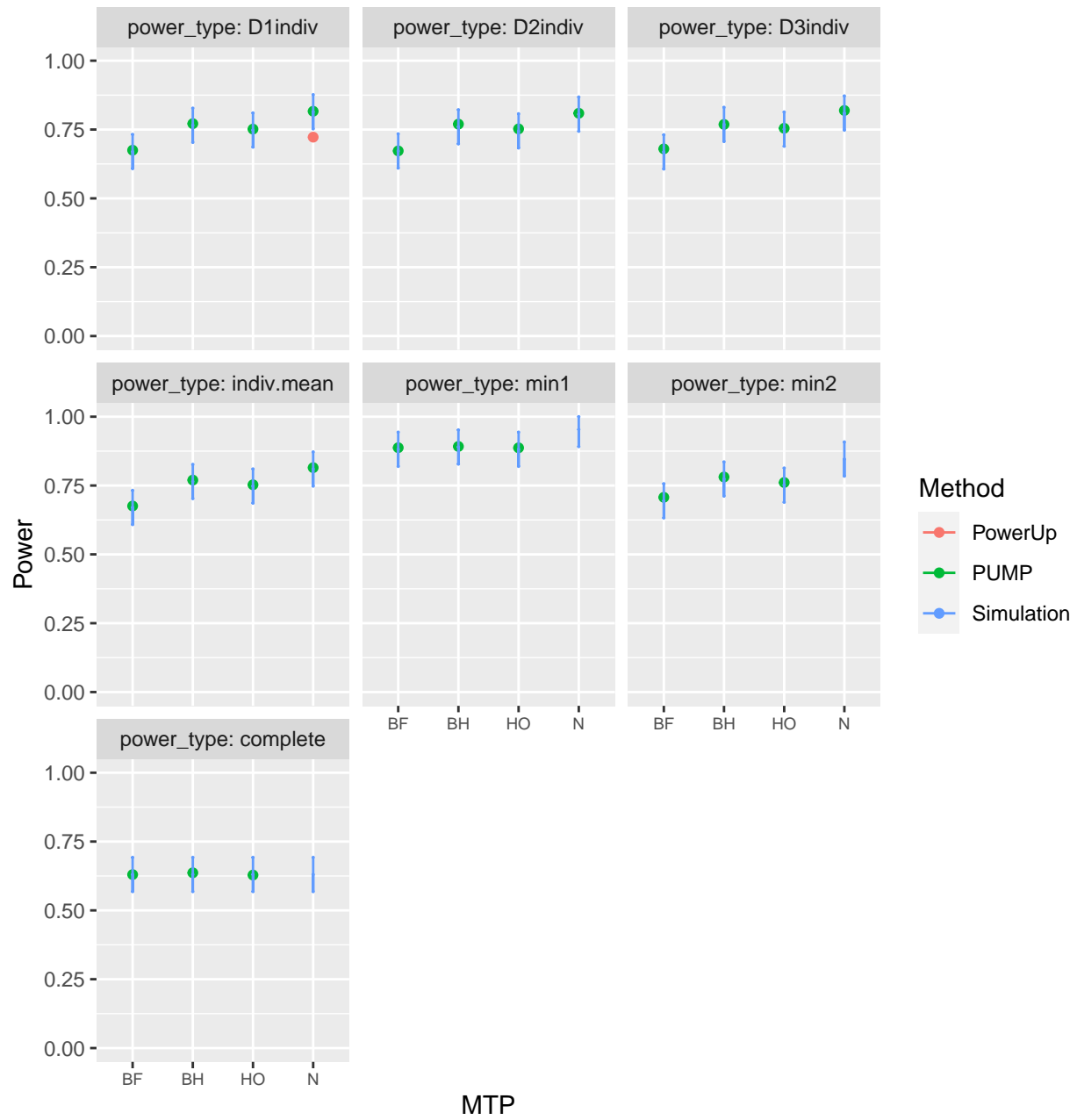


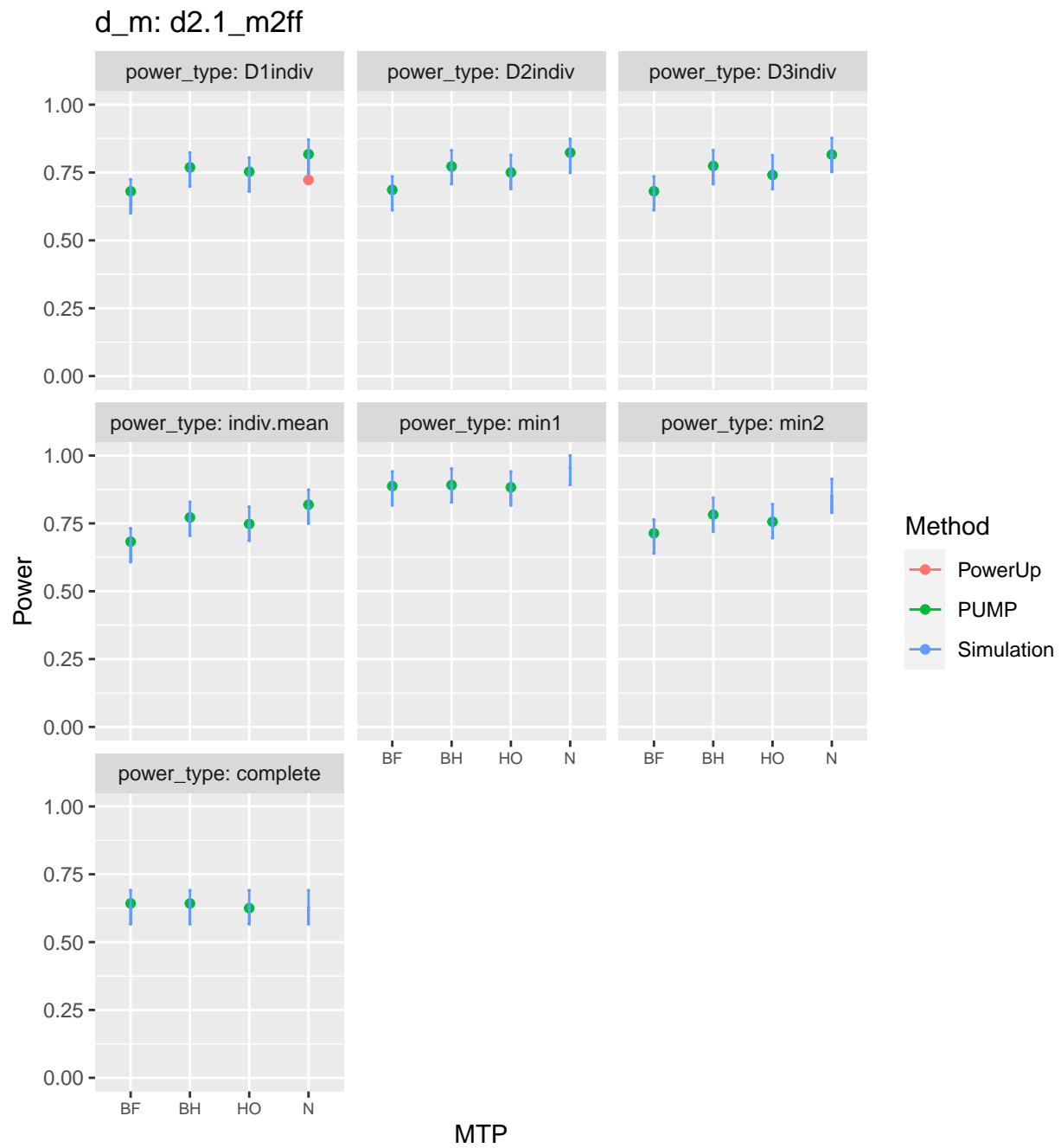


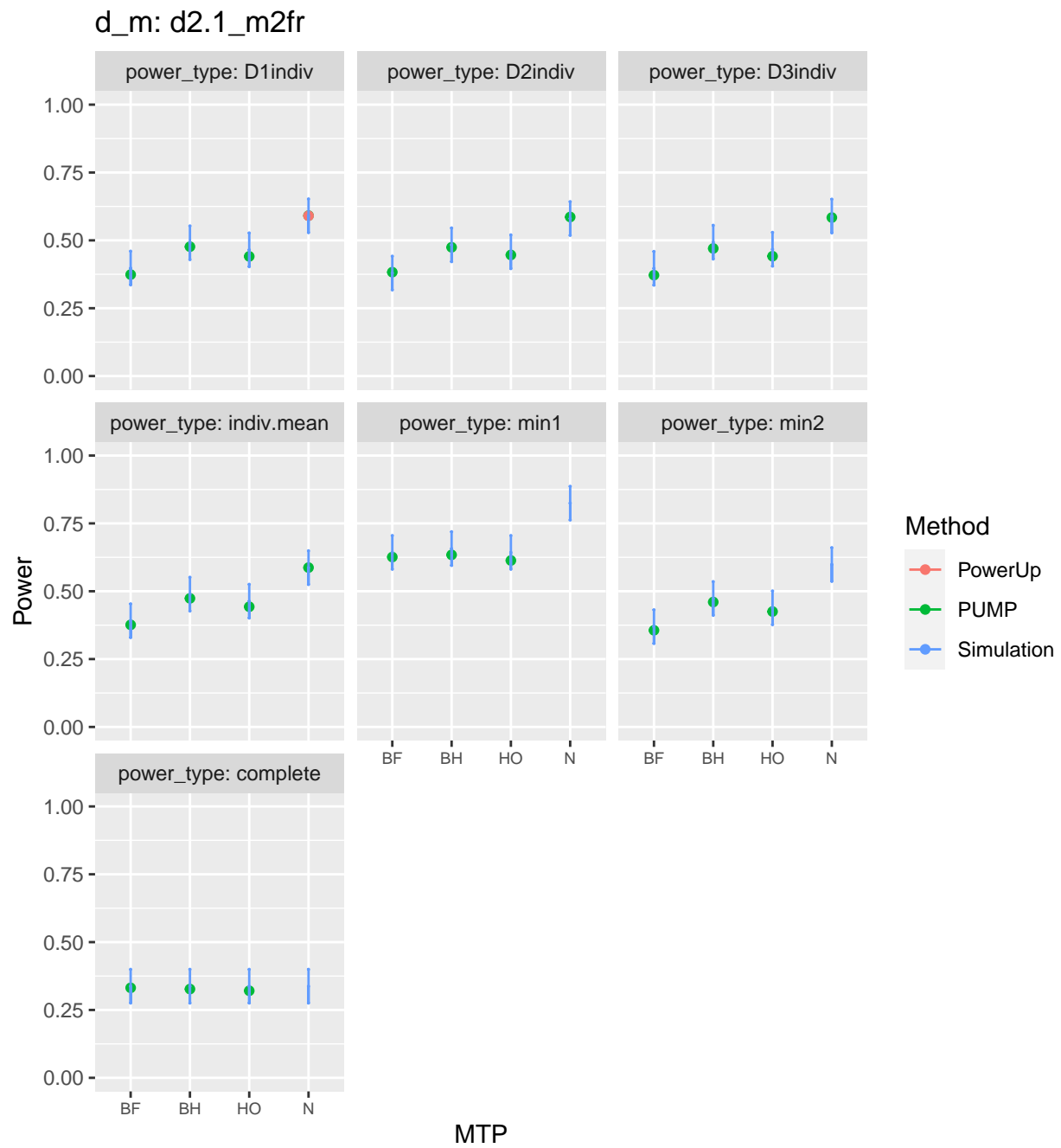


$\bar{n} = 75$

d_m: d2.1_m2fc

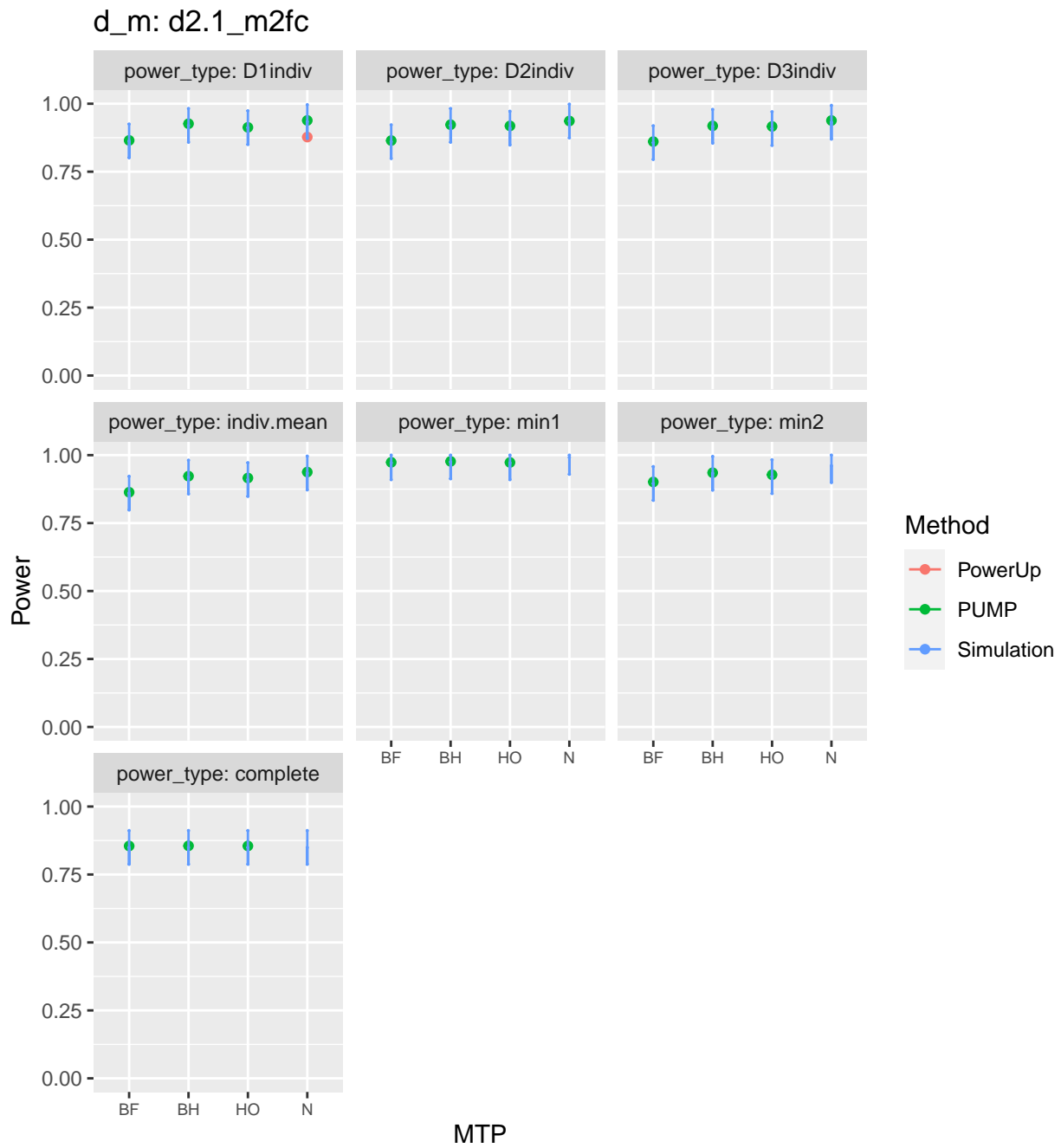




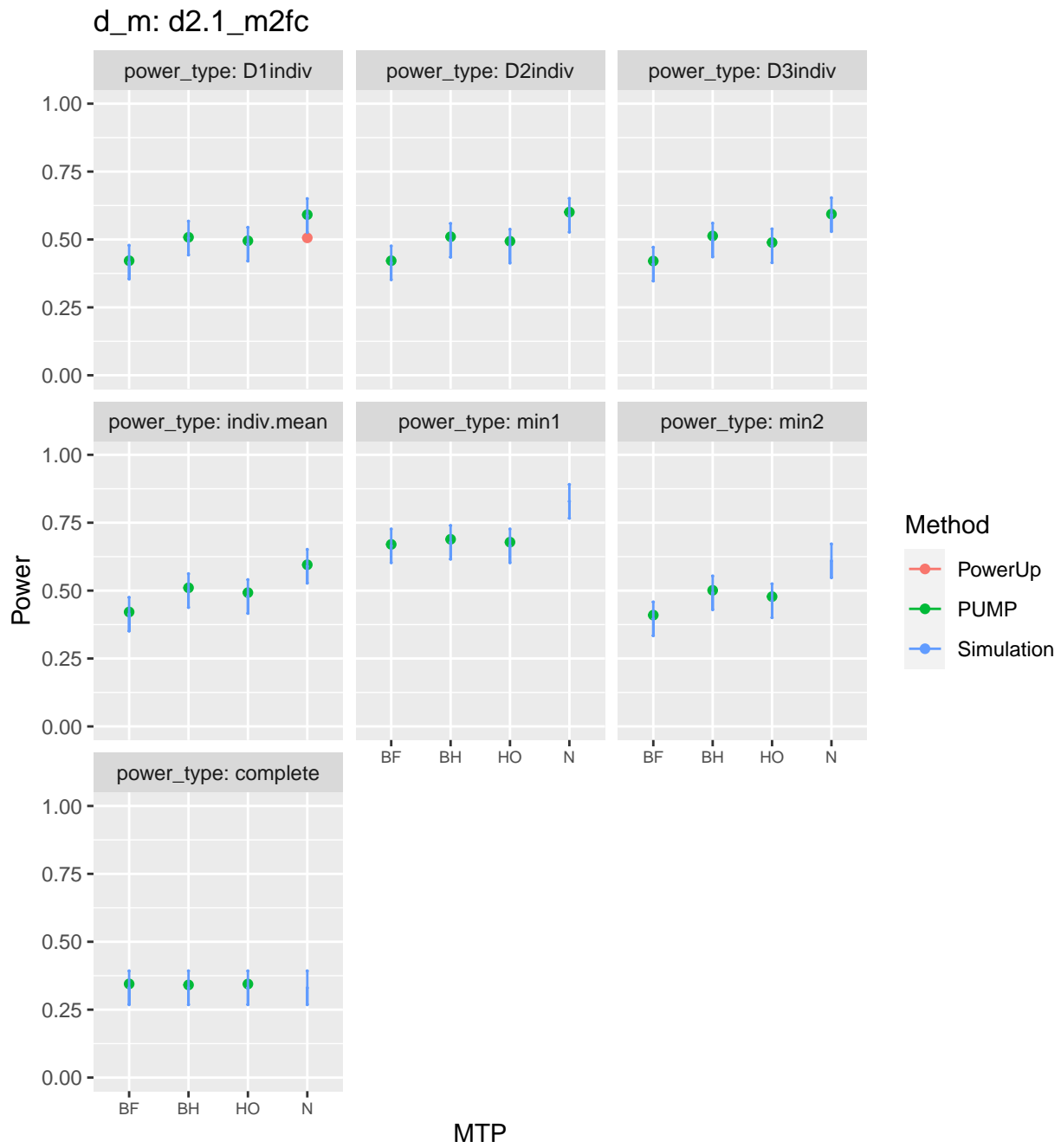


Varying R2

$R_1^2 = 0.6, 0.6, 0.6$



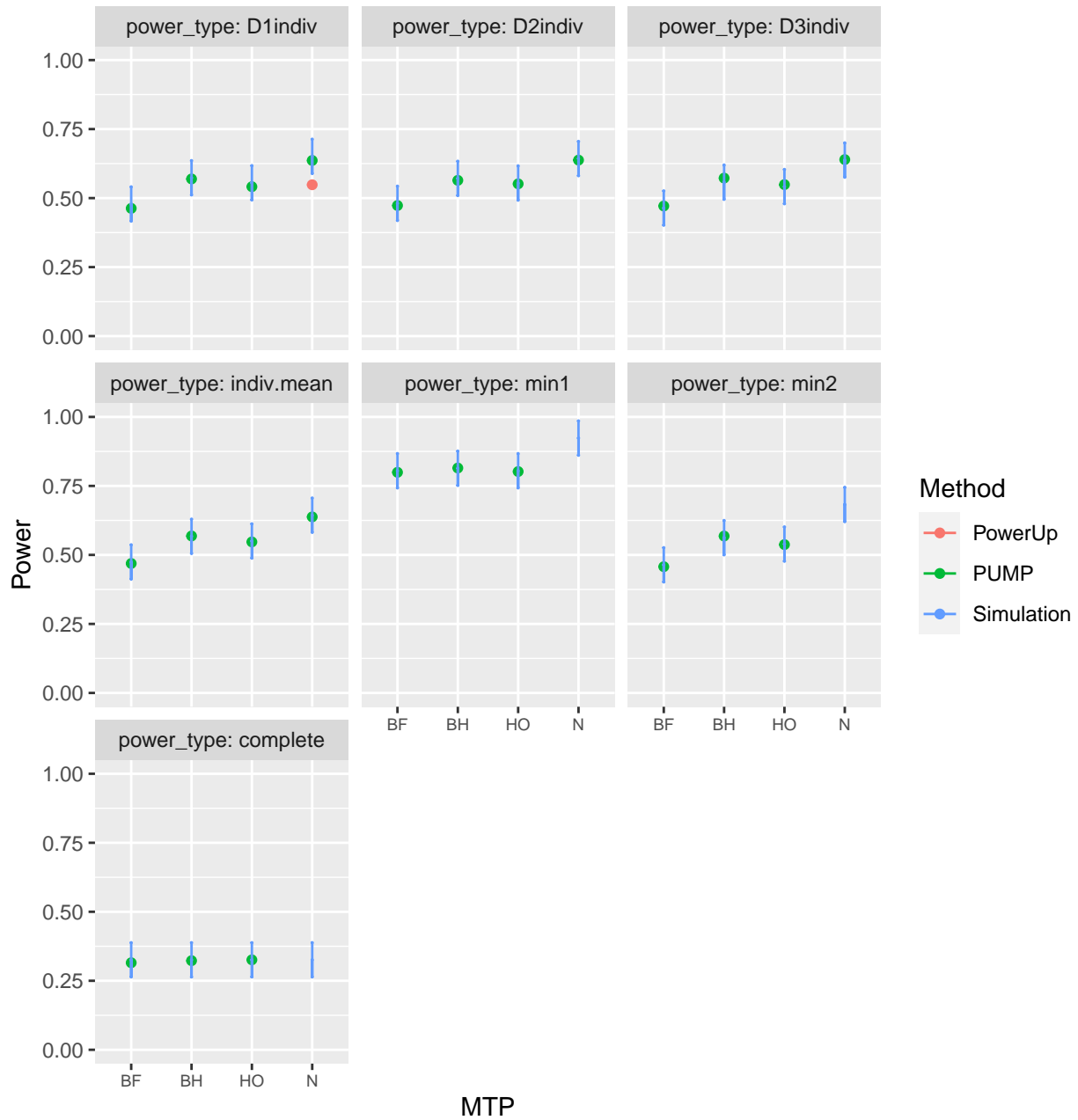
$$R_1^2 = 0, 0, 0$$



Varying rho

$\rho = 0.2$

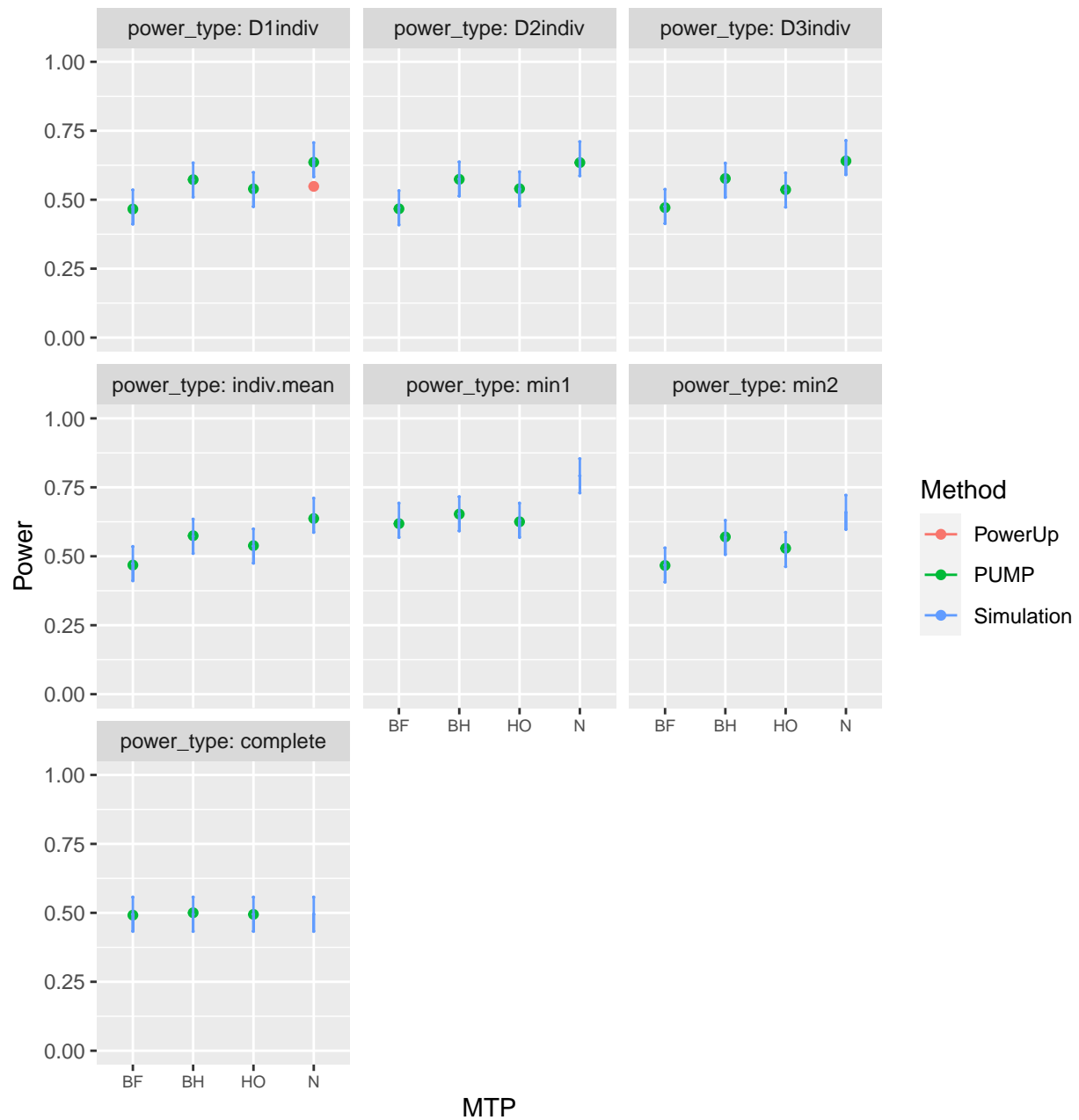
d_m: d2.1_m2fc



MTP

$\rho = 0.8$

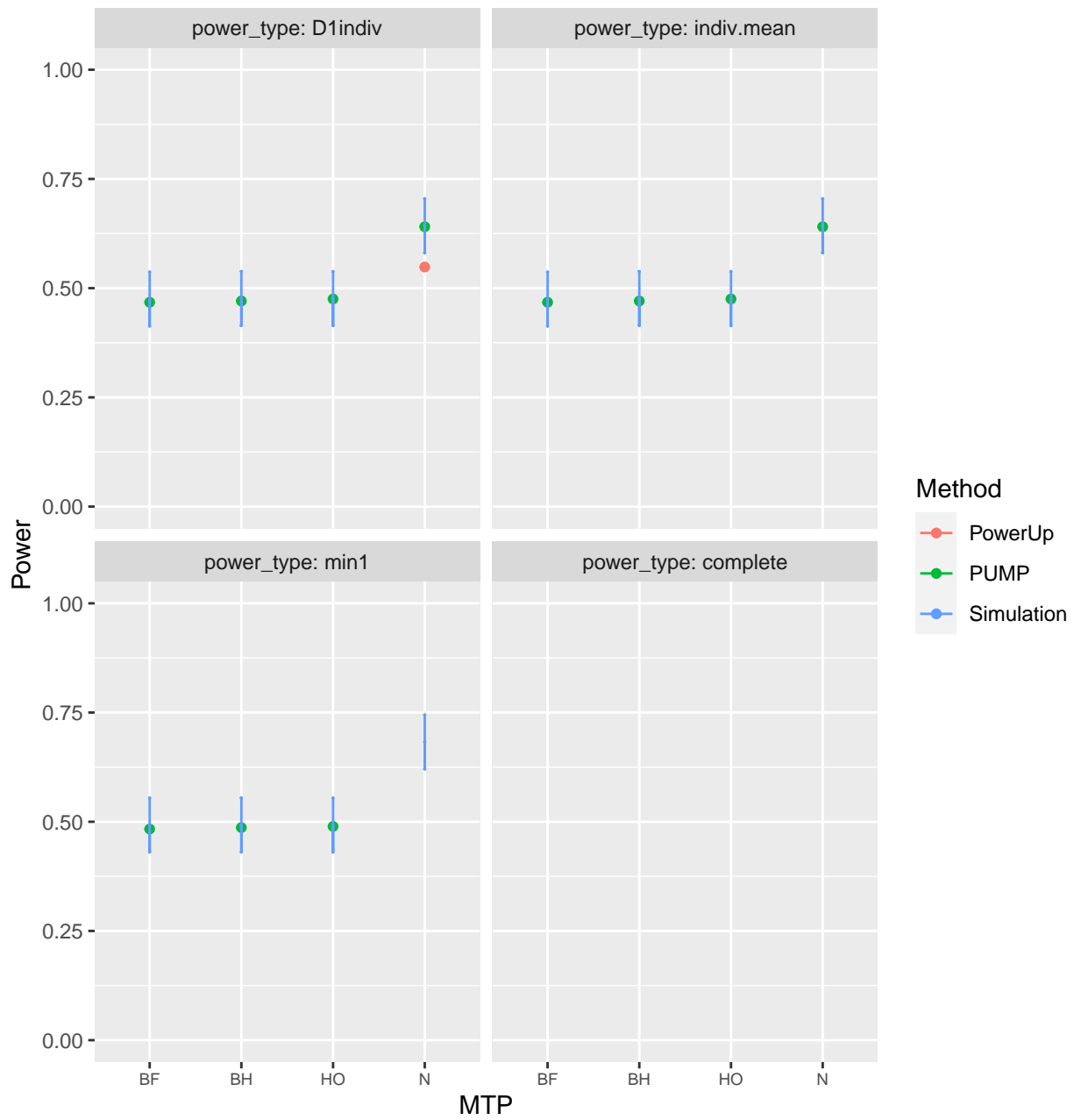
d_m: d2.1_m2fc



Varying true positives

MDES = 0.125, 0, 0

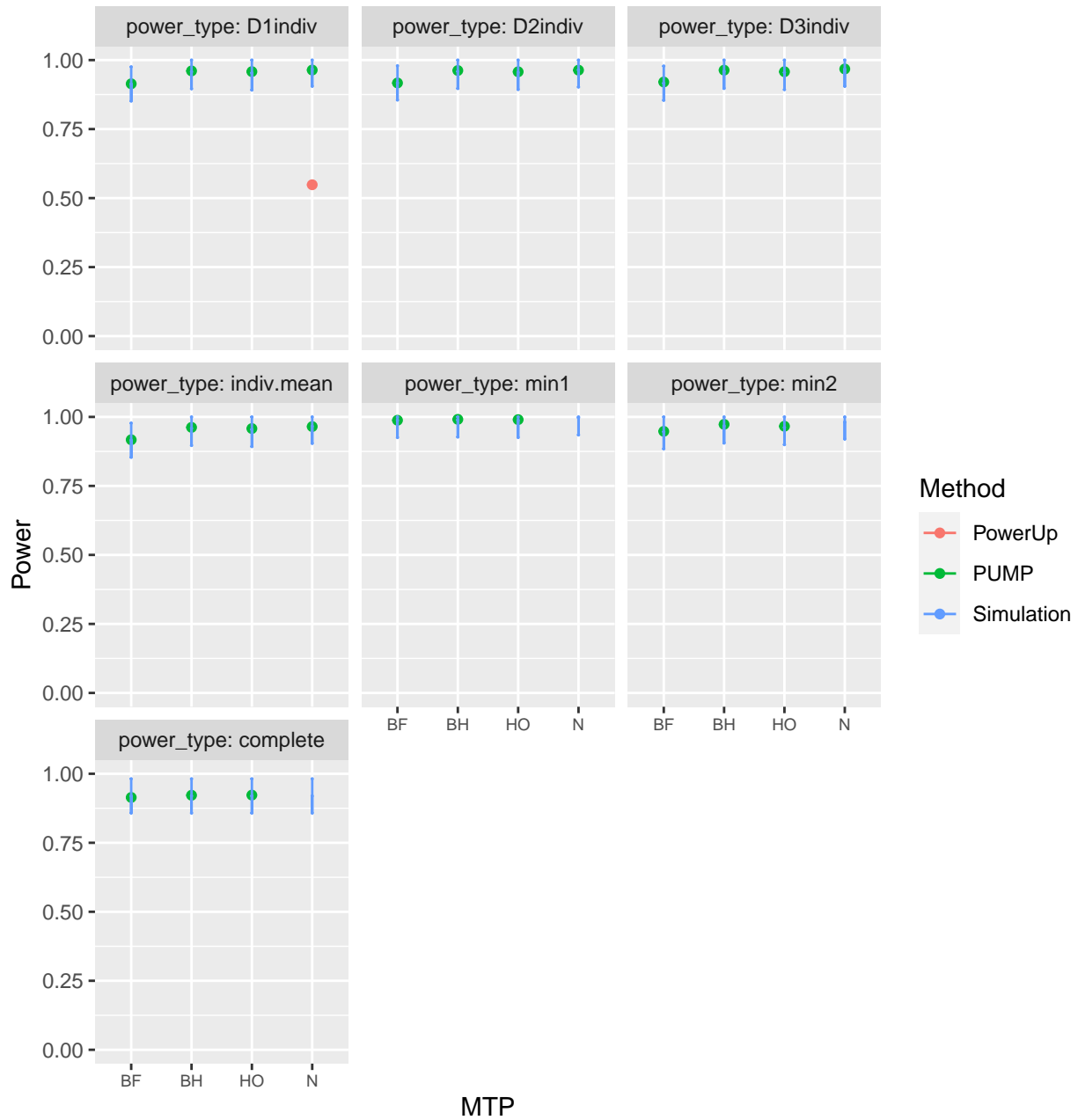
d_m: d2.1_m2fc



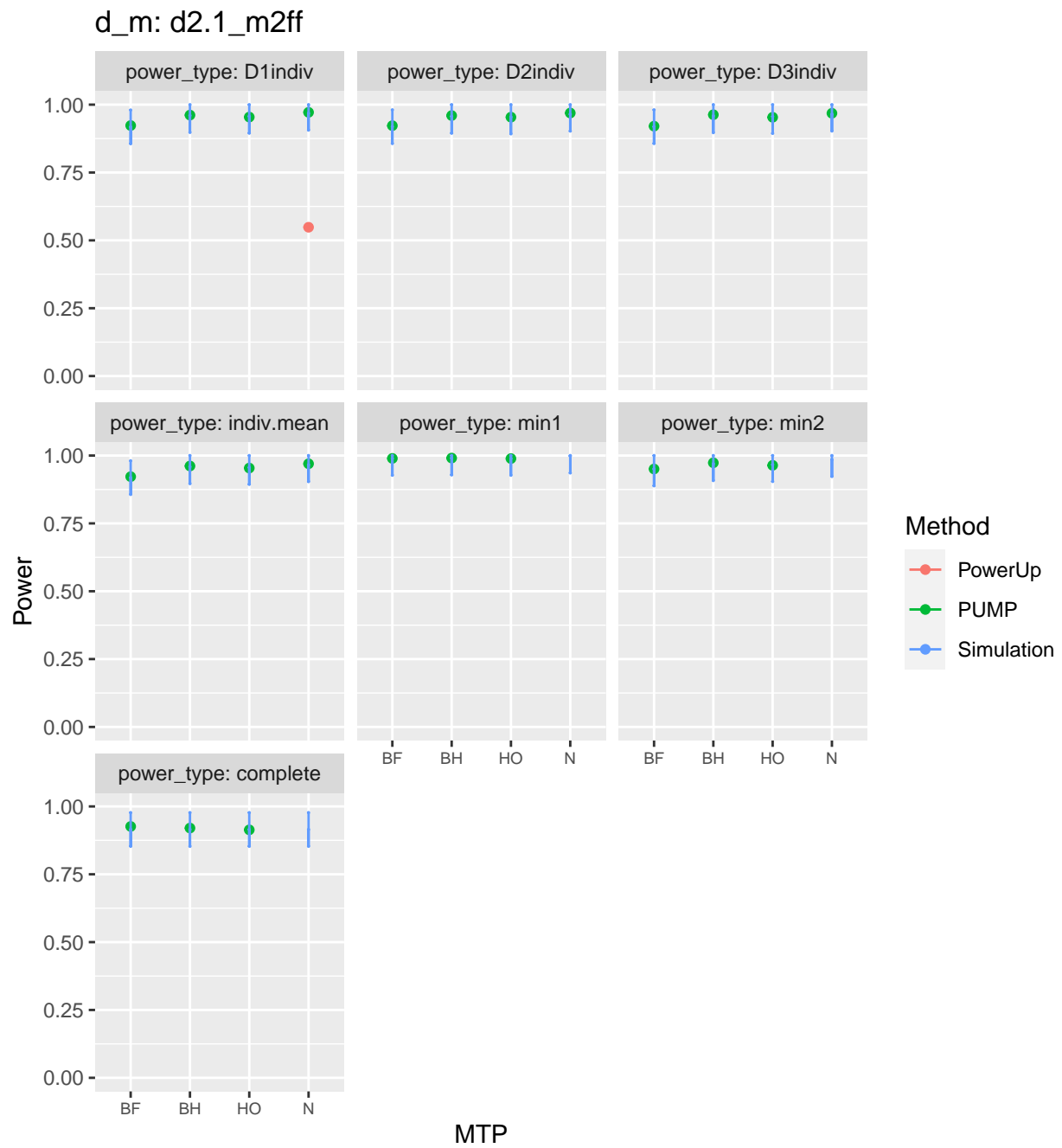
Varying ICC

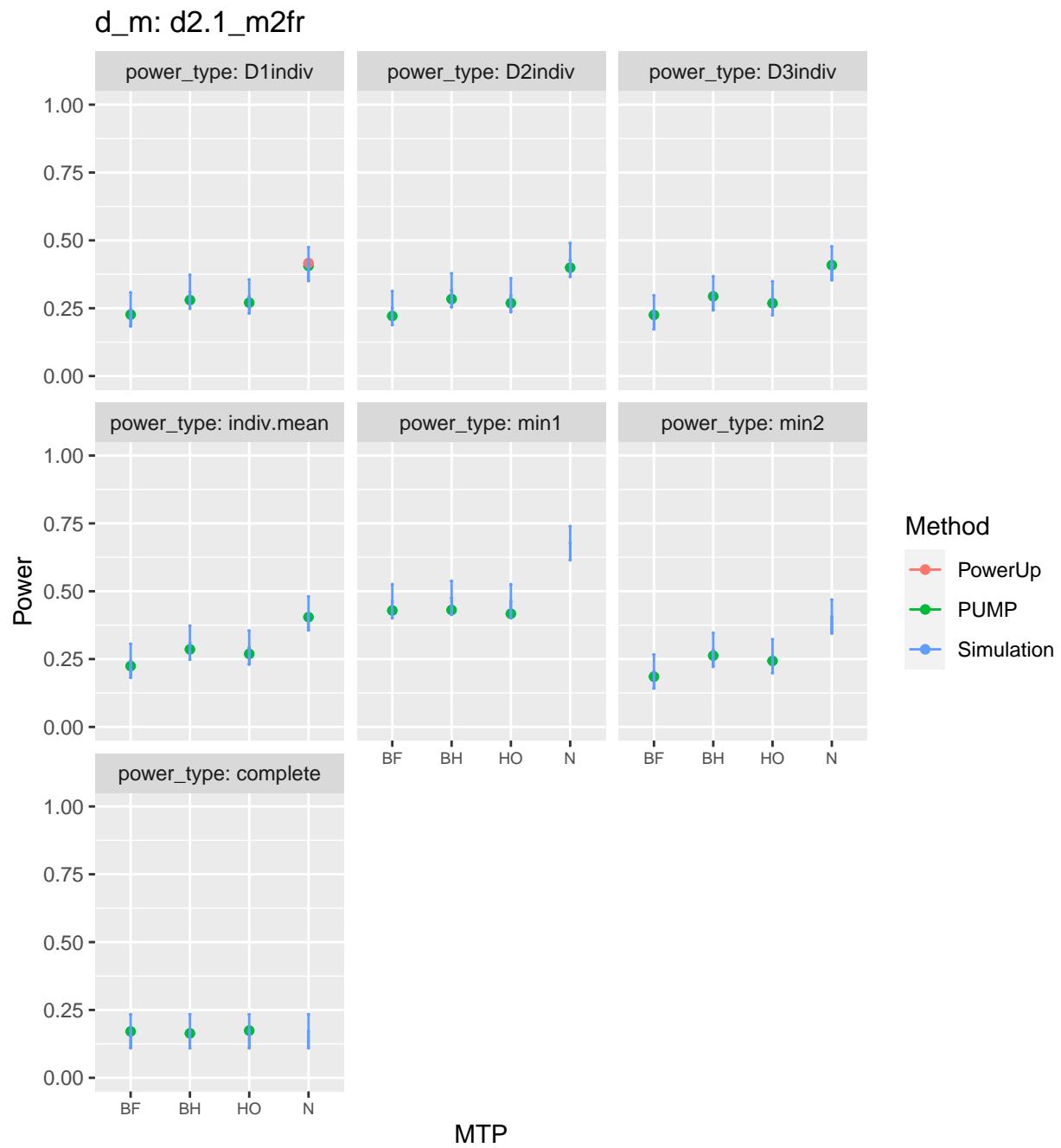
$ICC_2 = 0.7, 0.7, 0.7$

d_m: d2.1_m2fc



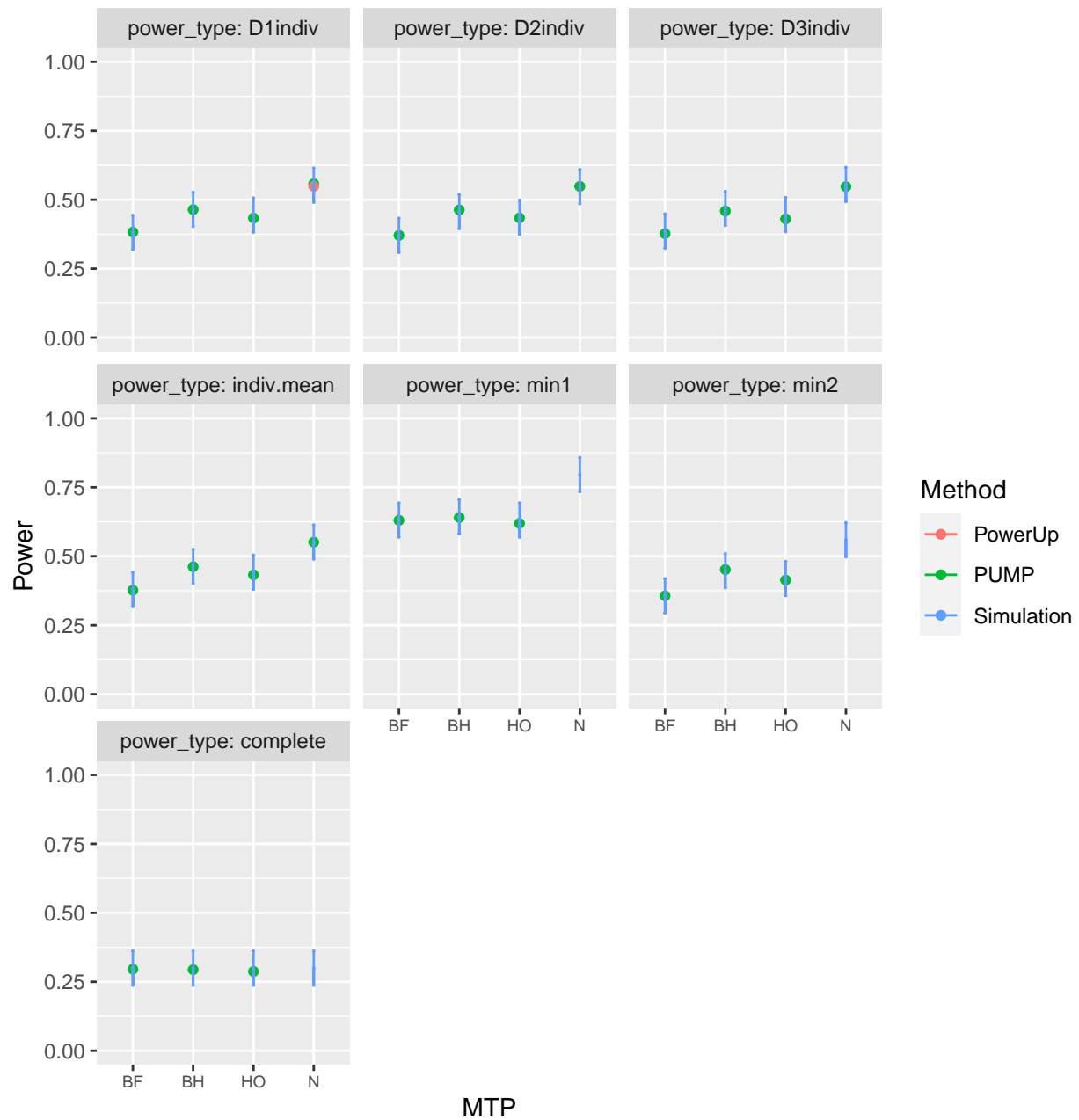
MTP

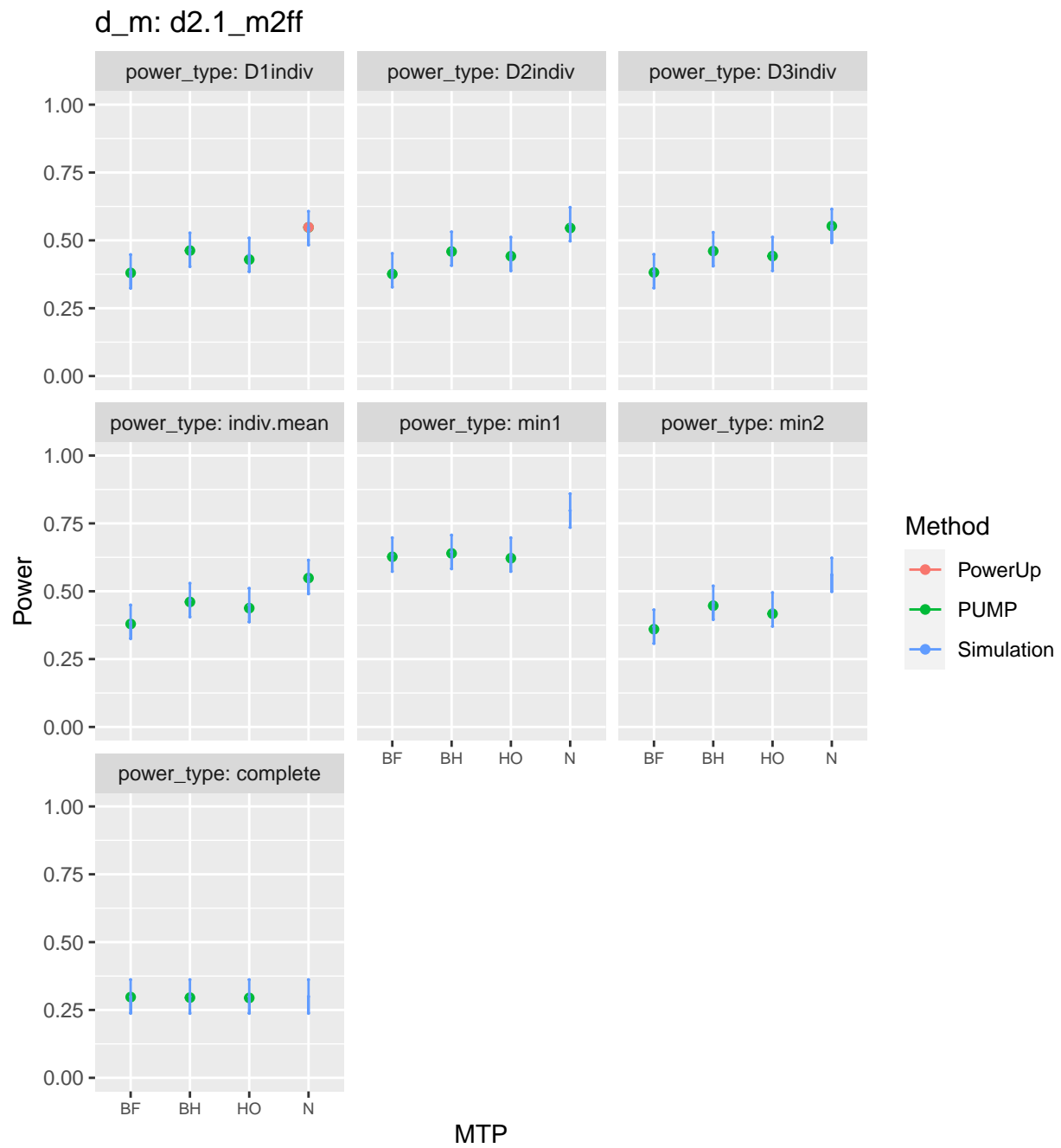


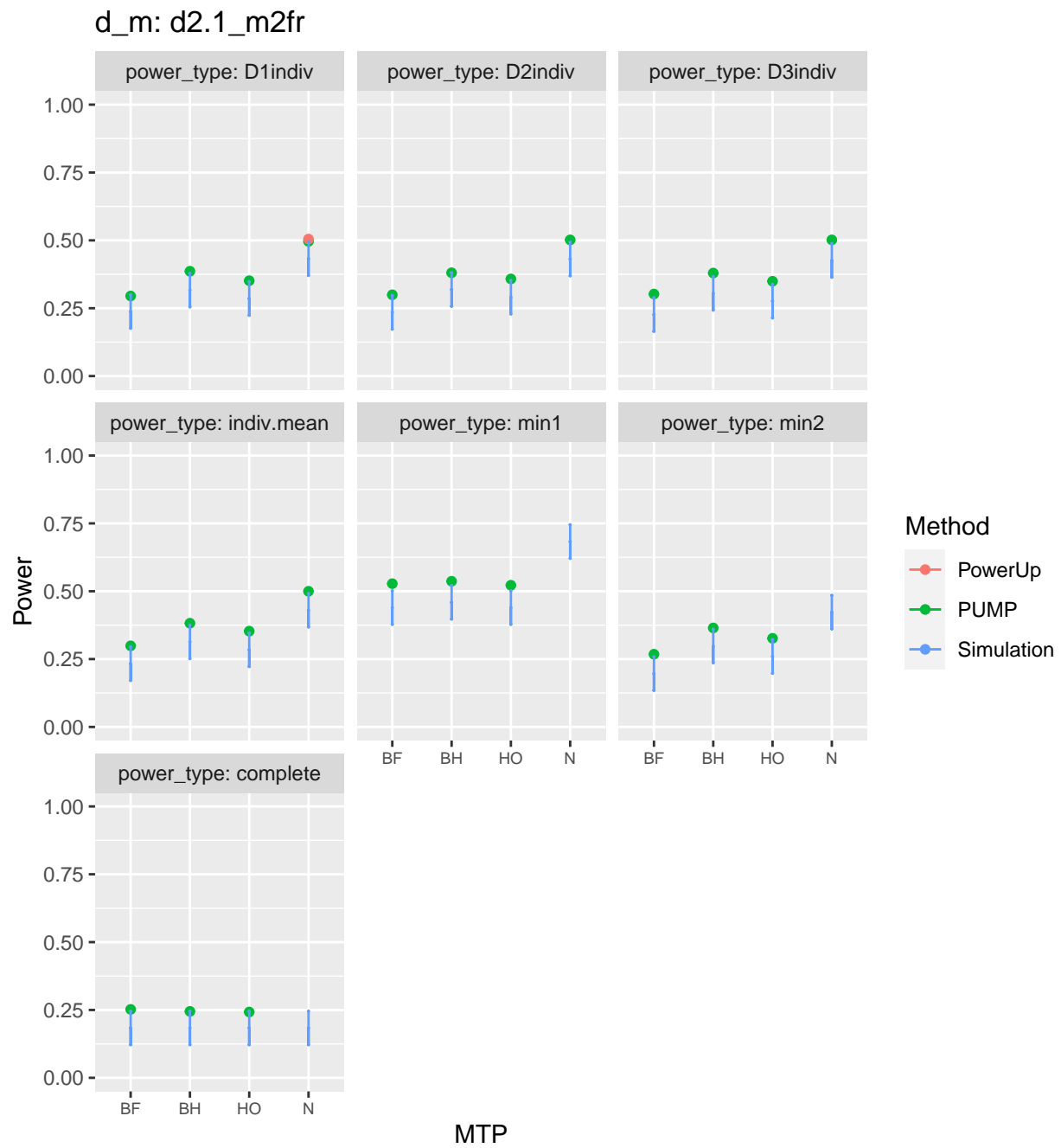


$ICC_2 = 0, 0, 0$

d_m: d2.1_m2fc



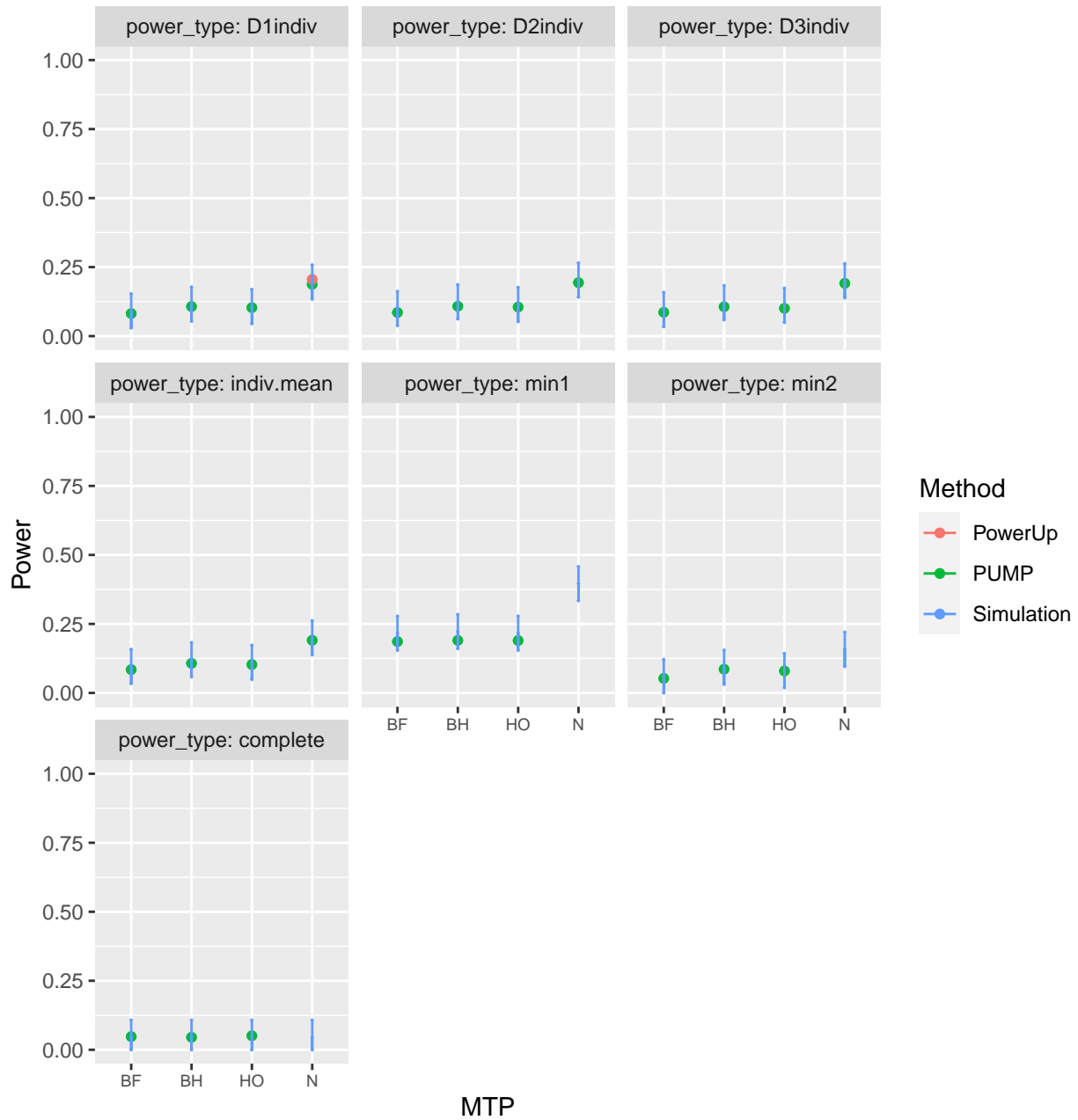




Varying Omega

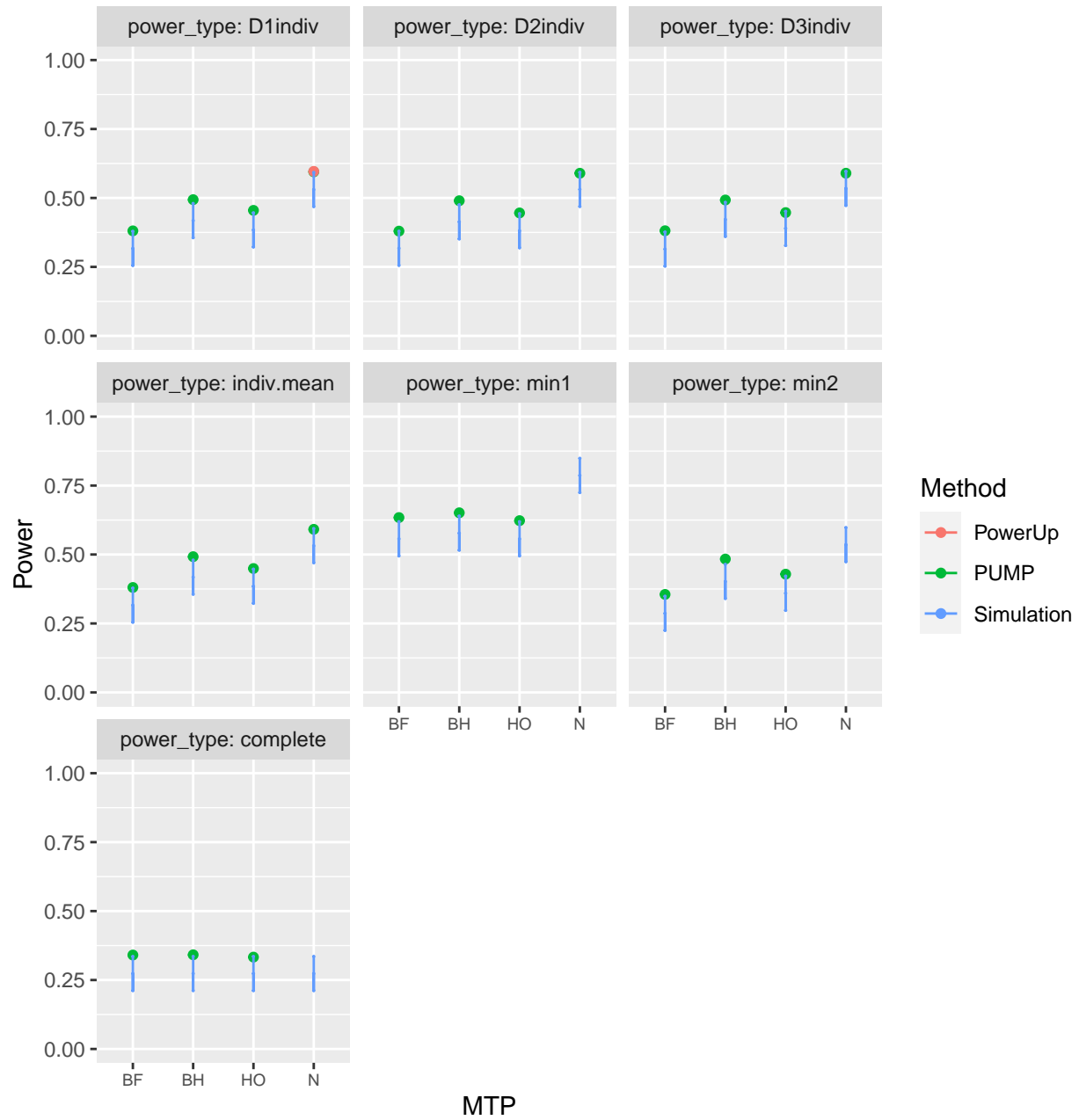
$\omega_2 = 0.8, 0.8, 0.8$

d_m: d2.1_m2fr



$\omega_2 = 0, 0, 0$

d_m: d2.1_m2fr



MDES validation

Target value: 0.125

```
##
##
## +-----+-----+-----+-----+
## |      MTP      | Adjusted MDES | D1indiv Power | Target MDES |
## +=====+=====+=====+=====+
## | Bonferroni |      0.125     |      0.47      |      0.125   |
## +-----+-----+-----+-----+
## |      BH      |      NA        |      NA         |      0.125   |
## +-----+-----+-----+-----+
## |      Holm     |      0.127     |      0.558     |      0.125   |
## +-----+-----+-----+-----+
##
## Table: d2.1_m2fc
##
##
## +-----+-----+-----+-----+
## |      MTP      | Adjusted MDES | D1indiv Power | Target MDES |
## +=====+=====+=====+=====+
## | Bonferroni |      0.123     |      0.46      |      0.125   |
## +-----+-----+-----+-----+
## |      BH      |      0.126     |      0.569     |      0.125   |
## +-----+-----+-----+-----+
## |      Holm     |      0.126     |      0.553     |      0.125   |
## +-----+-----+-----+-----+
##
## Table: d2.1_m2ff
##
##
## +-----+-----+-----+-----+
## |      MTP      | Adjusted MDES | D1indiv Power | Target MDES |
## +=====+=====+=====+=====+
## | Bonferroni |      0.125     |      0.269     |      0.125   |
## +-----+-----+-----+-----+
## |      BH      |      0.125     |      0.353     |      0.125   |
## +-----+-----+-----+-----+
## |      Holm     |      0.125     |      0.326     |      0.125   |
## +-----+-----+-----+-----+
##
## Table: d2.1_m2fr
```


Sample size validation

Target value: 20

```
##
##
## +-----+-----+-----+-----+
## |      MTP      | Sample.type | Sample.size | D1indiv.power |
## +=====+=====+=====+=====+
## | Bonferroni |      J      |      20      |      0.47      |
## +-----+-----+-----+-----+
## |      BH      |      J      |      20      |      0.562     |
## +-----+-----+-----+-----+
## |      Holm     |      J      |      21      |      0.546     |
## +-----+-----+-----+-----+
##
## Table: d2.1_m2fc
```

```
##
##
## +-----+-----+-----+-----+
## |      MTP      | Sample.type | Sample.size | D1indiv.power |
## +=====+=====+=====+=====+
## | Bonferroni |     nbar    |     50.55    |      0.47      |
## +-----+-----+-----+-----+
## |      BH      |     nbar    |      49      |      0.555     |
## +-----+-----+-----+-----+
## |      Holm     |     nbar    |      51      |      0.544     |
## +-----+-----+-----+-----+
##
## Table: d2.1_m2fc
```

```
##
##
## +-----+-----+-----+-----+
## |      MTP      | Sample.type | Sample.size | D1indiv.power |
## +=====+=====+=====+=====+
## | Bonferroni |      J      |      19      |      0.46      |
## +-----+-----+-----+-----+
## |      BH      |      J      |      21      |      0.577     |
## +-----+-----+-----+-----+
## |      Holm     |      J      |      20      |      0.543     |
## +-----+-----+-----+-----+
##
## Table: d2.1_m2ff
```

Target value: 50

```
##
##
## +-----+-----+-----+-----+
## |      MTP      | Sample.type | Sample.size | D1indiv.power |
## +=====+=====+=====+=====+
## | Bonferroni |     nbar    |     48.1     |      0.447     |
## +-----+-----+-----+-----+
## |      BH      |     nbar    |      51      |      0.573     |
## +-----+-----+-----+-----+
```

```

## +-----+-----+-----+-----+
## |      Holm      |      nbar      |      51      |      0.544      |
## +-----+-----+-----+-----+
##
## Table: d2.1_m2ff
##
##
## +-----+-----+-----+-----+
## |      MTP      | Sample.type | Sample.size | D1indiv.power |
## +-----+-----+-----+-----+
## | Bonferroni |      J      |      20      |      0.269      |
## +-----+-----+-----+-----+
## |      BH      |      J      |      21      |      0.362      |
## +-----+-----+-----+-----+
## |      Holm      |      J      |      20      |      0.322      |
## +-----+-----+-----+-----+
##
## Table: d2.1_m2fr
##
##
## +-----+-----+-----+-----+
## |      MTP      | Sample.type | Sample.size | D1indiv.power |
## +-----+-----+-----+-----+
## | Bonferroni |      J      |      20      |      0.269      |
## +-----+-----+-----+-----+
## |      BH      |      J      |      21      |      0.362      |
## +-----+-----+-----+-----+
## |      Holm      |      J      |      20      |      0.322      |
## +-----+-----+-----+-----+
##
## Table: d2.1_m2fr

```