Supplementary materials for the main submission entitled - A new metric for automatic discovery of periodic patterns in time series

Contents

Appendix A recalls the necessary notations and

1 Necessary notations

2 Behavior of raw weighted distance measure

2.1 NQT works

2.1.1 without NQT

```
knitr::include_graphics(here::here("simulations/raw/null_design_scale/figs/gamma_ridge_nxbynfacet.png"))
```

2.1.2 with NQT

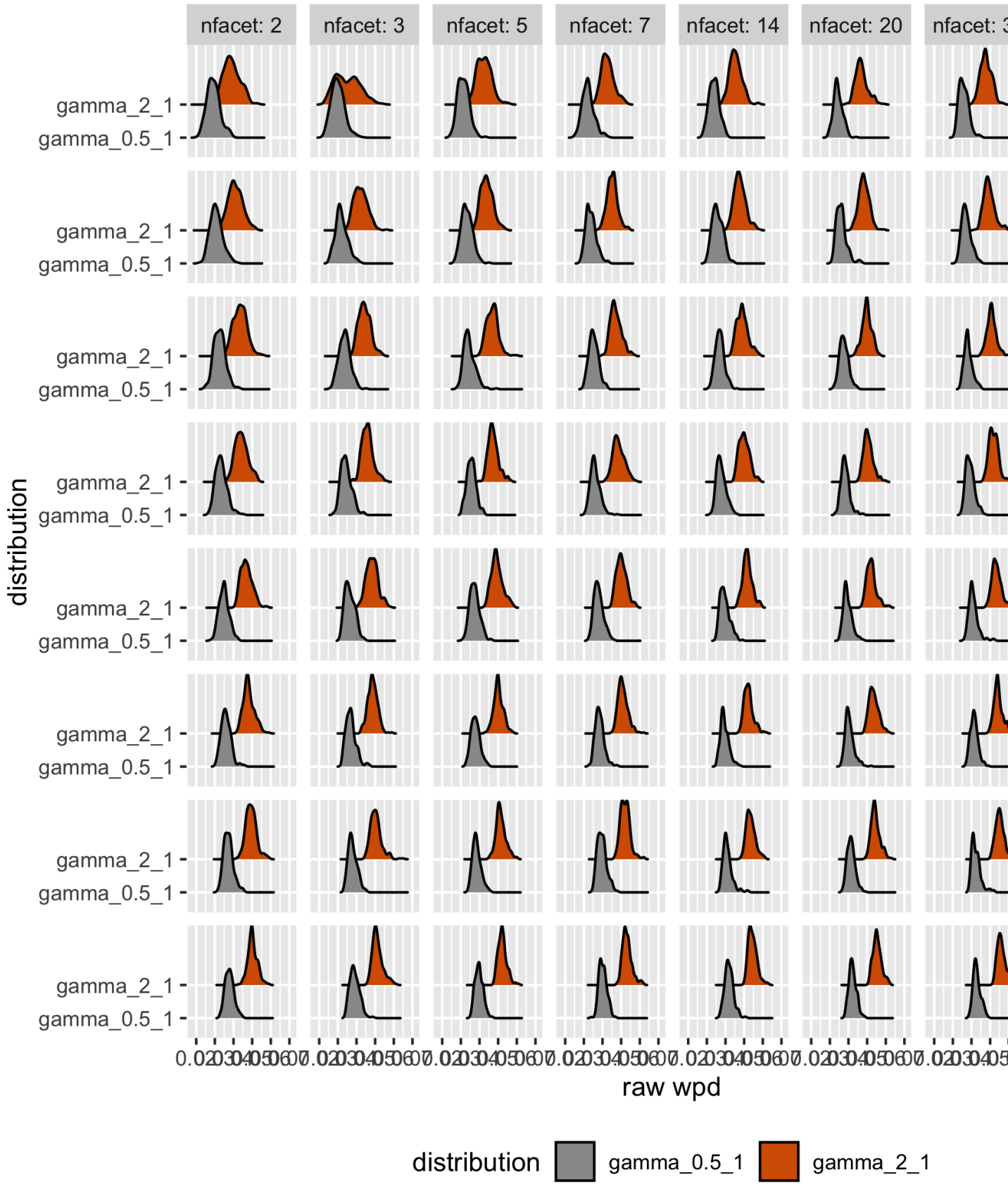


Figure 1: Ridge plots of raw wpd is shown for Gamma(0.5,1), Gamma(2,1) distribution. The densities change across different facet and x levels and also looks different for the two distributions, which implies wpd value is affected by the change in the shape paramter of the gamma distribution.

```
knitr::include_graphics(here::here("simulations/raw/null_design_quantrans/figs/diff_mean3_gamma.png"))
```

2.2 By distribution

```
knitr::include_graphics(here::here("simulations/raw/null_design_quantrans/figs/diff_mean3_normal.png"))
```

2.3 By category levels

```
knitr::include_graphics(here::here("simulations/raw/null_design_quantrans/figs/nxbyfacet_ridge_wpd_N05.p
```

```
knitr::include_graphics(here::here("simulations/result_report/","nfacet_by_nx_raw.png"))
```

2.4 Tuning parameter

```
knitr::include_graphics(here::here("simulations/tuning_param/figs/fixed_omega.png"))
```

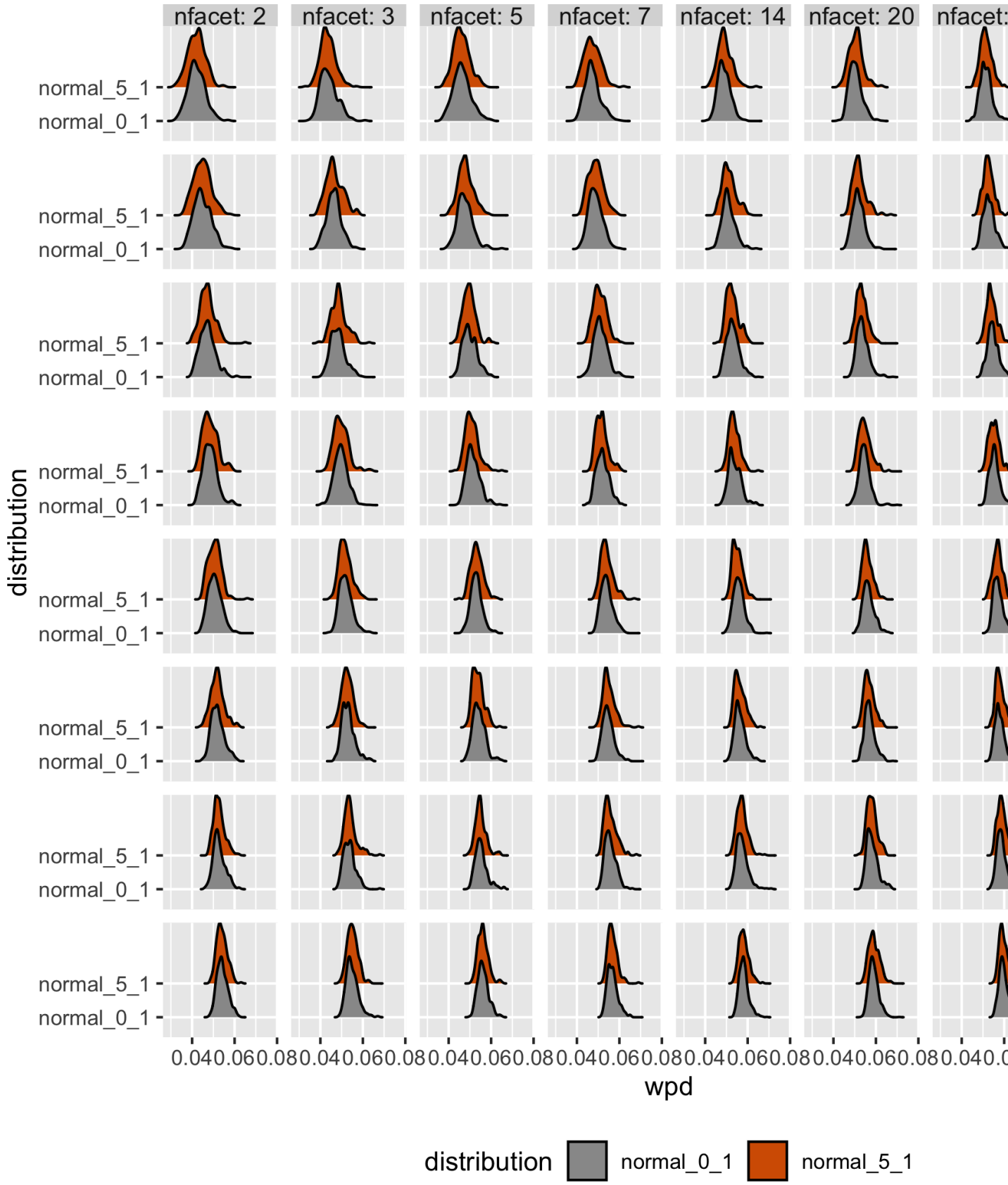


Figure 2: Ridge plots of raw wpd is shown for Gamma(0.5,1), Gamma(2,1) distribution. The densities change across different facet and x levels but look same for the two distributions, which implies wpd value is unaffected by the change in the shape paramter of the gamma distribution

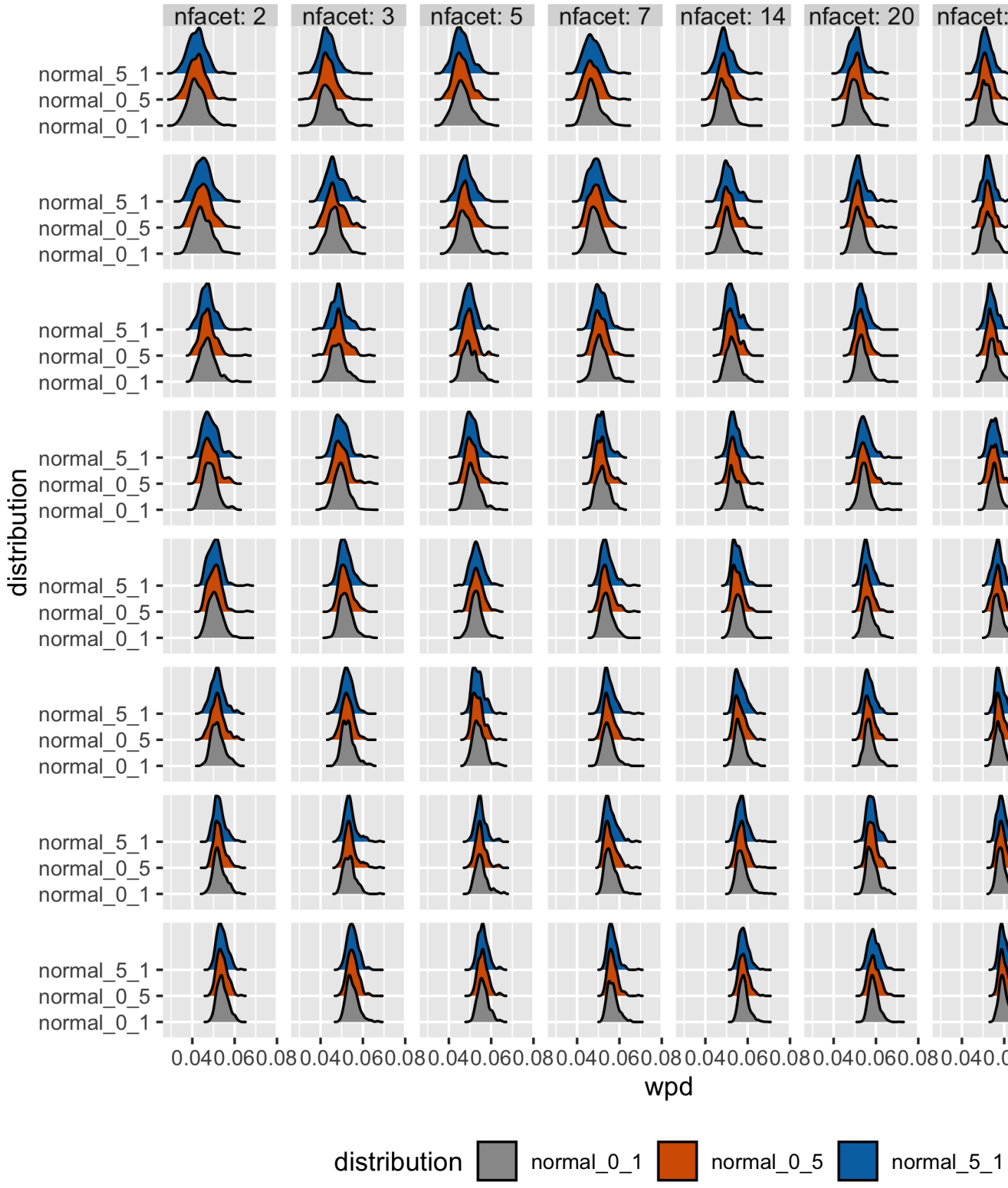


Figure 3: Ridge plots of raw wpd is shown for N(0,1), N(5,1) and N(0,5) distribution. The densities change across different facet and x levels but look same for each panel, which implies wpd value is unaffected by the change in mean and standard deviation of the normal distribution

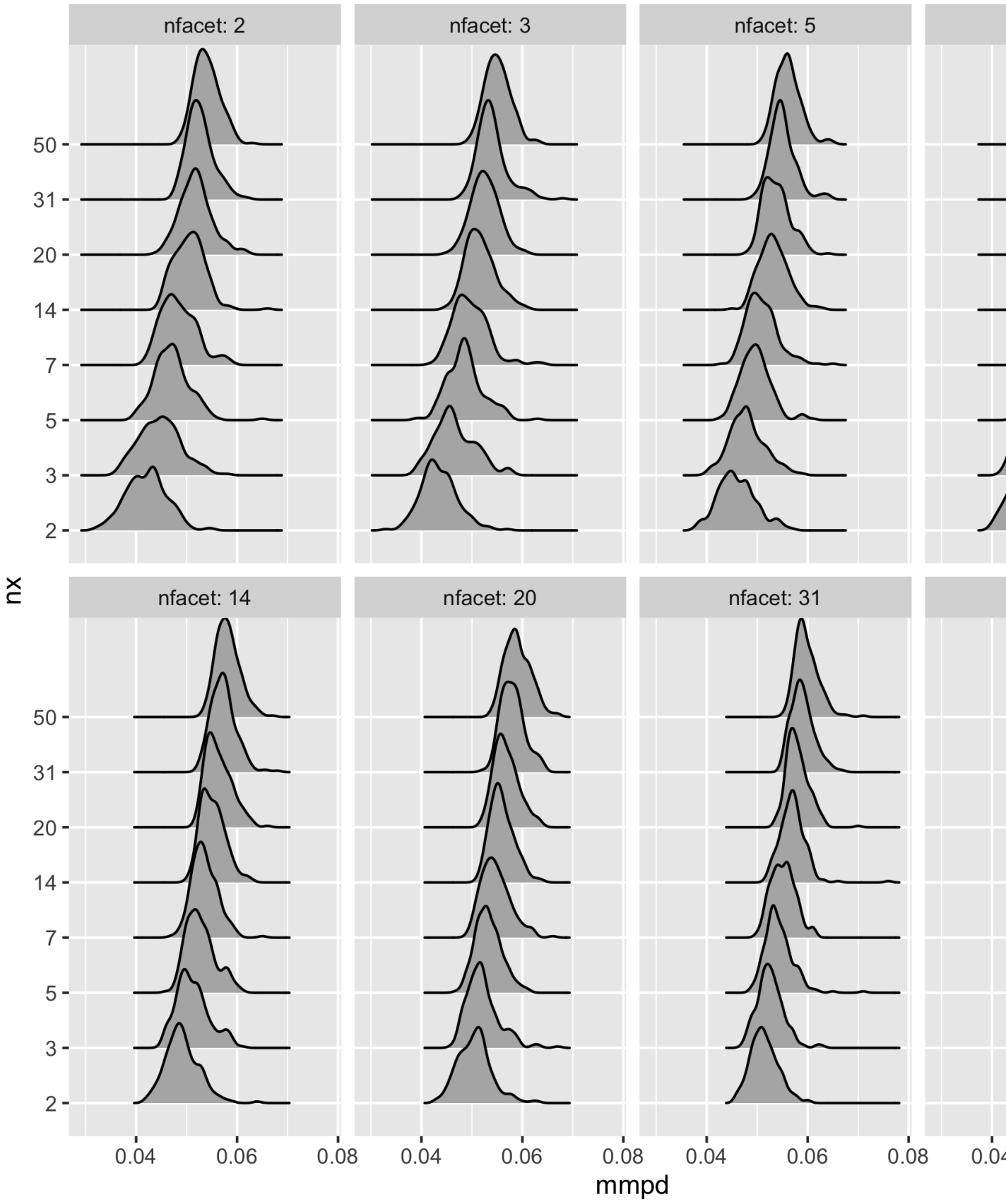
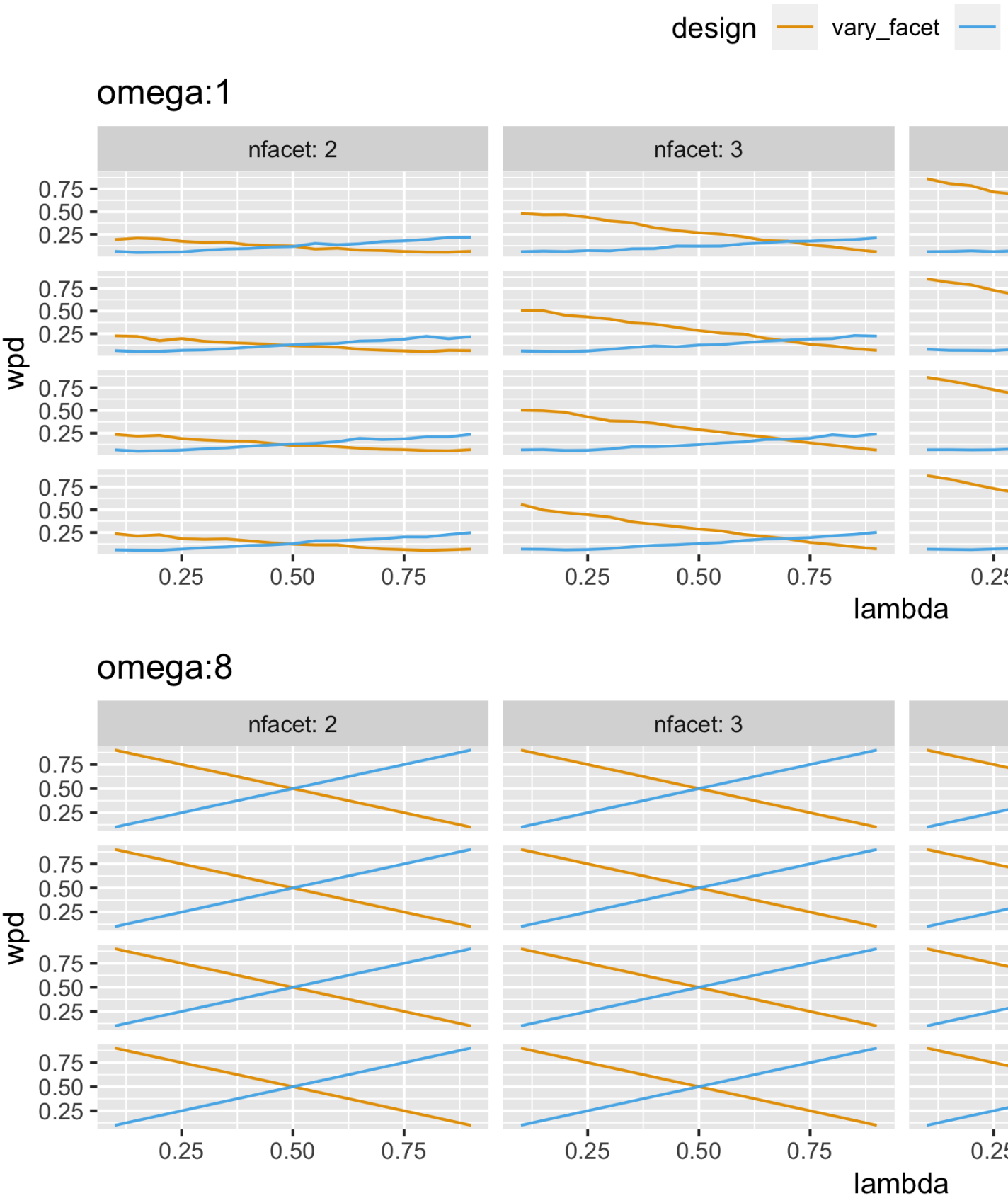


Figure 4: Ridge plots of raw wpd is shown for N(0,5) distribution. For each panel, it could be seen that the location shifts to the right for increasing x levels. Across each panel, the scale of the distribution seems to change for low/moderately lower values and higher values of nfacets and left tails are longer for lower facet levels.


design
vary_facet
omega:1
nfacet: 2
nfacet: 3
wpd
0.75
0.50
0.25
0.25
0.50
0.75
lambda
omega:8
nfacet: 2
nfacet: 3
wpd
0.75
0.50
0.25
0.25
0.50
0.75
lambda

```
knitr::include_graphics(here::here("simulations/tuning_param/figs/intersection_plot.png"))
```

2.5 Increment

3 Behavior of normalised distance measure

3.1 sample size

3.2 number of permutations

3.3 designs

4 Ranking and selecting harmonies

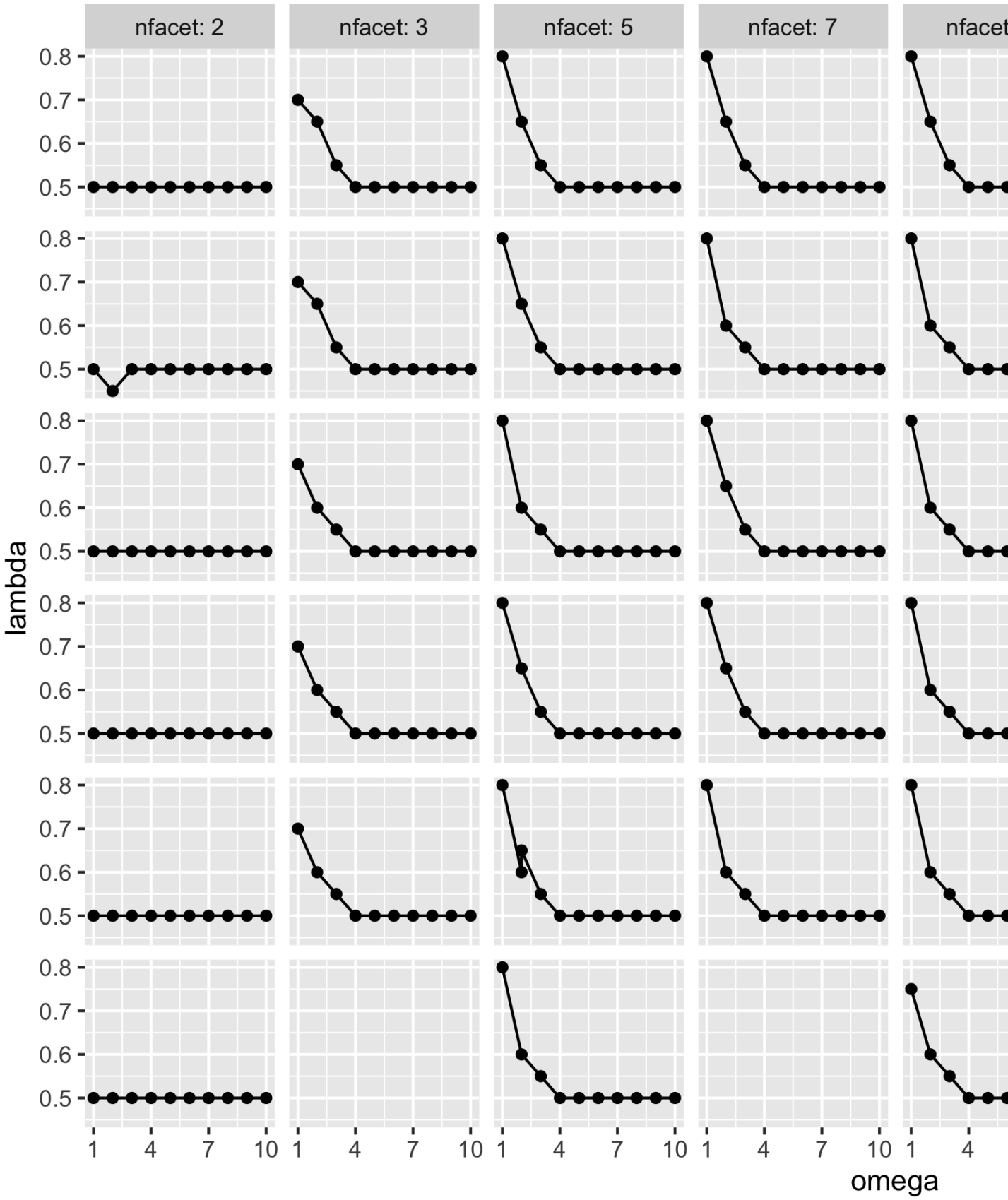


Figure 5: For most panels it is observed that the most common value of the tuning paramter for which the designs interact is 0.5, which implies any value greater than 0.5 could be chosen to up-weigh the within-facet distances and down-weigh the between-facet distances for most sitatuions.