Galaxies in filaments have more satellites

The satellite luminosity function in cosmic web

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Data: SDSS DR8

- **The candidates of primary galaxies**:
  Spectroscopic sample, $m_r < 17.77$
  with spectroscopic redshift.

- **The candidates of satellite galaxies**:
  Photometric sample, $m_r < 20.5$
  most of them only have photometric redshift.

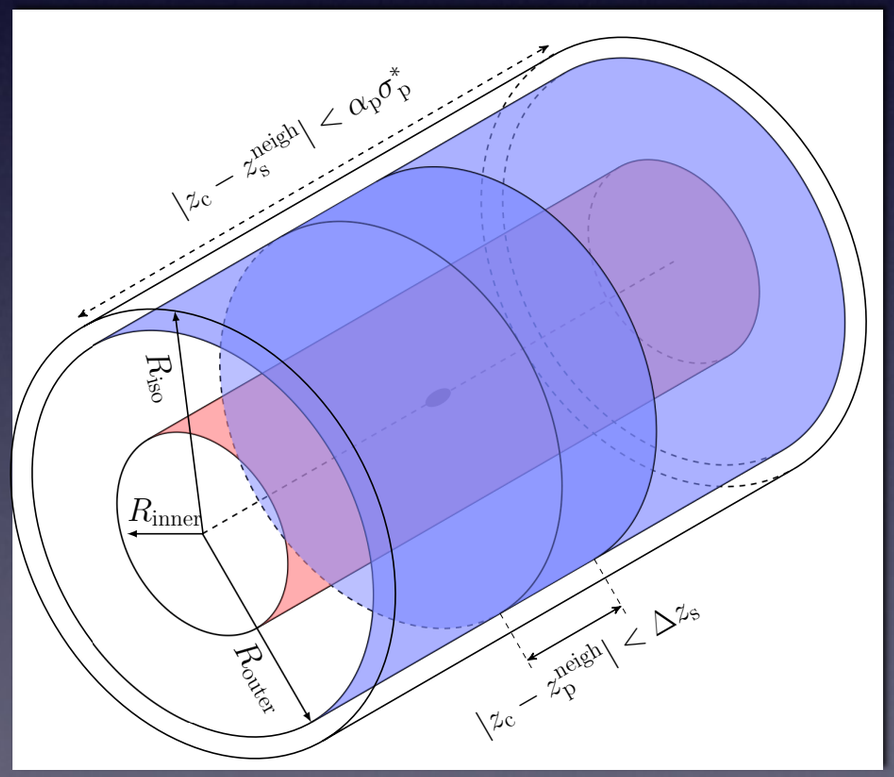
Data: isolated primary

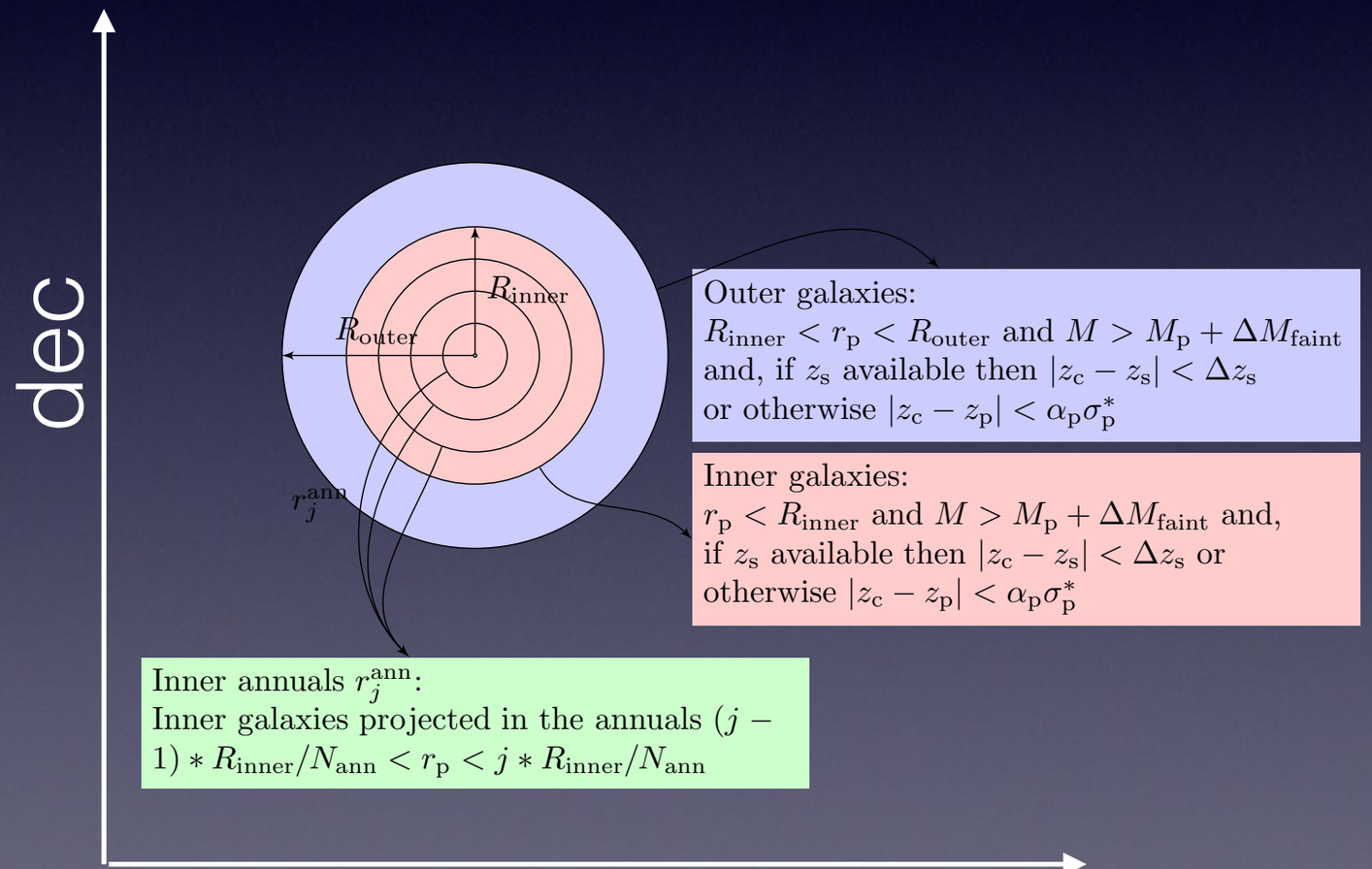
- **Isolated primary galaxies**:
  should be at least 0.5 mag brighter than the neighbouring galaxies

- In three magnitude bins:
  $-21.5<M_p<-20.5$
  $-22.5<M_p<-21.5$
  $-23.5<M_p<-22.5$

Method: Satellite LF

Search cylinder is in redshift space, along the line of sight





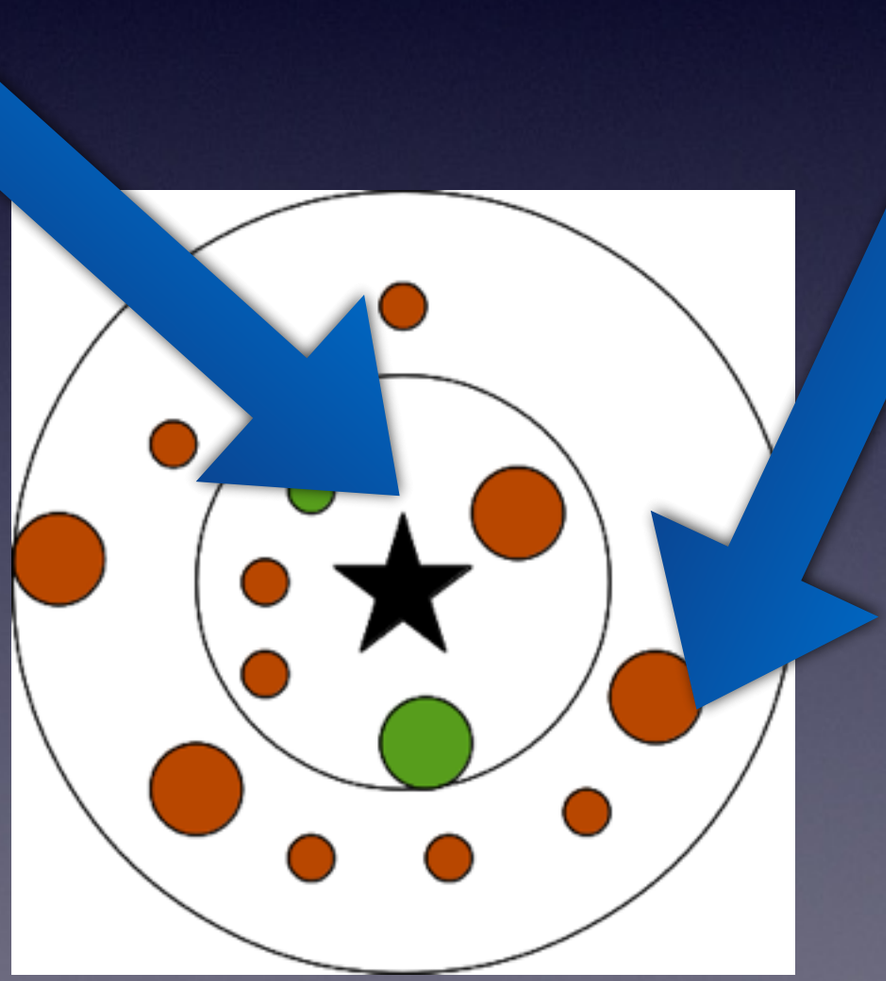
For each isolated primary galaxies:

Number of Satellites =

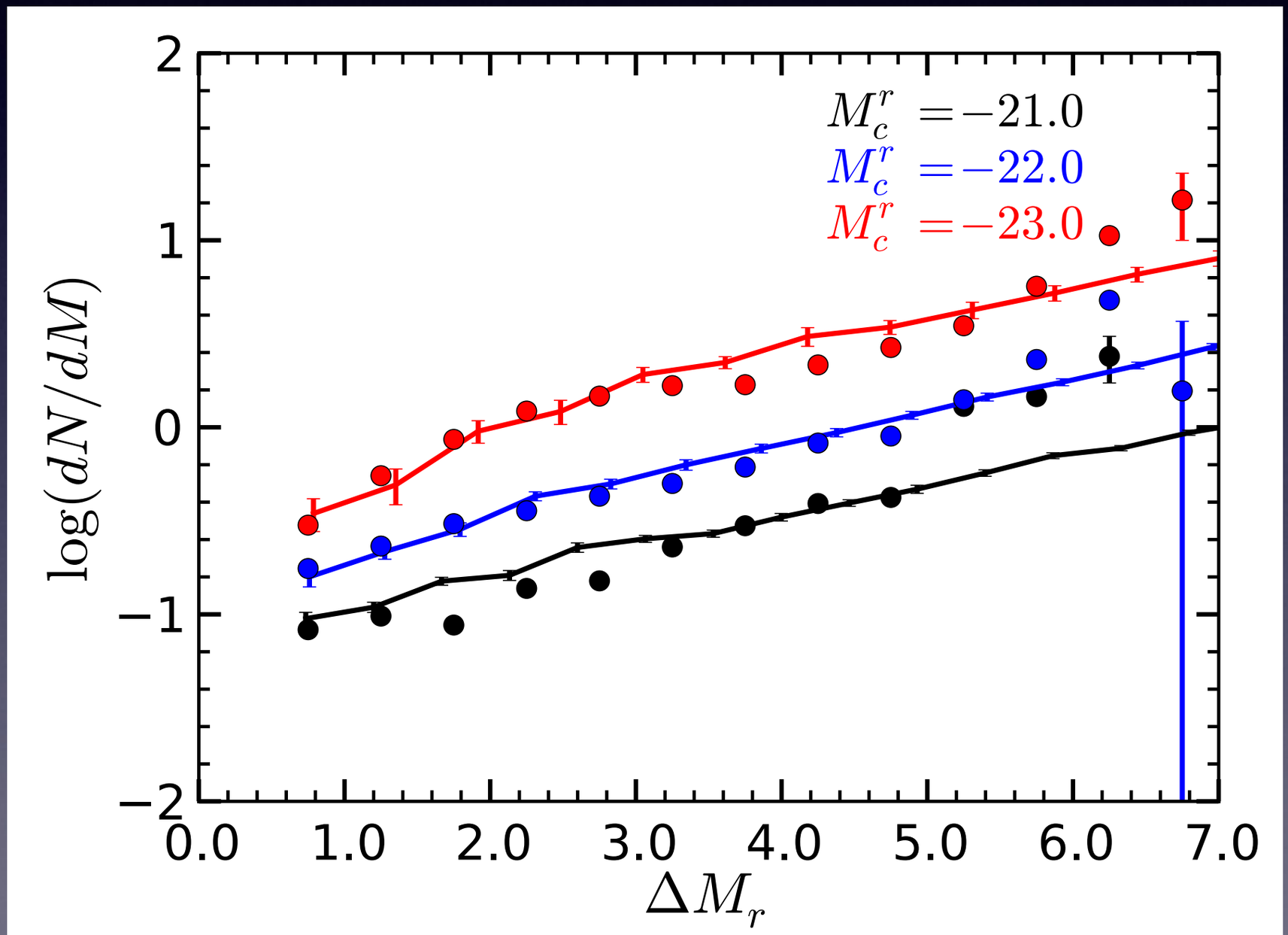
Number of inner galaxies

—

Scaled number of outer galaxies



Satellite LF for isolated primary galaxies

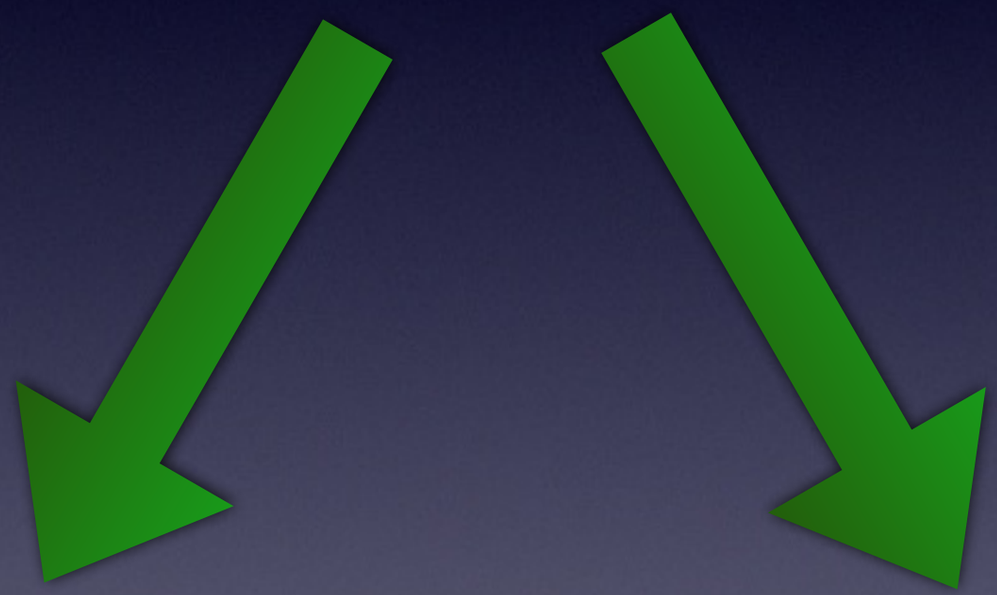


Lines: model (GALFORM, SAM)

Points: SDSS

Splitting the isolated primaries

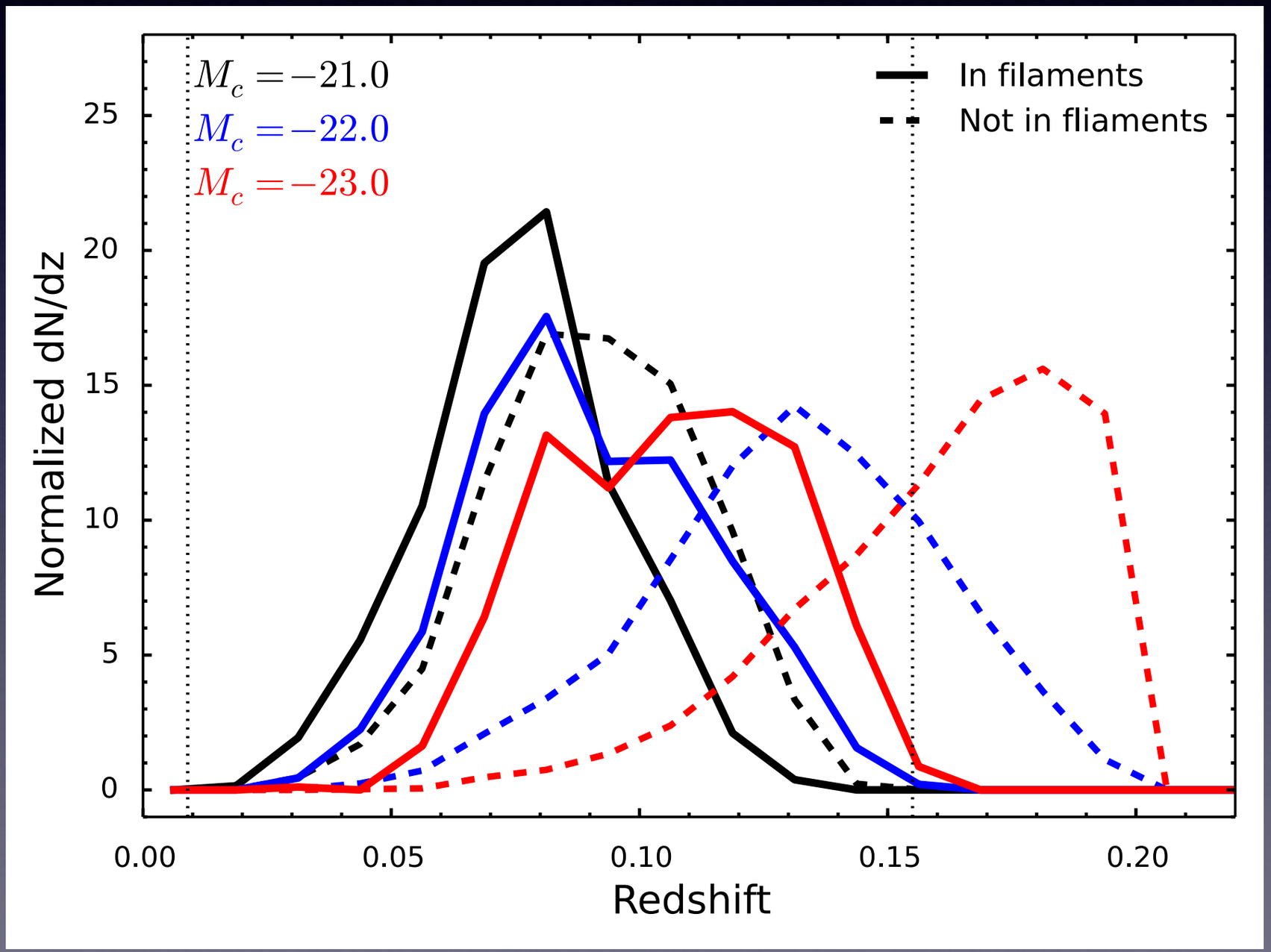
Isolated primaries



in-filaments

not-in-filaments

Redshift bias of primary galaxies



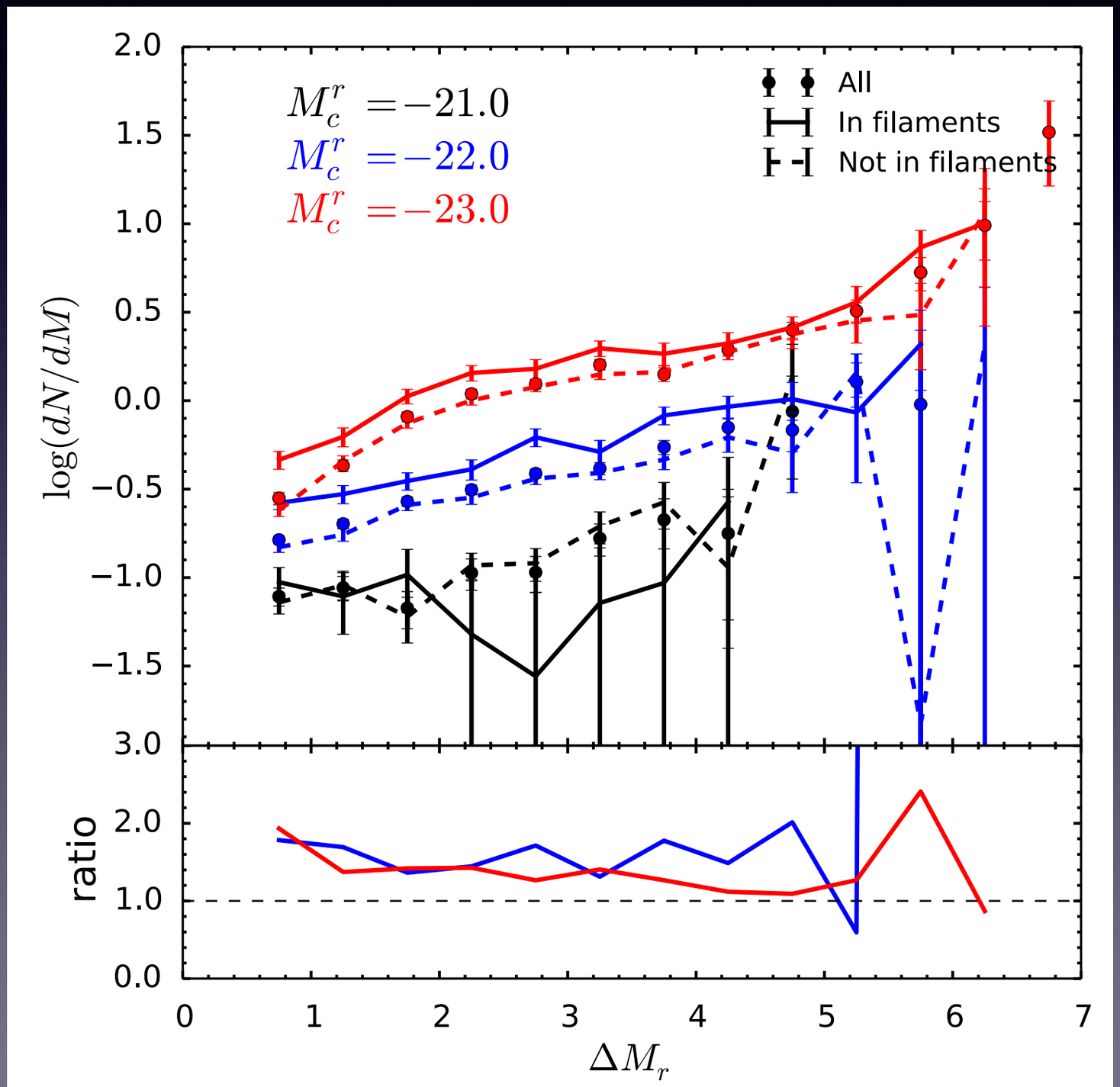
The fraction of galaxies in filaments :

-21.0: 18.5 %

-22.0: 11.0%

-23.0: 15.1%

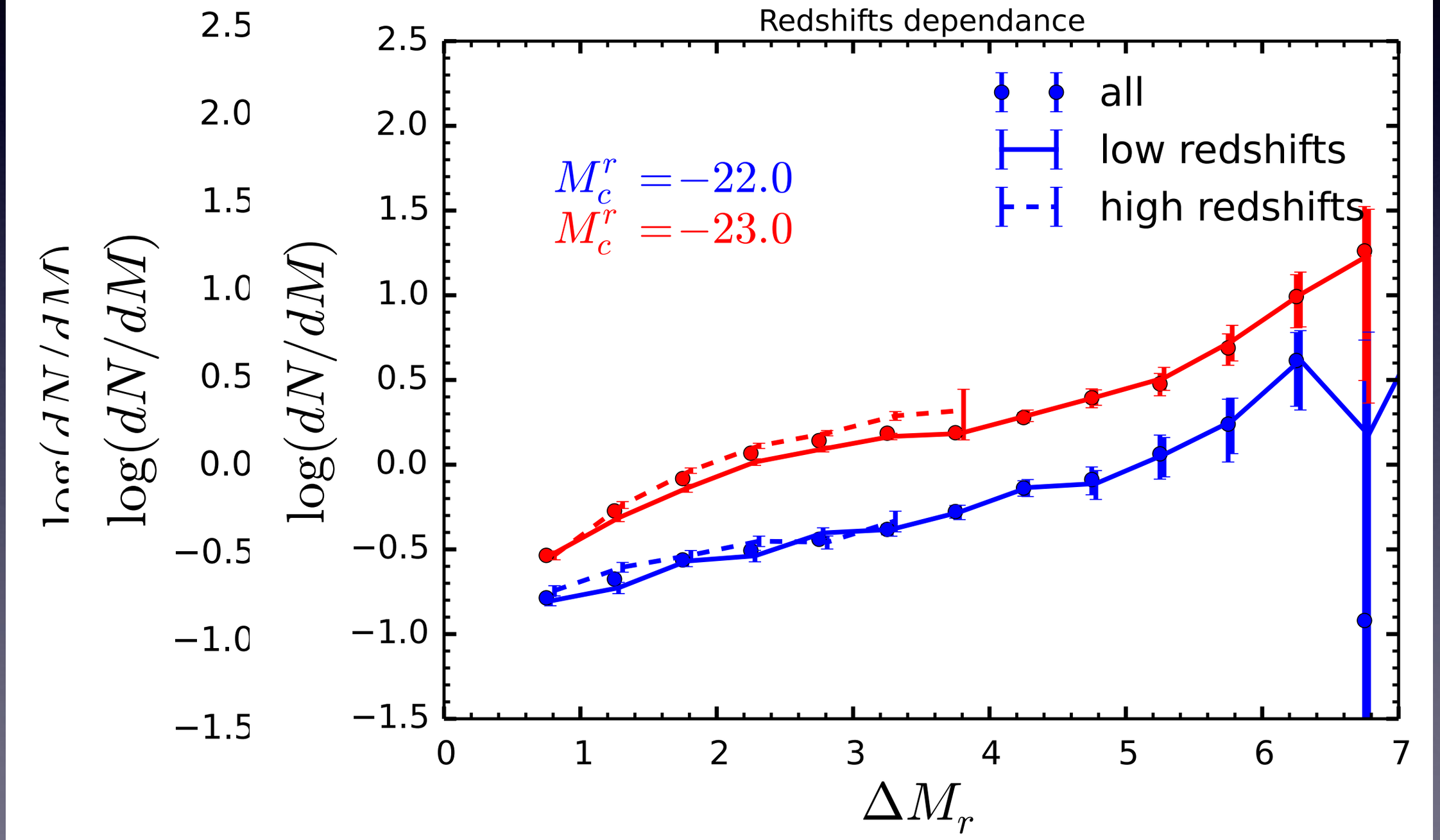
Satellites LFs for galaxies in filaments and not in filaments



Is it real or just…?

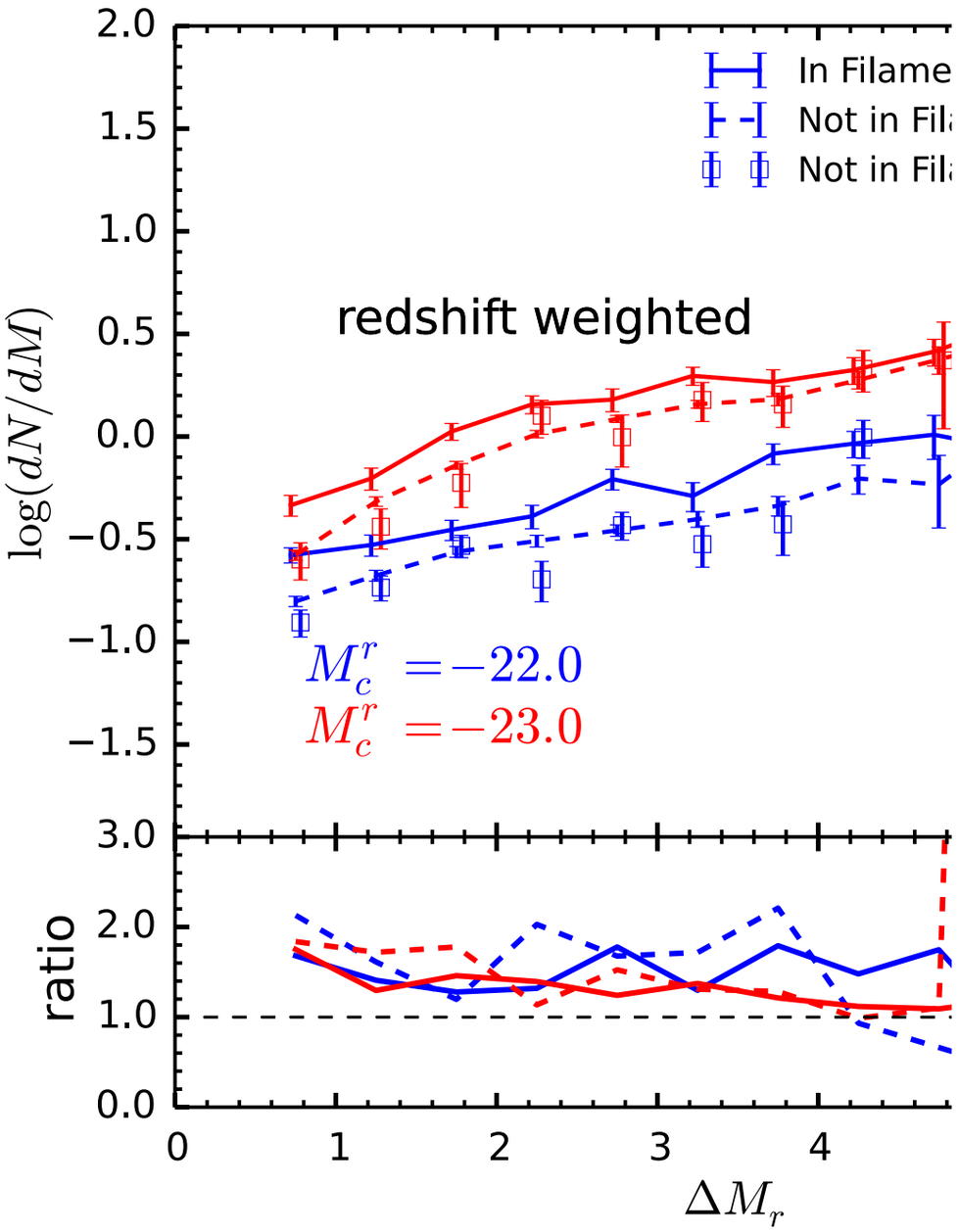
The bias in the estimate of the satellite LFs ?

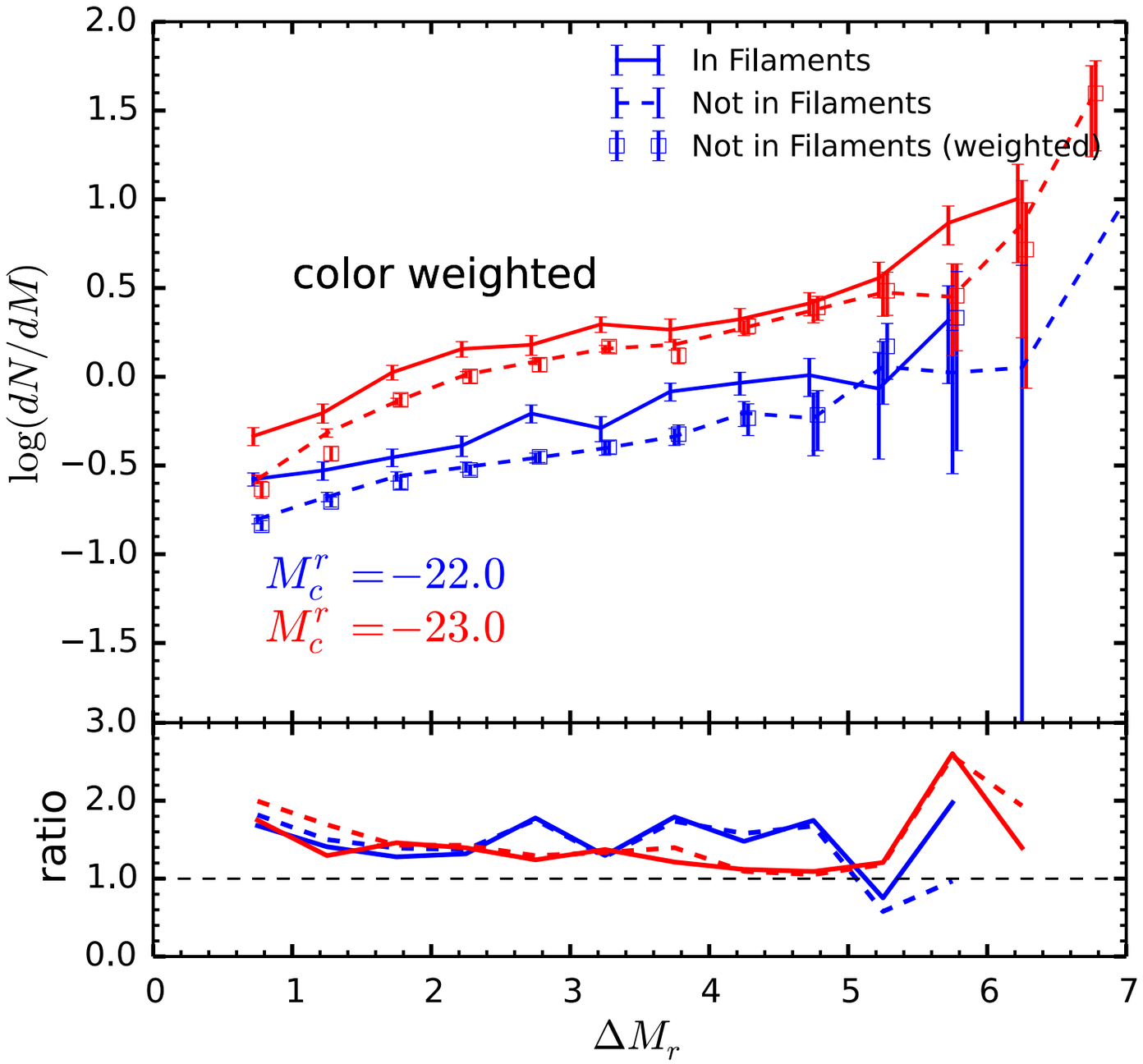
Satellite LFs for isolated primaries



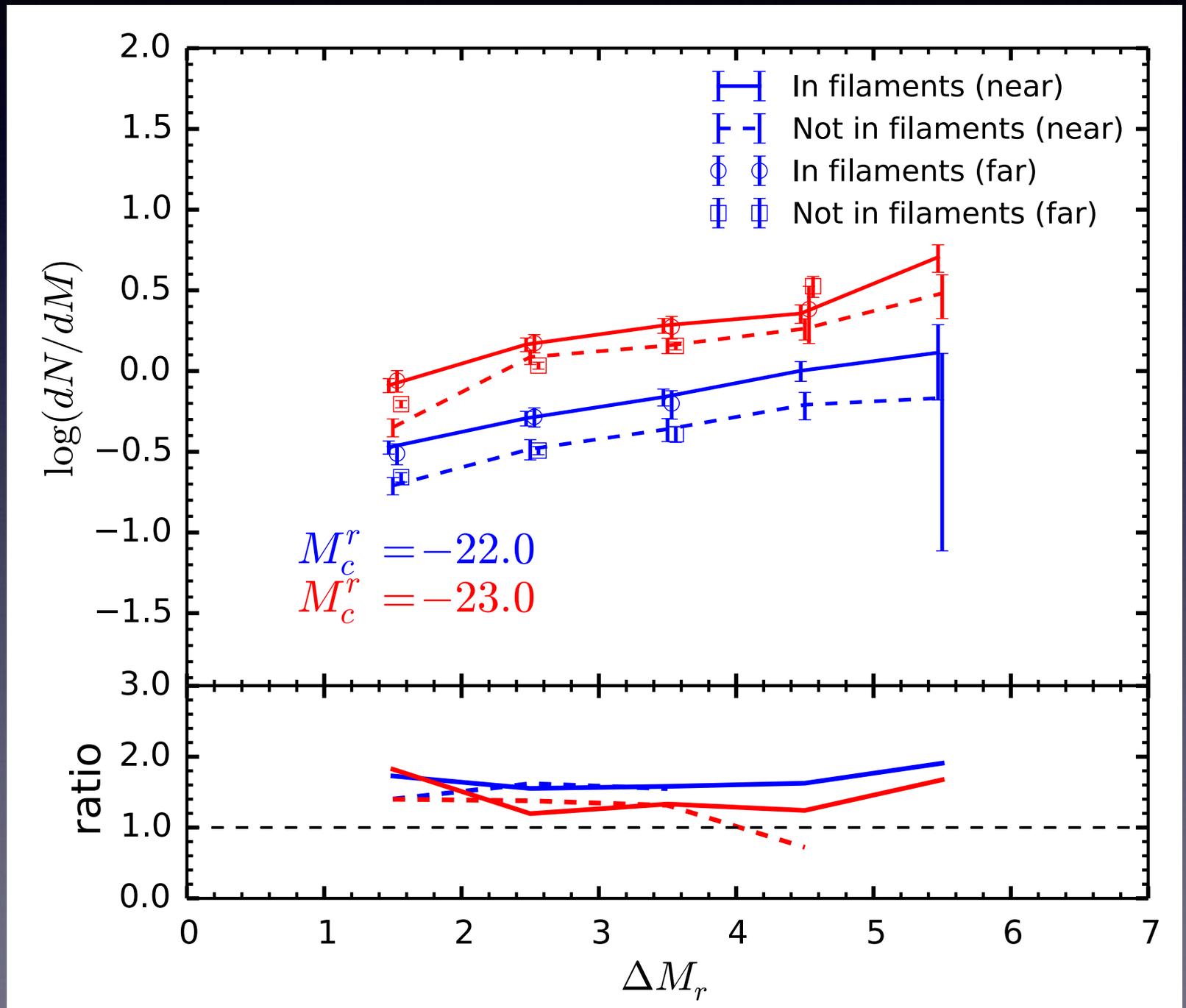
The Bias in the data (galaxy sample, filaments sample)?

weighted satellite LFs





Dependance on the redshift of primaries near and far subsamples



Near:

0.04<z<0.09

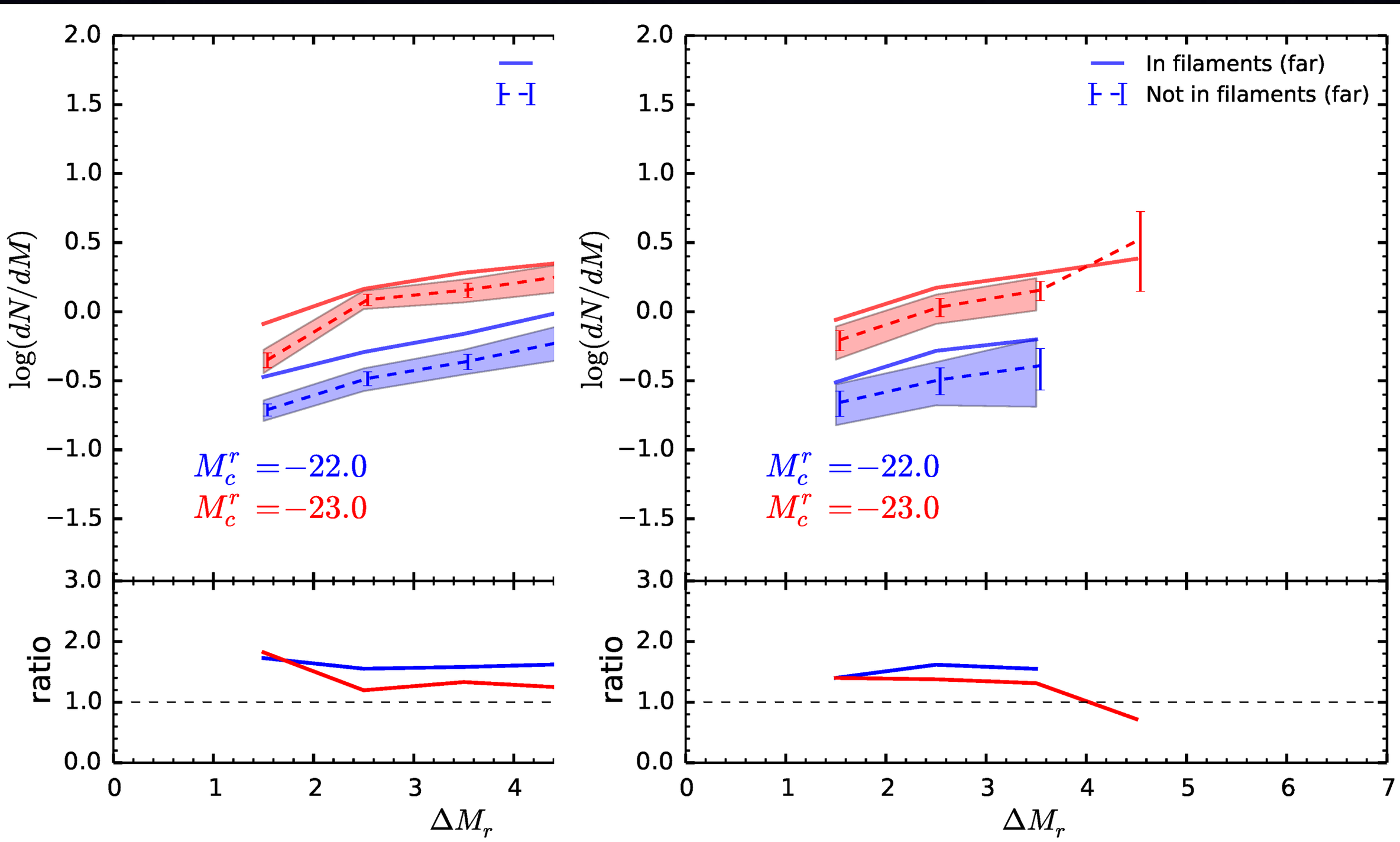
0.05<z<0.11

Far:

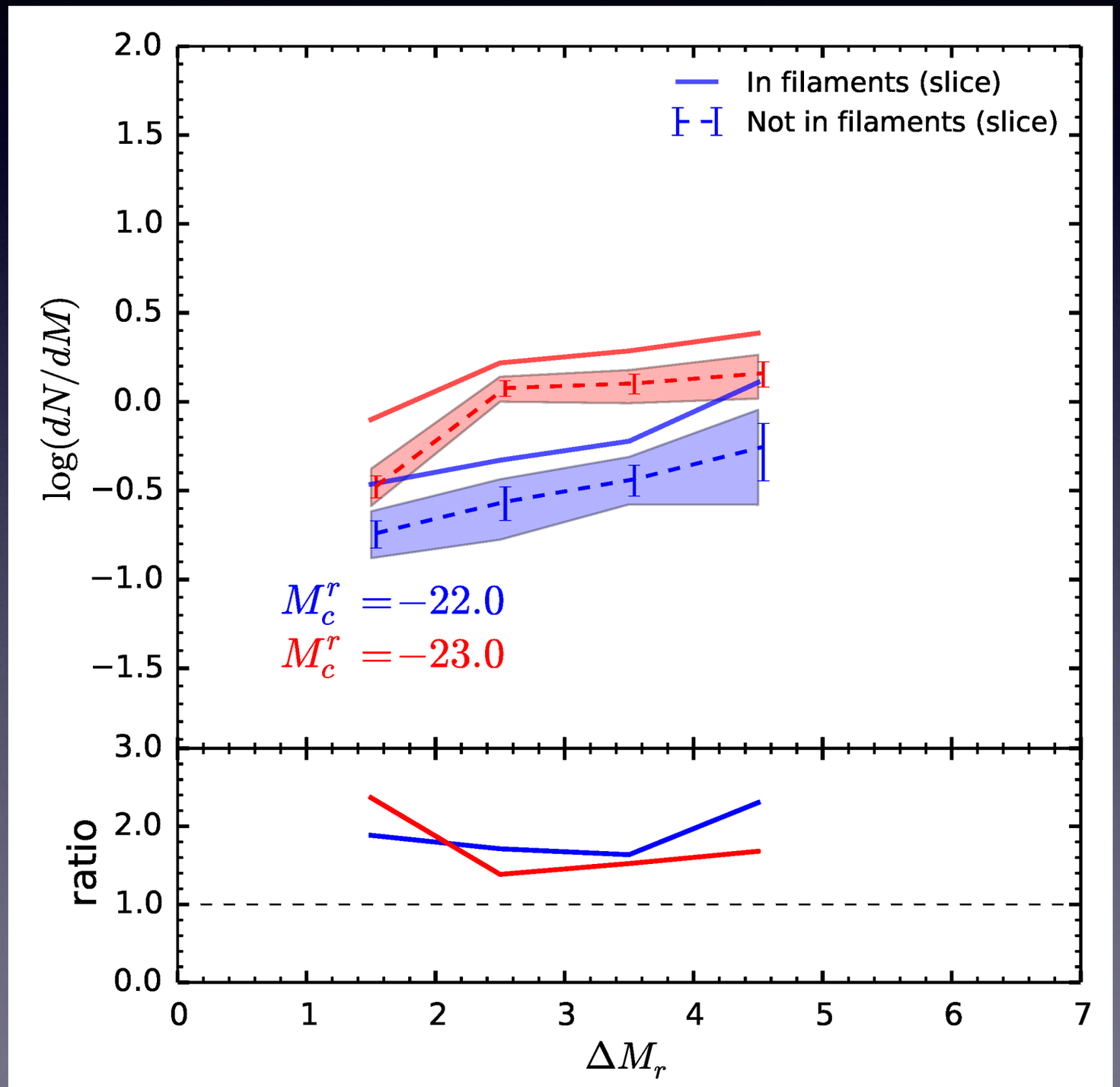
0.09<z<0.14

0.11<z<0.15

The significance of difference



Satellite LFs of primaries in redshift slice

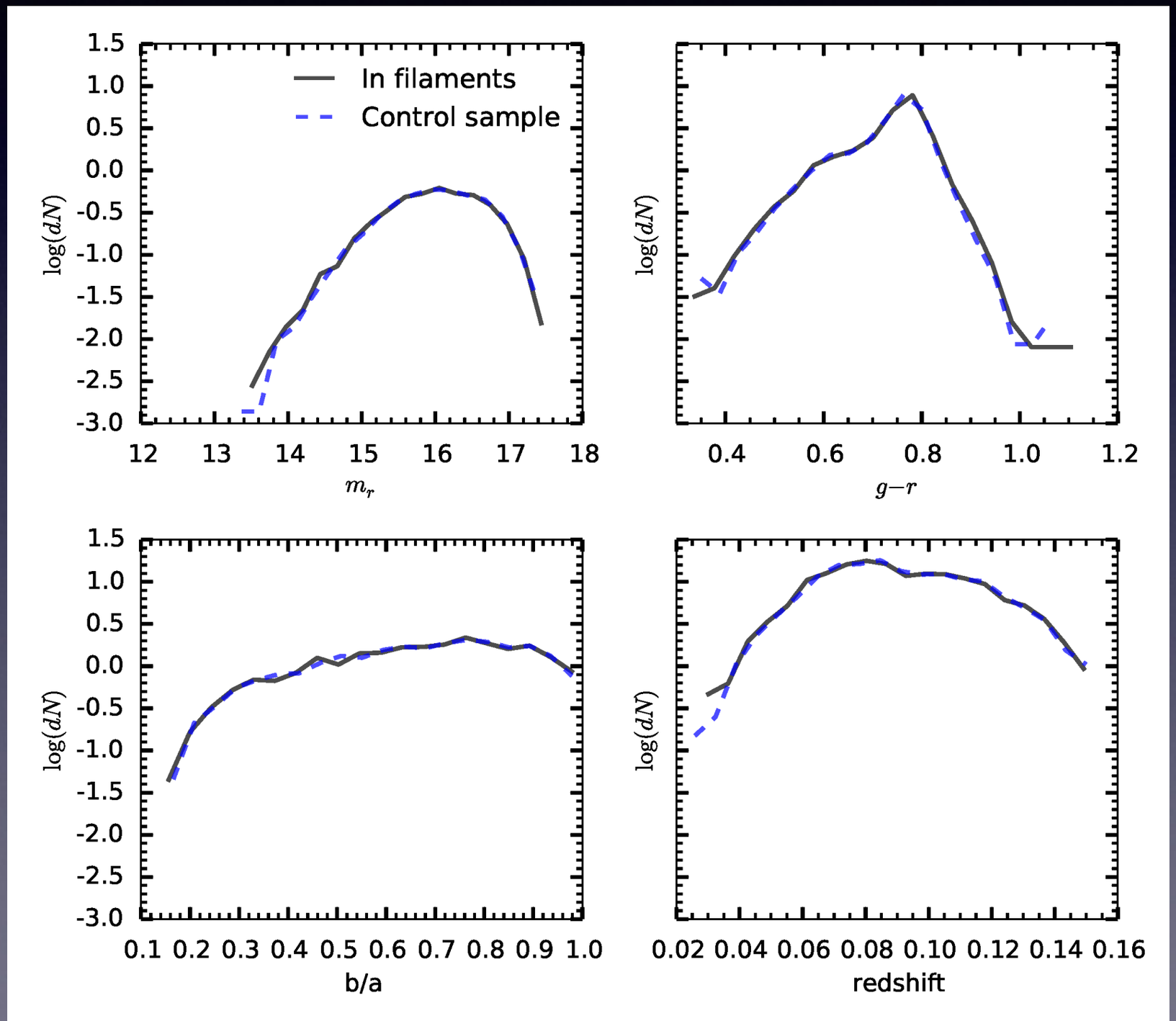


Redshift range:

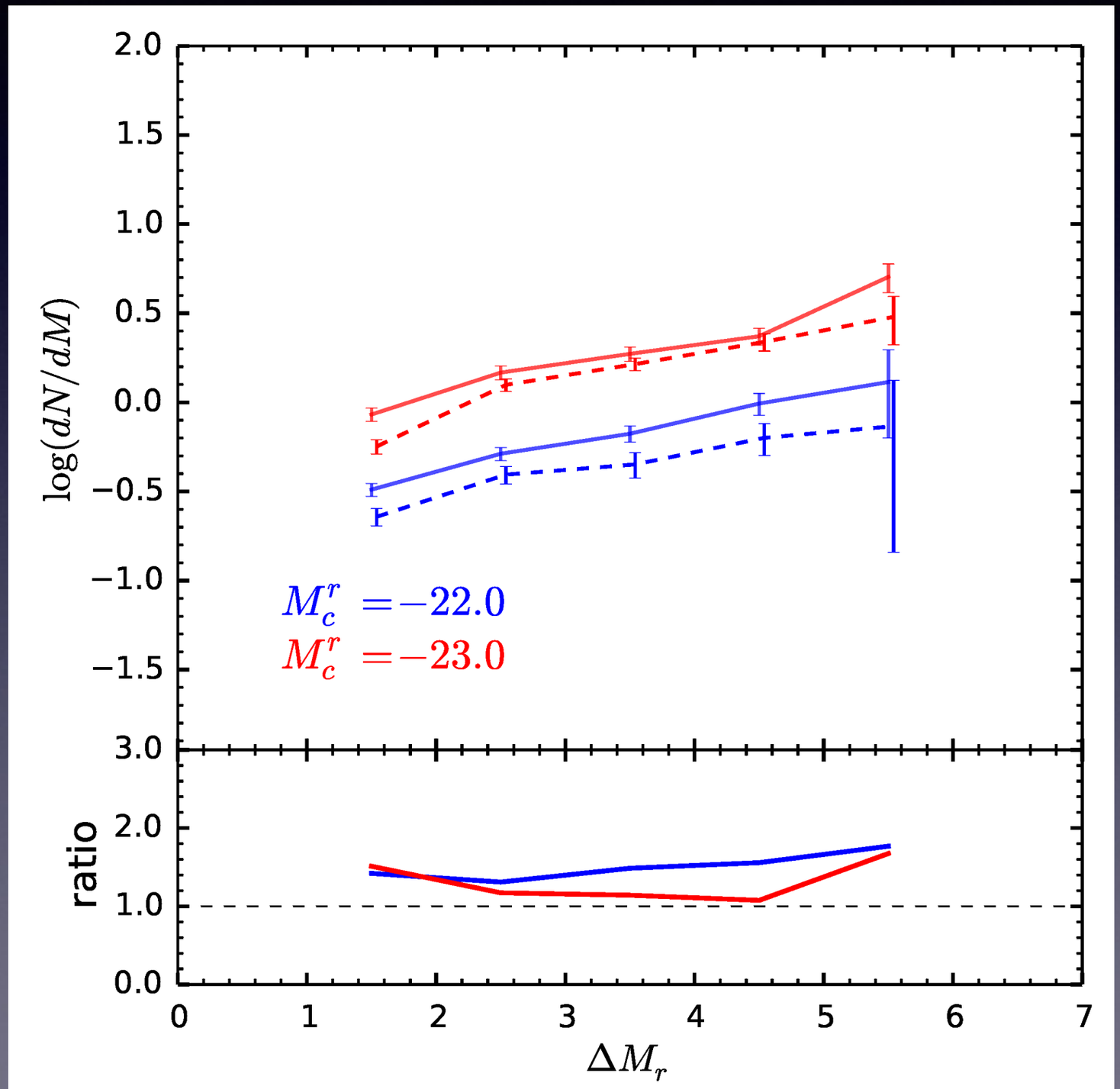
0.07<z<0.09

0.08<z<0.10

Control samples



Satellite LFs for galaxies in filaments and not-in-filaments galaxies in control samples



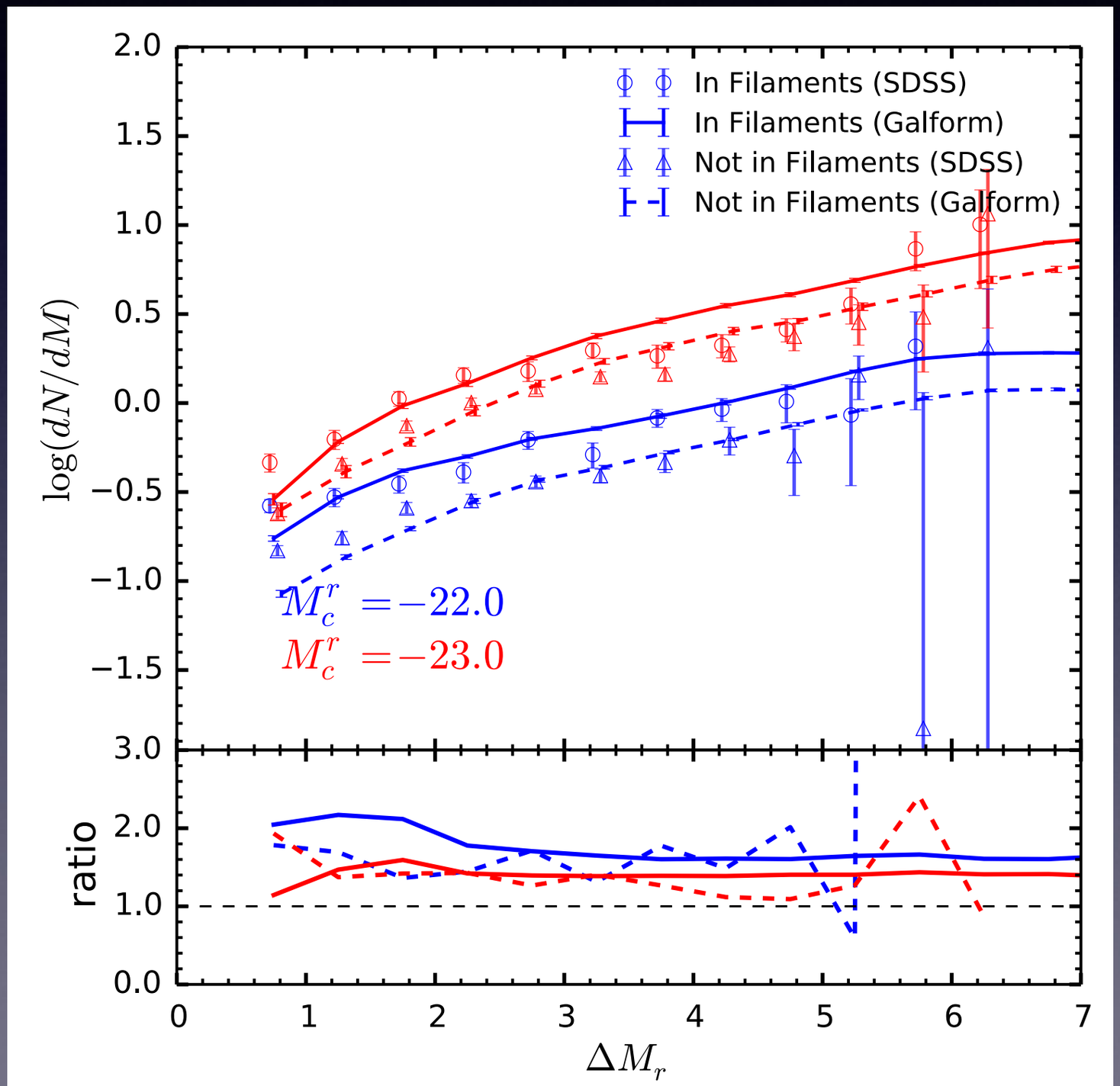
Conclusion

- at a given magnitude, isolated galaxies in filaments have more bright satellites than isolated galaxies that are not in filaments.

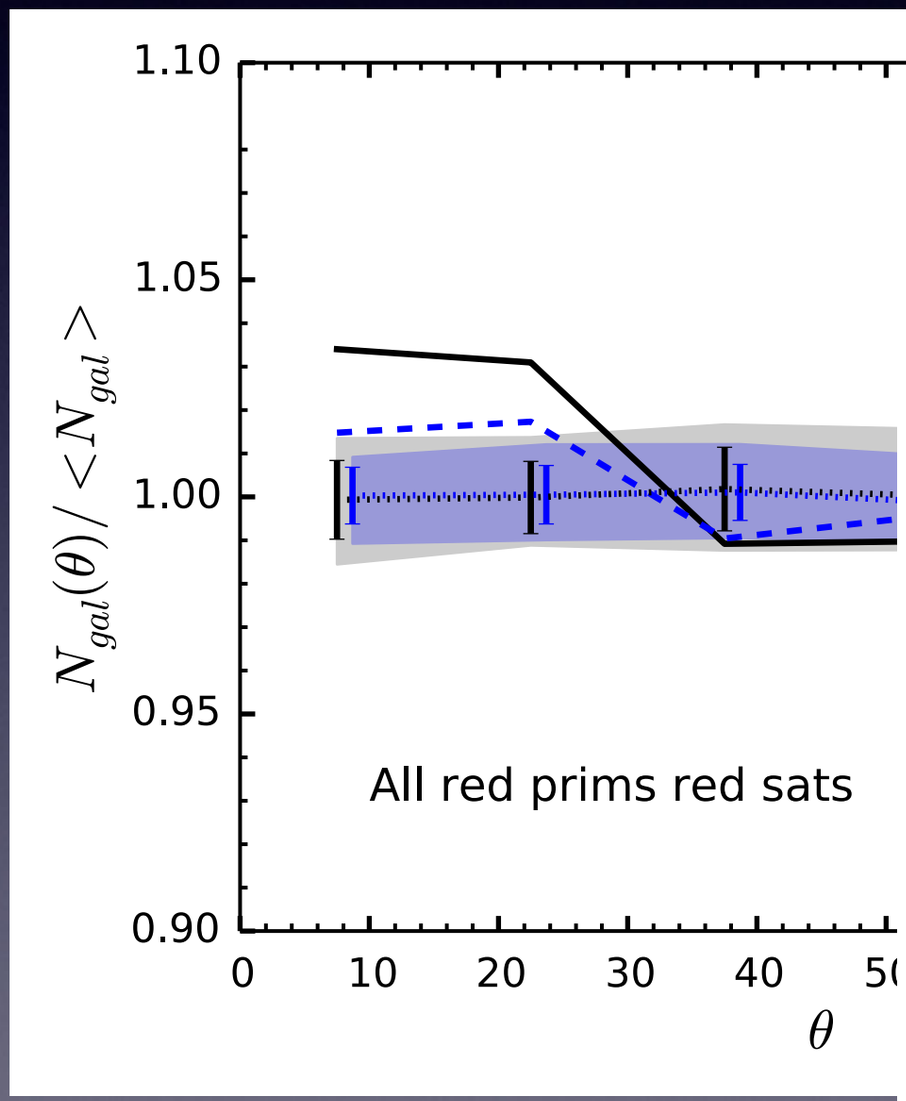
- The difference in filaments and non-filament satellite LF cannot be attributed to colour, redshift bias. They are intrinsically different.

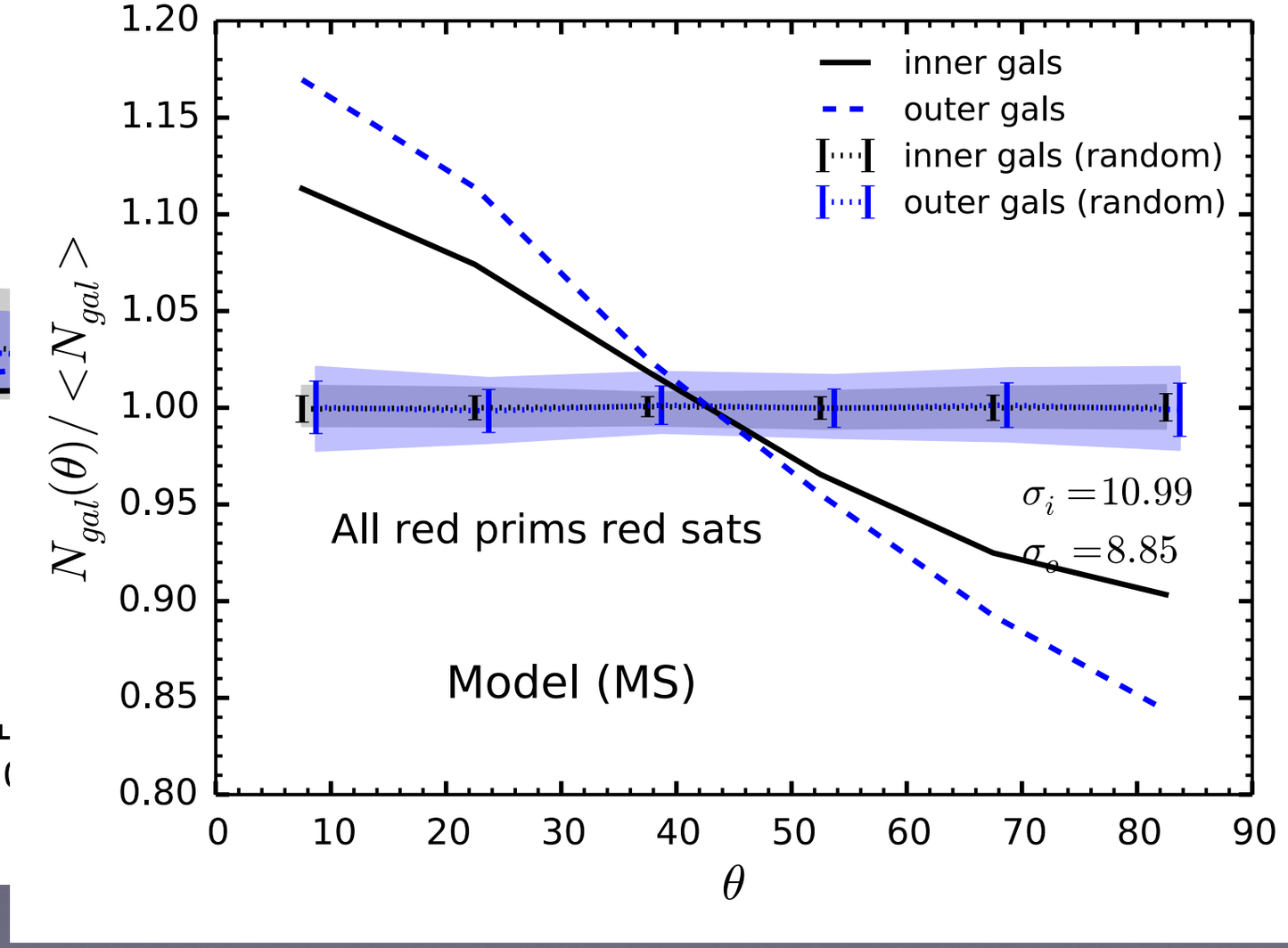
Future work

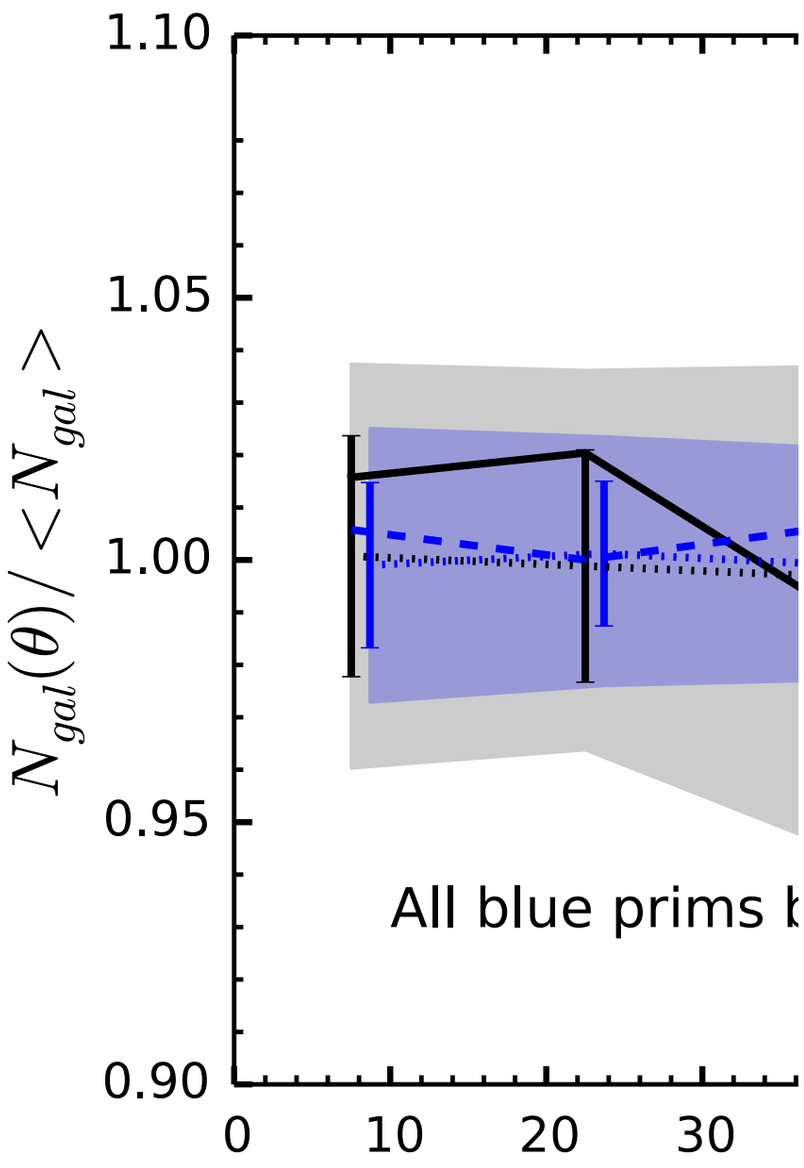
Comparison with model galaxies

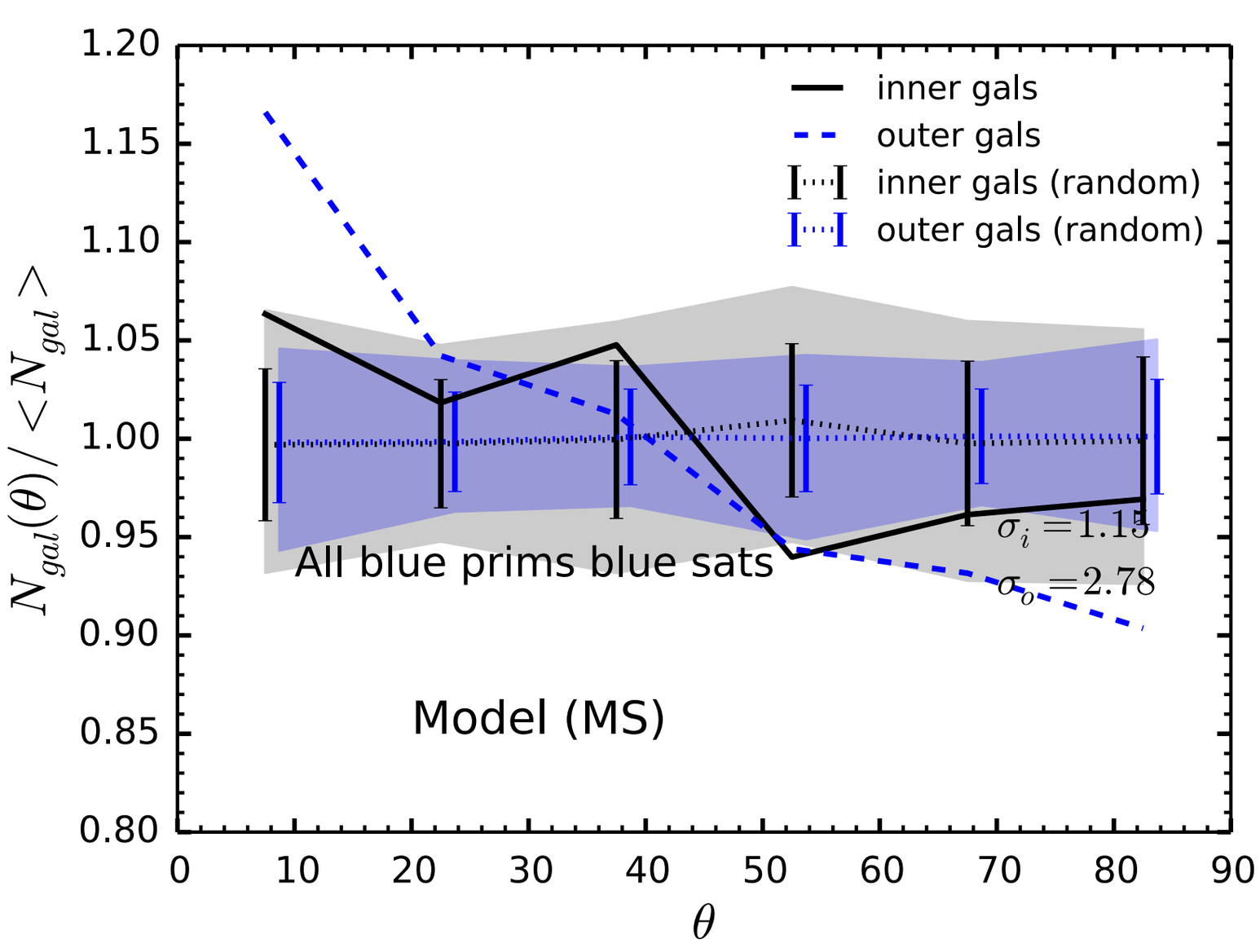


Alignment


1.10
1.05
1.00
0.95
0.90
0
10
20
30
40
$N_{gal}(\theta) / < N_{gal} >$
θ
All red prims red sats


1.20
1.15
1.10
1.05
1.00
0.95
0.90
0.85
0.80
0
10
20
30
40
50
60
70
80
90
$N_{gal}(\theta) / < N_{gal} >$
θ
inner gals
outer gals
inner gals (random)
outer gals (random)
All red prims red sats
$\sigma_i = 10.99$
$\sigma_o = 8.85$
Model (MS)


1.10
1.05
1.00
0.95
0.90
0
10
20
30
$N_{gal}(\theta) / < N_{gal} >$
All blue prims b


1.20
1.15
1.10
1.05
1.00
0.95
0.90
0.85
0.80
0
10
20
30
40
50
60
70
80
90
θ
$N_{gal}(\theta) / < N_{gal} >$
inner gals
outer gals
inner gals (random)
outer gals (random)
All blue prims blue sats
$\sigma_i = 1.15$
$\sigma_o = 2.78$
Model (MS)

Thank you