

On the origin of slow and fast rotating galaxies

Anna Weigel

ETH Zurich

with Kevin Schawinski



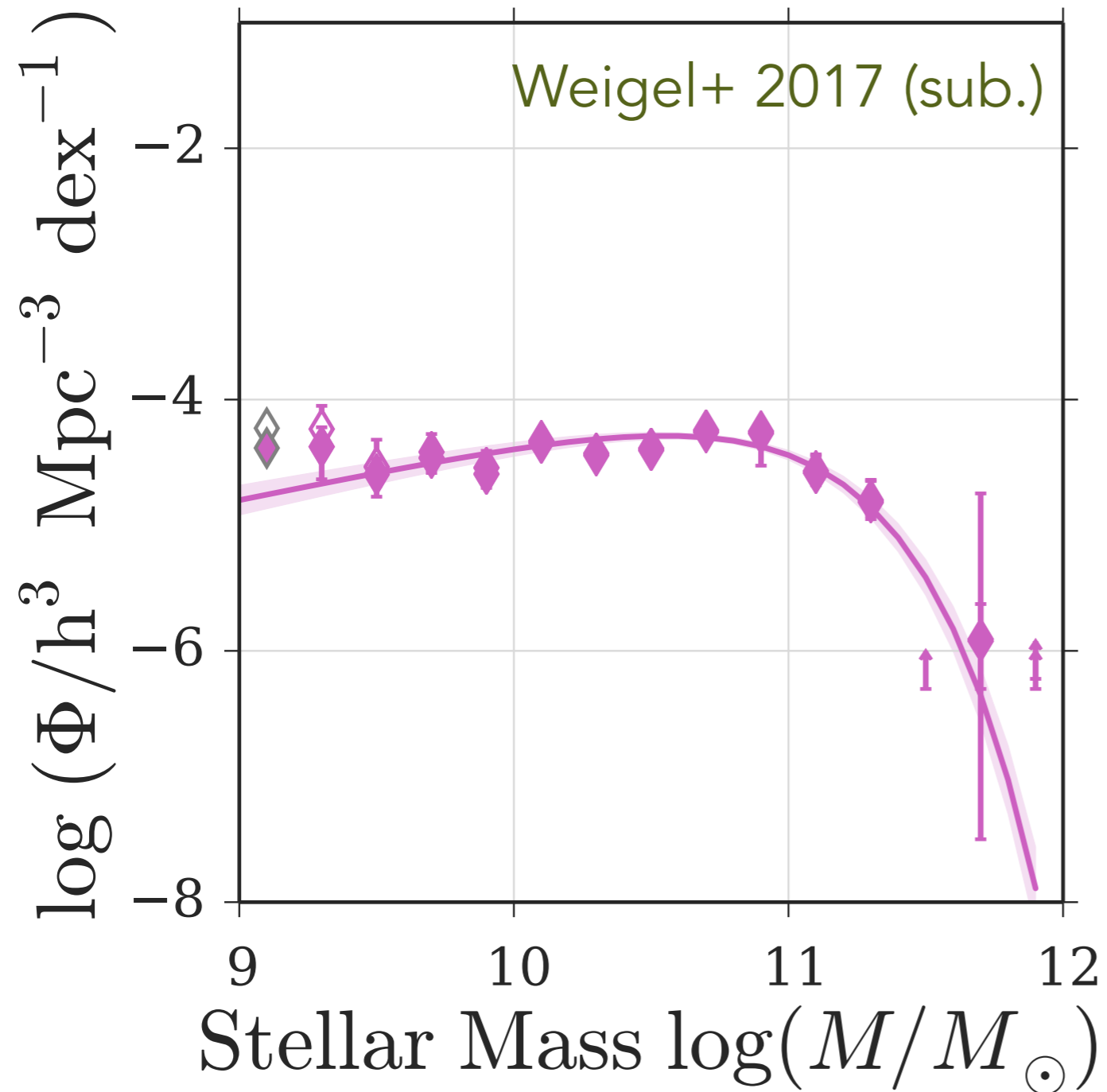
ETH black hole group

assumptions:

1. **major mergers** lead to formation of elliptical galaxies with **slow rotator kinematics**
2. slow rotators cannot be created through alternative processes

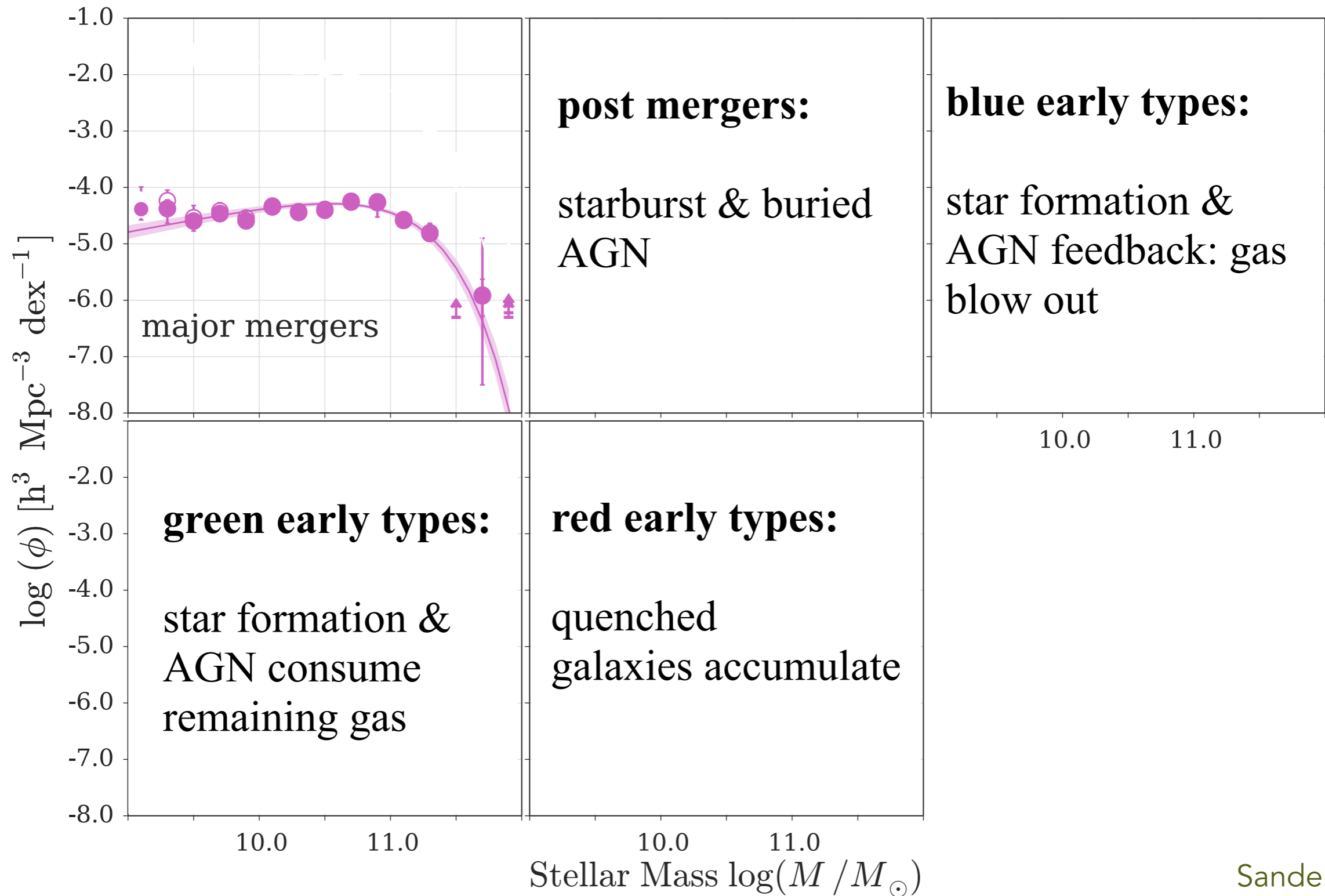
place to test assumptions: **green valley**

previous work



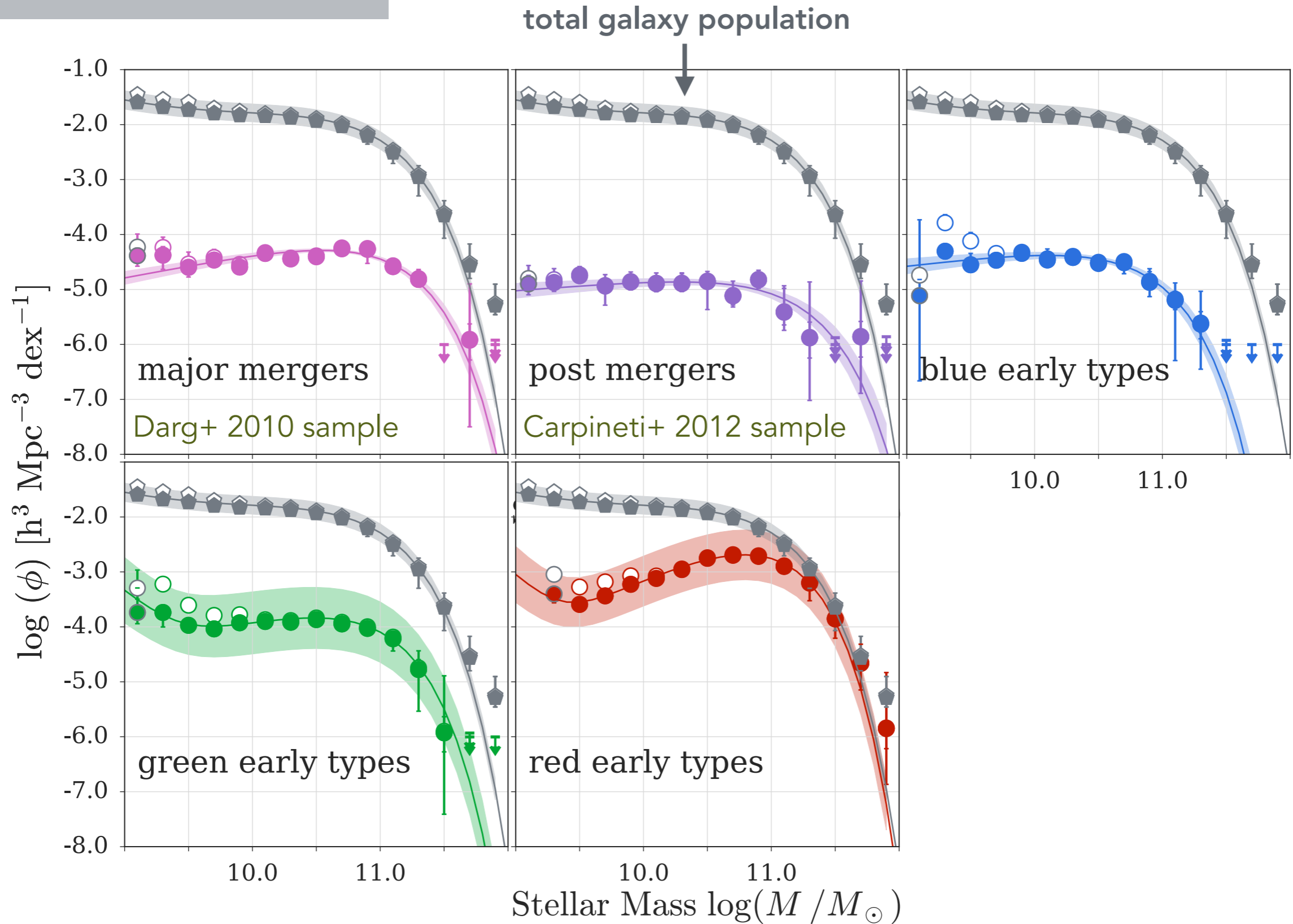
- SDSS DR7 (York+ 2000, Abazajian+ 2009)
- $z = 0.02 - 0.06$
- visual classifications
Darg+ 2010 sample + Galaxy Zoo 1 (Lintott+ 2008, 2011)
- 3 mass fct. methods (Weigel+ 2016)



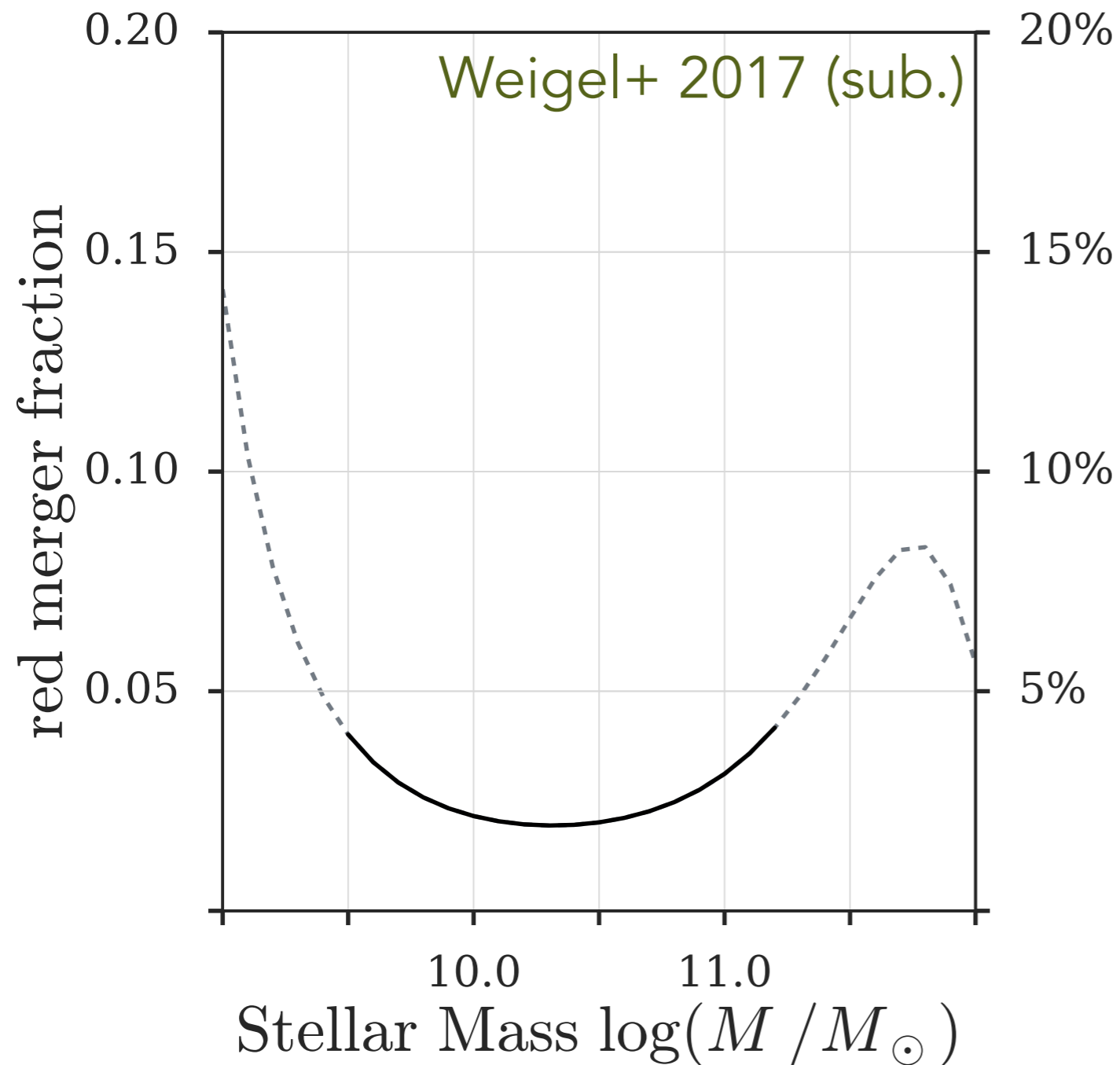


previous work

Weigel+ 2017 (sub.)






previous work

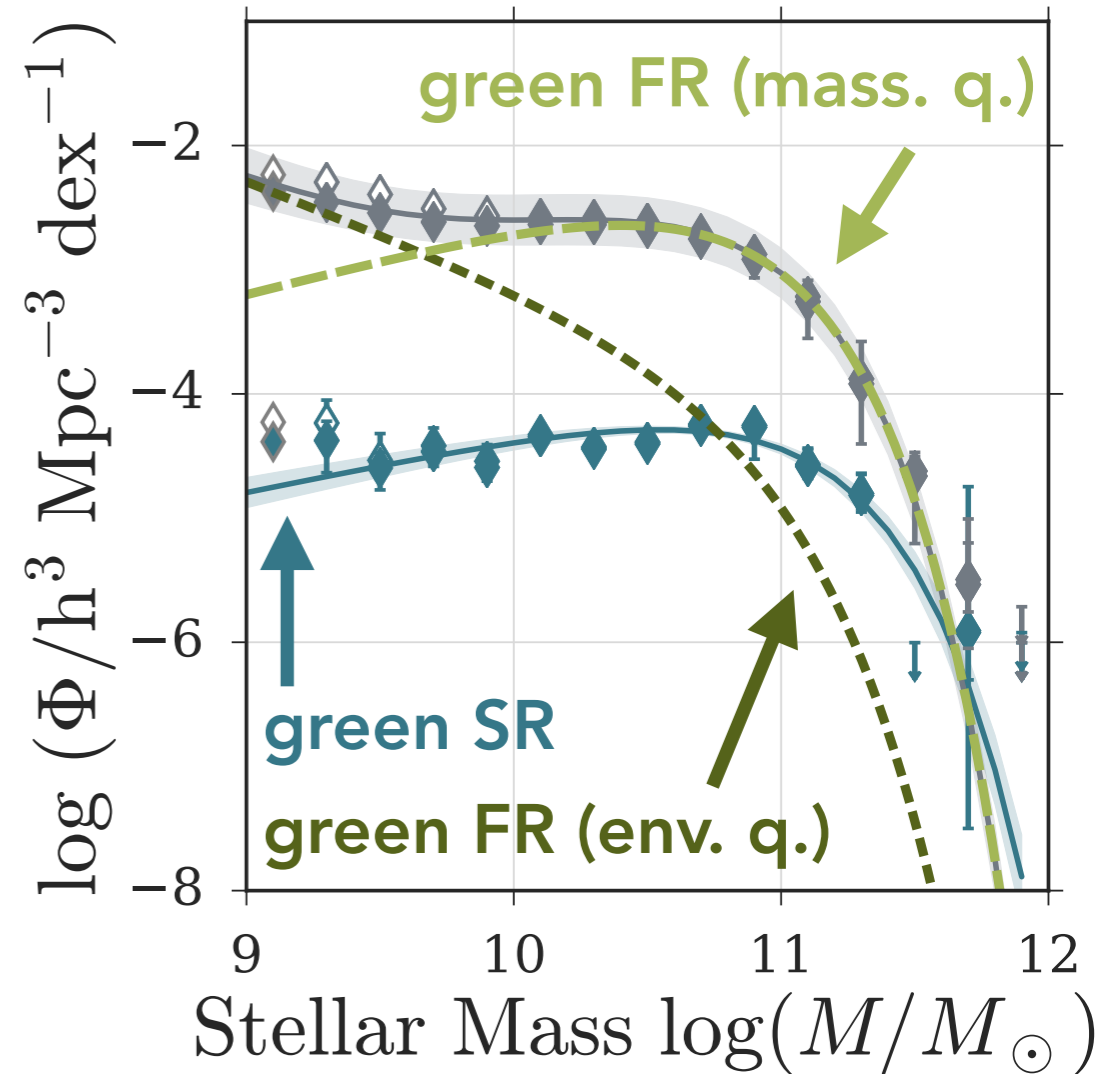


- major merger quenched galaxies only make up small fraction of quenched galaxies
- as early types, on average transition green valley on shorter time scale than all green galaxies

(Schawinski+ 2014, Smethurst+ 2015)

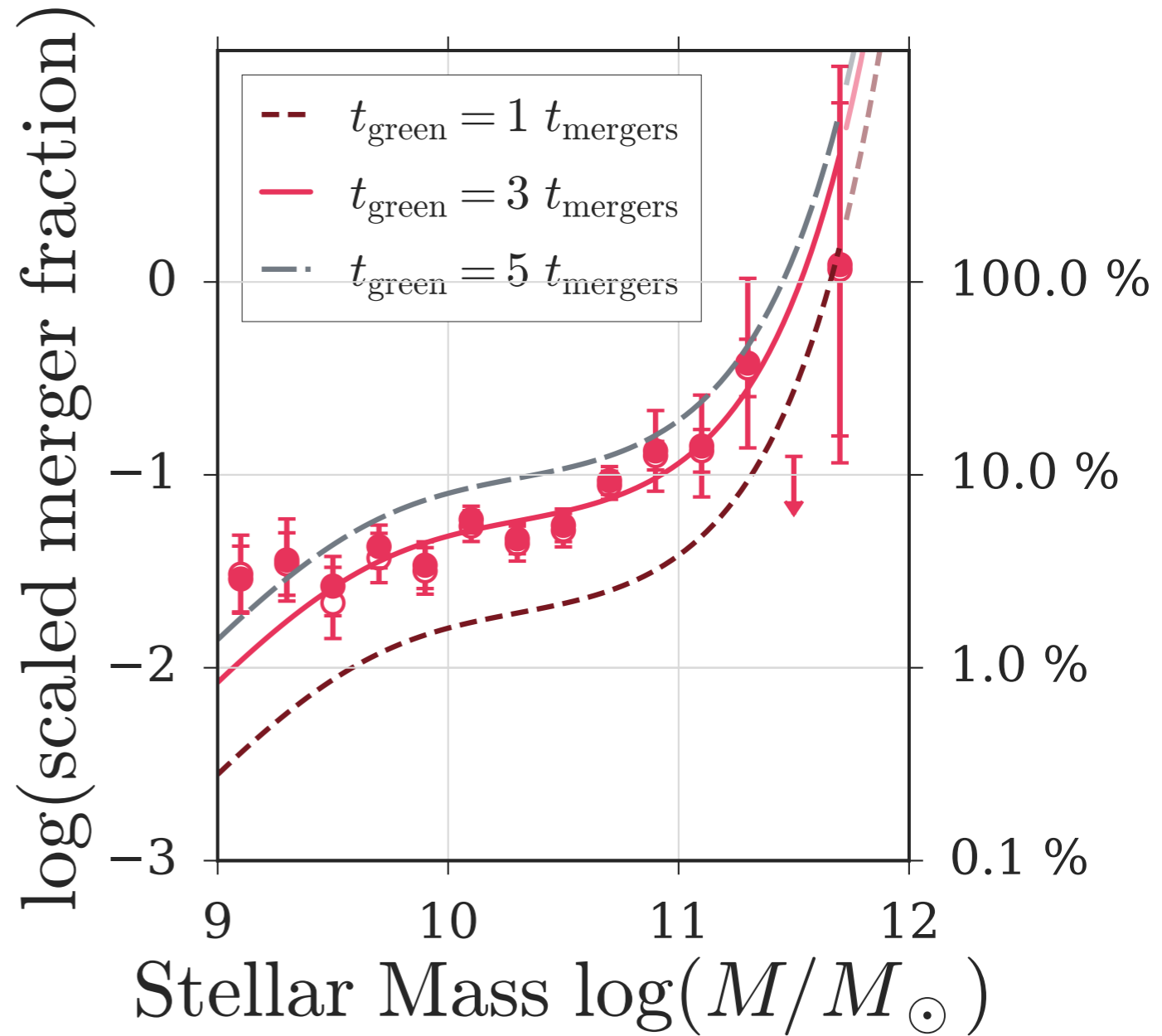
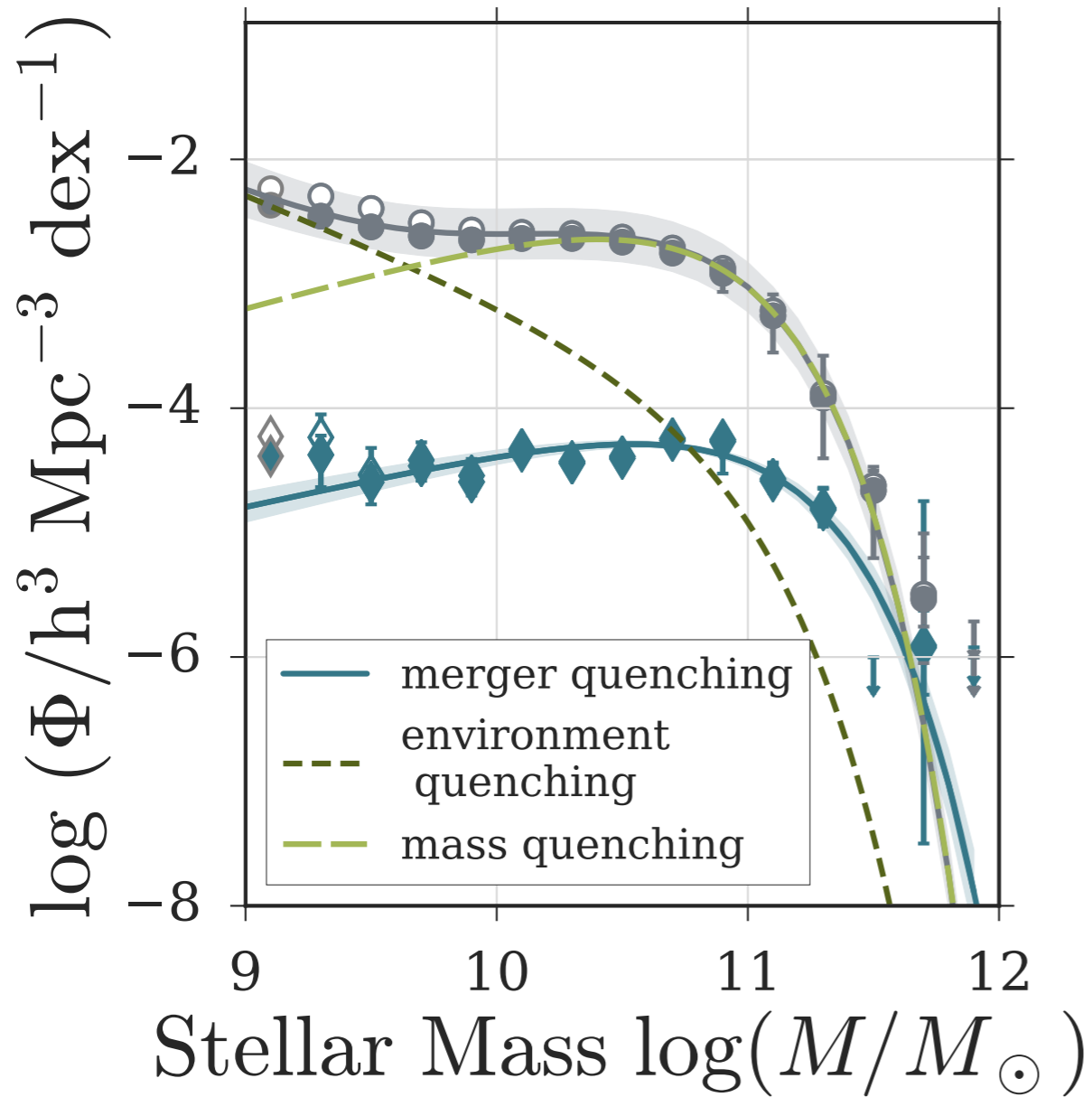
quenching

merger quenching		slow rotator formation	rapid green valley transition
environment quenching		fast rotator formation	gradual green valley transition
mass quenching		fast rotator formation	gradual green valley transition

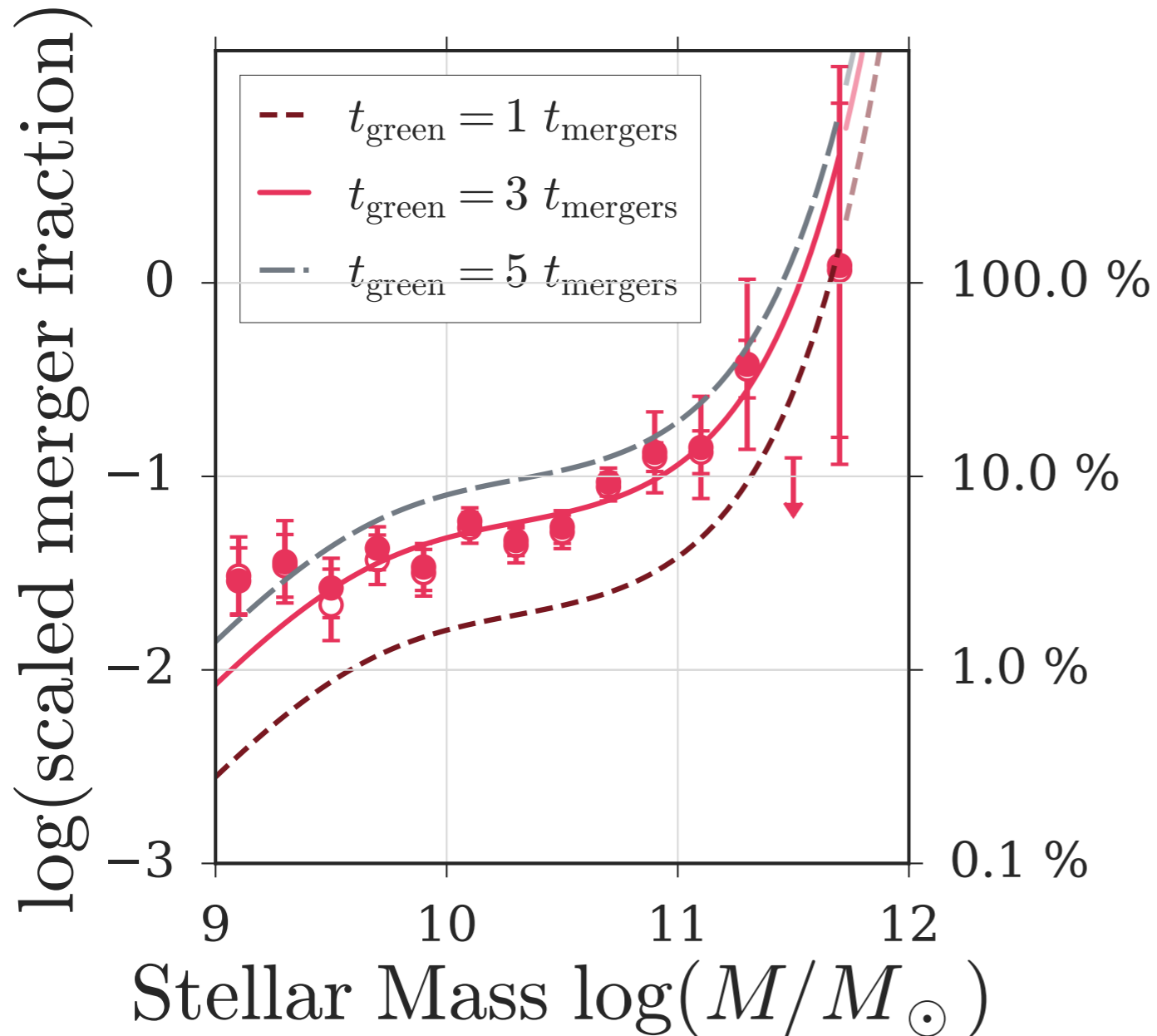


Peng+ 2010, 2012

supporting evidence

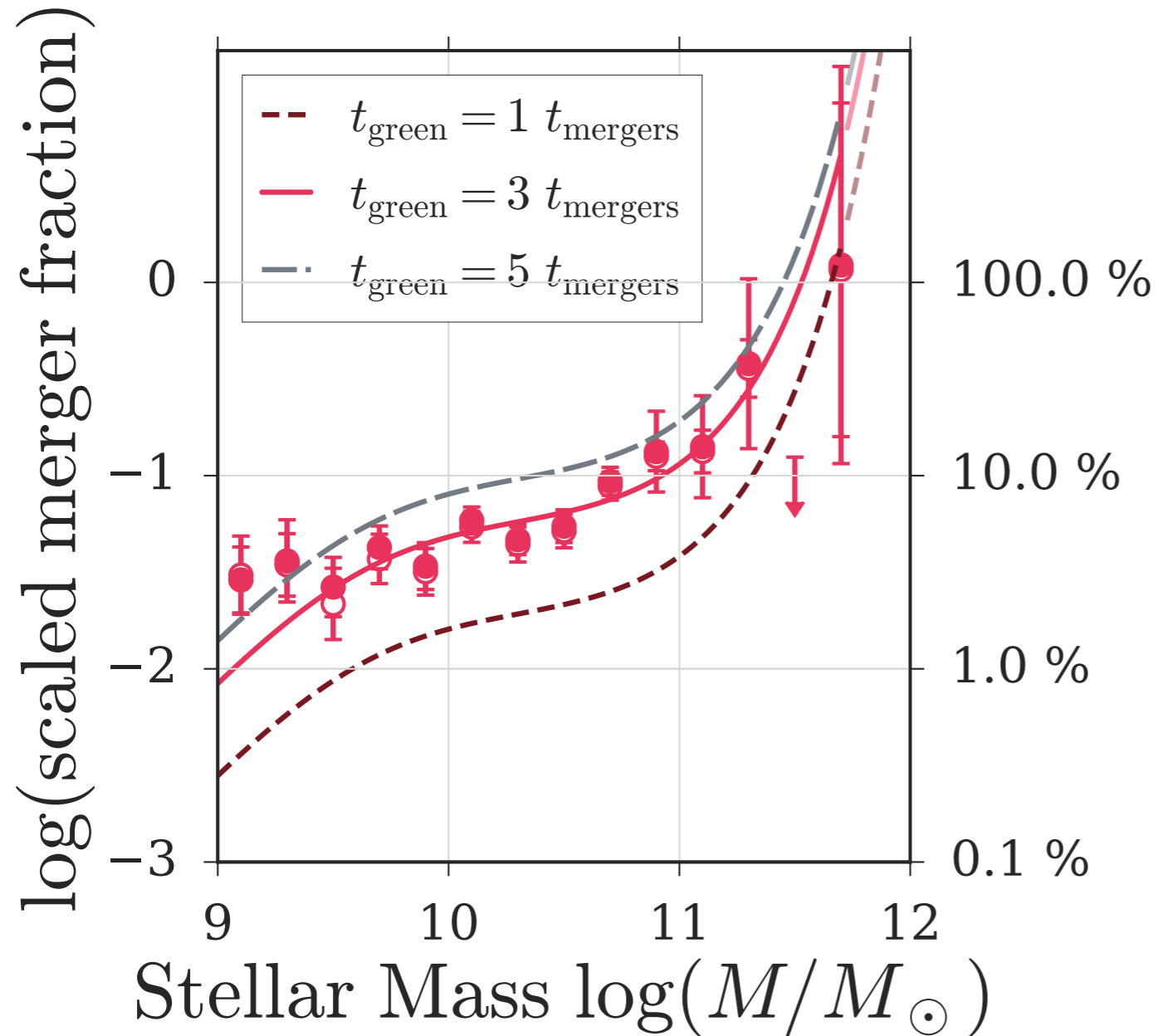


supporting evidence



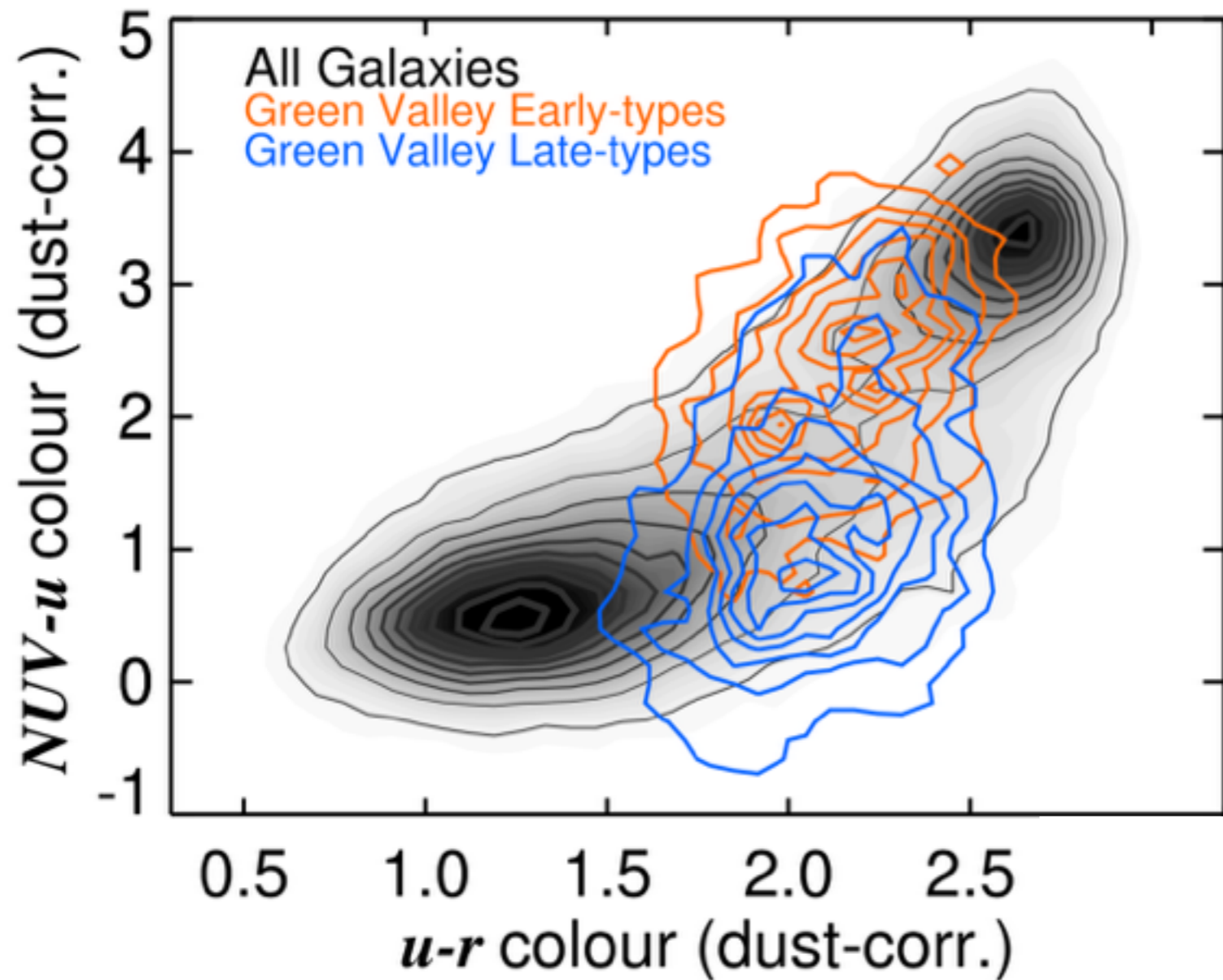
- overall fraction of green slow rotators is low
e.g. Emsellem+ 2011
- mass dependence: increase in slow rotator fraction towards higher M
e.g. Emsellem+ 2011, Cappellari+ 2013, Veale+ 2017

testing the model



- slow rotator fraction in the green valley
- no slow rotators in green valley > created through dry mergers on red sequence?

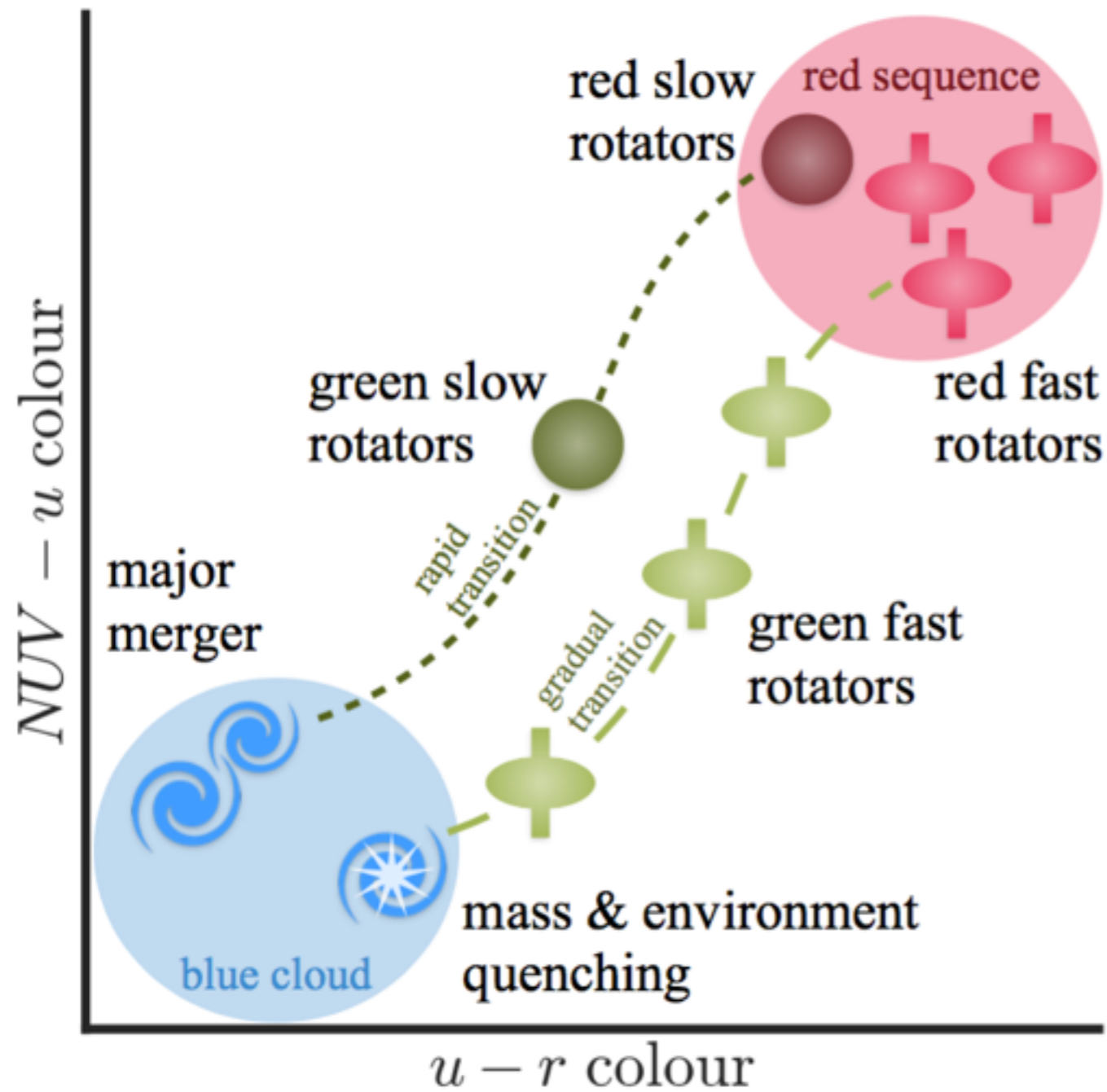
testing the model



- early types transition green valley more rapidly than late types

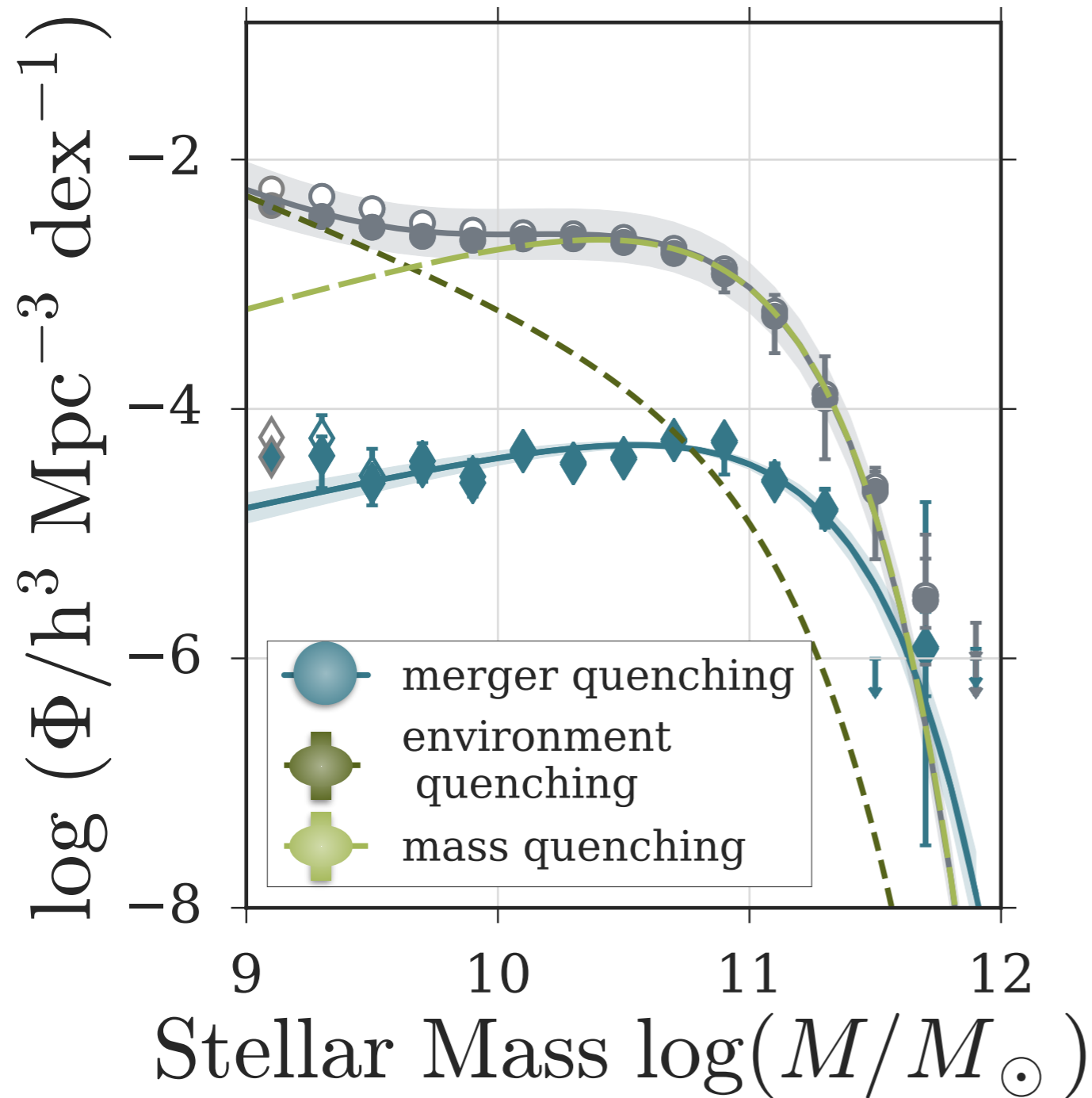
Schawinski+ 2014

testing the model



- separate slow and fast rotators in NUV-optical colour-colour diagram

testing the model



- construct stellar mass functions:
- **slow rotators:** ~ major merger mass function
- **fast rotators:** ~ green mass function

quenching

quenching = changes in **colour**, **morphology** & **kinematics**?

mass & environment quenching:

compare kinematics:

- different: evidence for separate quenching channels
- same: different triggers lead to same kinematics or should not be treated separately

conclusion

green valley:

- help constrain fast/slow rotator formation &
- connection between kinematics & quenching

IFU surveys:

- able to test some of these predictions already?
- well understood selection function?