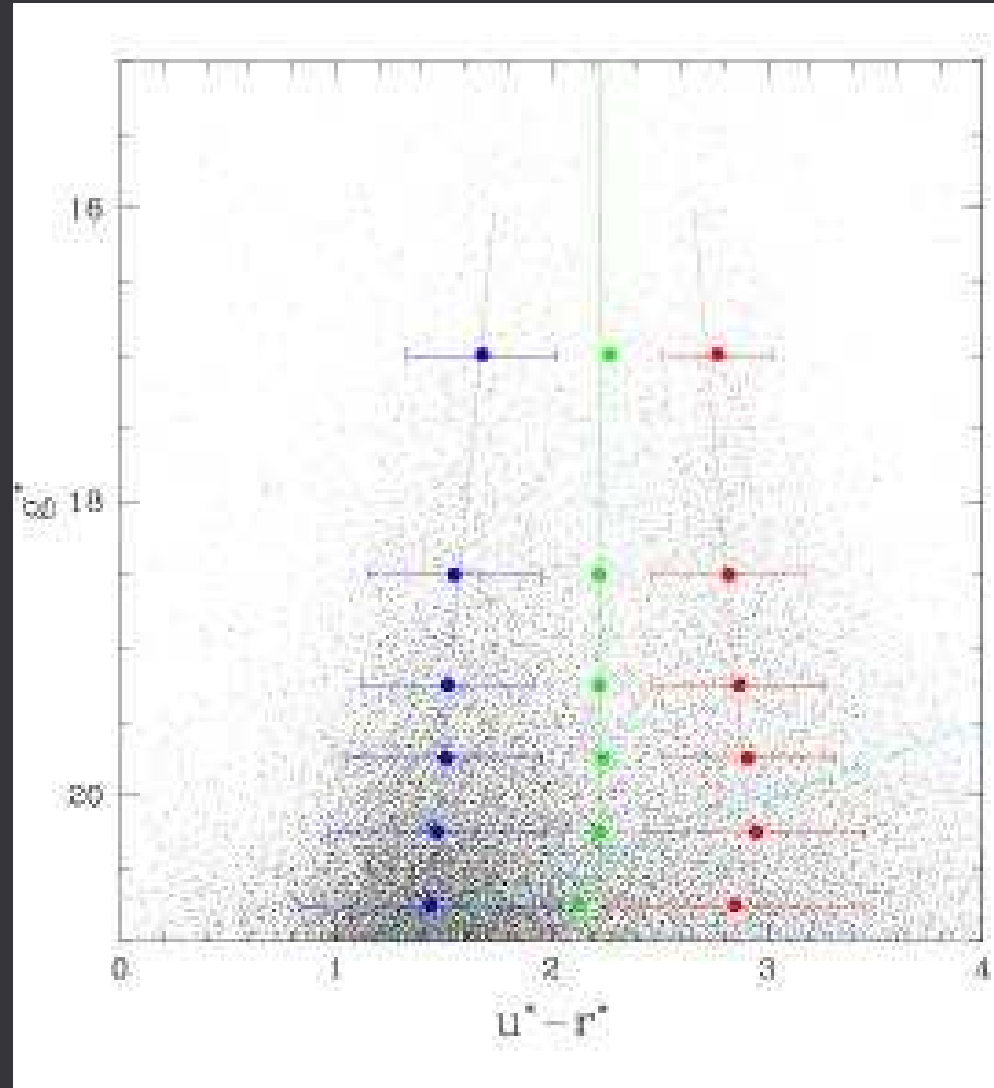
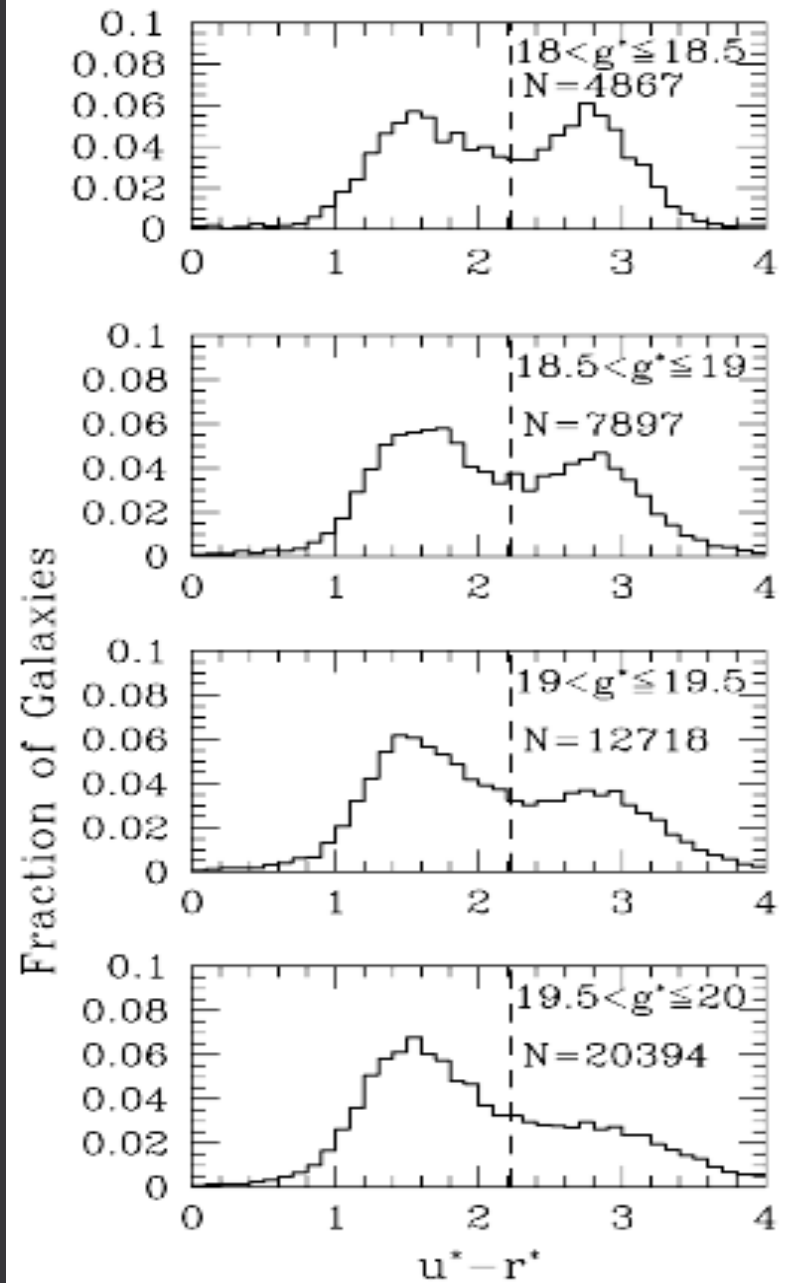


**THE BIMODAL COLOR DISTRIBUTION OF
GALAXIES: BACKGROUND AND
IMPLICATIONS FOR FOR VVDS**

Galaxy rest-frame colors in the local Universe: SDSS

- 150000 galaxies with $g^* < 21$
- 2 peaks are evident in the color distribution in the CM diagram (here u^*-r^*)
- “Valley” between the two peaks at $(u^*-r^*) \sim 2.22$
- Note that here colors are observed, not rest-frame (but bulk of galaxies have $z < 0.3$)

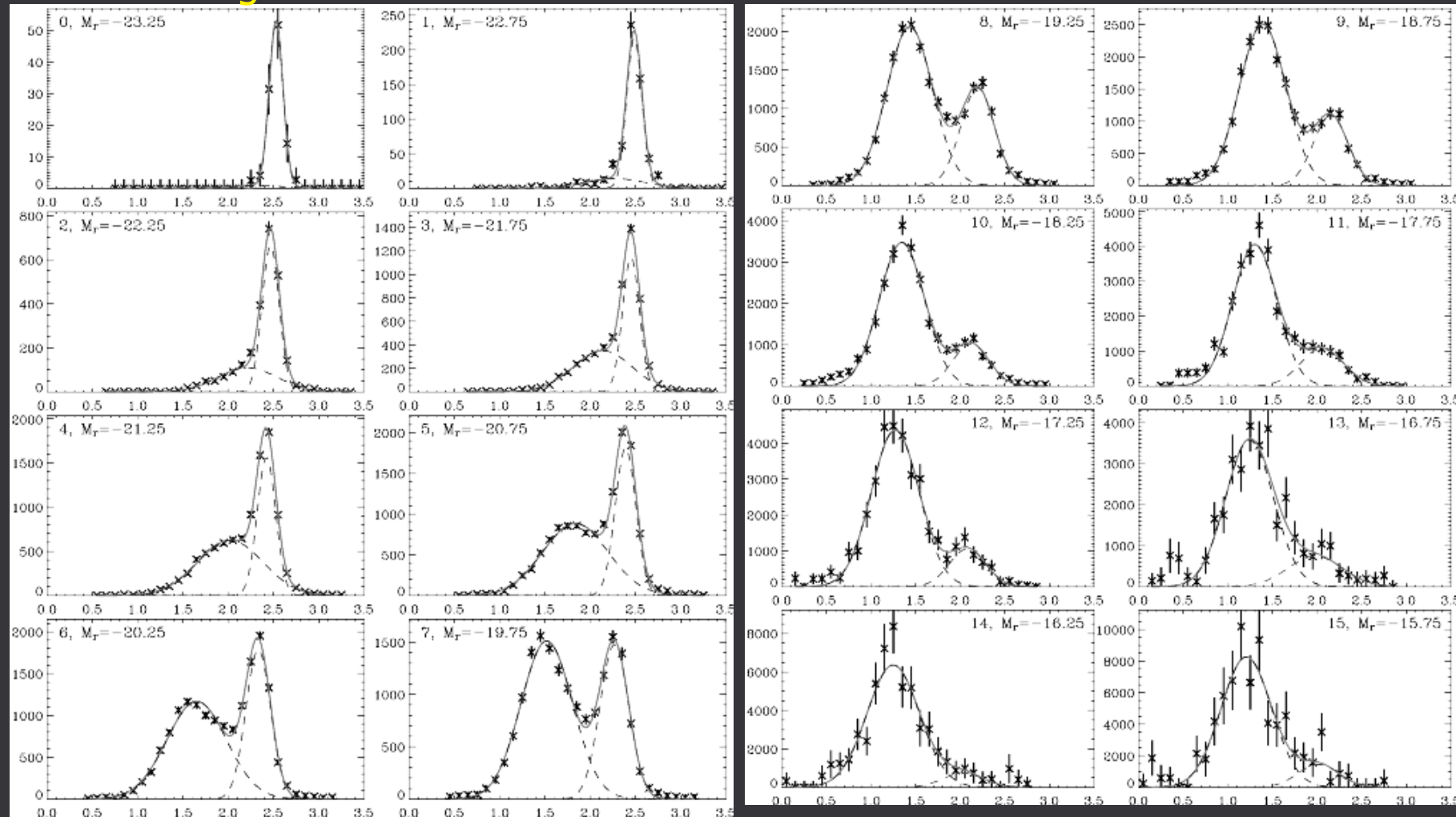




Strateva et al. 2001, AJ,122,1861

Rest-frame: bimodality is evident over a wide range of absolute magnitudes:

$$-22 < M_r < -17$$



Baldry et al. 2003, astro-ph/0309710

MORPHOLOGY:

- Good correspondence between color and morphology: 97.6% of early type galaxies have $u^*-r^*>2.22$, 73% of late-type have $u^*-r^*<2.22$ (Strateva et al., 2001)
- Red galaxies have higher Concentration Index (Strateva et al., 2001)

CLUSTERING AT Z=0:

- Red population more clustered: (Budavari et al., 2003)

$$r_0 = 6.59 \pm 0.17$$



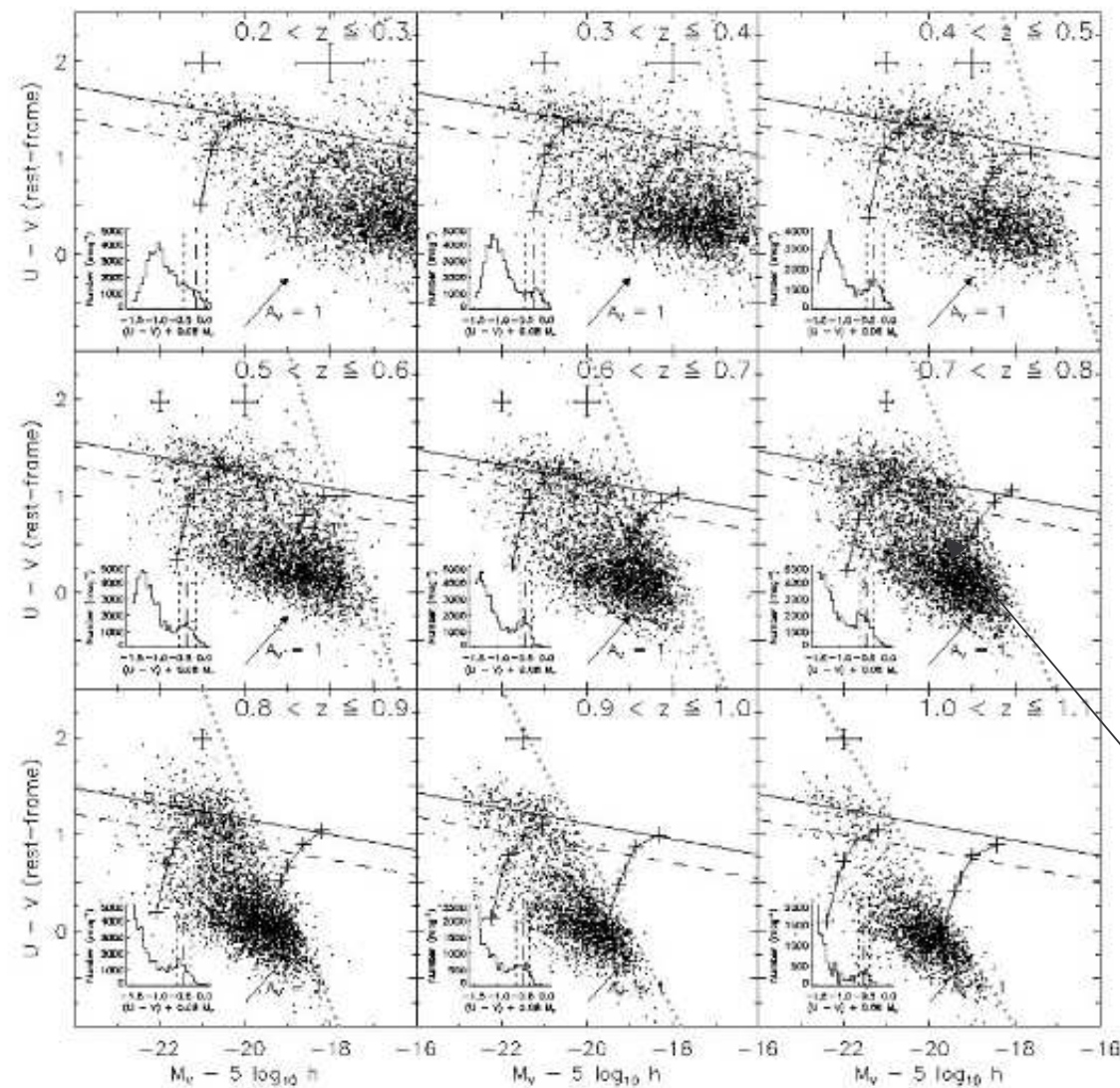
Red population

$$r_0 = 4.51 \pm 0.19$$

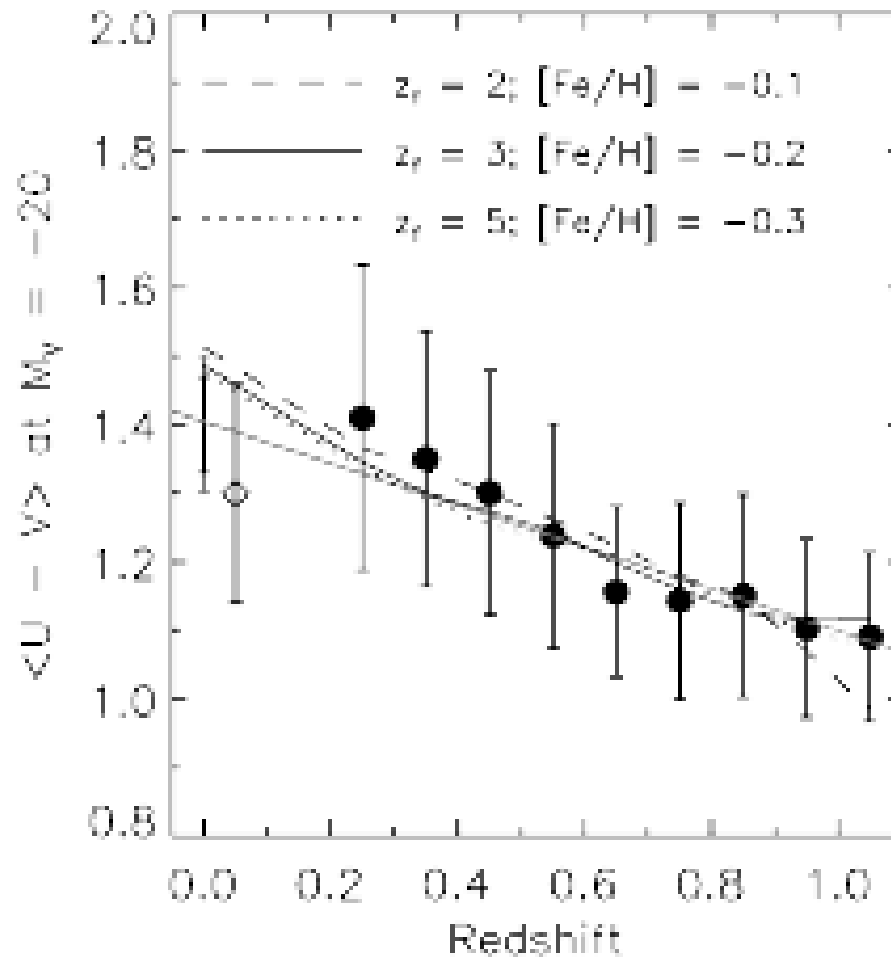


Blue population

Redshift evolution (0.2 < z < 1.1): COMBO-17



- 25000 galaxies with $R < 24$
- Evidence for bimodality out to $z \sim 1$



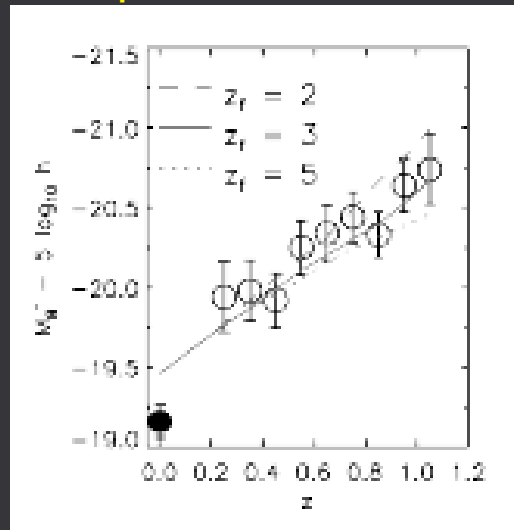
- “Red-sequence” galaxies get redder by ~ 0.3 mag since $z=1$
- Compatible with passive evolution
- Usual age-metallicity degeneracy: no univocal formation redshift

Bell et al. 2004

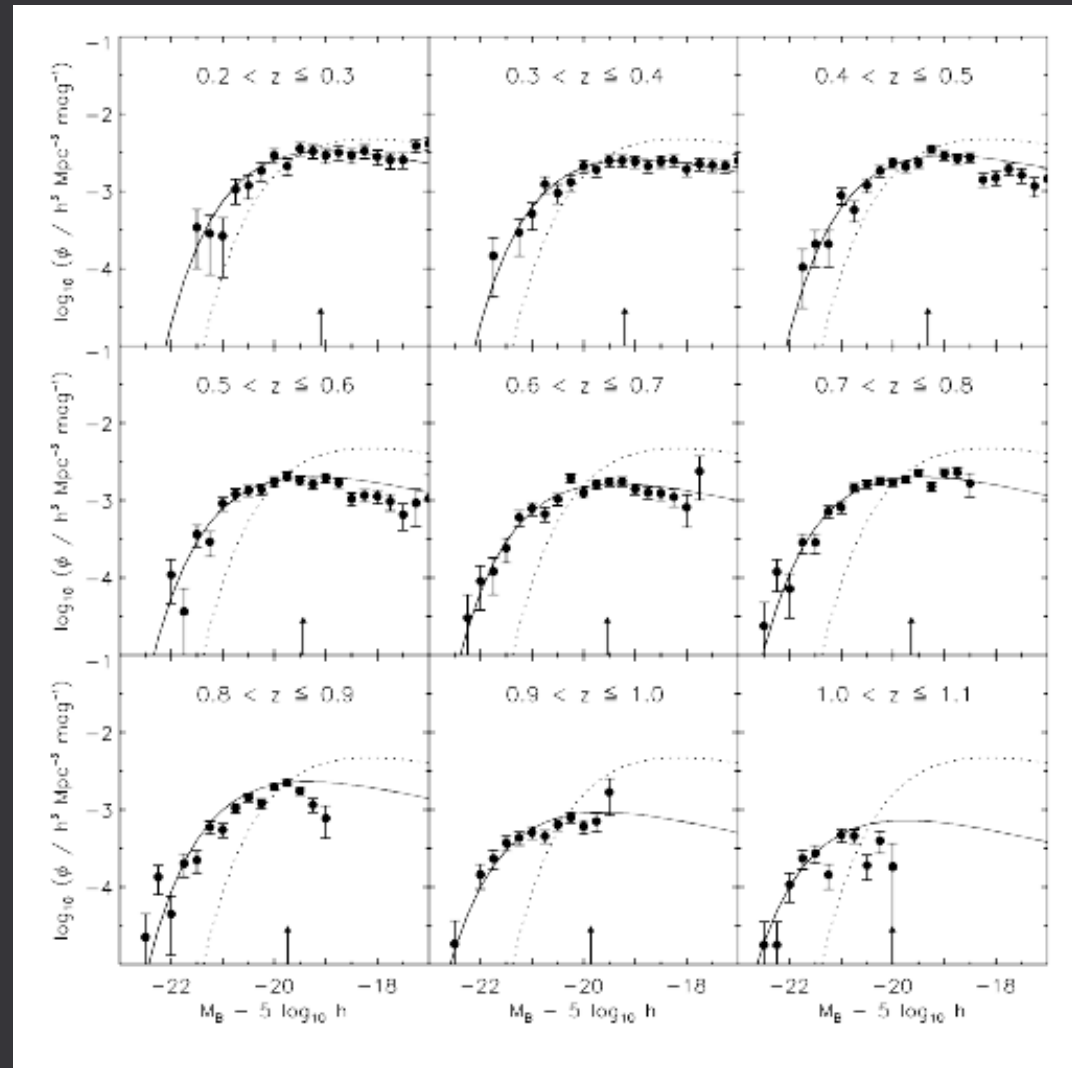
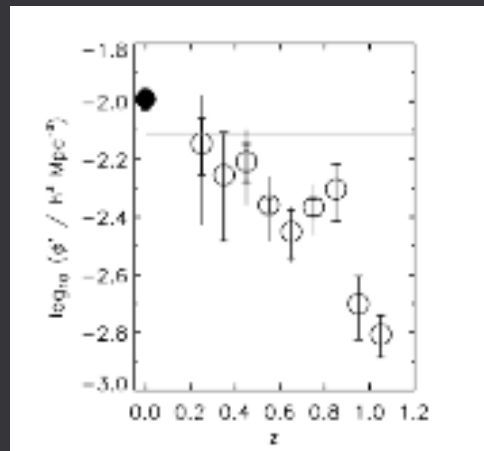
⊘ Did stars in red galaxies form before or after the assembly of the galaxy itself?

Evolution of the red-sequence luminosity function:

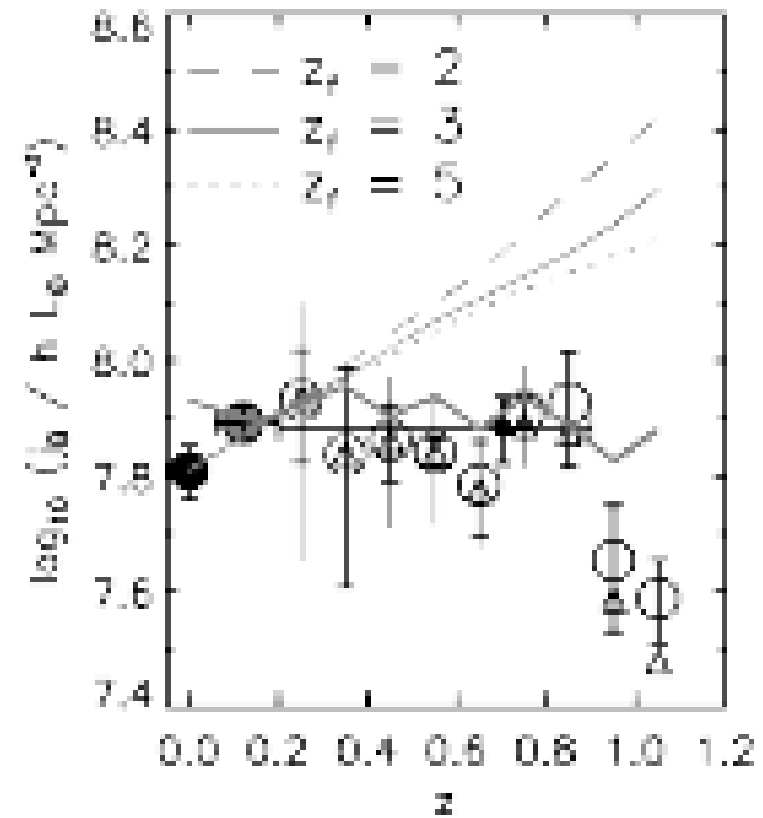
Evolution of M^* again consistent with passive evolution



Strong evolution of normalization Φ^*



However, B-band luminosity density does not evolve, while in a passively evolving population it should FADE by a factor 2-3



Stellar mass in red-sequence galaxies has grown by a factor 2-3 since $z=1$

Role of mergers

Bell et al., 2004: the most luminous red galaxies are brighter than the most luminous blue galaxies

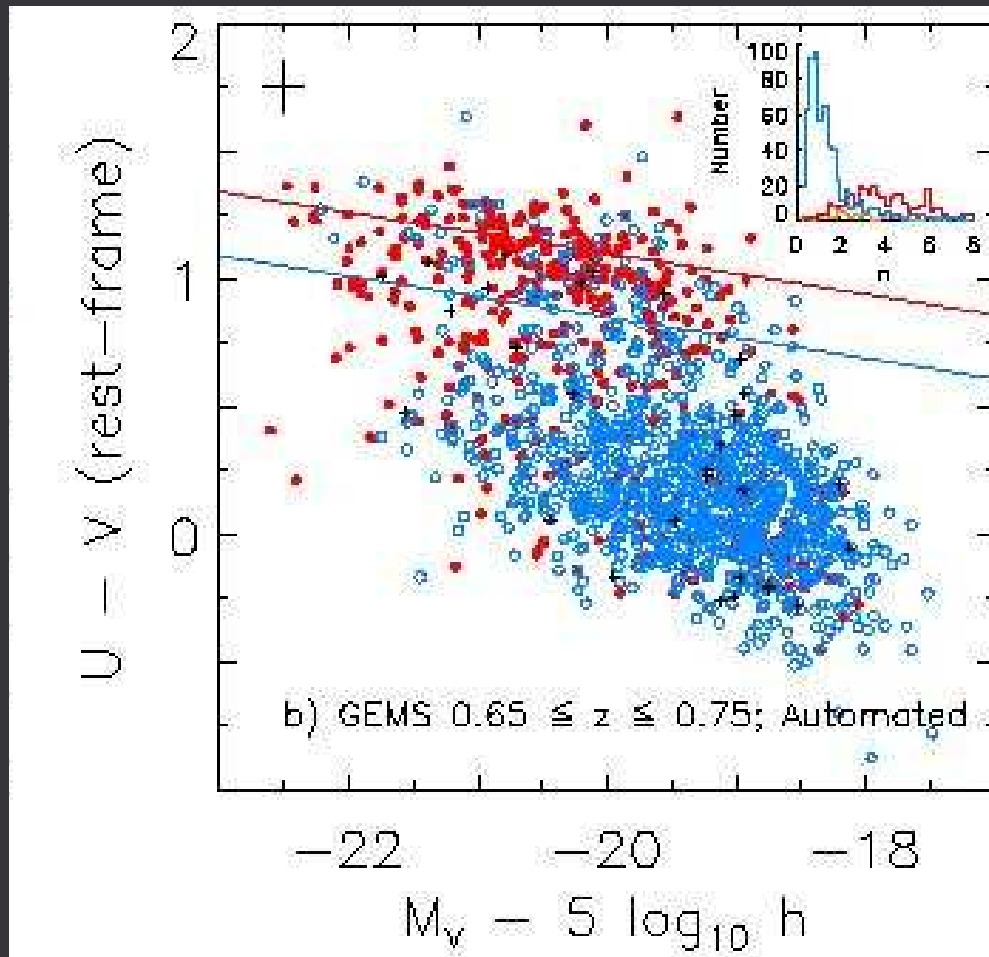
- ∅ They formed at high z and then evolved passively?
- ∅ They formed from mergers

Wolf et al., 2004: only 20% of the diminishing SFR since $z=1$ can be explained as due to decline of merger rate

- ∅ SFR decline mostly due to quiescent spiral SFR decline

Therefore, mergers could explain the increase in stellar mass, but have difficulty to explaining the evolution of colors

Morphological nature of red-sequence galaxies



Bell et al. 2004, ApJ,600,L11

Ø1500 galaxies with $0.65 < z < 0.75$ (COMBO-17 + GEMS)

Ø74% of red-sequence galaxies are early-types (E/S0)

ØWeiner et al. 2004 (DEEP1): 73% are early-type, 12% are edge-on disks, 10% DIFRGs

Note that for EROs ($R-K > 5$), only 30-40% identified with early-type galaxies: selection effect or strong evolution between $z=1.5$ and $z=0.7$?

Ongoing/planned/suggested work

From VVDS alone:

- VVDS bimodal colour distribution (first view): Franzetti, Scodreggio, et al.
- Clustering and origin of red population: Guzzo et al.
- Blue population: evolution of SFR
- ... Look to COMBO-17 papers and get inspired...

Adding SWIRE

- Optical/Infrared rest-frame colours: Franceschini (PD), Ricciardelli, LG, MS, PF

