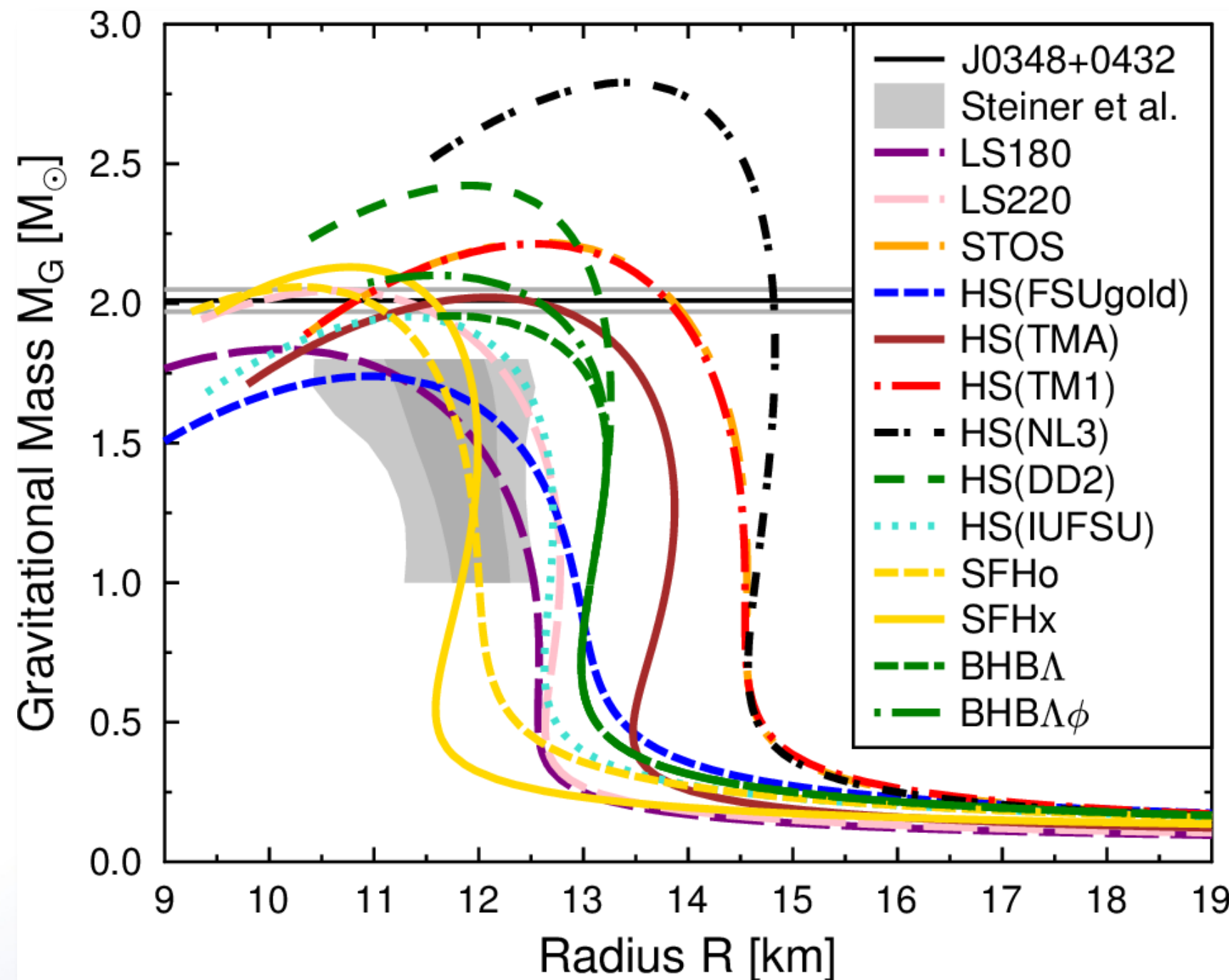


SN EOS – neutron star mass-radius relation



- Pulsar J0348+0432: Antoniadis et al. Science 2013
- radius measurements from Steiner et al. ApJ 2010, 2013
- similar results from Chiral EFT (Hebeler et al. PRL 2010)
- SFHo and SFHx: fitted to NS radii (Steiner, MH, Fischer ApJ 2013)
- BHB: hyperonic degrees of freedom included

[T. Fischer, MH, et al.; EPJA50 (2014)]

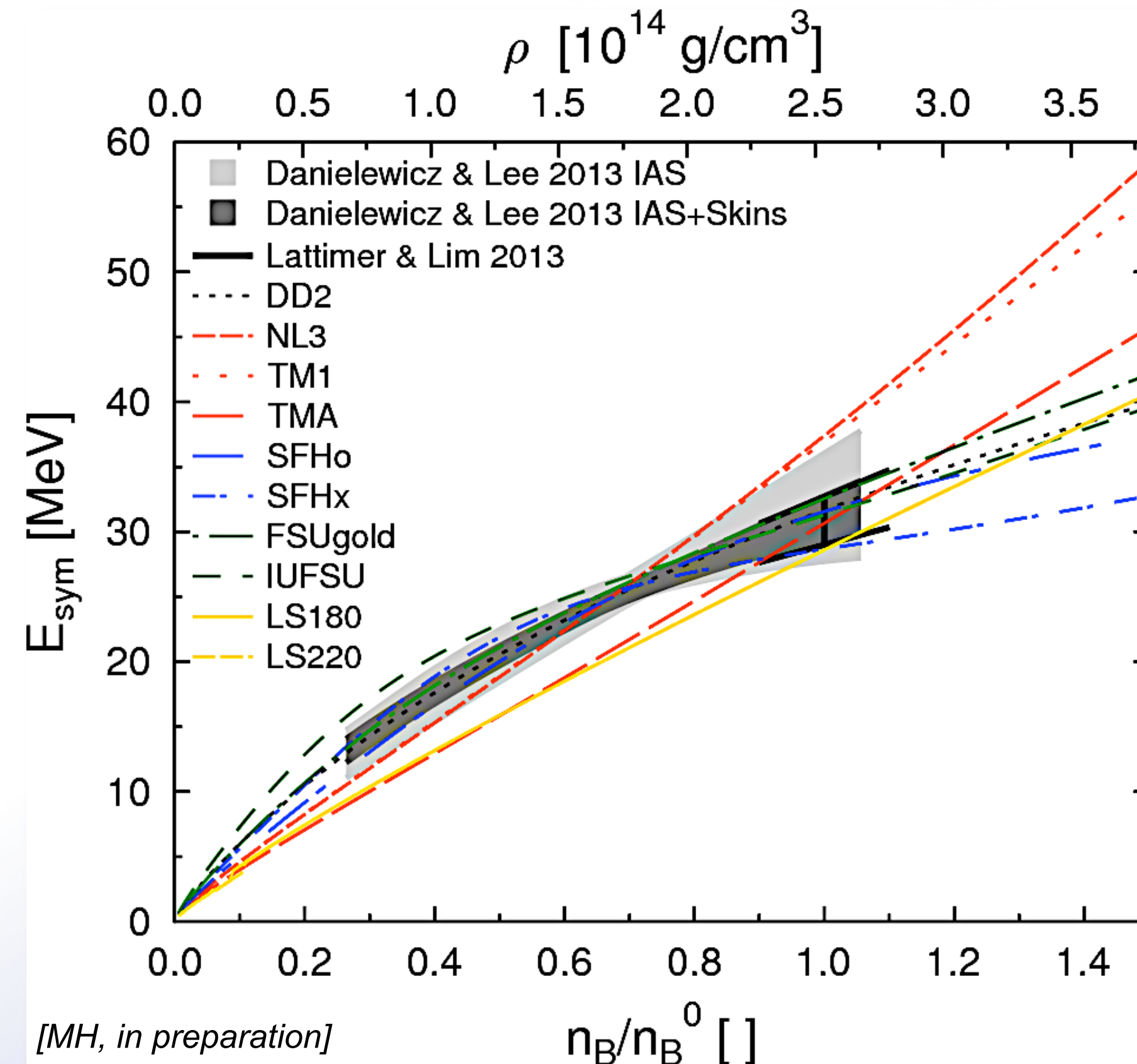
[S. Banik, MH, D. Bandyopadhyay; APJS214 (2014)]

EOS constraints – symmetry energy

based on:

[Danielewicz & Lee; NPA922 (2014)]

[Lattimer & Lim; ApJ771 (2013)]



- derived from binding energies of isobaric analog states
- NL3, STOS(TM1), and LS in disagreement
- DD2: matches well
- SFHo and SFHx: small NS radii improve E_{sym}

$$n_B^0 \sim 0.16 \text{ fm}^{-3} \\ \sim 2 \times 10^{14} \text{ g/cm}^3$$

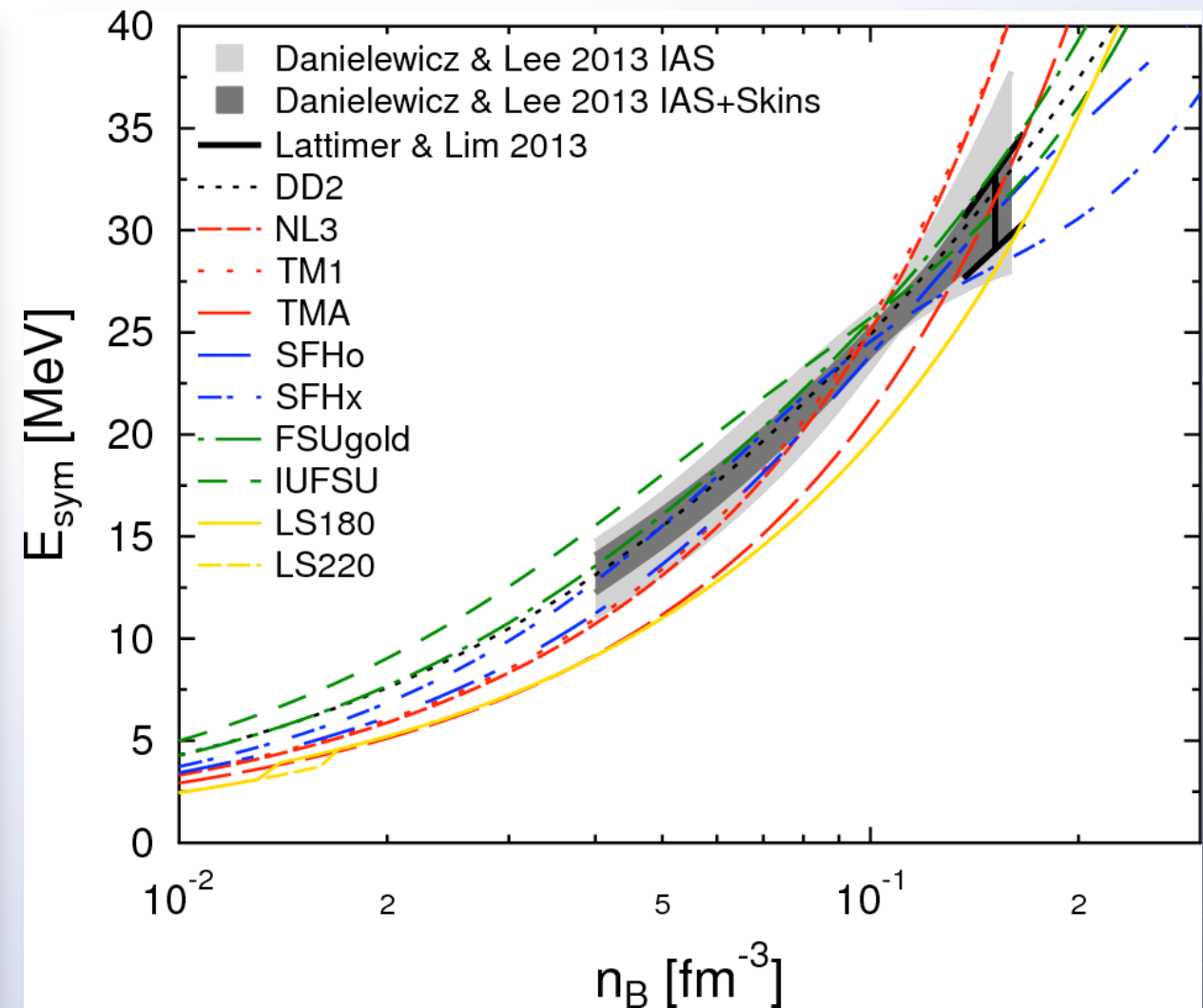
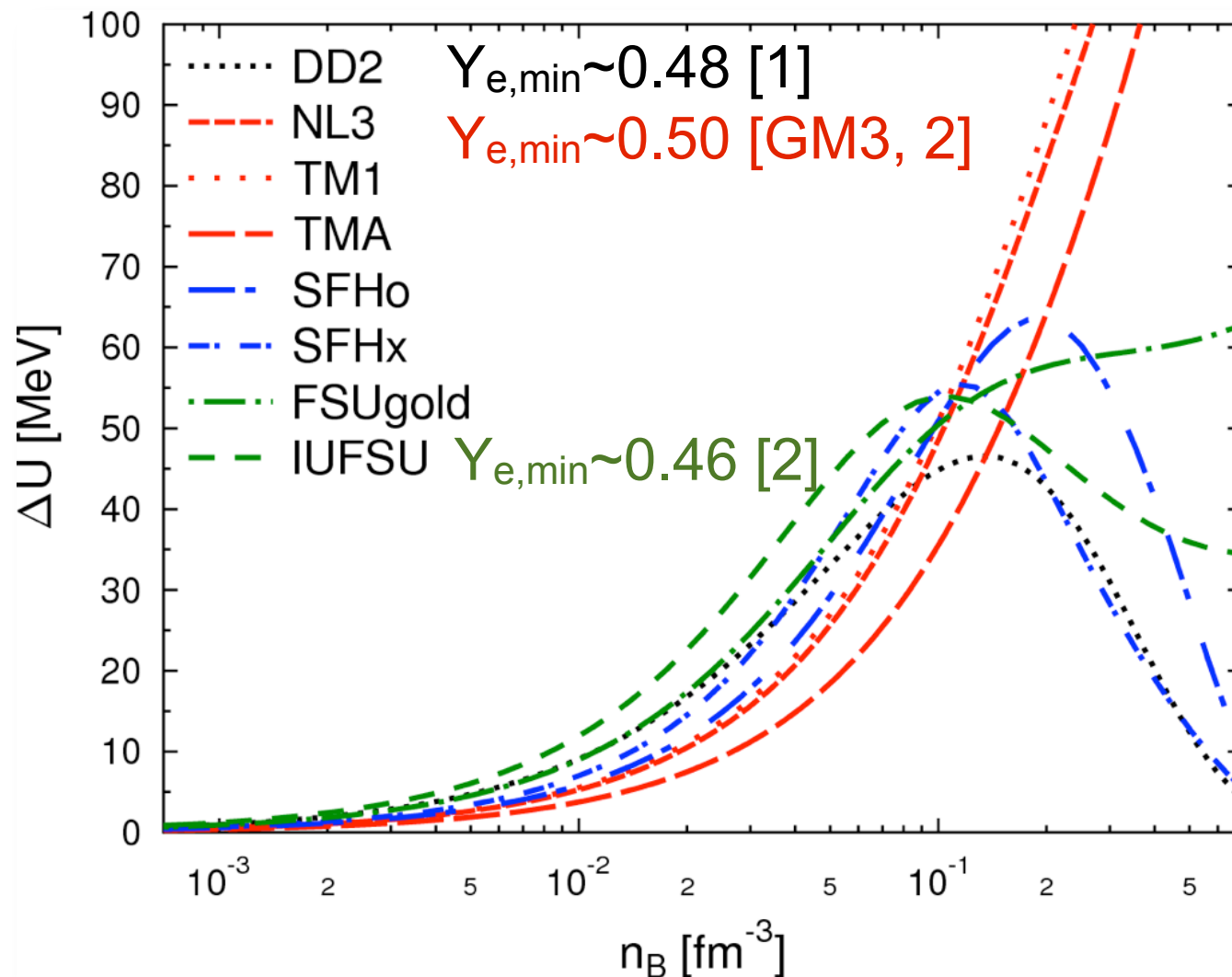
Effect of mean-field potentials

- Martinez-Pinedo et al. 2012, Roberts & Reddy 2012:
- mean-field potentials U_n , U_p
 - ignored in previous simulations
 - change the neutrino mean-energies
- charged-current rates depend on $\Delta U = U_n - U_p$

$$\Delta U \simeq 4 (1 - 2Y_e) E_{\text{sym}}^{\text{int}}(n_B)$$

- interaction part of the symmetry energy $E_{\text{sym}} = E_{\text{sym}}^{\text{int}} + E_{\text{sym}}^{\text{kin}}$

Implications for nucleosynthesis in neutrino-driven winds



- combining results from simulations with nuclear physics constraints:
- $0.46 < Y_{e,\min} < 0.5 \rightarrow$ no full r-process
- uncertainties: correlations, light nuclei, neutrino scattering, weak rates, momentum-dependent interactions, convection, ...

[1]: Martinez-Pinedo et al.; JPG41 (2014)

[2]: Roberts et al.; PRC86 (2012)