



Figure S.4: The Empirical Power of the Heterogeneous LRT Statistics (Het-LRT) of the Models (3) and (5), MetaSKAT, and MetaBurdenWST at  $\alpha = 0.0001$ , When Causal Variants Were Only Rare and the Genetic Effect is Simulated as Heterogeneous. When Neg pct = 0, All Causal Variants Had Positive Effects; When Neg pct = 20, 20%/80% Causal Variants Had Negative/Positive Effects; When Neg pct = 50, 50%/50% Causal Variants Had Negative/Positive Effects.