

**$\beta$ -Pareto efficiency**

$$e^{\frac{n\epsilon}{2m-2}} \leq \sup \beta \leq e^{\frac{n\epsilon}{m-1}}$$

(Prop 1–2)

**$\kappa$ -PC-efficiency**

$$\sup \kappa = 0$$

(Prop 5)

**$\epsilon$ -Differential privacy**

$$\frac{(m-1)e^\epsilon}{(m-1)e^\epsilon + 1} \leq \sup \gamma \leq \frac{(m-1)e^{n\epsilon}}{(m-1)e^{n\epsilon} + 1}$$

(Prop 3–4)

$$\sup \eta = e^\epsilon$$

(Prop 7–8)

**$\gamma$ -SD-efficiency**

**$\eta$ -Condorcet loser criterion**