Any probability distribution majorizes the uniform distribution,

$$(1/n, 1/n, \ldots, 1/n) \prec (p_1, p_2, \ldots, p_n),$$

which means that the sum of the k largest probabilities in $\{p_1, \ldots, p_n\}$ is at least k/n for all k in the range $1 \leq k \leq n$. Since the elementary symmetric functions are Schur-concave (meaning that they are monotonically decreasing with respect to the relation $\prec$), it follows that $e_m(1/n, 1/n, \ldots, 1/n) \geq e_m(p_1, p_2, \ldots, p_n)$.