$$\cdots \begin{array}{c} \{\hat{\rho}_i\} \\ \boxed{\not\!\swarrow} \end{array}$$
$$\cdots \underline{}$$

$$\Longleftrightarrow \quad \mathbb{P} = \{p_i\}, \quad p_i = \mathrm{tr}[(\hat{\rho}_i^0 \otimes \hat{I}^1)(\ldots)]$$
$$= \mathrm{tr}[\hat{\rho}_i \mathrm{tr}_1[(\ldots)]]$$