

causally-related^{11,40}

$(e.P(e) \rightarrow\rightarrow e'.Q(e'))$ with R
 $\equiv_{\text{def}} \exists f:\{e:\mathbb{E} \mid P(e)\} \rightarrow\{e:\mathbb{E} \mid Q(e)\} . (e.P(e) \rightarrow a.f(a) \rightarrow e'.Q(e'))$ with R

clarification:

$\text{causally-related}(es;e.P(e);e'.Q(e');R)$
 $\equiv_{\text{def}} \exists f:\{e:\text{es-E}(es) \mid P(e)\} \rightarrow\{e:\text{es-E}(es) \mid Q(e)\}$
 $\quad \text{causal-bijection}(es;a.f(a);e.P(e);e'.Q(e');R)$