Just Testing

Rob van Glabbeek

University of Edinburgh, Scotland

27 April 2023

Semantic equivalences

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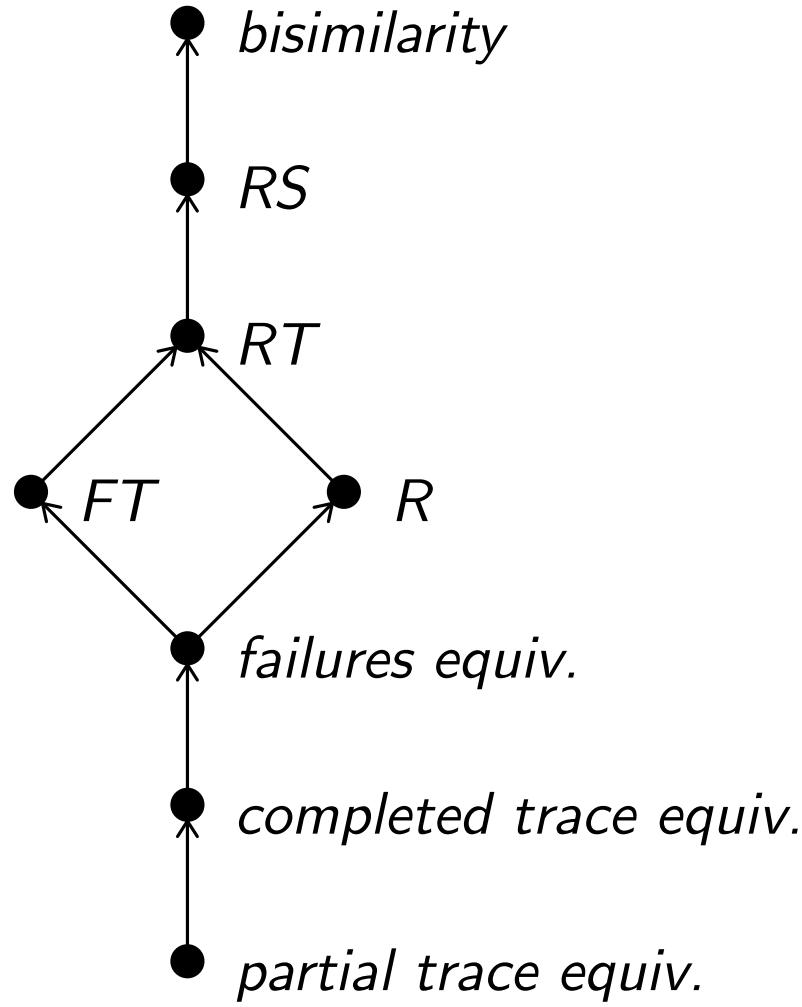

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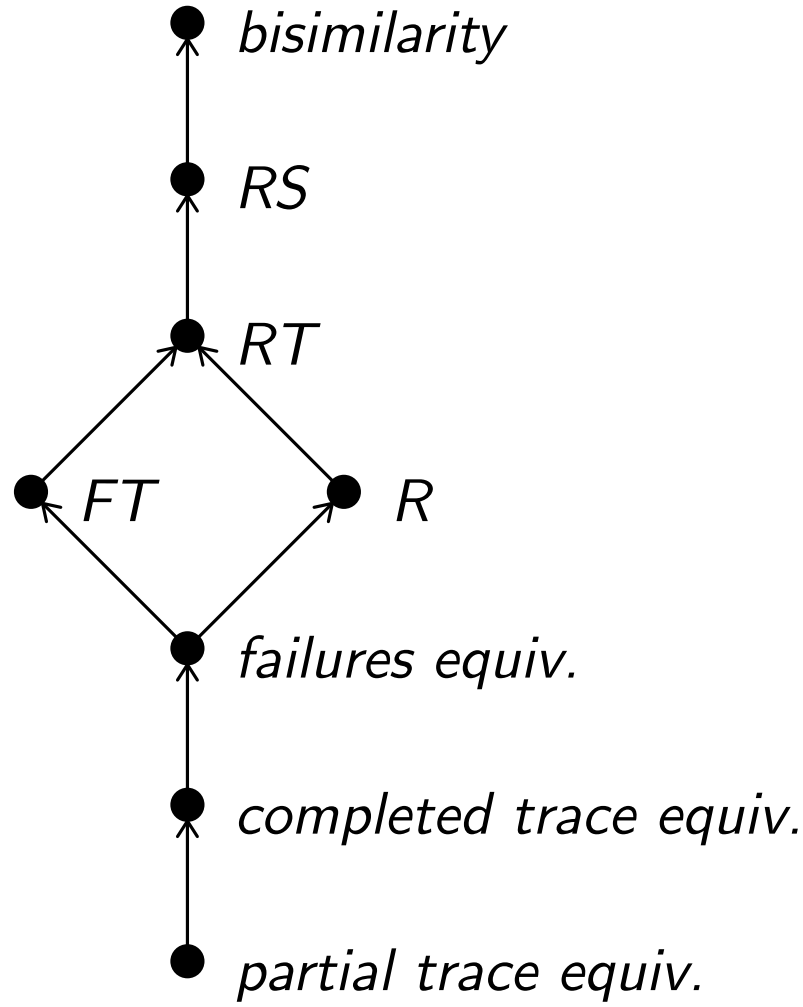

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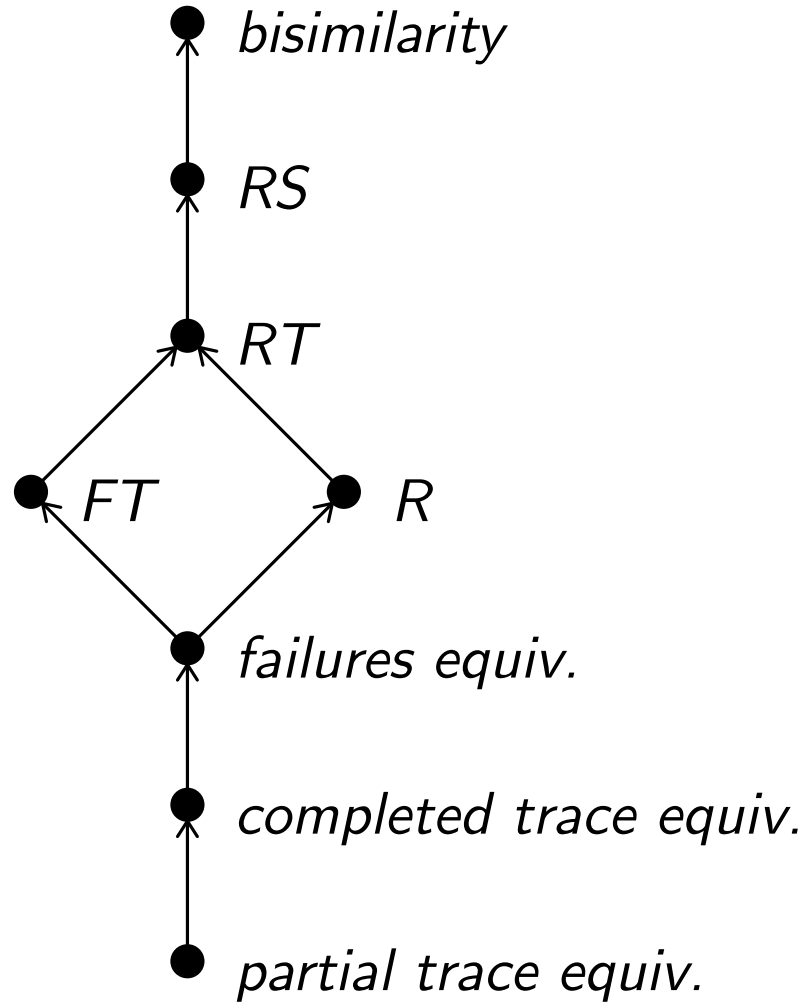

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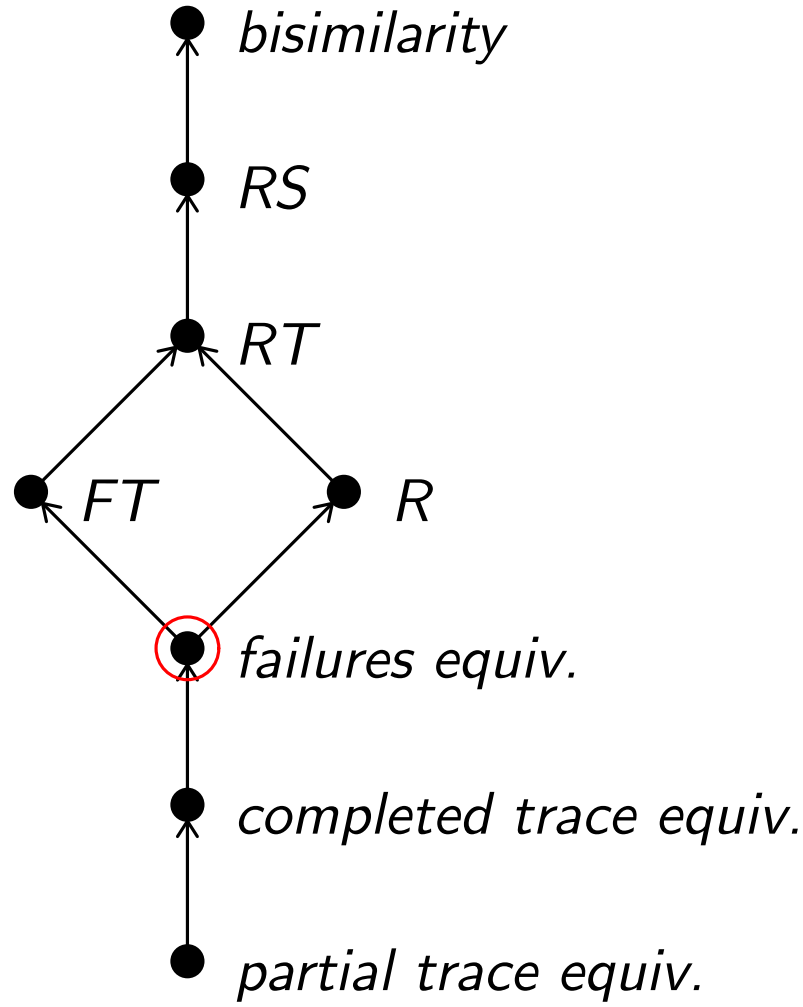

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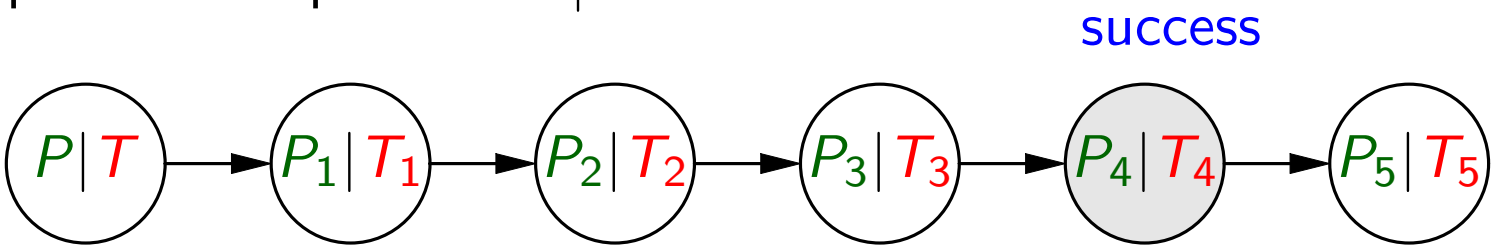

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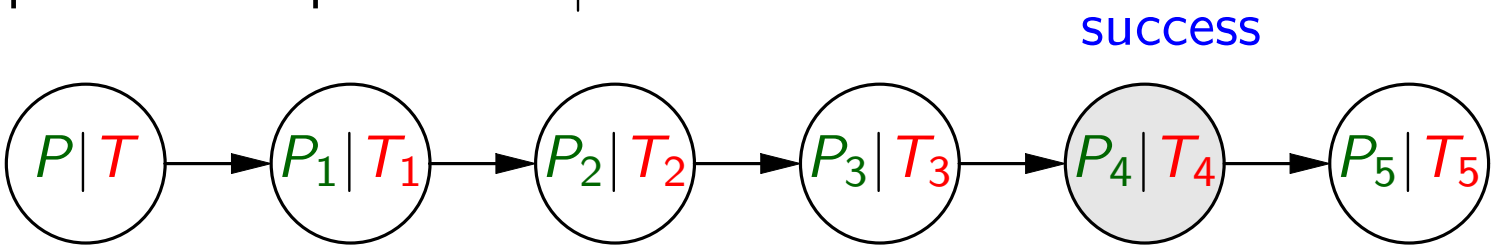

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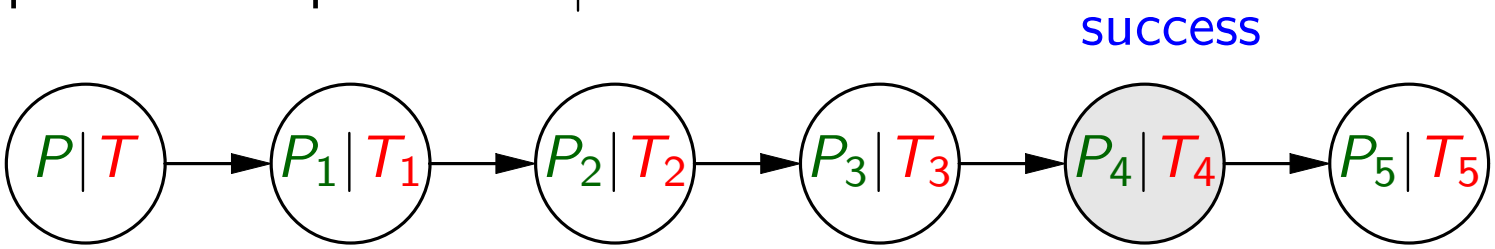

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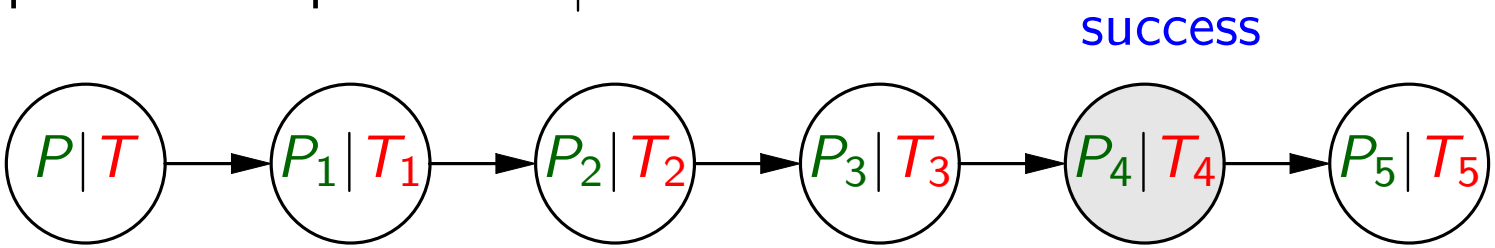

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CCS versus CSP parallel composition in may-/must-testing

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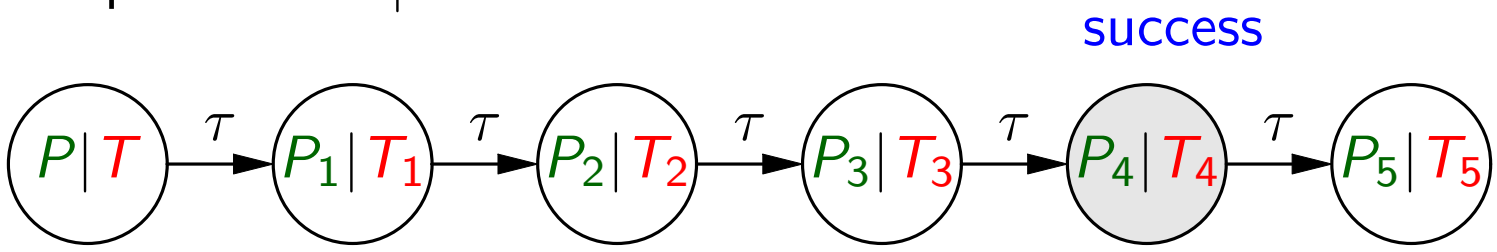

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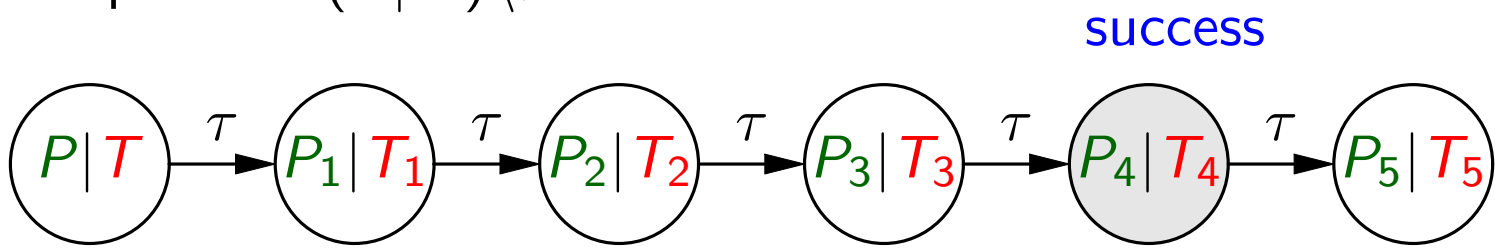

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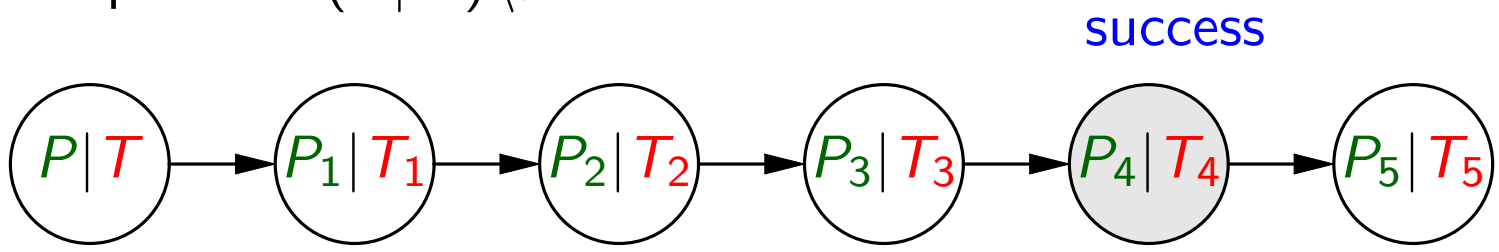

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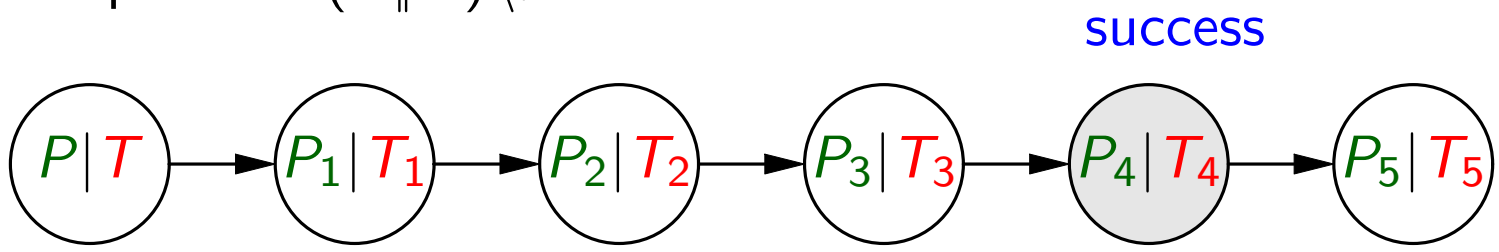

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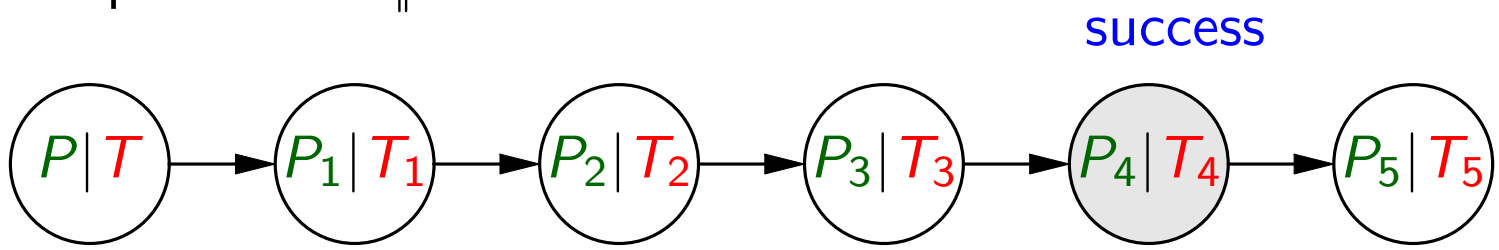

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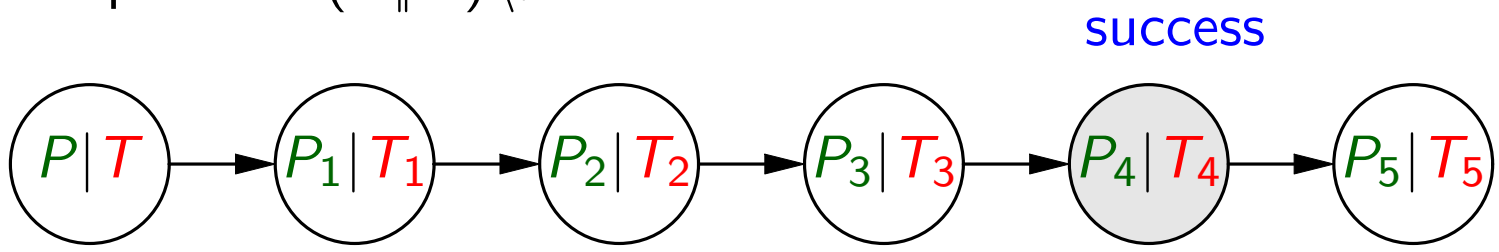

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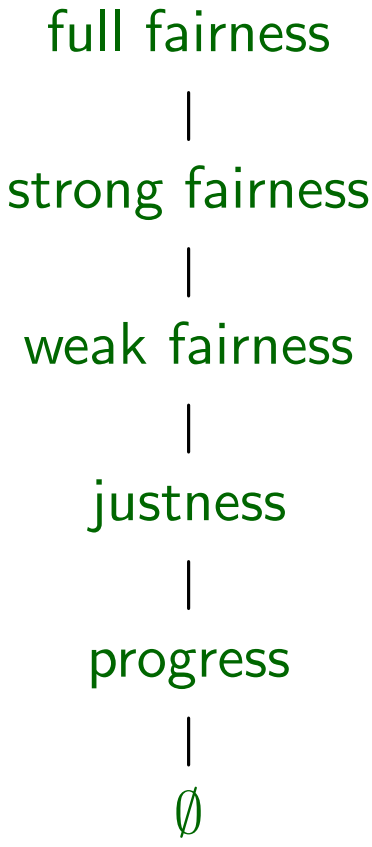

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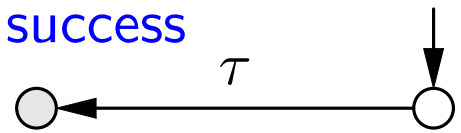

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|

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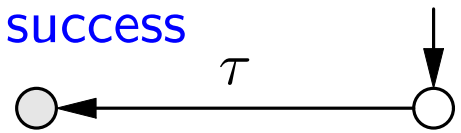

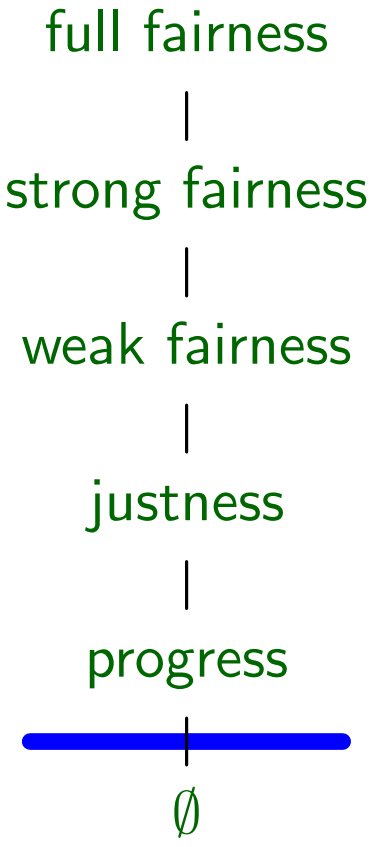

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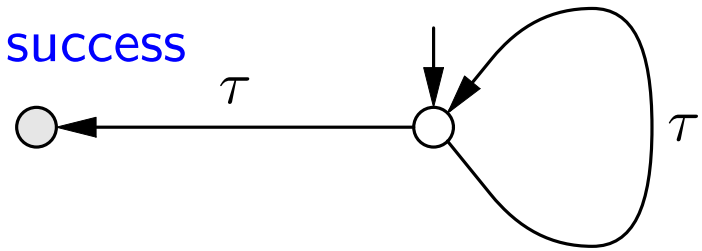

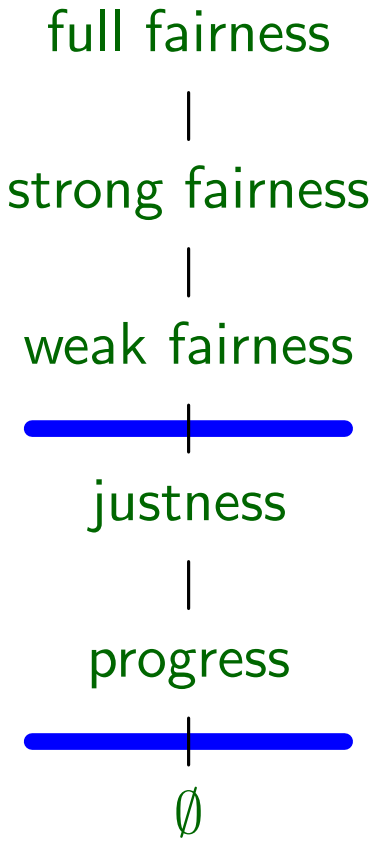

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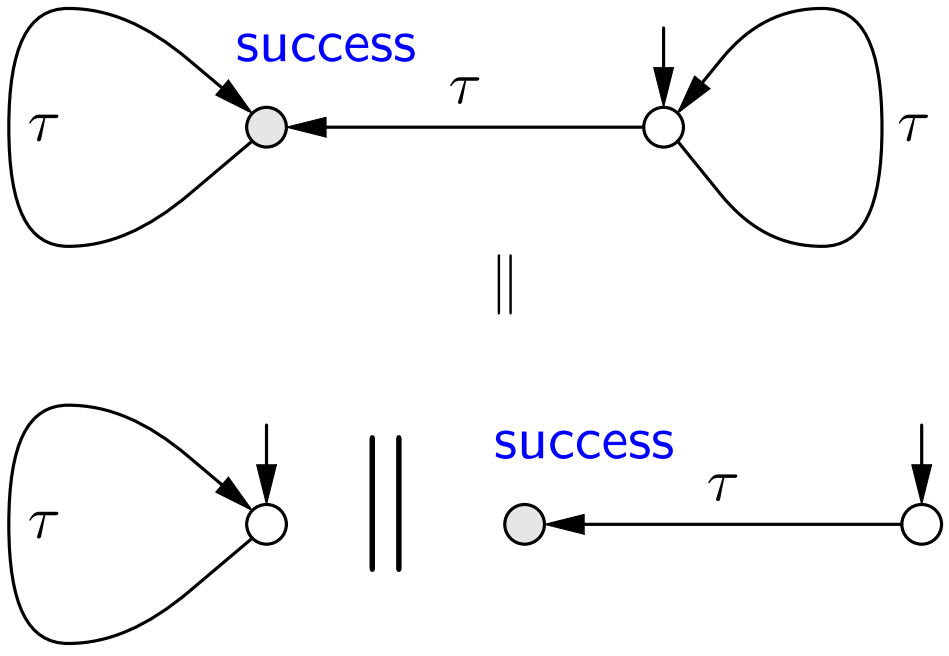

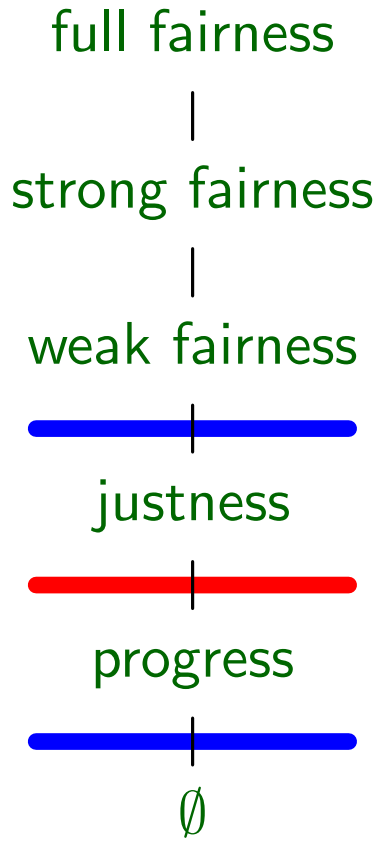

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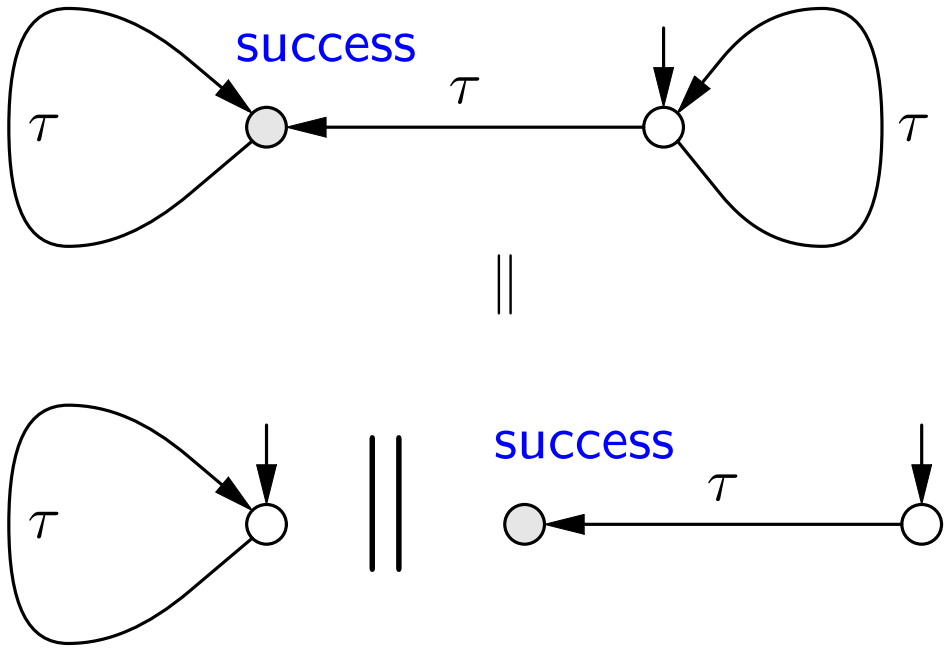

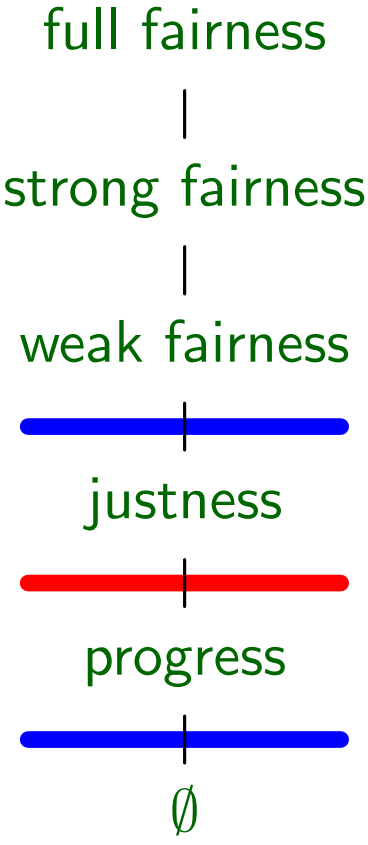

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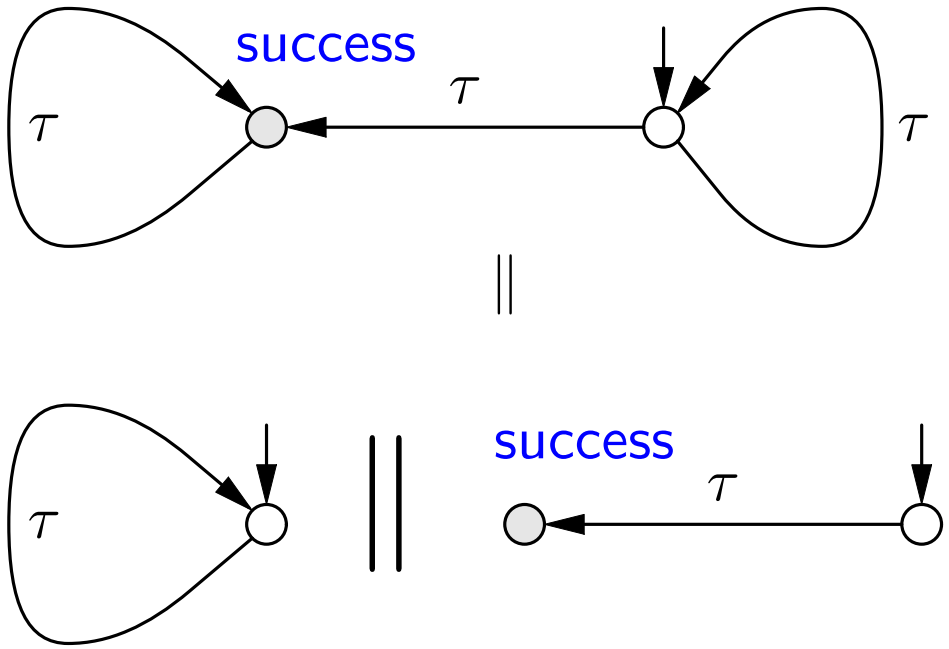

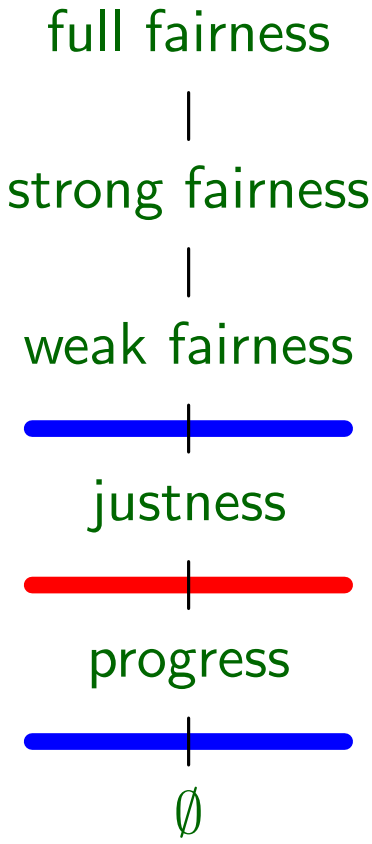

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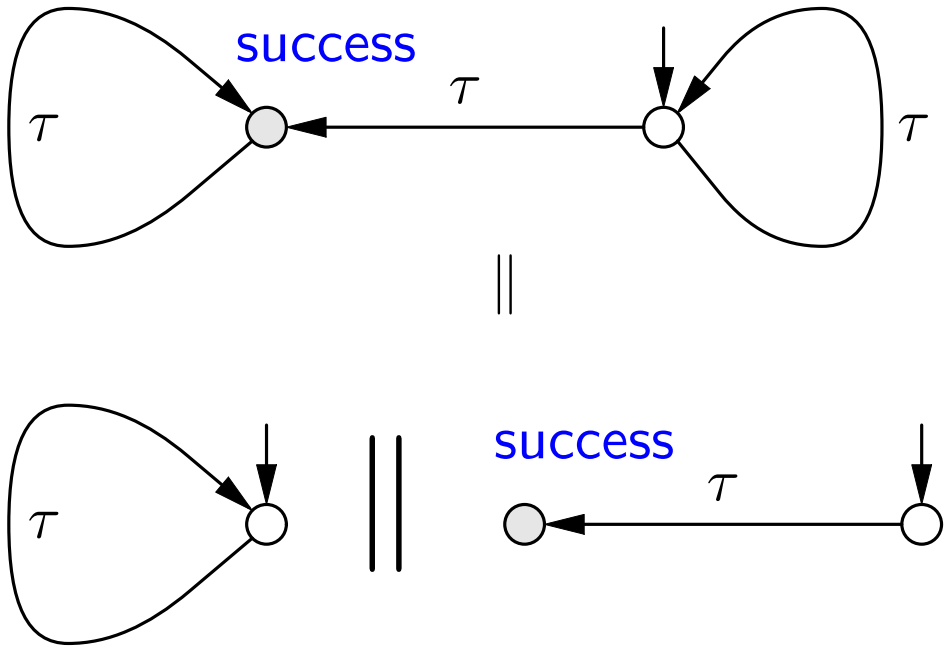

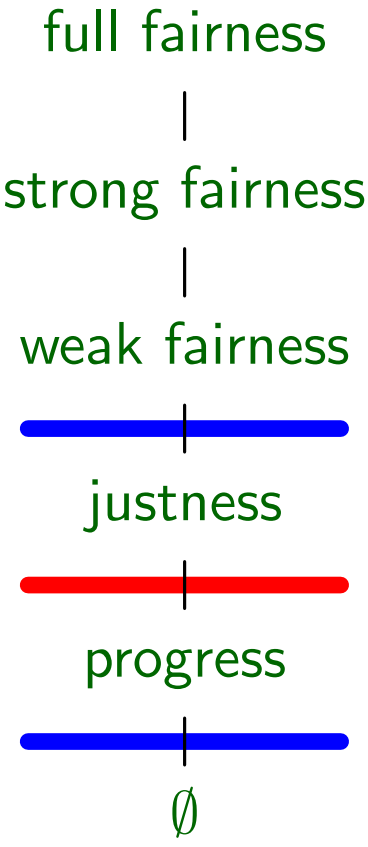

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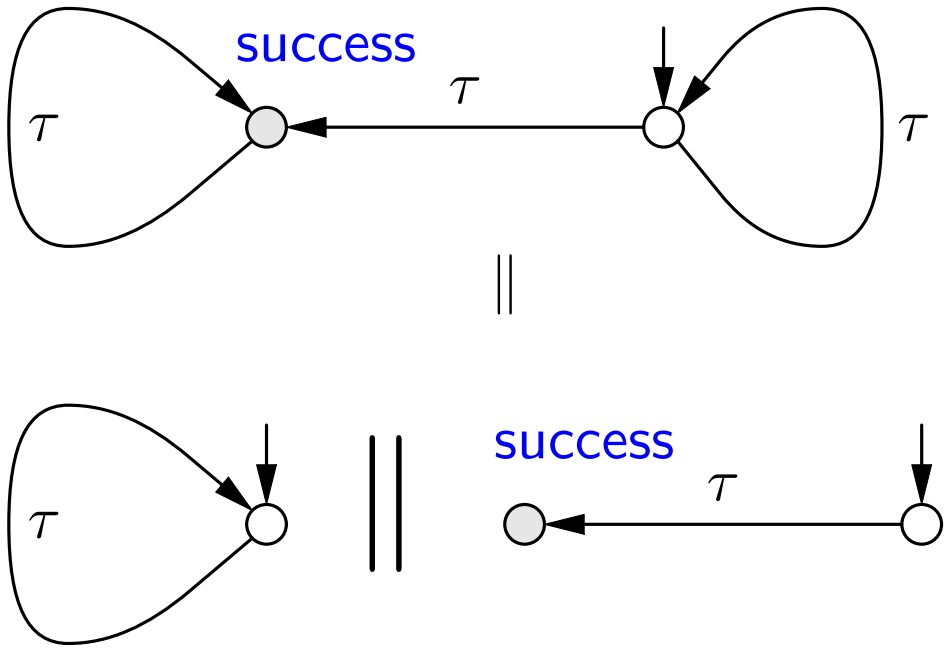

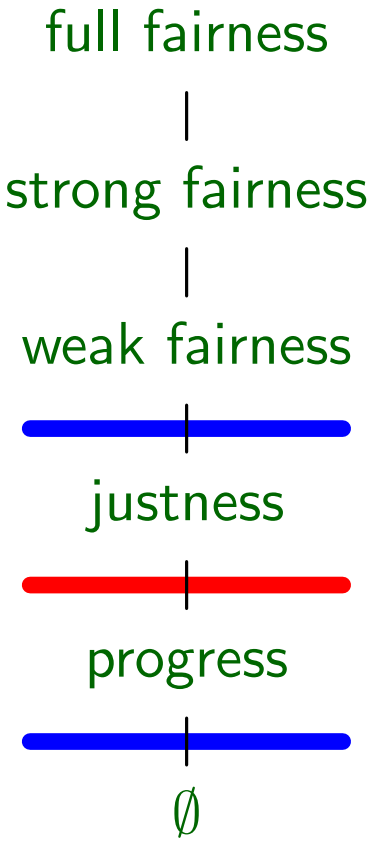

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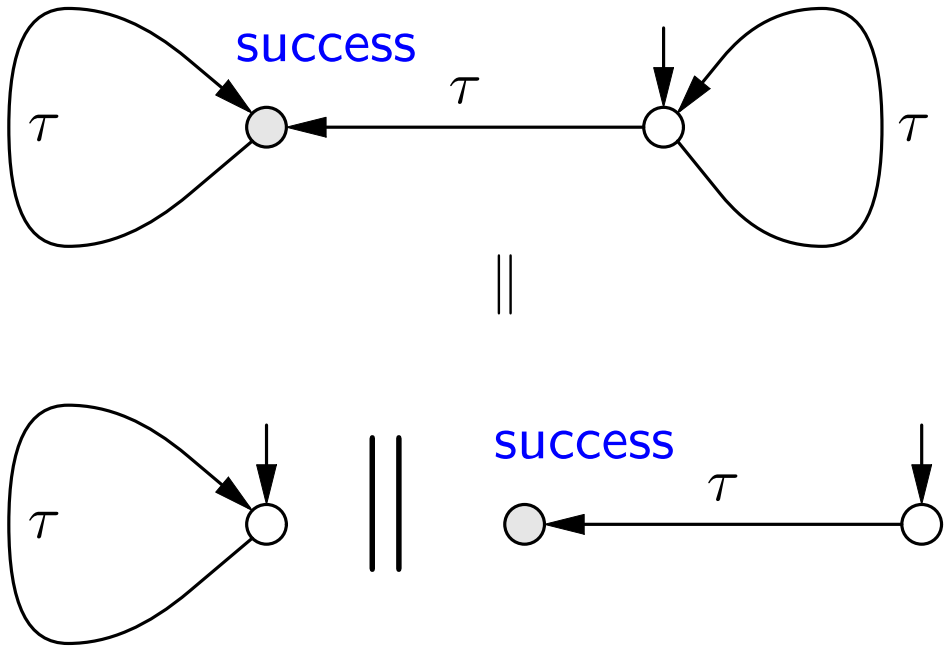

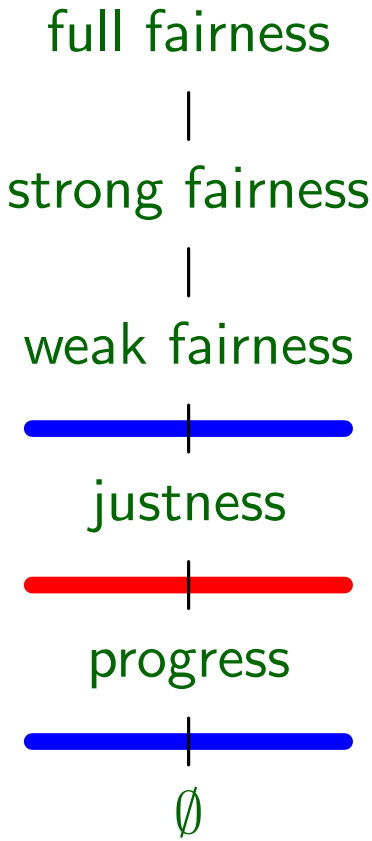

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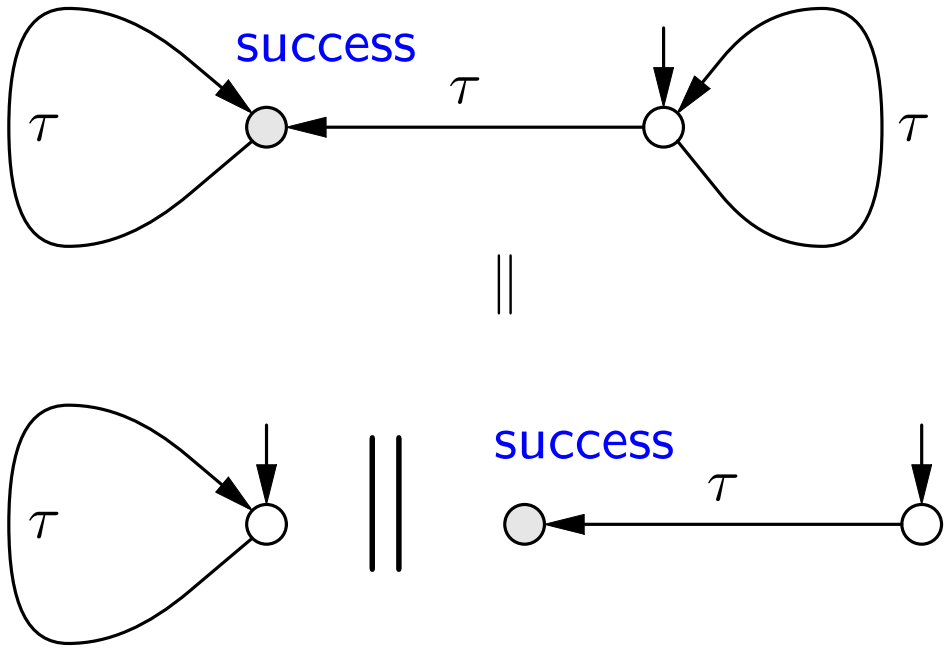

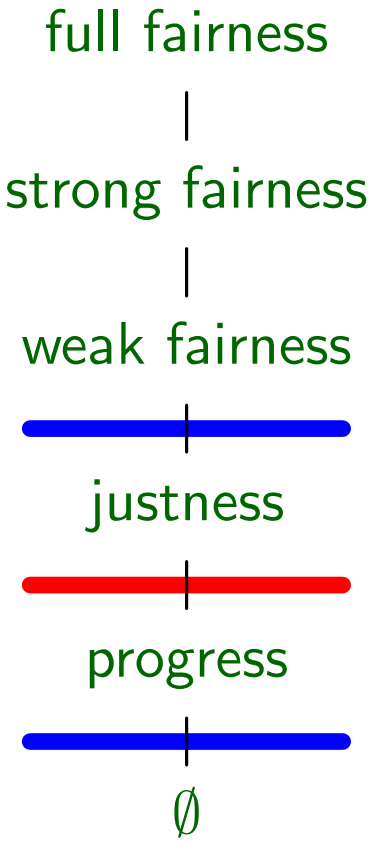

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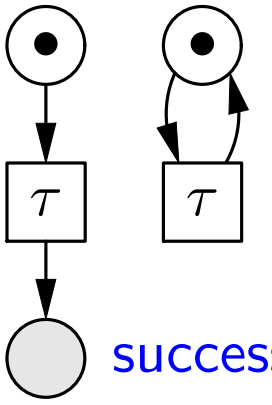

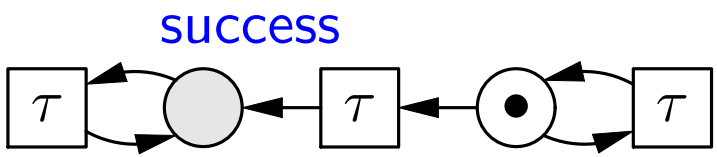

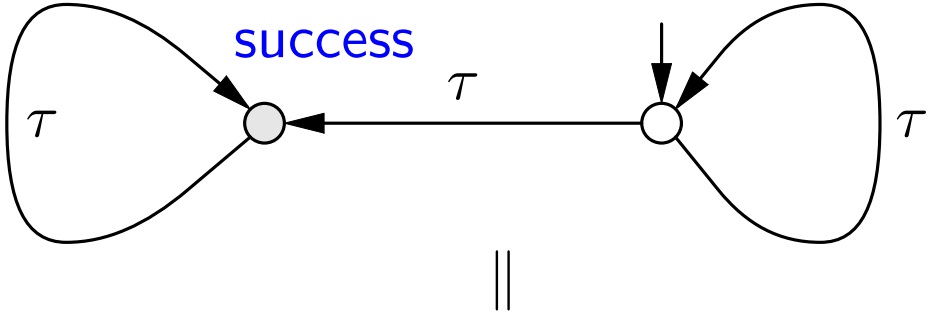

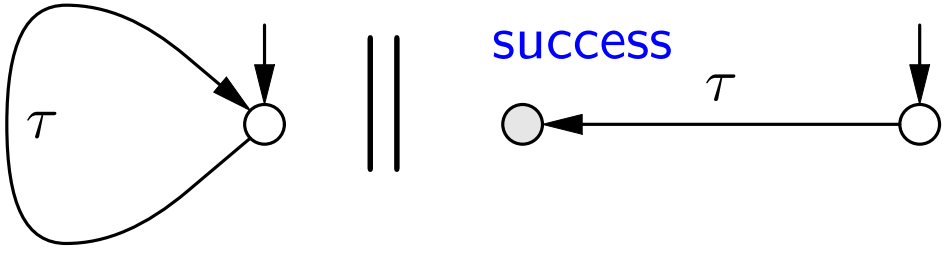

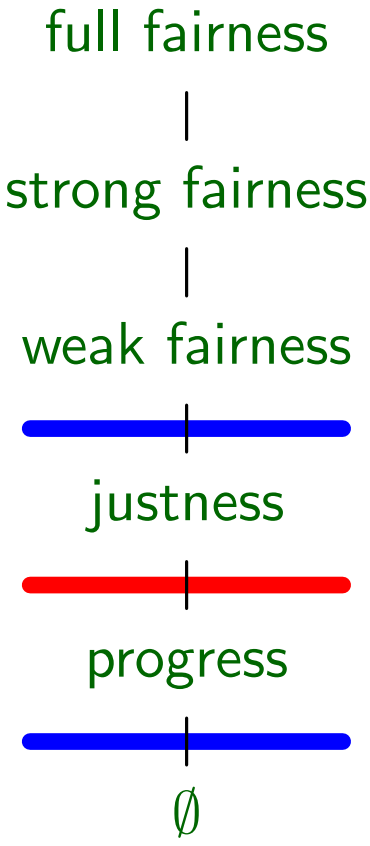

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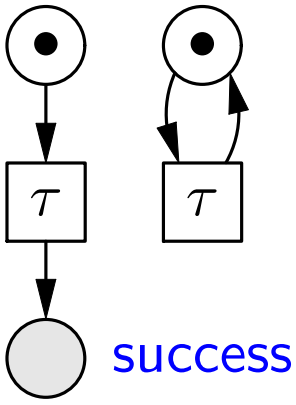
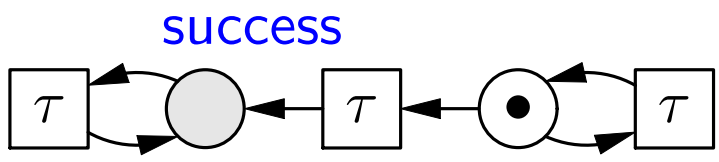
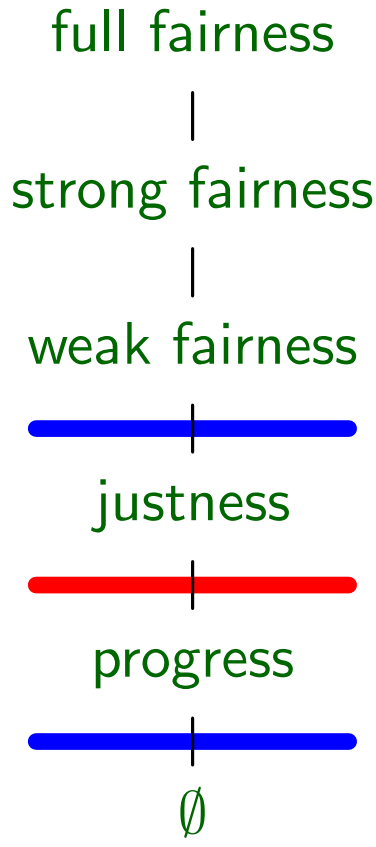




Justness on Petri nets:

Whenever a transition is enabled,
either it fires eventually
or one of its resources will be consumed.



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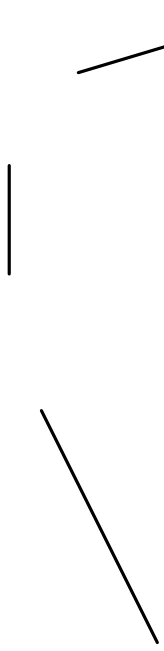
when taking justness as the underlying completeness criterion.

$\equiv^{J}_{\mathrm{must}}$ is the coarsest congruence (for parallel composition, concealment and injective relabelling) that preserves LT properties.

$\equiv^{J}_{\mathrm{must}}$ coincides with the *fair failure equivalence* defined on Petri nets by Walter Vogler in 2002. However, Vogler did not obtain this equivalence through a (must-)testing scenario.

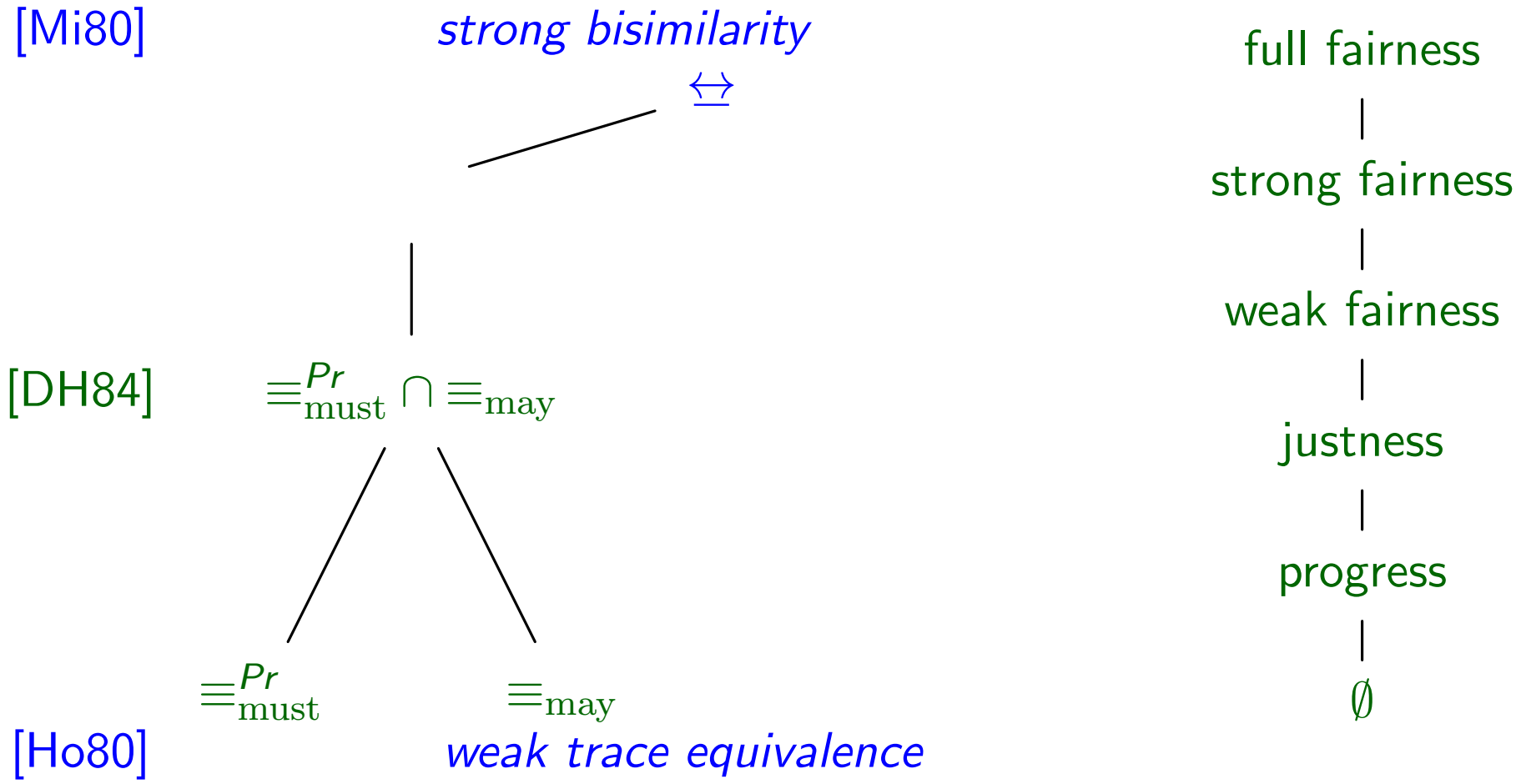
A spectrum of testing preorders and bisimilarities

[Mi80] *strong bisimilarity* $\leftrightarrows$

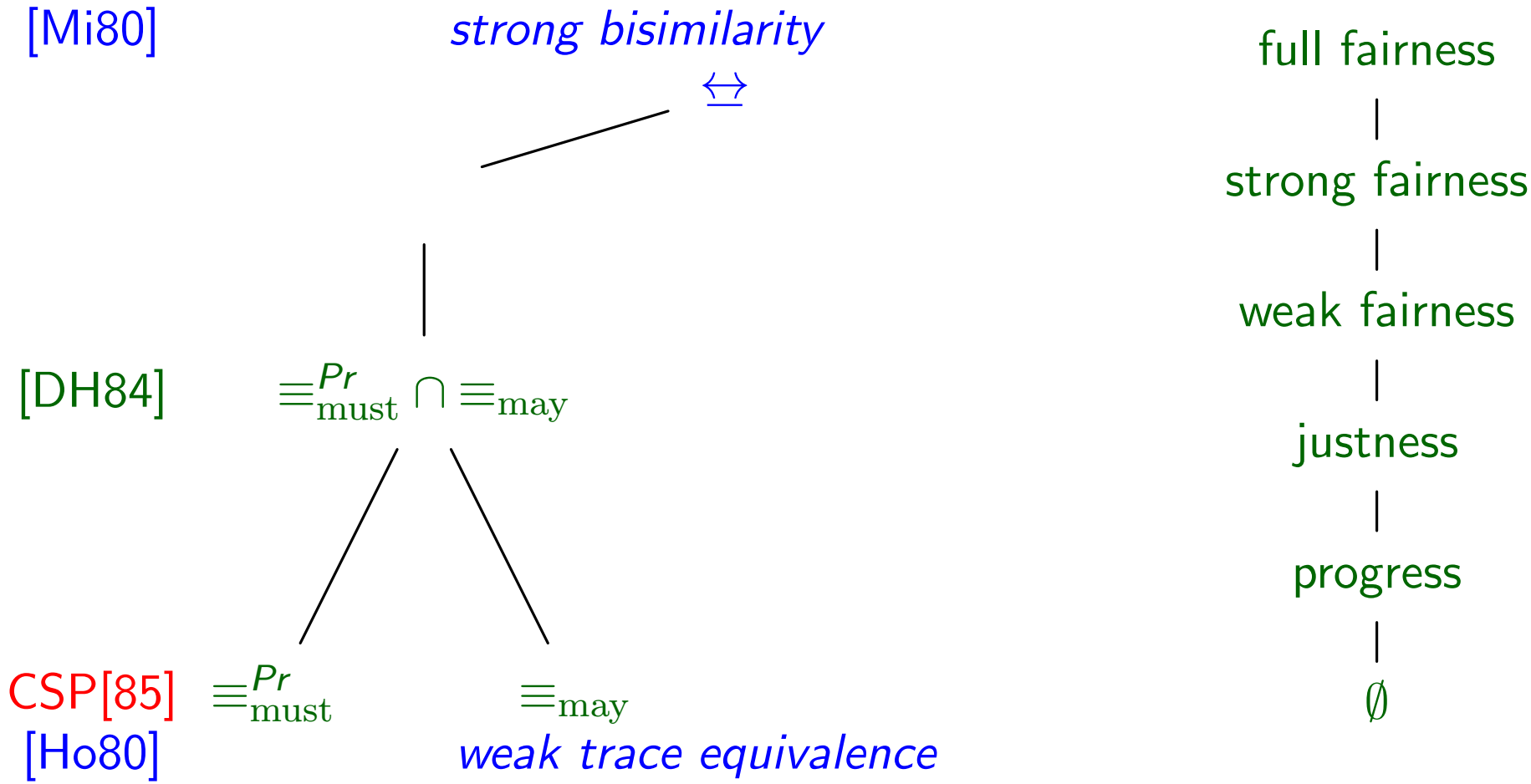


[Ho80] *weak trace equivalence*

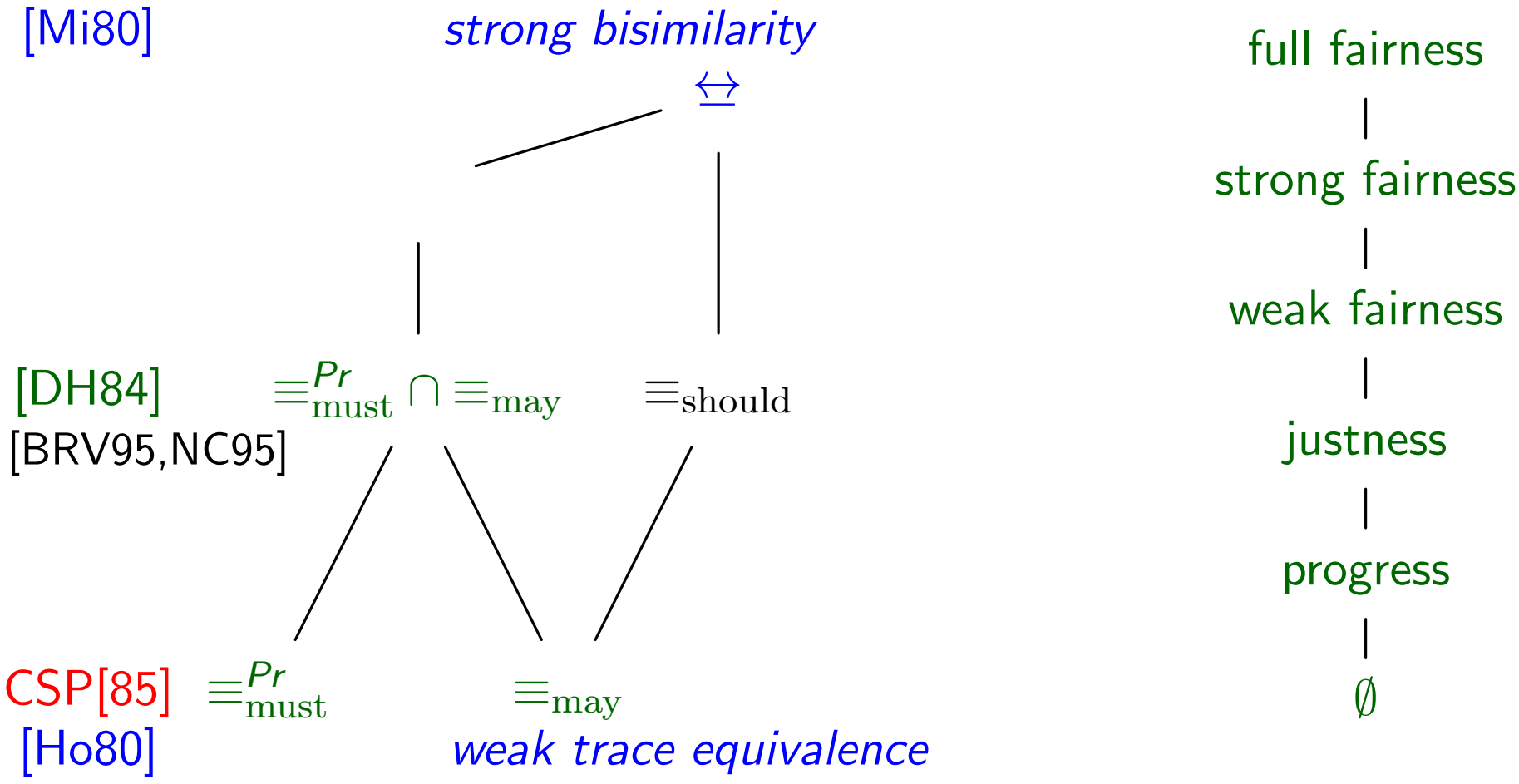
A spectrum of testing preorders and bisimilarities



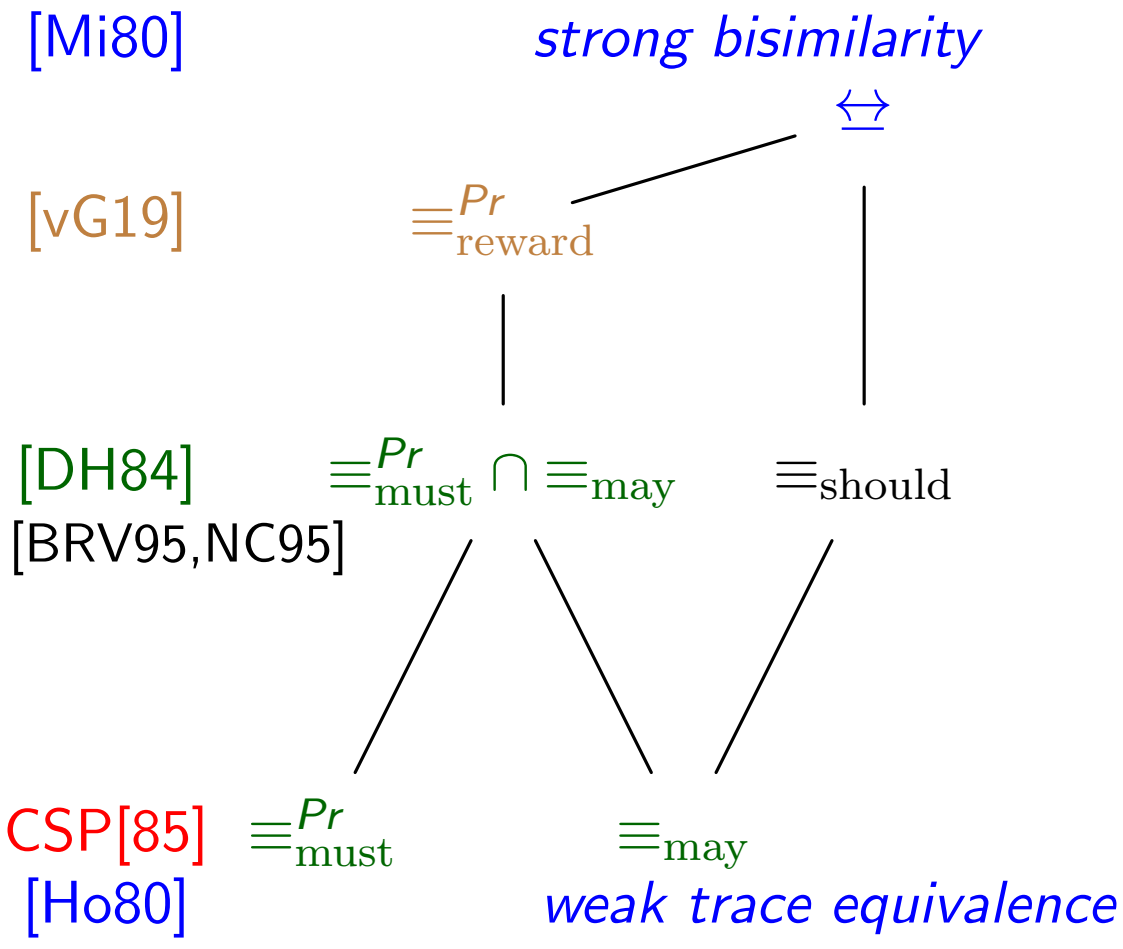
A spectrum of testing preorders and bisimilarities



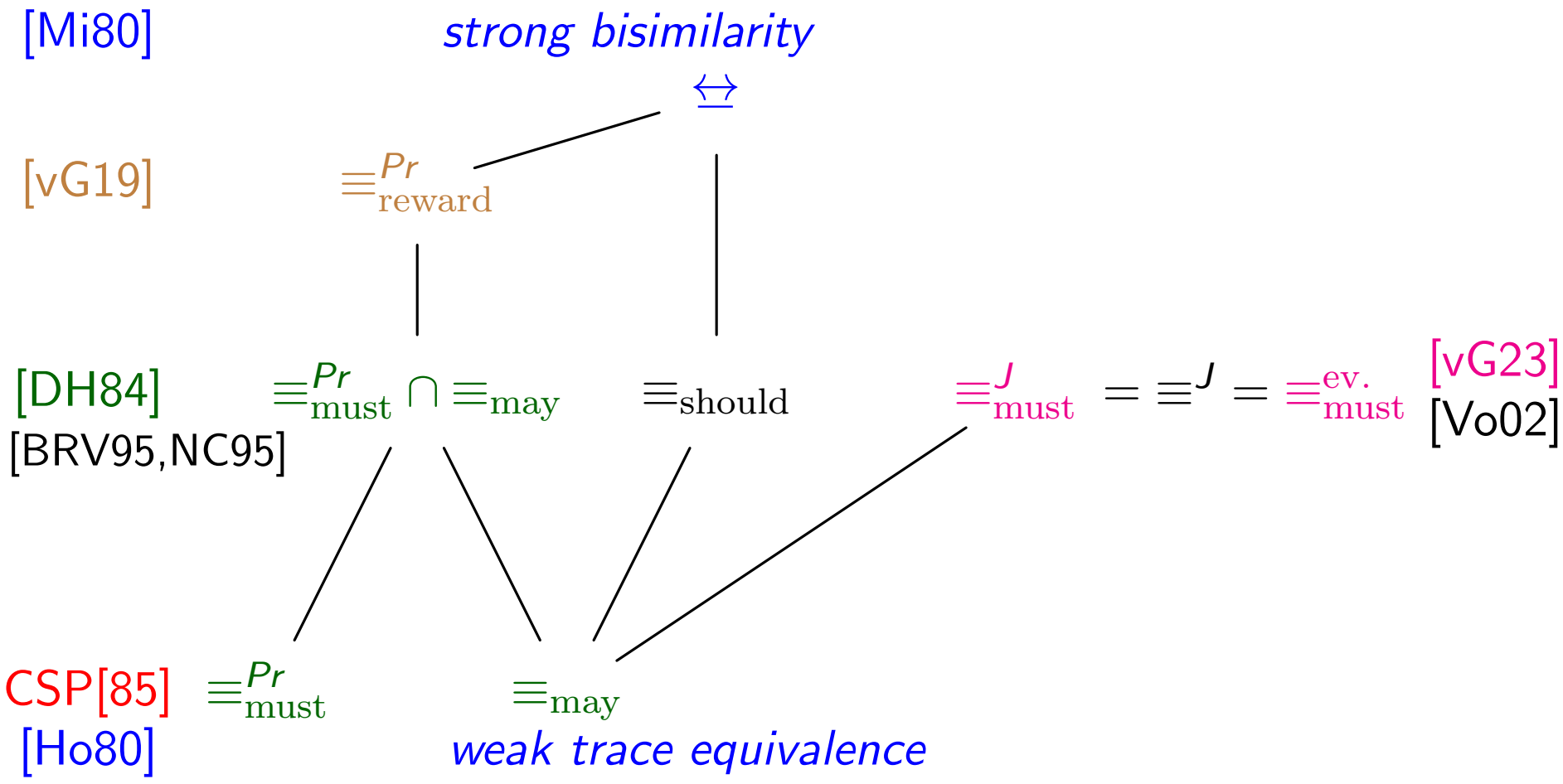
A spectrum of testing preorders and bisimilarities



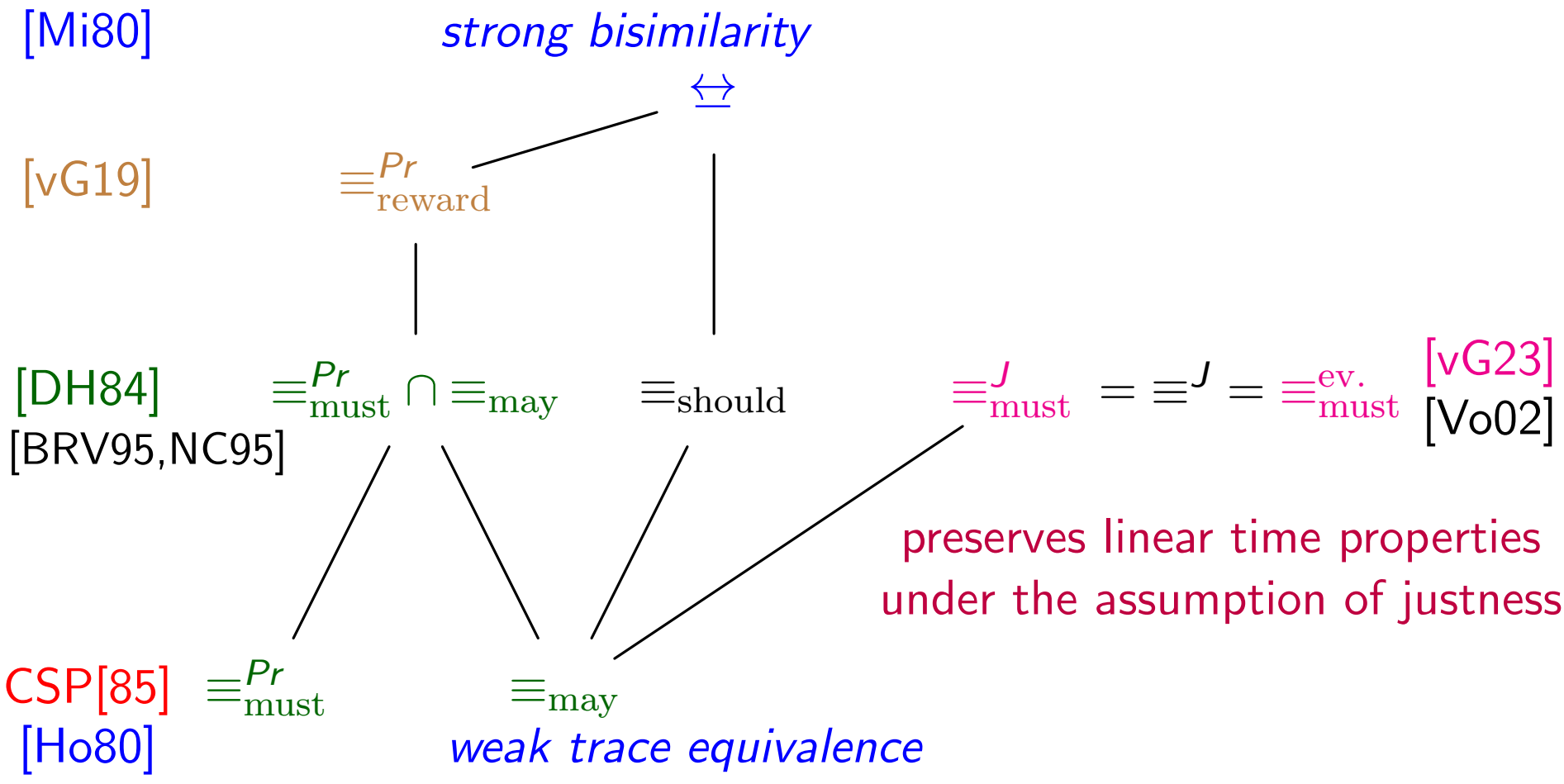
A spectrum of testing preorders and bisimilarities



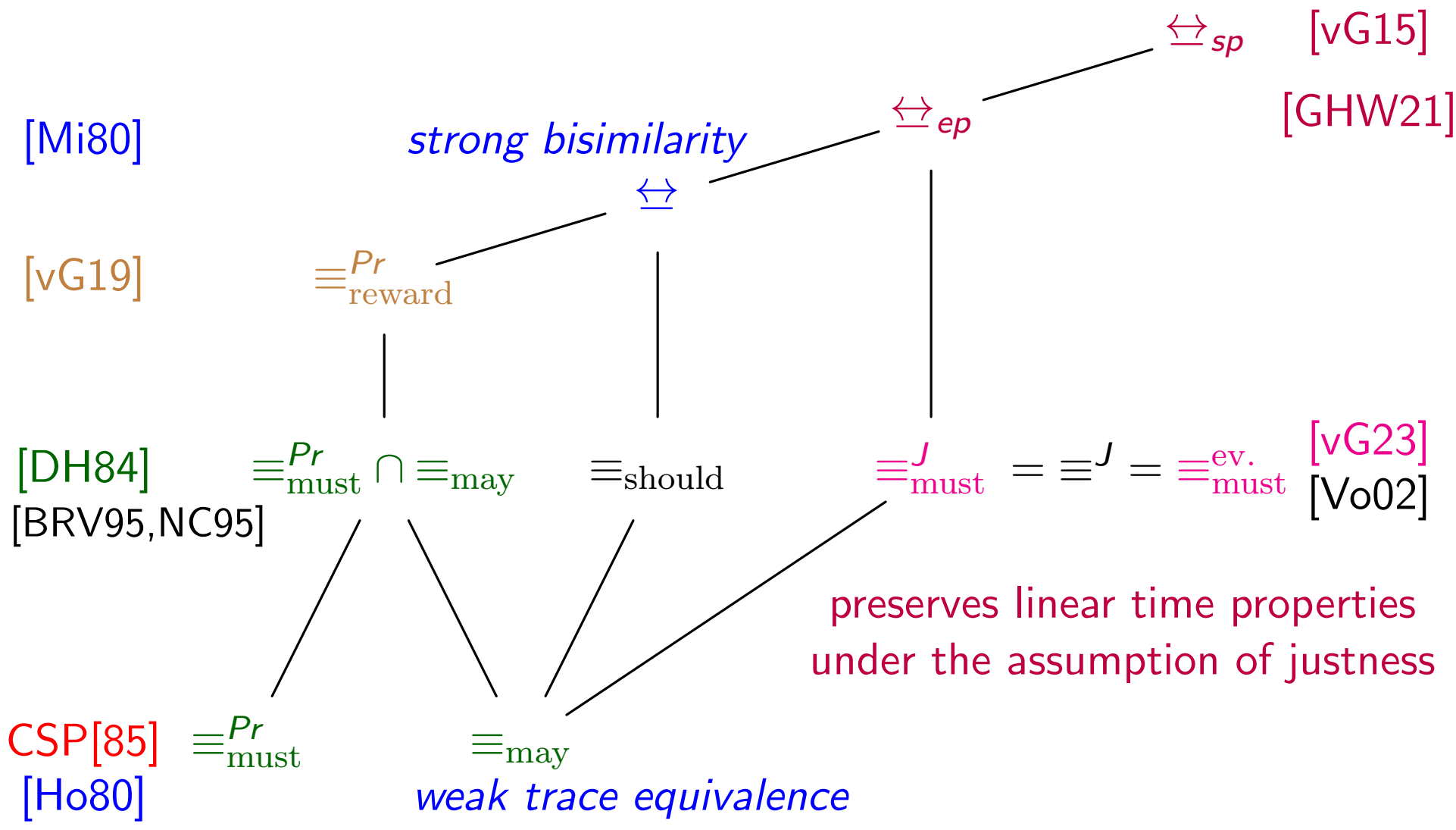
A spectrum of testing preorders and bisimilarities



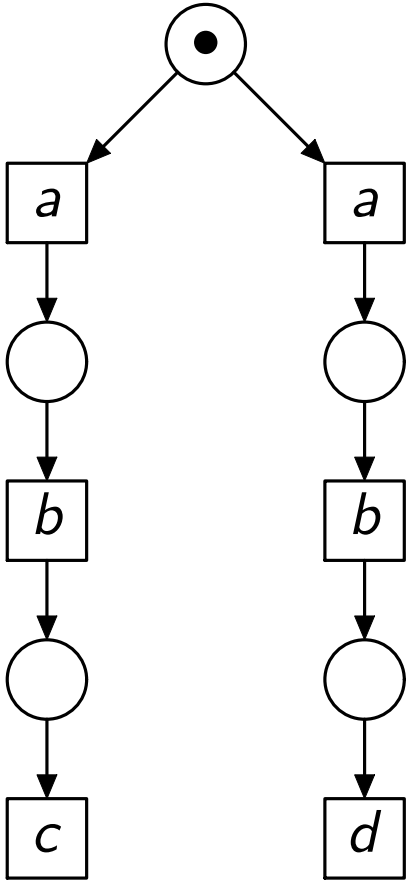
A spectrum of testing preorders and bisimilarities



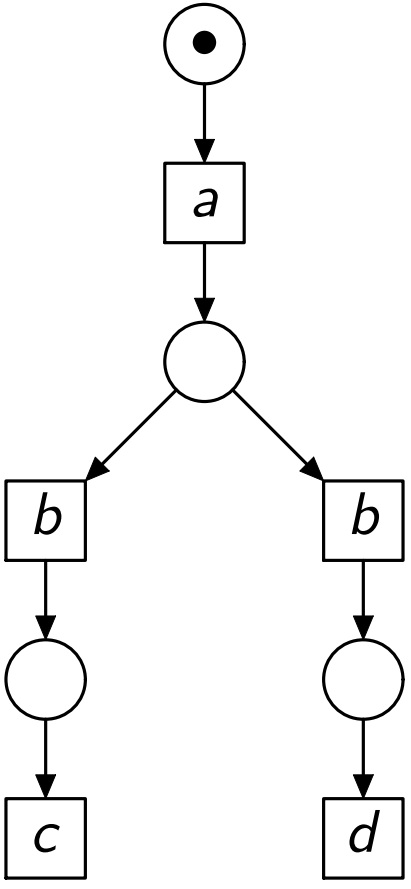
A spectrum of testing preorders and bisimilarities



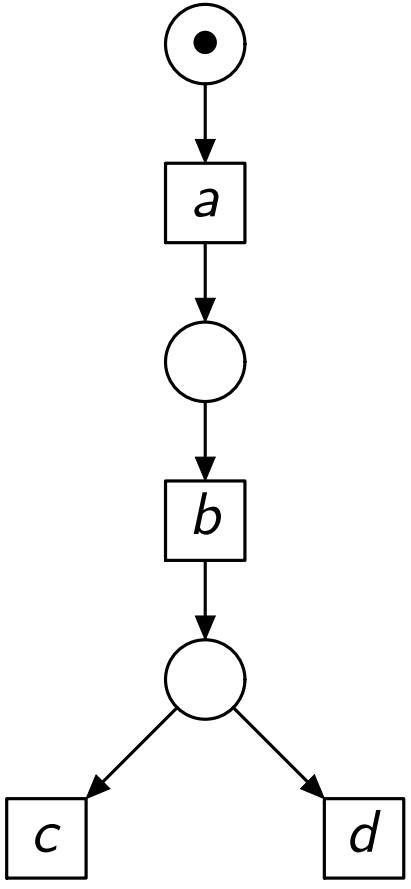
Examples – branching time



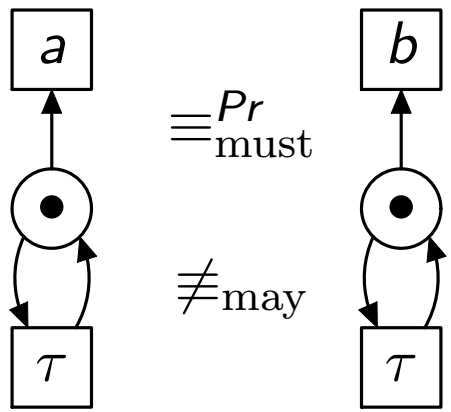
$\equiv_{\text{may}}$
$\equiv^{Pr}_{\text{must}}$
$=^{Pr}_{\text{reward}}$
$\equiv_{\text{should}}$
$\equiv^{J}_{\text{must}}$
$\not\Leftrightarrow$
$\not\Leftrightarrow_{ep}$



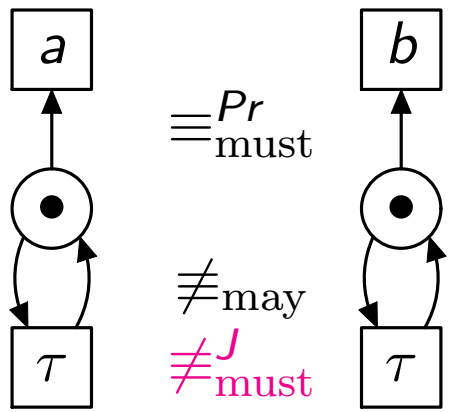
$\equiv_{\text{may}}$
$\not\equiv^{Pr}_{\text{must}}$
$\neq^{Pr}_{\text{reward}}$
$\not\equiv_{\text{should}}$
$\not\equiv^{J}_{\text{must}}$
$\not\Leftrightarrow$
$\not\Leftrightarrow_{ep}$



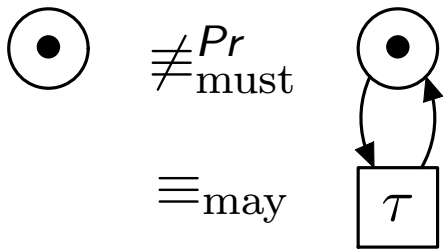
Examples – must testing cannot see past divergence



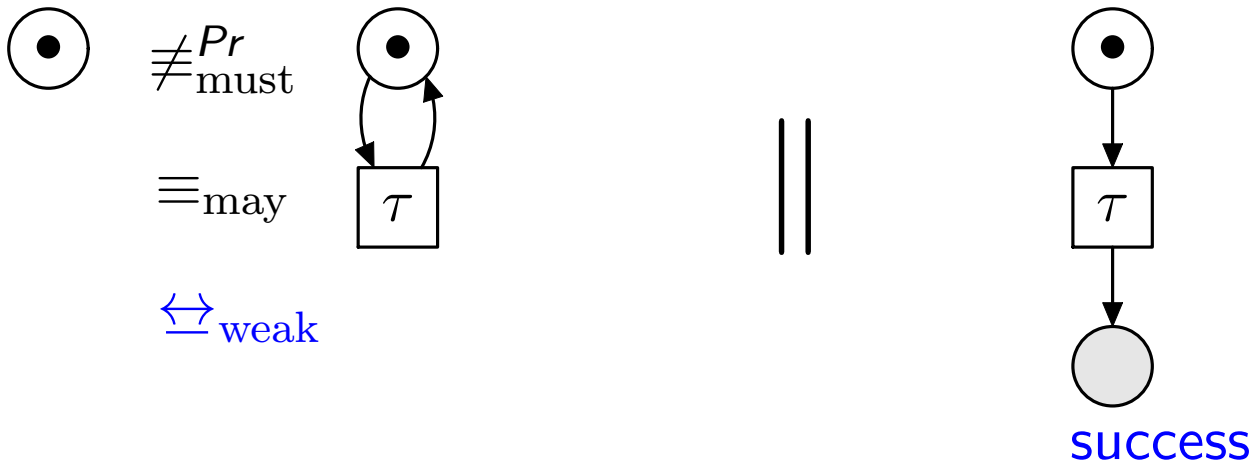
Examples – must testing cannot see past divergence



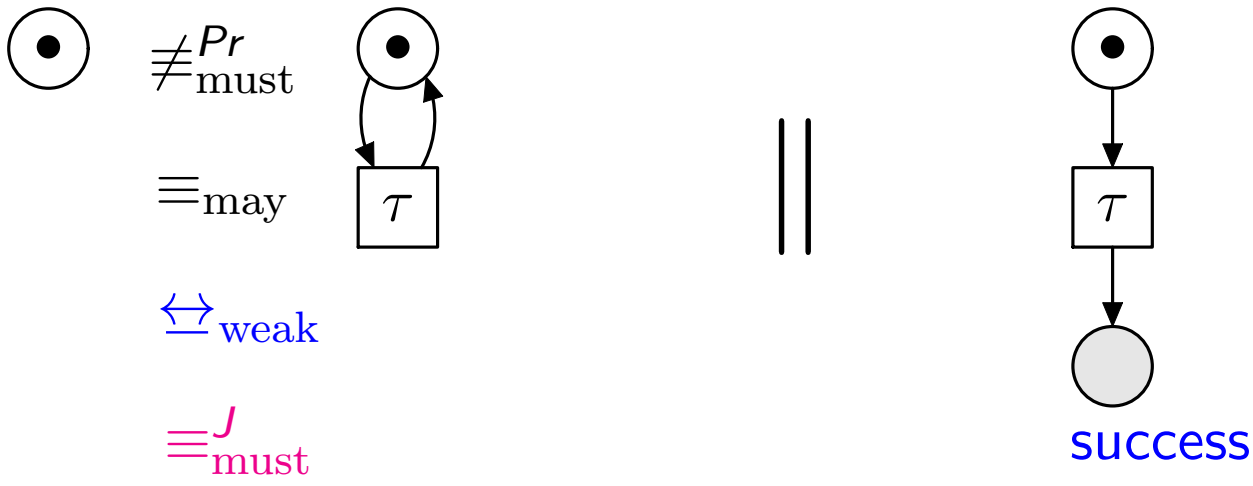
Examples – must testing tells apart deadlock and divergence



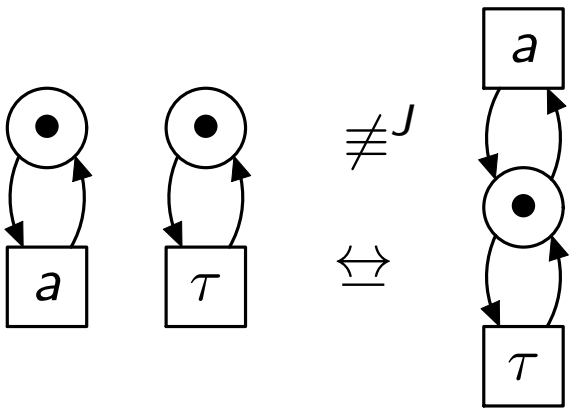
Examples – must testing tells apart deadlock and divergence



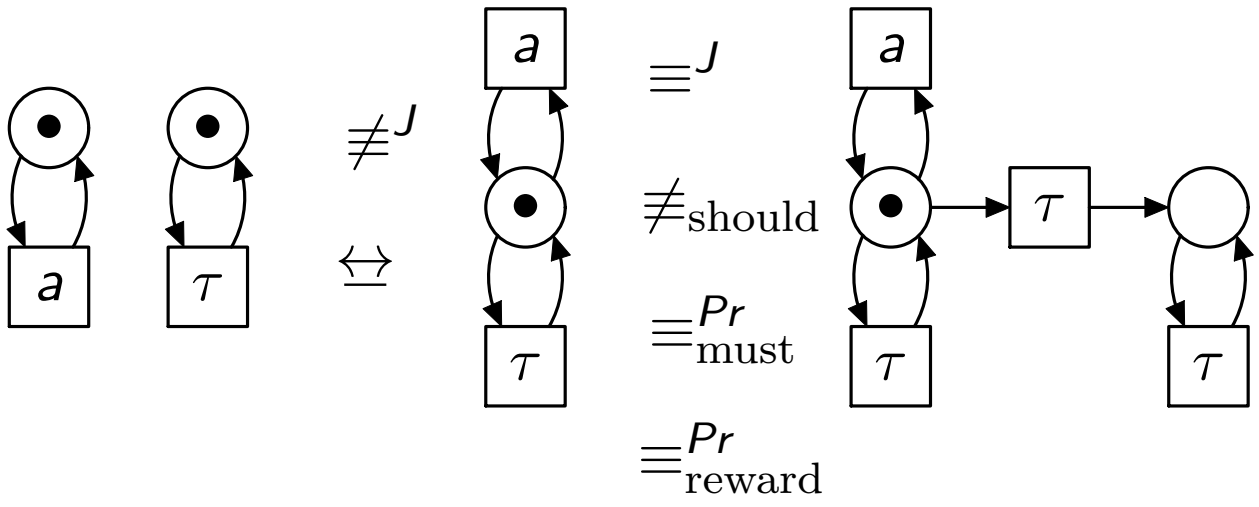
Examples – must testing tells apart deadlock and divergence



Examples – justness and full fairness



Examples – justness and full fairness



full fairness

|

strong fairness

|

weak fairness

|

justness

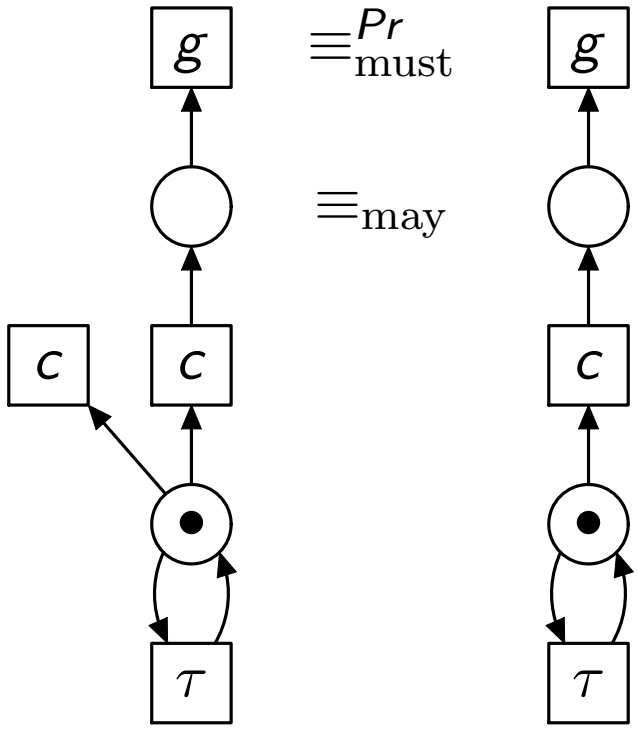
|

progress

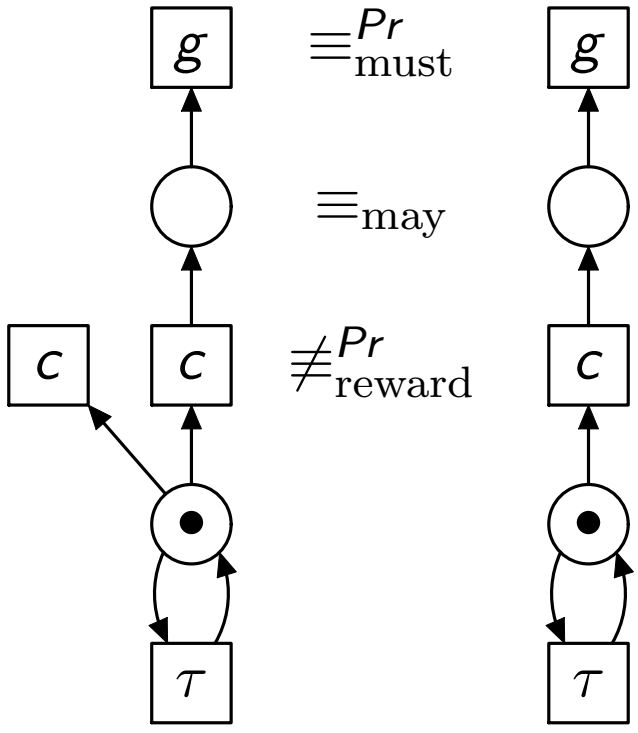
|

∅

Examples – conditional liveness



Examples – conditional liveness



Examples – conditional liveness