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## Thank you for your report on XV10673A

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Thu, Jun 29, 2023 at 12:28 PM

To: jenca@mat.savba.sk

Here is a copy of your report which you recently submitted via our web server:

Please do not worry if the formatting looks awry; fixed width fonts are required.

Referee: 943792 Dr. Anna Jencova  
Current Email: [jenca@mat.savba.sk](mailto:jenca@mat.savba.sk)  
MsCode: XV10673A  
Date: 29Jun2023

Enough significant new physics? No  
Sound and not misleading? Maybe  
Well organized, clear? Maybe  
Subject matter appropriate? Maybe  
Length appropriate? Yes

Quality of research: Average  
Quality of presentation: Good

Recommendation:  
Do not publish; see report.

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begin\_report

In the revised version, the authors added some explanations and made some changes. The paper is now more understandable, but the main issues remain: lack of genuinely new results. This is not to say that the paper does not contain interesting points, as described in the comments below. But these are not sufficiently elaborated and/or their significance is

not clear.

1. In the examples in the paper, the TBR as applied here restricts the quantum evolution into the classical process obtained by fixing the basis states, thus completely ignores the quantum effects such as entanglement or superposition. The QBR, however, retains the full (unitary) evolution. It is no surprise at all that these two approaches lead to different conclusions. Quantum theory is not classical, after all. If this observation is the main result of the paper, then I am still not impressed.
2. What might be more interesting is the theory of quantum causal relations using the quantum conditional states and the Petz map, along the lines of Ref. [23]. The remarks after Def. 2 seem to suggest that in the setting of Def. 2, deterministic inference is possible only in inherently classical situations (i.e. sets of mutually orthogonal states and their probabilistic mixtures), where the TBR should be appropriate. But there is no rigorous treatment or justification behind Def. 2 and the conclusions after. Moreover, the whole setting is applied in the simple case of unitary evolutions, where it trivialises. In fact, the developments in Sec. II are not necessary for the rest of the paper.
3. In Sec. IV, the authors demonstrate that in the setting based on Ref. [20], the TBR leads to the same paradoxical conclusions as the Frauchiger-Renner paradox and can be resolved by QBR. A similar example based on Refs. [21,22] is presented in Sec. VI. This might be of some value, showing that the paradoxes are caused by superpositions and entanglement and can be resolved by QBR.

end\_report

Comments for the Editors:

In my opinion, the paper does not contain enough material to be published. It only shows that wrong reasoning leads to wrong conclusions. There are interesting parts, but not elaborated enough even after revision. However, I am not so familiar with the paradoxes treated in this paper, so I might have misjudged the significance of this part of the paper.