

## ***Interactive comment on “Sharing water and benefits in transboundary river basins” by D. Arjoon et al.***

### **Anonymous Referee #3**

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This is a fine paper, but its contribution is somewhat hidden and not sufficiently developed/motivated. I have five comments that should help improve the paper.

1. P3 L 14–17. You implicitly state that axiomatic approaches ignore economic welfare. This is not exactly true. You may not be aware of some recent work in this area, e.g.: - Ambec, S., A. Dinar, and D. McKinney (2013). Water sharing agreements sustainable to reduced flows. *Journal of Environmental Economics and Management* 66(3), 639–655. - Van den Brink, R., G. van der Laan, and N. Moes (2012). Fair agreements for sharing international rivers with multiple springs and externalities. *Journal of Environmental Economics and Management* 63(3), 388–403. These papers apply axioms on the welfare distribution resulting from the physical allocation of water. Actually, most axiomatic papers in the river sharing literature do so.

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2. You introduce, in Sections 2.1-2.3 a social planner that collects all information and derives an appropriate social cost of water and its related price. A tremendous task I would say, especially since water is not a regular good and this price will vary by quality, location, time, and possibly other aspects. What is more problematic is that the planner relies on all water users for its collection of information, a crucial step in the analysis. In Section 2.1 this process is described but this section ignores the problem posed by incentive compatibility: why would users truthfully reveal their demand curves (or make truthful bids) if they could benefit by pretending a higher demand curve (i.e. a higher bid)? Sure, the section mentions some methods to check the reliability of information, like remote sensing, but this does not eliminate the incentives to "cheat".

3. In general, it is not clear what the status quo / baseline situation is w.r.t. property rights over water, which makes it hard to interpret the model. I see three candidates for the status quo: - First, on P4 L26 an exogenous water price  $P_D$  is introduced. This suggests that there is a planner or a market active in the status quo, where users can buy their water. - Second, expected net benefits (ENB) are derived assuming that a user can abstract any water unhampered by other (upstream) users' water use. This suggests that you take the principle of Unlimited Territorial Integrity as your status quo. - Third, the sharing of the RBA money seems to ignore any historical water use rights. This suggests that the status quo is one without any water use or where the RBA owns all water (since apparently water prices are paid to the RBA).

4. In Section 2.1, ENB was calculated as consumer surplus. In Section 3.2, however, ENB is calculated as unconstrained water use ( $D_j$ ) multiplied by productivity ( $P_j$ ). This seems to be a completely different measure. Where consumer surplus equals willingness to pay minus the water price for all consumed units of water and is measured in money terms, this new measure is a production measure: productivity of water times consumed units of water, probably measured in terms of physical output. This is very confusing (it is also confusing that  $P$  is used to denote both productivity and price). In section 3.3, Eq (2), again the production measure is used to calculate gross benefits.

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Gross benefits cannot be the product of water use and productivity.

5. The innovative part of the paper is where you distribute the rents using the axiomatic approach. This method is postponed to Section 3.5. My main comment here is that there is no clear motivation for distributing E such that each user obtains an equal proportion of benefits (FNB+tp) to claims (ENB). There are many axiomatic solutions that are similar in spirit to yours, but I do not see a compelling motivation why this particular new rule is introduced and applied here. It seems standard to motivate a new solution in terms of its characterizing properties, but such a characterization is not provided here. There are some statements in the text that claim this rule satisfies the properties "solidarity" and "security of minimum benefits", but these properties are not clearly defined. Note that I am not saying that a full characterization should be provided here, as that is perhaps less relevant for the HESS audience, but I would expect a convincing motivation for introducing this new solution over any other (existing) solutions. Two additional minor comments: - By taking account of FNB in your bankruptcy rule, you have a problem that is more general than a standard bankruptcy problem (see e.g. work by Hougaard). - Your proposed solution does not take into account historical water use or any other property rights regime? (see my comment on the status quo).

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