

# Free-Riding in Multi-Issue Decisions

Martin Lackner

DBAI, TU Wien

Jan Maly

DBAI, TU Wien

Oliviero Nardi

DBAI, TU Wien

**Scenario.** A group needs to settle multiple independent decisions (or *issues*), either at the same time or over time. We want to have *fair outcomes*, i.e., we want to satisfy all voters (to some extent) across the issues.

**Example.** A committee organizing a party.

When?	Budget?	Theme?
Where?	Food?	Guest?

**Free-Riding.** Untruthfully opposing an alternative (winning by a large margin) in some issue in order to receive greater consideration in other issues. For instance:

- ▶ Unanimous location (the *Nice Pub*), but no consensus on the date.
- ▶ If (only) you oppose the *Nice Pub*, it still wins.
- ▶ Being “dissatisfied” with the location, out of fairness, you get more weight when deciding the date.

You got the location you liked, but you decided the date:  
**you are a free-rider.**

We investigate *when is free-riding possible*, its *computational complexity*, and *experimentally assess its risk* for voters (i.e., the likelihood of it leading to a worse outcome).

We focus on *approval ballots*, and on two families of voting rules (Thiele and ordered weighted averaging rules). Both consider the *satisfaction of voters* to make *fair decisions*.

**Bad news.**

- ▶ Free-riding is *possible with all rules* except issue-wise majority.
- ▶ *In some cases* (e.g., issues are decided at the same time by the leximin rule) it *never leads to a worse outcome*.

**Good news.**

- ▶ For many rules, when issues are decided one after the other, free-riding *can lead to a worse outcome*.
- ▶ Simulations indicate that the *risk of free-riding is high*: in some settings, up to 20% of the time it leads to a worse outcome.
- ▶ Deciding if free-riding is *possible* or *beneficial* is often **NP-hard**.

**Free-riding is unavoidable** in fair multi-issue decision making. However, it is **risky** for many voting rules, and its **consequences are hard to predict**. Thus, it is less appealing as it might seem at first.

