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Probabilistic Assignment Problem with Multi-unit Demands: A Generalization of the Serial Rule and its Characterization

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Abstract

We study a probabilistic assignment problem when agents have multi-unit demands for objects. We first introduce two fairness requirements to accommodate different demands across agents. We show that each of these requirements is incompatible with stochastic dominance efficiency (henceforth, we use the prefix "sd" for stochastic dominance) and weak sd-strategy-proofness, unless all agents have unitary demands. We next introduce a new incentive requirement which we call limited invariance. We explore implications of these requirements in combination of consistency or converse consistency.

Our main result is that the generalized serial rule, which we propose as an adaptation of the serial rule to our setting, is the only rule satisfying sd-efficiency, the sd proportional-division lower-bound, limited invariance, and consistency. Uniqueness persists if we replace the sd proportional-division lower-bound by sd normalized-no-envy, or consistency by converse consistency, or both. The serial rule in Bogomolnaia and Moulin (2001) is characterized as a special case of our generalized serial rule.

JEL classification: C70, D61, D63.

Keywords: the generalized serial rule; sd-efficiency; sd proportional-division lower-bound; sd normalized-no-envy; limited invariance; consistency; converse consistency; weak sd-strategy-proofness.

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