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Ex-post Optimal Knapsack Procurement

Felix Jarman* Vincent Meisner†

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Abstract

We consider a budget-constrained mechanism designer who selects an optimal set of projects to maximize her utility. Projects may differ in their value for the designer, and their cost is private information. In this allocation problem, the quantity of procured projects is endogenously determined by the mechanism. The designer faces ex-post constraints: the participation and budget constraints must hold for each possible outcome, while the mechanism must be strategyproof. We identify settings in which the class of optimal mechanisms has a deferred acceptance auction representation which allows an implementation with a descending-clock auction. Only in the case of symmetric projects do price clocks descend synchronously such that the cheapest projects are implemented. The case in which values or costs are asymmetrically distributed features a novel tradeoff between quantity and quality. The reason is that guaranteeing allocation to the most favorable projects under strategyproofness comes at a price of a diminished expected number of implemented projects.

JEL-Classification: D02, D44, D45, D82, H57.
Keywords: Mechanism Design, Knapsack, Budget, Procurement, Auction, Deferred Acceptance Auctions.

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