The bipartite rationing problem

Hervé Moulin

In the bipartite rationing problem, a set of agents share a single resource available in different "types", each agent has a claim over only a subset of the resource-types, and these claims overlap in arbitrary fashion. The goal is to divide fairly the various types of resource between the claimants, when resources are in short supply.
With a single type of resource, this is the classic rationing problem (O'Neill), of which the three benchmark solutions are the proportional, uniform gains, and uniform losses methods. We extend these and other methods to the bipartite context, imposing the familiar consistency requirement: the division is unchanged if we remove an agent (resp. a resource), and take away at the same time his share of the various resources (resp. reduce the claims of the relevant agents).
We find that most parametric rationing methods (Young) cannot be consistently extended, and come close to characterize the subset of those that can. The latter reduce essentially to the loss calibrated rationing methods, a new family of methods containing the proportional method, and the uniform gains and uniform losses as limit points. They admit a single consistent extension, although uniform gains and uniform losses admit infinitely many.

Joint work with Jay Sethuraman