Accepted Manuscript

Pareto optimal matchings with lower quotas

Katarína Cechlárová, Tamás Fleiner

PII: S0165-4896(17)30064-1
DOI: http://dx.doi.org/10.1016/j.mathsocsci.2017.03.007
Reference: MATSOC 1936

To appear in: *Mathematical Social Sciences*

Received date: 16 September 2016
Revised date: 23 March 2017
Accepted date: 23 March 2017

Please cite this article as: Cechlárová, K., Fleiner, T., Pareto optimal matchings with lower quotas. *Mathematical Social Sciences* (2017), http://dx.doi.org/10.1016/j.mathsocsci.2017.03.007

Pareto optimal matchings with lower quotas

Katarína Cechlárová[1]*and Tamás Fleiner[2]
[1]Institute of Mathematics, Faculty of Science, P.J. Šafárik University, Jesenná 5, Košice, Slovakia
email: katarina.cechlarova@upjs.sk
[2]Budapest University of Technology and Economics and MTA-ELTE Egerváry Research Group, Magyar tudósok körútja 2, H-1117, Budapest, Hungary,
email: fleiner@cs.bme.hu

April 8, 2017

Abstract

We consider the problem of allocating applicants to courses, where each applicant has a capacity, possibly greater than 1, and a subset of acceptable courses that she ranks in a strict order of preference. Each course has a lower and an upper quota, indicating that if it is assigned some applicants then their number has to be between these two bounds. We further suppose that applicants extend their preferences over courses to preferences over bundles of courses lexicographically.

In this setting we present several algorithmic results concerned with the computation of Pareto optimal matchings (POMs). Firstly, we extend the Serial Dictatorship with Project Closures mechanism to the case when an applicant can be assigned more than one course. We show that unlike in the one-to-many case no mechanism is strategy-proof against dropping manipulations and that this mechanism is strategy-proof against reordering strategies only for some picking sequences. We further show the intractability of the following problems: deciding about the Pareto optimality of a given matching, computation of a POM with maximum cardinality and computation of a POM in case of indifferences.

Keywords: matching, Pareto optimality, sequential mechanism, computational complexity, strategy-proofness

1 Introduction

We study two-sided matching markets with one-sided preferences. One side of the market, the set A (of agents, students, workers, researchers) has strict ordinal preferences over the other side, represented by the set C (of objects, schools, courses, firms, projects etc), but not vice versa. The aim is to match agents to objects. As preferences of agents are often conflicting, a suitable compromise for optimality notion has to be chosen. One of the most popular one is Pareto optimality, widely studied in the literature on matchings Abdulkadiroğlu and Sönmez (1998); Abraham et al. (2004); Brams and King (2005); Cechlárová et al. (2014, 2016a,b); Krysta et al.

*corresponding author