

# Scheduling Two Competing Agents When One Agent Has Significantly Fewer Jobs

Danny Hermelin<sup>\*1</sup>, Judith-Madeleine Kubitzka<sup>2</sup>, Dvir Shabtay<sup>1</sup>, Nimrod Talmon<sup>\*\*2</sup>, and Gerhard Woeginger<sup>3</sup>

<sup>1</sup> Ben Gurion University of the Negev, Israel  
hermelin@bgu.ac.il, dvirs@bgu.ac.il

<sup>2</sup> TU Berlin, Germany

judith-madeleine.kubitzka@campus.tu-berlin.de, nimrodtalmon77@gmail.com

<sup>3</sup> Eindhoven University of Technology, The Netherlands  
gwoegi@win.tue.nl

**Abstract.** We study the complexity of scheduling non-preemptive jobs of two given agents on one machine, while respecting the upper-bounds on the weighted sum of completion times which are given individually for each agent. Since the problem is known to be hard even for quite restrictive variants, we focus on the case where one agent has significantly smaller number of jobs than the other, and show that the problem becomes much more tangible in this case. Specifically, we present three algorithms for various cases that are all efficient when one agent has a relatively small number of jobs. We complement these algorithms by showing that the general problem is NP-complete even when one agent has a single job.

---

\* The research leading to these results has received funding from the People Programme (Marie Curie Actions) of the European Union's Seventh Framework Programme (FP7/2007-2013) under REA grant agreement number 631163.11, and by the Israel Science Foundation (grant No. 551145/).

\*\* Supported by DFG Research Training Group MDS (GRK 1408).