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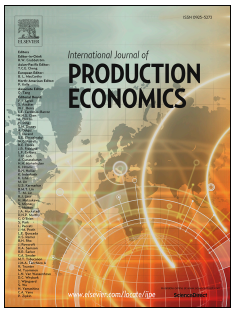

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Single Machine Scheduling with Controllable Processing Times and an Unavailability Period to Minimize the Makespan

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Abstract.

We study a single machine scheduling problem, where job processing times are controllable, and there is a fixed machine unavailability interval. We assume that the job processing time is a convex decreasing function of the amount of resource allocated to its processing operation. We further assume that there is a budget restriction on the total resource allocation cost. Our aim is to find a job schedule that minimizes the makespan. We prove that the problem is NP-hard and develop both a constant factor approximation algorithm and a fully polynomial time approximation scheme (FPTAS) for solving it. The FPTAS is obtained despite the fact that we could not design a pseudo-polynomial time algorithm for finding the optimal solution.

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