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# An optimization model for integrating production and distribution planning in furniture companies

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## Abstract

We propose a mixed integer programming model that integrates production and distribution planning in Brazilian small furniture companies, in which the manufacturer has one production line and a small fleet of heterogeneous vehicles to make deliveries. Our formulation properly represents the problem and can be used to support the planning of production and distribution operations in small companies. A set of random instances is used to evaluate the performance of the model in terms of both solution quality and computational effort. In order to show the benefits of coordinating production and distribution operations, we compare our model with a two-step procedure that follows the common practice of furniture companies. In such a procedure, the integrated model is decomposed into two smaller subproblems, representing production and distribution decisions, respectively. These two subproblems are then solved sequentially in order to find a feasible solution to the problem. Numerical experimentation using a general-purpose solver showed that the integrated model can be used to solve instances with up to twenty customers and five products, whose size is considered realistic for small companies. Results also pointed out that integrating production and distribution decisions allows us to find solutions with lower total cost than those obtained by the sequential procedure. Still, solving the integrated model requires a higher computational effort.

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