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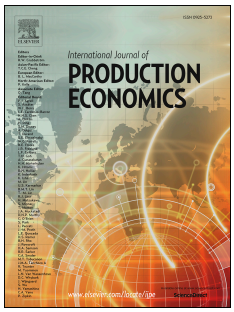

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PII: S0925-5273(17)30166-4

DOI: 10.1016/j.ijpe.2017.05.017

Reference: PROECO 6727

To appear in: *International Journal of Production Economics*

Received Date: 10 October 2016

Revised Date: 1 April 2017

Accepted Date: 29 May 2017

Please cite this article as: AlDurgam, M., Adegbola, K., Glock, C.H., A single-vendor single-manufacturer integrated inventory model with stochastic demand and variable production rate, *International Journal of Production Economics* (2017), doi: 10.1016/j.ijpe.2017.05.017.

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A single-vendor single-manufacturer integrated inventory model with stochastic demand and variable production rate

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Abstract

This paper investigates an alternative way to react to demand uncertainty in an integrated inventory model, namely the variation of the production rate that enables the manufacturer to reduce lead times and the corresponding demand uncertainty. To investigate the impact of variable production rates on the supply chain, this paper considers a single-vendor single-manufacturer integrated inventory model where the vendor ships finished products in multiples of full truckloads to the manufacturer. The objective of the model is to coordinate both production and distribution of the product in such a way that the total costs of the supply chain are minimized. A solution procedure is suggested, and the behaviour of the model is analysed in numerical examples. Our results illustrate that the total supply chain cost is reduced when the manufacturer's production rate is included as a decision variable in the model. These savings can generally benefit both the vendor and the manufacturer. However, in situations where coordinated decision making is initially not beneficial to the vendor, the supply chain members can benefit from a revenue sharing contract that supports the sharing of the total savings.

Keywords: *Integrated inventory model, variable production rate, stochastic demand, full truckload shipments*

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