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# Make-to-order, make-to-stock, or delay product differentiation? A common framework for modeling and analysis

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## Abstract

Delaying product differentiation is a hybrid strategy that strives to reconcile the dual needs of high variety and quick response time. A common product platform is built to stock in the first stage of production (called the Make-To-Stock (MTS) stage) which is then differentiated into different products after demand is known in the second stage (known as the Make-To-Order (MTO) stage). In this article, we develop models to compute the costs and benefits of delaying differentiation in series production systems when the order lead times are load dependent. The models are then used to gain insights through analytical and numerical comparisons. For example, we observe the following patterns in a large number of numerical experiments. The effect of congestion in the MTS and MTO stages is asymmetric with tighter capacity at the MTO stage having a greater detrimental effect on the desirability of delaying differentiation. If

there is flexibility in choosing the point of differentiation, higher loading is observed to favor later differentiation. Also, if the sequence in which work is performed can be affected, then placing workstations that have a tighter capacity in the MTS stage lowers costs.

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