Abstract

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Play hard, work hard? How Tetris experience impacts the performance in manual truck loading for retail distribution

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Learning curve literature in operations management has established that the accumulation of output enhances volume-based experience and leads to per-unit performance improvements. However, little is known how specific characteristics affect performance. In manual truck loading for grocery retail distribution, truck drivers load differently shaped transportation units (e.g., pallets and roll cages) into different transportation assets (e.g., light truck vs. semi-trailer truck). As drivers have to minimize vacated spaces while working under time pressure, this task is akin to playing Tetris. The truck drivers' Tetris task gets more complicated as the variety of units (i.e., size and shape) to be loaded and the variety of trucks increases. Hence, while two drivers might have handled the same number of units (identical volume experience), their experience with heterogeneity of loading units and vehicle assets might differ. So far, no empirical study has examined how differences in these different experience dimensions affect performance. In this study, we juxtapose the established aggregated volume experience against the fine-grained experience measures (unit variety and asset variety experience) and their interplay. We use a large-scale longitudinal dataset from a German brick-and-mortar grocery retailer to examine how different forms of experience affect the time needed by a professional truck driver to manually load a truck. Our empirical sample includes more than 7 million units loaded by 648 truck drivers in a four-year period from 2018 to 2021. The shapes of units that have to be loaded and the truck types utilized by drivers vary on a daily basis. For empirical examination, we apply a log-logistic accelerated failure time model with loading time as our dependent variable. The different experiences represent the independent variables. Specifically, the cumulative number of trucks loaded by a driver captures volume experience proposed by extant experience curve literature. Unit variety experience is the cumulative number of trucks loaded by a driver for a given variety level. The cumulative number of trucks loaded by a driver for a given truck type is what we term asset variety experience. We find that as more fine-grained experience types are considered in the model, volume experience has a significant decelerating effect on truck loading time. A possible explanation is a competency trap where truck drivers with higher overall experience persist with current practices and do not learn alternatives that are superior in the long term. Interestingly, unit variety experience, asset variety experience, and the interaction of both variety experiences have a significant accelerating impact on truck loading time. Hence, these aspects might force workers to apply new routines and flexibly align them to the specific setting they face. These results indicate that accumulating the mere volume of tasks might not have salutary performance effects per se as the key factor might be how workers handle heterogeneity in the characteristics of work activities. We further test for moderation effects and find that the filling level of trucks moderates the performance impact of all experience types indicating that task complexity plays a critical role. In summary, we follow calls to open the "black box" of the learning curve by examining different forms of experience in retail operations beyond pure volume-based learning. While unidimensional volume experience is capable to capture time-dependent behavioral aspects, e.g., competency traps, variety-related experiences capture specific traits of individual experience which allow to identify detailed insights on how learning works. Retail managers can include these mechanisms in training sessions and scheduling planning in order improve operational performance.