

**AN INVESTIGATION ON OFF-HOUR DELIVERY POLICY
DESIGN USING OPTIMAL INCENTIVES AND A BEHAVIORAL
MICRO-SIMULATION APPROACH**

by

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ABSTRACT

The objectives of this dissertation are to provide insight in designing off-hour delivery programs by developing: (1) policies to optimally distribute financial incentives to receivers gained from various funding mechanisms; (2) methods to simulate the behaviors of receivers and carriers pertaining to off-hour deliveries; (3) an understanding of how different market segments influence OHD operations; and (4) an understanding of how policy design will increase participation in off-hour deliveries. These objectives were achieved through policy mathematical models and a Behavioral Micro-Simulation framework developed here.

The mathematical policy models developed in this dissertation serve as guidelines to optimally distribute financial incentives, and to finance them through cases considering an exogenous budget and regular-hour penalties. In general, the optimal incentives found depend on: (1) the class elasticity to off-hour deliveries; (2) the average number of class tours per receiver; (3) the tour elasticity; (4) the cost to move tours to the off-hours; (5) the revenues collected from penalties; and (6) the inverse off-hour delivery market share. Using these optimal solutions, numerical experiments were conducted to prove that: (1) tours can be shifted to the off-hours when receivers are given incentives to accept off-hour deliveries; and (2) the penalties considered were all effective at generating a budget for OHD incentives.

The analyses done using the Behavioral Micro-Simulation revealed several key results: (a) financial incentives given to receivers in exchange for accepting off-hour deliveries, and financial rewards to carriers making off-hour deliveries would increase participation in off-hour deliveries; (b) time of day toll surcharges have no major impact on increasing off-hour deliveries; (c) carriers located close to their urban customers are more likely to participate in off-hour deliveries as they can easily begin to accrue the benefits from off-hour delivery operations; and, (d) increased enforcement of parking fines for double parking during the regular hours could increase the number of carriers participating in off-hour deliveries.