Loot Box Selling

A *loot box* is a random bundle of virtual items whose contents are not revealed until after purchase. Loot box selling is popular in video games, and accounted for $30 Billion revenue in 2018.

**Research Questions:**
1. How to price and design loot boxes optimally to maximize revenue?
2. What is the impact of loot boxes on customers and sellers?

**Unique Box vs. Traditional Box**

*Unique boxes* allocate an item uniformly at random *without replacement*, i.e., they never allocate duplicates.

*Traditional boxes* allocate an item uniformly at random *with replacement*.

**Model:** $N$ items in the game. Each customer has i.i.d. valuation to each item, with mean valuation $\mu$.

**Performance Metric:** Average revenue and surplus per item. The revenue per item is at most $\mu$.

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<th>Revenue</th>
<th>Price</th>
<th>Selling Volume</th>
<th>Consumer Surplus</th>
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<td>Unique</td>
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Table: Performance of unique box and traditional box when $N$ is large.

**Insights for sellers:** The value of knowing customer inventory – from 36.7% to 100% of potential revenue!

**Insights for customers:** customers consume almost the same amount of loot boxes, and they actually pay more and have less surplus for unique boxes!

Loot Box Design

**Multiple items in one box:** Everything holds.

**Multiple classes of items:** Uniform allocation is asymptotically optimal for both unique box and traditional box, and everything holds!

**Loot Box with Trade-in System**

Setting: any item (duplicates or unwanted) can be traded in for $c$ value.

**Insights for sellers:** The trade-in system can further improve the profit, and now loot boxes are guaranteed to outperform separate retailing.

**Insights for customers:** When the seller is profit maximizing, the consumer surplus can be improved by at most 1.4%, and negative in most cases!

**Reference**

Chen, Ningyuan and Elmachtoub, Adam and Hamilton, Michael and Lei, Xiao, Loot Box Pricing and Design (August 1, 2019). Scan the QR code for paper!