Massachusetts Institute of Technology — OPERATIONS RESEARCH CENTER

# Unearthing the perfect gem: Optimizing staffing to boost retail performance


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## Overview

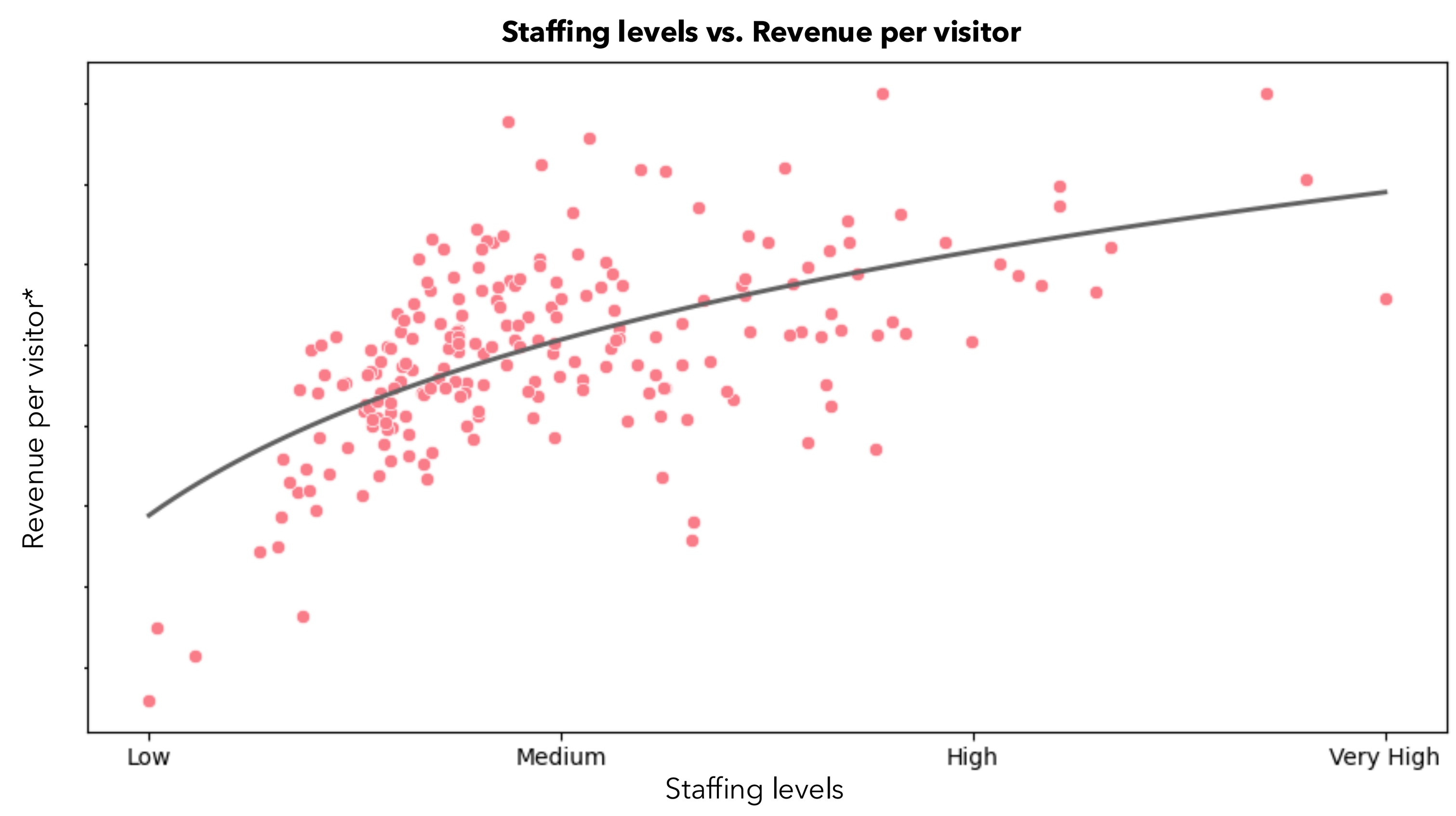
### Problem motivation

**Pandora is a global leader in affordable luxury jewellery.**
Sales patterns are highly seasonal, fluctuating by weekday & weekend and around key holidays, resulting in variable staffing needs

**Operating over 2500 stores globally, staffing is both one of the largest cost drivers & a key commercial lever.**

- **Cost risk:** Overstaffing during low-traffic periods inflates labor spend
- **Growth lever:** Understaffing during peak demand leaves revenue on the table

**There is a trade-off between revenue gains and labor costs.**
As staffing levels increase, revenue per visitor rises, but so does the cost to serve each customer. Finding the right balance is key to maximizing profit.




**How can we optimize staffing levels to maximize revenue without overspending on labor?**

## Approach – Pilot on UK stores

### Methodology

**To optimize staffing, we must first understand its impact on sales. We therefore follow a two-step approach:**

1. **Model** sales response function

   *Goal: Understand how staffing and traffic interact to drive sales*

2. **Determine** profit-maximizing staffing levels

   *Goal: Optimize the trade-off between labor cost and sales uplift*

### Data

**Transaction data**
Orders, sales revenue, basket value

**Labor hour data**
Past labor hours, wages, min. staffing

**Time metadata**
Promotions, day of week, cyclicity

**Store traffic data**
Daily visitor counts per store

**Store metadata**
Store size, design concept, location

### Step 1: Model

We formulate a typical Cobb-Douglas production function to model the dynamics of labour (L) and customer traffic (T) over retail sales, by store i & day t:

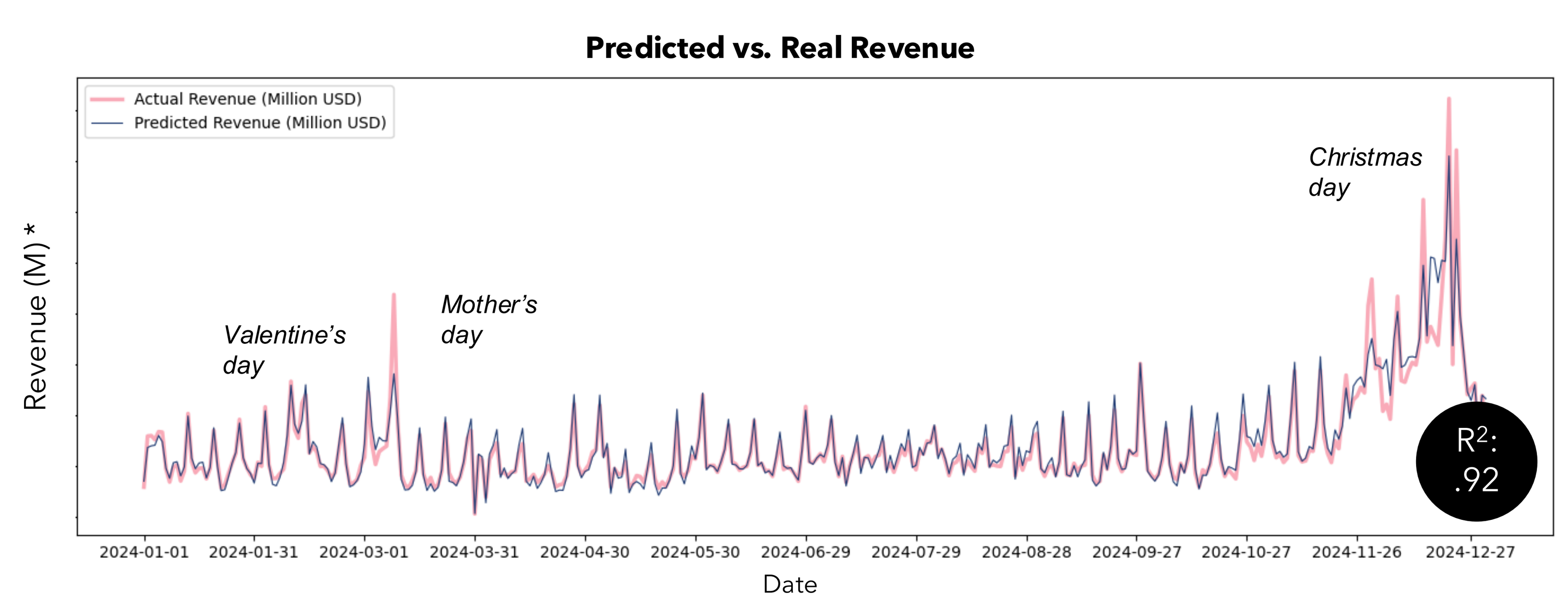
$$S_{it} = \alpha_i * T_{it}^{\beta_1} * \exp\left(\beta_2 \frac{T_{it}}{L_{it}}\right)$$

$\beta_1, \beta_2$: *Learned coefficients*

$S_{it}$: *Sales at store i per day t*; $\alpha_i$: *Store potential*; $T_{it}$: *Traffic contribution*; $\frac{T_{it}}{L_{it}}$: *Staffing level*

To run an OLS regression, we linearize by taking the logarithm and add controls:

$$\ln(S_{it}) = \beta_0 + \beta_1 \ln(T_{it}) + \beta_2 \frac{1}{T_{it}/L_{it}} + \text{Controls} + \epsilon_{it}$$



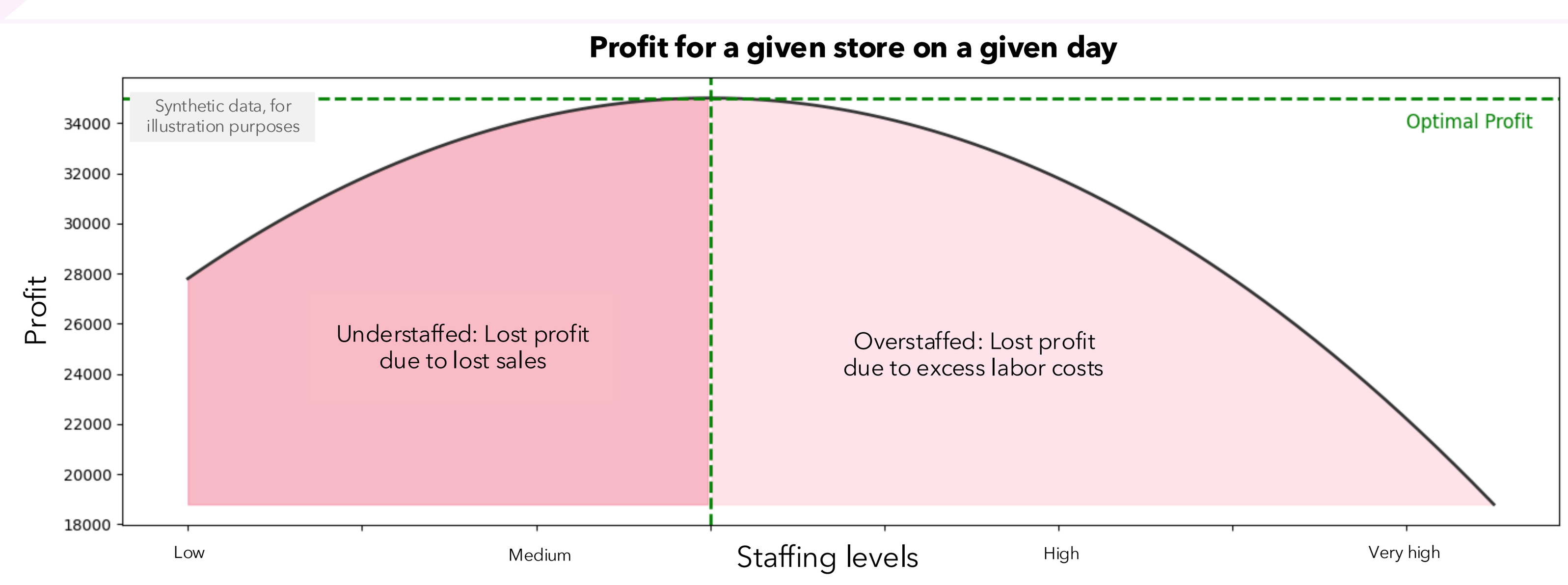

Our model works well as it captures seasonal trends, accounts for diminishing returns to staffing, and adjusts for store-specific potential.

### Step 2: Optimize

Now that we understand how staffing affects sales, we can find the level that maximizes profit. We define profit as:

$$Profit = Revenue * Margin - Labor\ Cost$$

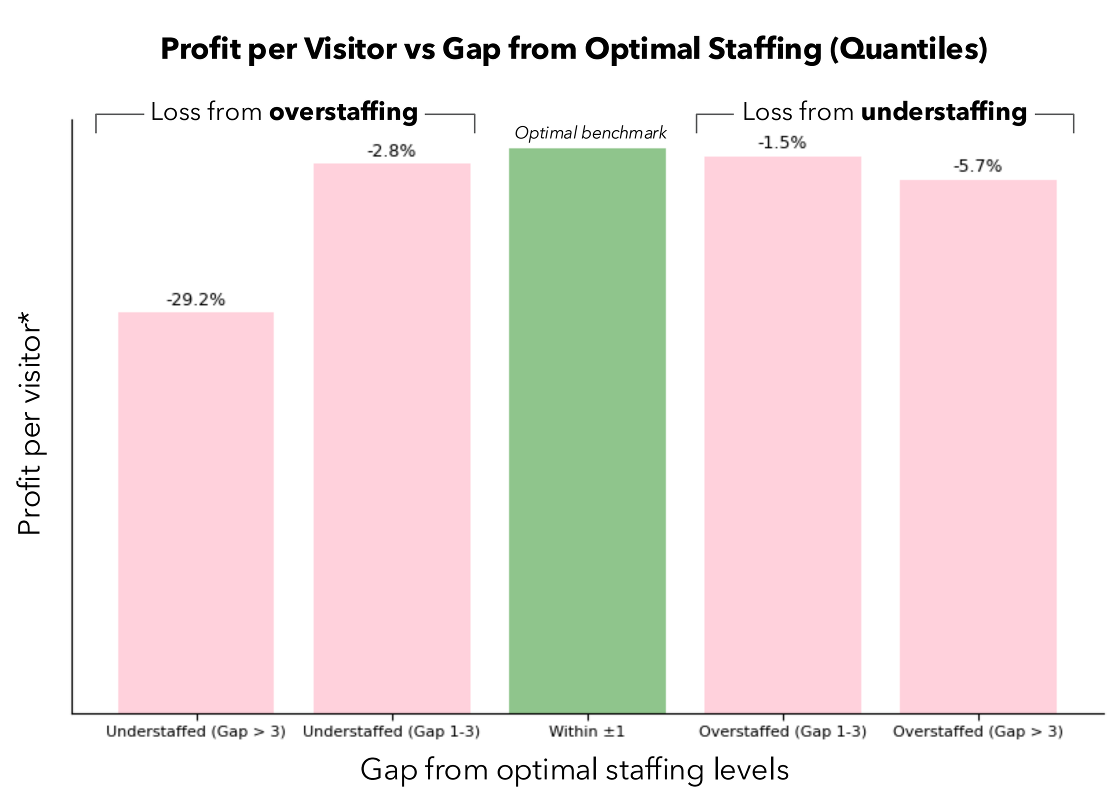
This allows us to hit the sweet spot where staffing drives the most value and avoid overstaffing that wastes budget.




## Results

### UK Pilot results

To validate our model, we compare historical profit per visitor between stores operating near their optimal staffing levels and those operating further away




**+2%** Profit gain through realistic short-term changes

### Business impact

**-7%** **Labor costs** by reducing overstaffing in low-traffic periods

**+3%** **Lost sales recovery** by addressing understaffing in peak demand

**$69M** **Annual profit potential** by scaling to other markets

* *Potential business impact and actual values have been simplified or anonymized for confidentiality. All figures reflect potential gains and depend on multiple factors, including successful implementation and stable operating conditions. This poster is intended to illustrate methodology; detailed analyses remain with Pandora*