2018
MIT SCM

The Power of Small Firms

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Introduction

99%

Small firms in LatAM

50 Million Nanostores

70%

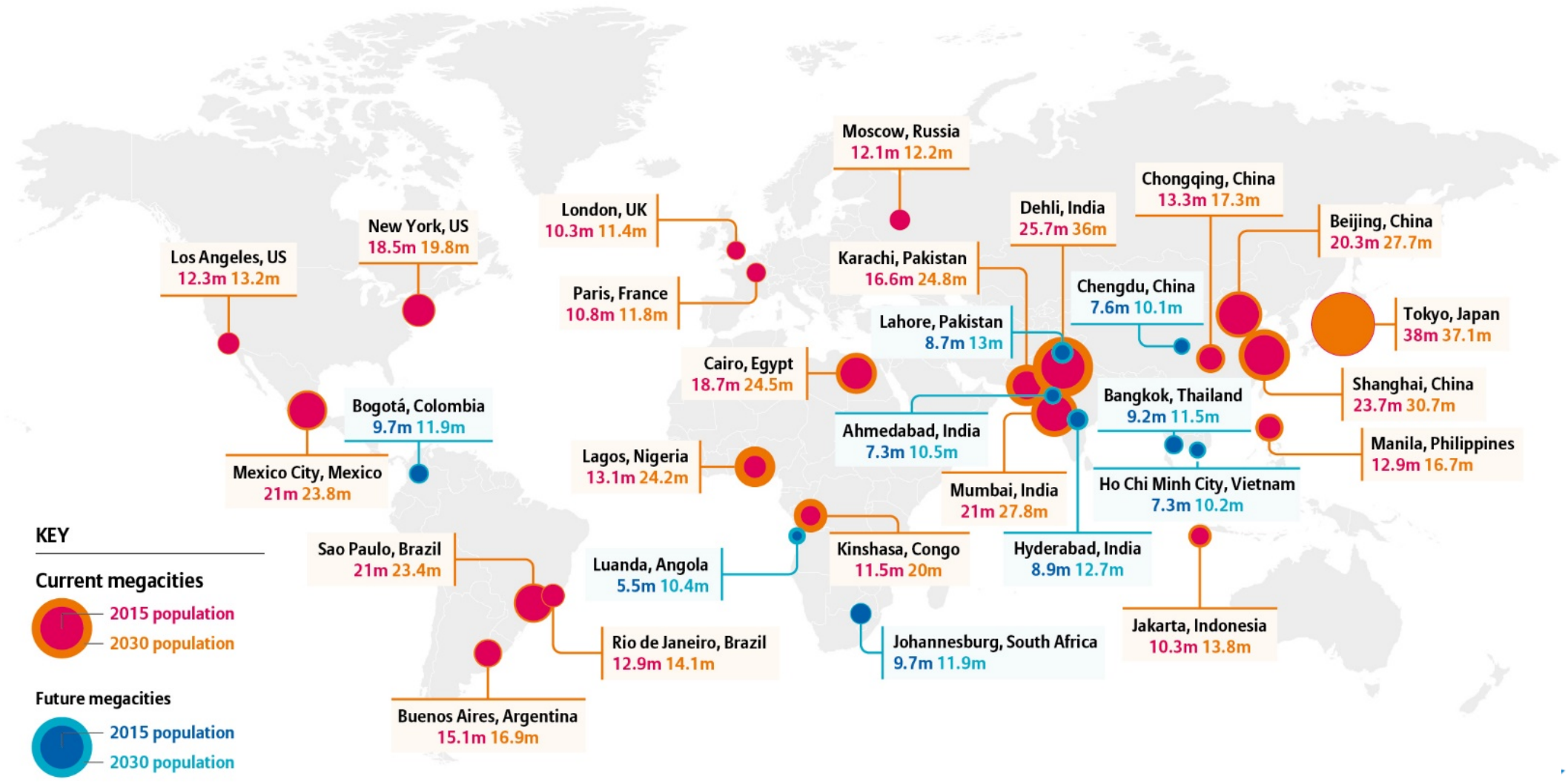
Market-Share of CPGs

Survival Rate

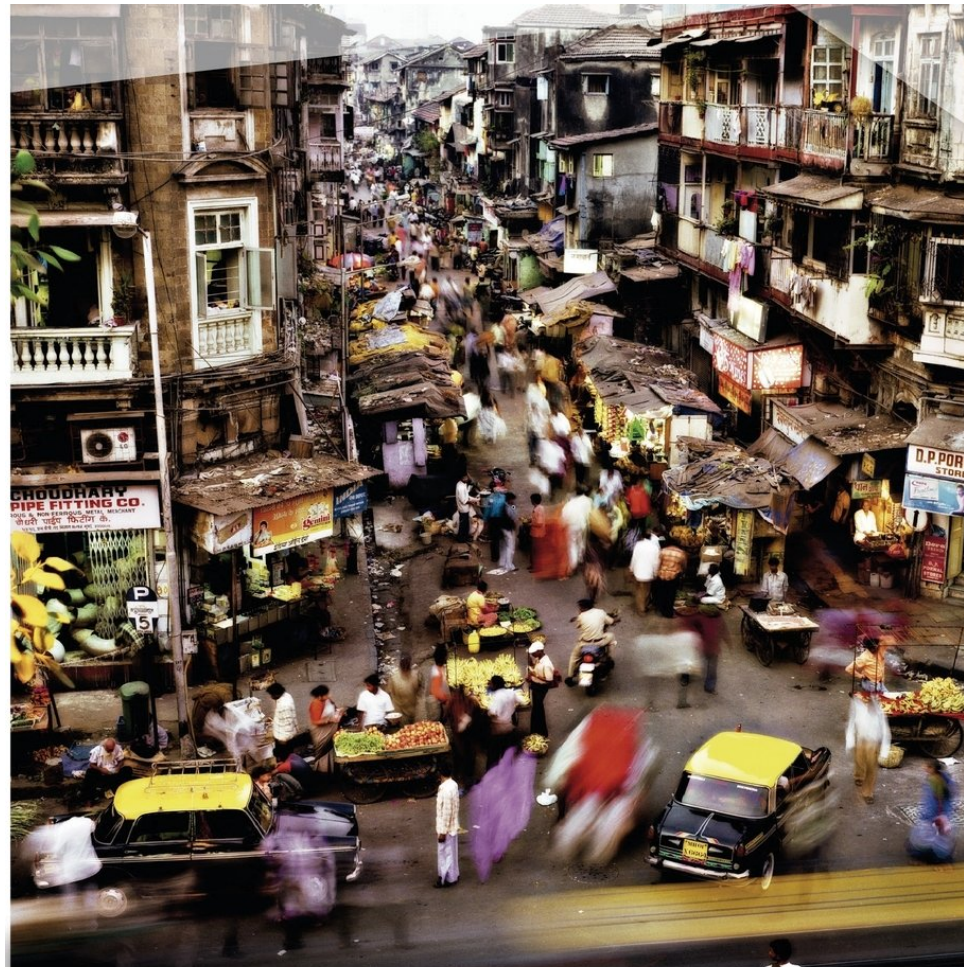
Easy to Enter

The logistics and channel strategies to reach them are "the next opportunity in global retailing." Blanco and Fransoo (2013, p. 2)

Figure 1 Selected current and future megacities 2015 to 2030



Source: World Urbanization Prospects: The 2014 Revision



Megacity: India

Traffic

Unknown addresses

Population density

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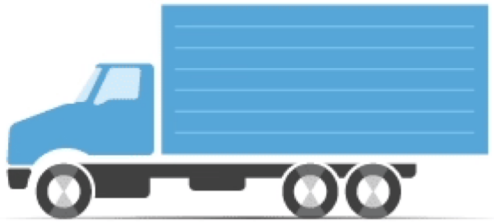
Research Question

What's the impact of the birth/death of nanostores in the logistics costs of a Consumer Packaged Goods company?



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Potential Variables that increase the logistics costs

Dynamic Routing

Fuel Consumption

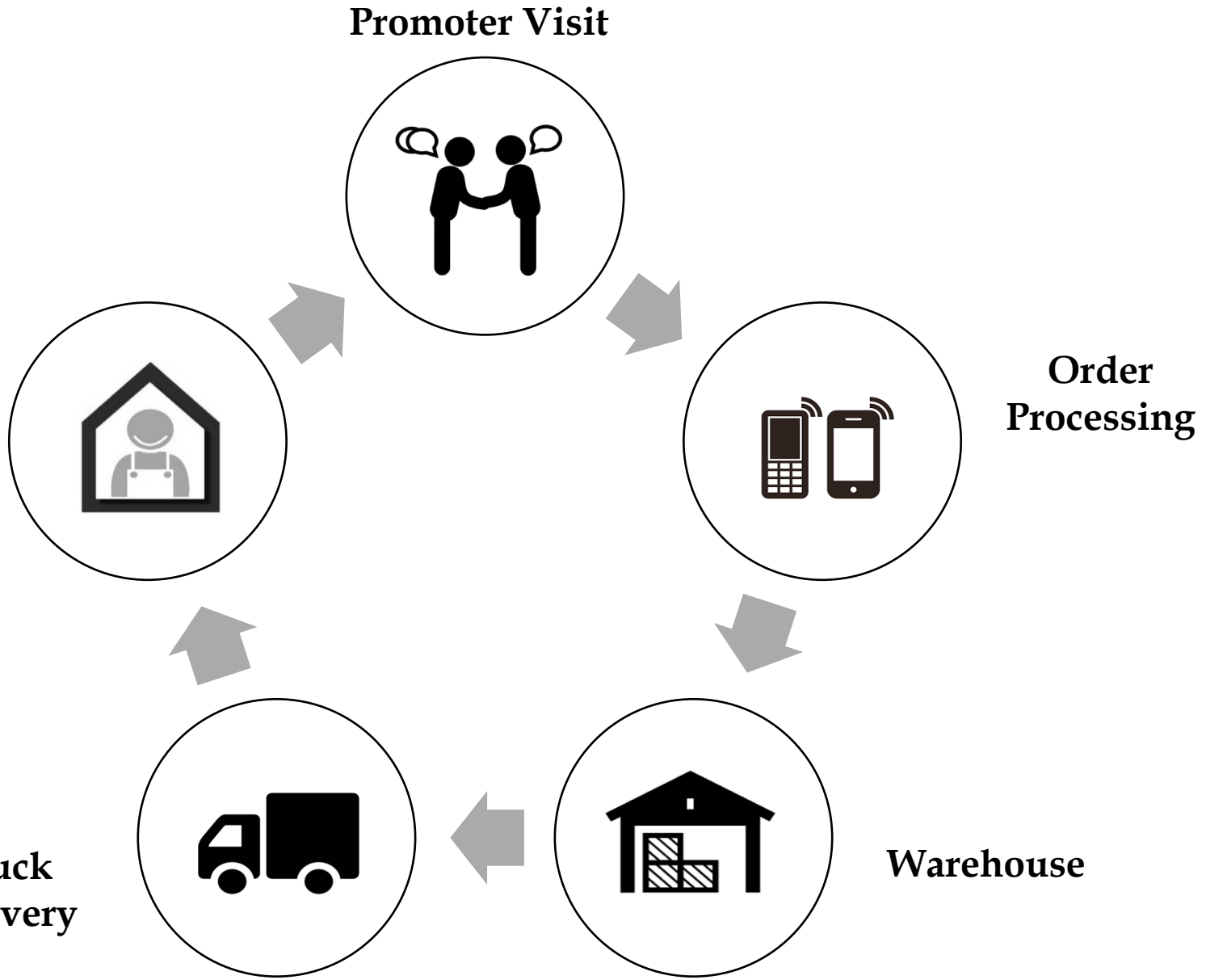
Time to unload-load

Number of stops

Lower drop-size

Time to deliver

TENOLI



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Experimental Setting

Tenoli's Operations

Tenoli's warehouse

Loading to the truck using the Bucket Brigade method

Tenoli's Operations

Unloading to deliver to the customer

Counting the products

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Tenoli's Operations

Charging in cash

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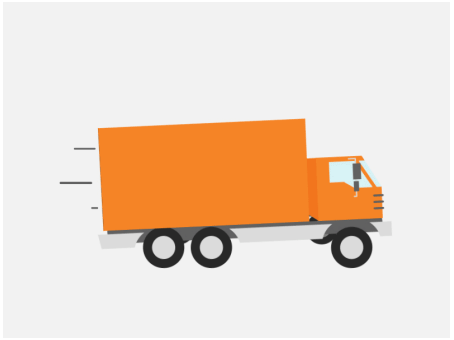
SALADITAS

Methodology

Cost-to-serve

Cost-to-serve every NANOSTORE

Commercial



Logistics

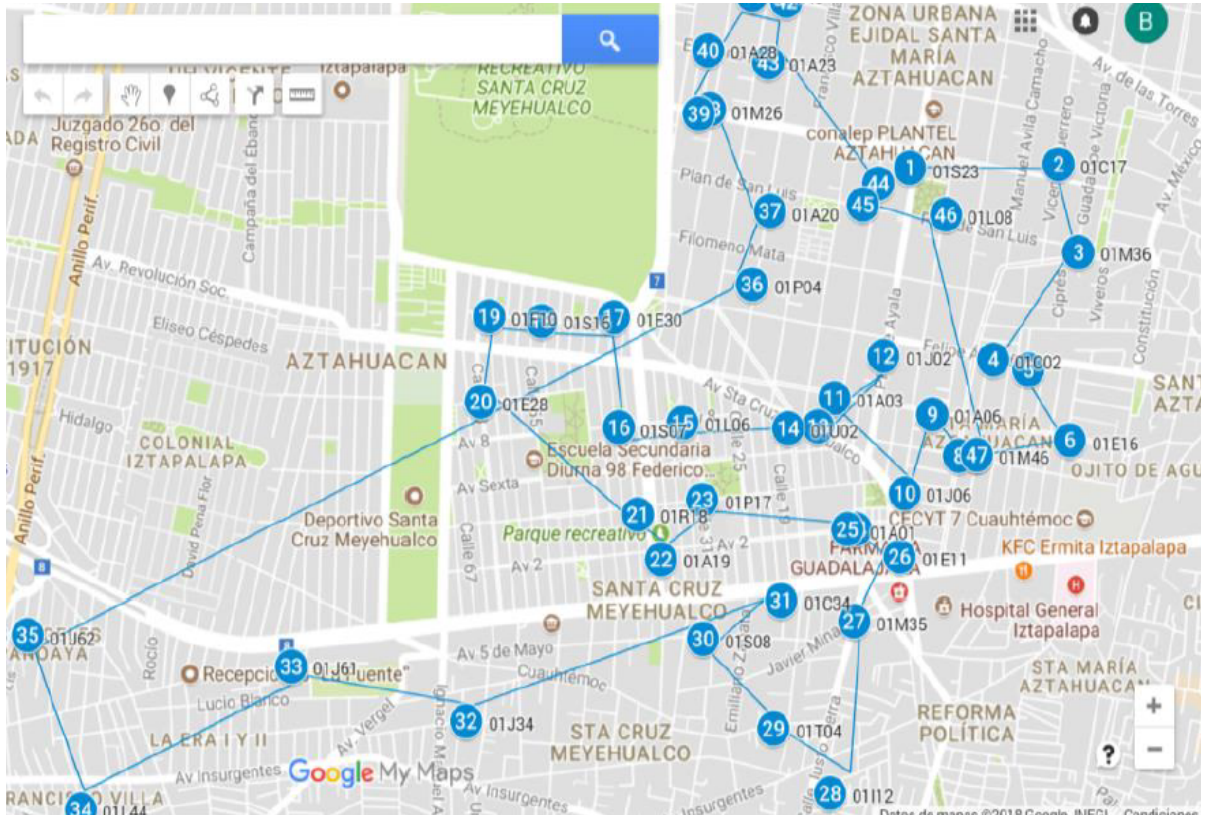
Identify the **COST-DRIVERS** for NEW & OLD customers

Methodology

Continuous Approximation

Estimate the expected tour distance d for a **near-optimal** tour to visit n customer locations spread over a service area A.

One-to-many system



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Distance estimation: One-to-many system

$$E[d_{TSP}] \approx k_{TSP}\sqrt{nA} = k_{TSP}\sqrt{n\left(\frac{n}{\delta}\right)} = \frac{k_{TSP}n}{\sqrt{\delta}}$$

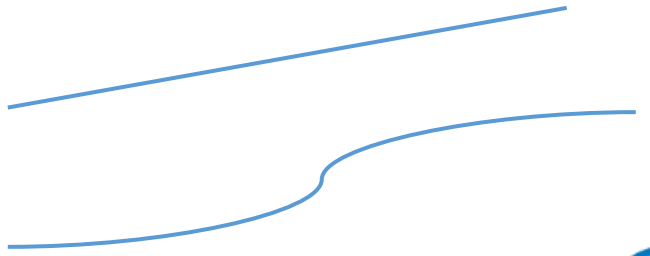
A = Area of district
N = number of stops in district}
δ = Density (# stops/area)
k = VRP network factor (unitless)
d_{TSP} = Traveling salesman distance
d_{STOP} = Average distance per stop

$$k_{TSP} = \begin{cases} 0.87 & Eucledian\ metric \\ 1.15 & Manhattan\ metric \end{cases}$$

Real distance: Point-to-point equation

$$D_{A-B} = k_{CF} * \sqrt{(x_A - x_B)^2 + (y_A - y_B)^2}$$

k_{CF} is a scalar multiplier that adapts district-level distance approximations to account for road network (Merchan, Winkenbach, & Sheffi, 2017).



Mathematical Modelling

Expected number of loads/unloads (customer + origin)

Expected number of linehaul moves or tours

Expected distance for the linehaul portion. How do I get this?

Expected local delivery distance regardless of number of tours

$$Transportation\ Cost = c_s\left[E[n] + \frac{E[D]}{Q_{max}} + \frac{1}{2}\right] + c_d\left(2\left[\frac{E[D]}{Q_{max}} + \frac{1}{2}\right] * d_{LineHaul} + \frac{E[n]k_{TSP}}{\sqrt{\delta}}\right) + c_{vs}E[D]$$

Cost per item per stop

E[n]=Expected number of stops in district
E[D]=Expected demand in district
Q_{MAX}=Capacity of each truck
c_s=Cost per stop ($/stop)
c_d=Cost per distance ($/mile)
c_{vs}=Cost per unit per stop ($/item-stop)

δ=Density (# stops/Area)
k_{TSP} =TSP network factor (unitless)
d_{TSP}=Traveling Salesman Distance
d_{stop}=Average distance per stop

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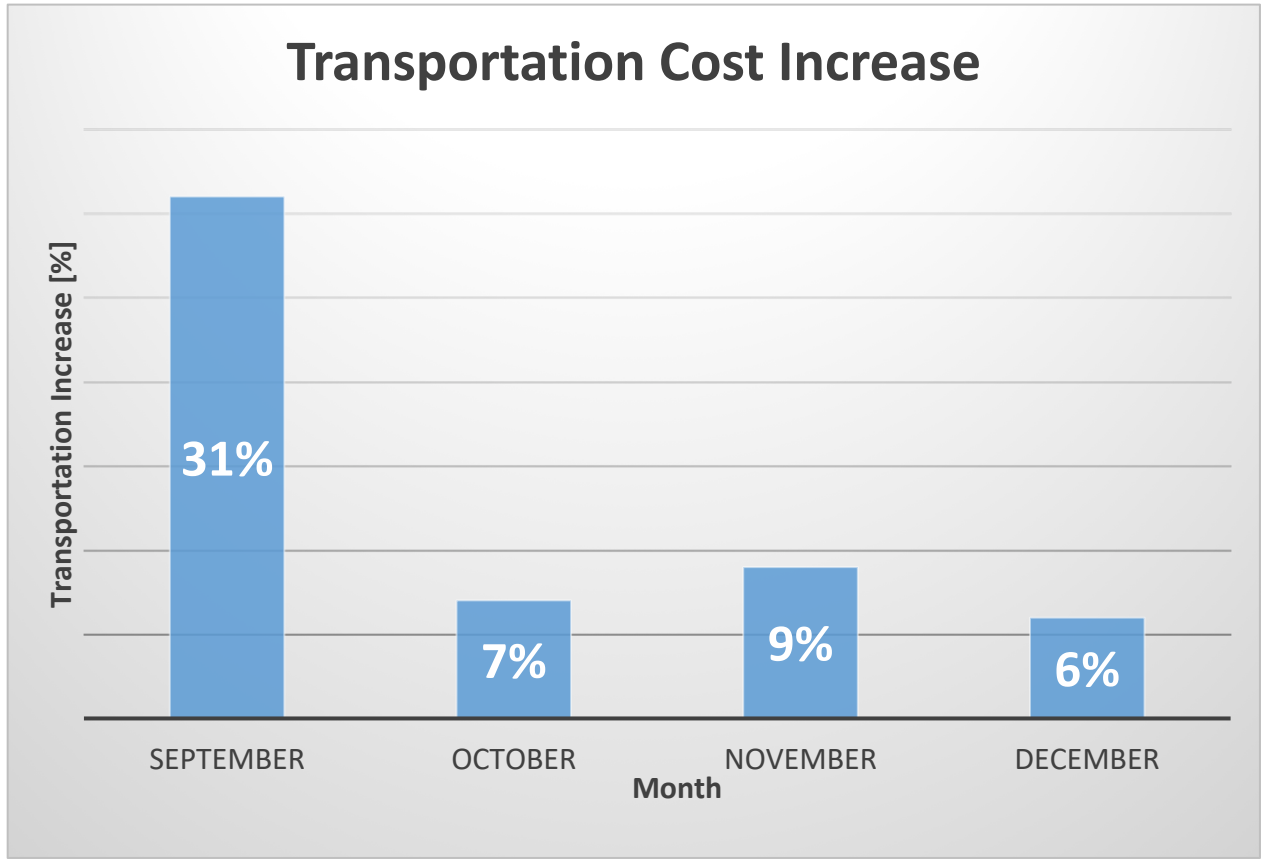

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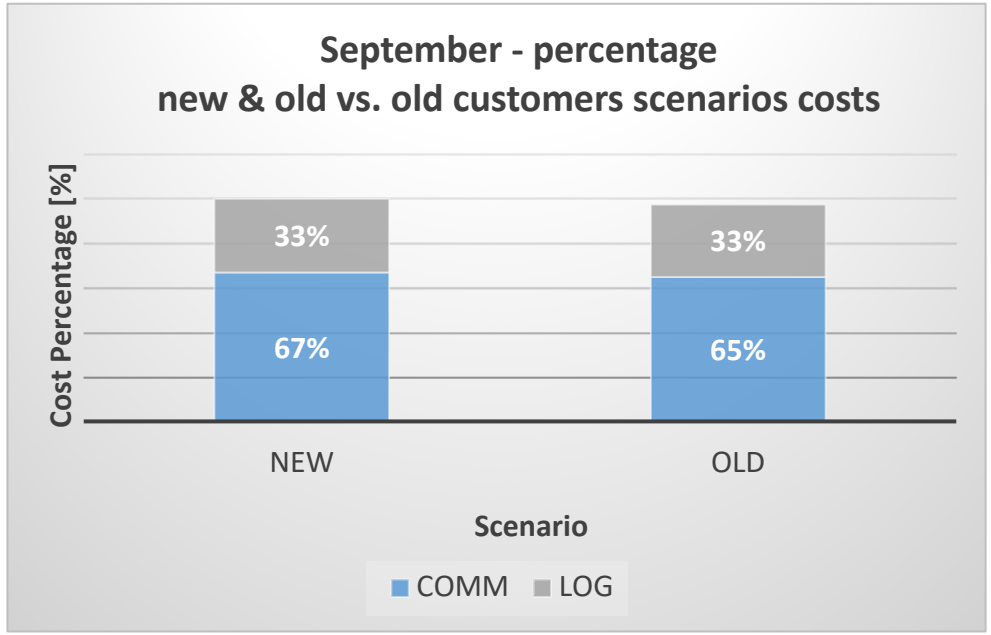
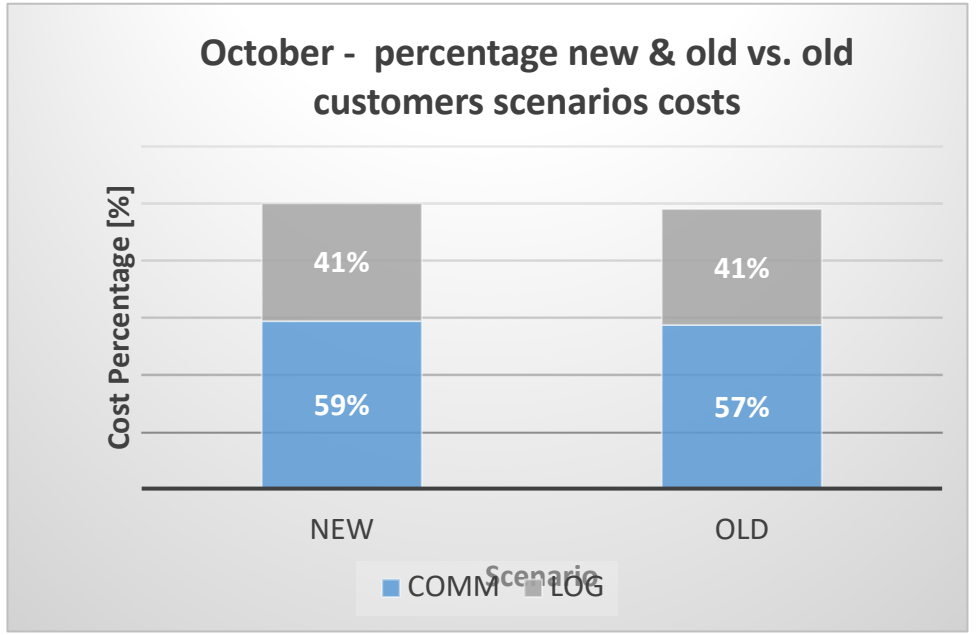
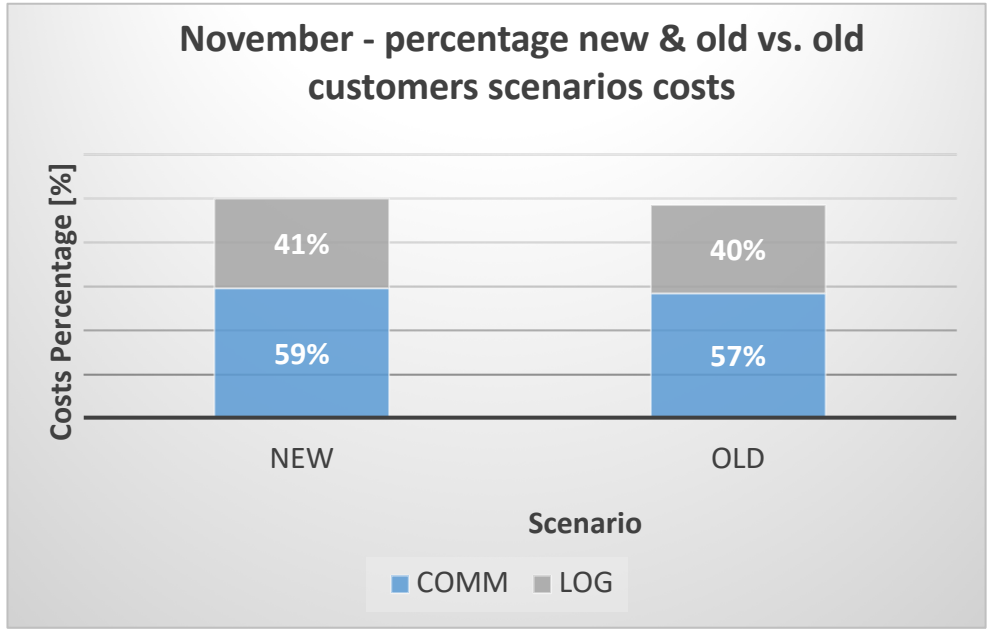
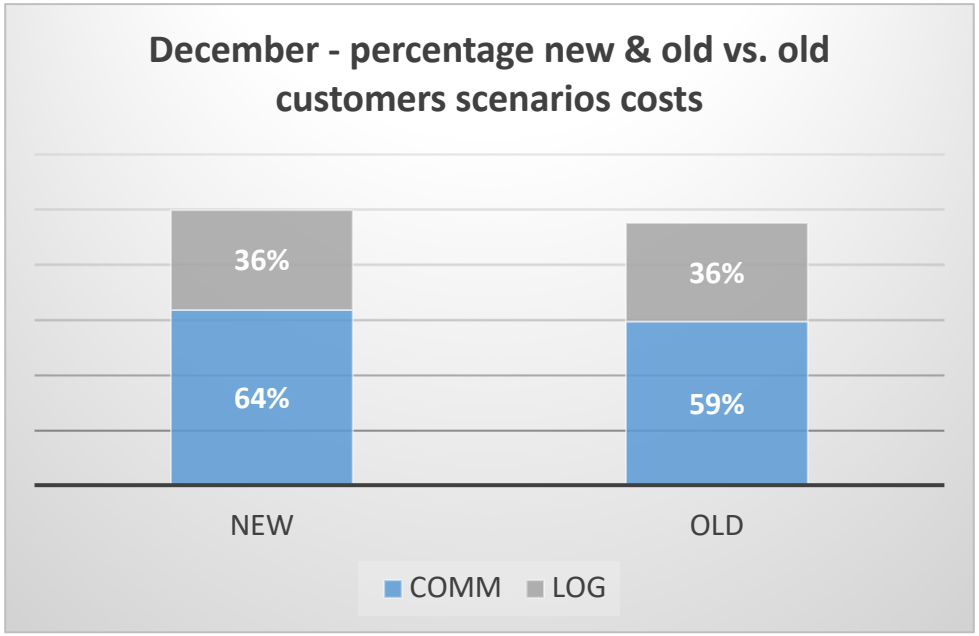
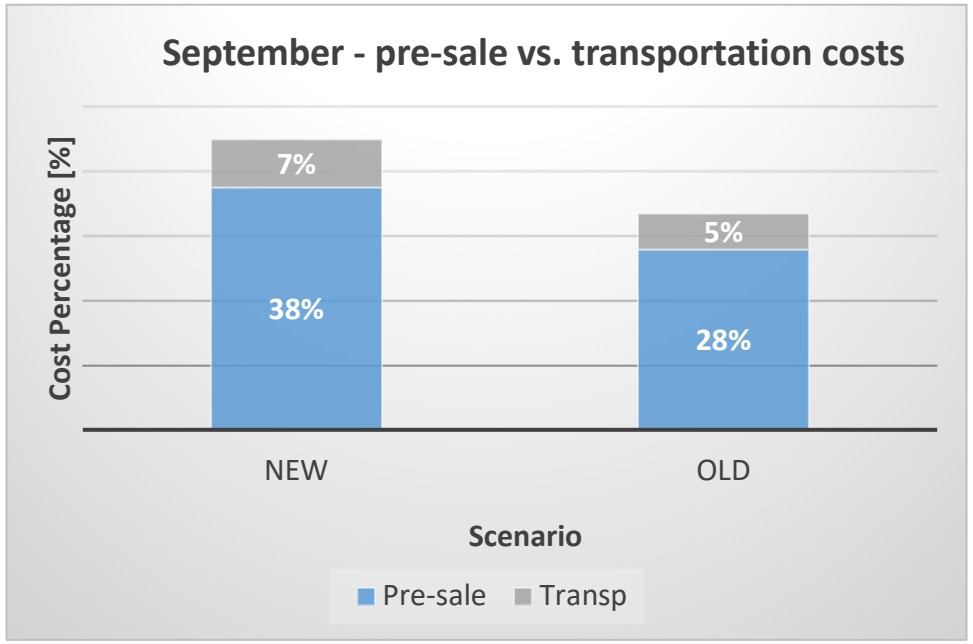
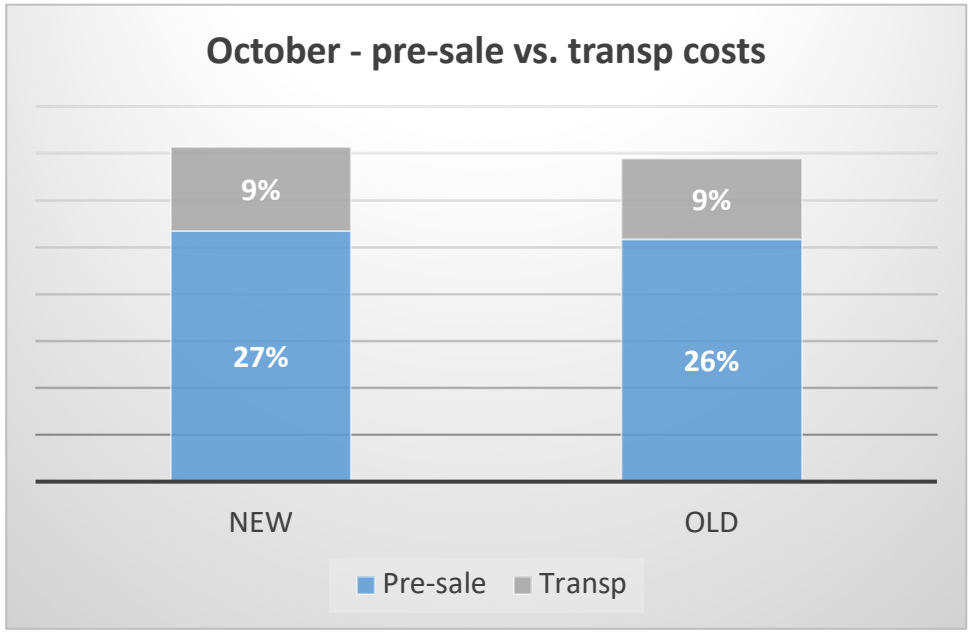

September - percentage
new & old vs. old customers scenarios costs
Cost Percentage [%]
33%
67%
33%
65%
NEW
OLD
Scenario
COMM
LOG

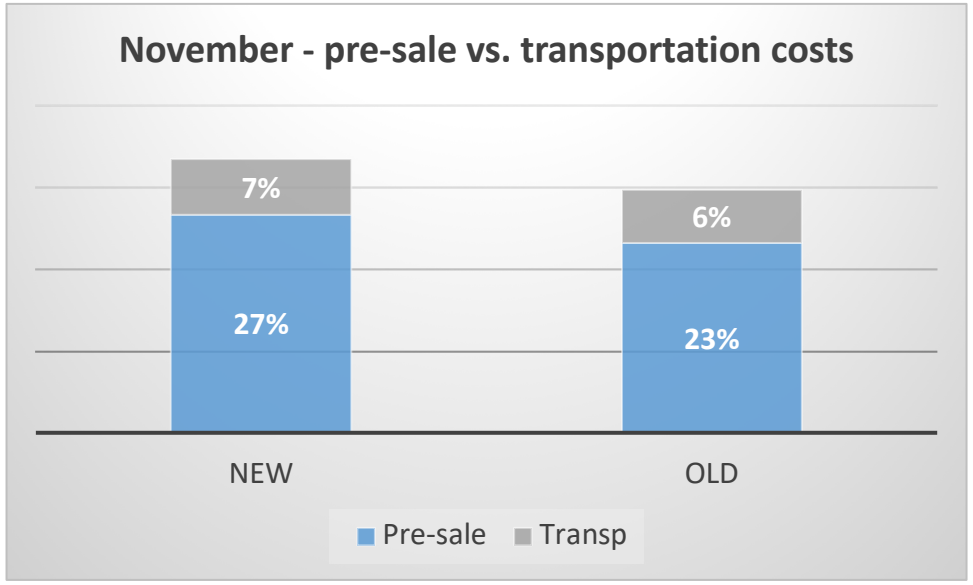

October - percentage new & old vs. old
customers scenarios costs
Cost Percentage [%]
41%
59%
41%
57%
NEW
OLD
Scenario
COMM
LOG

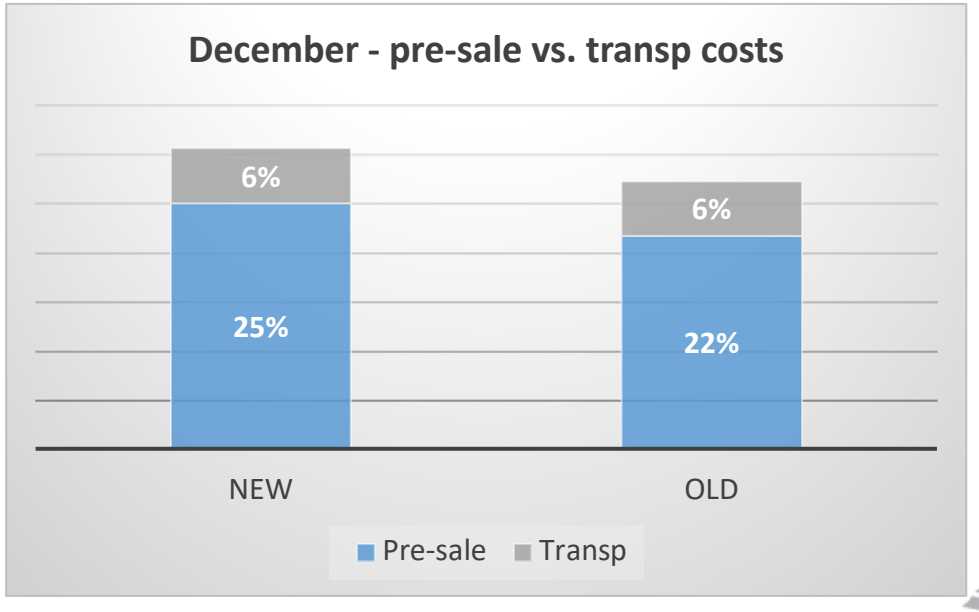

November - percentage new & old vs. old
customers scenarios costs
Costs Percentage [%]
41%
59%
40%
57%
NEW
OLD
Scenario
COMM
LOG


December - percentage new & old vs. old
customers scenarios costs
36%
64%
36%
59%
NEW
OLD
COMM
LOG


September - pre-sale vs. transportation costs
Cost Percentage [%]
7%
38%
5%
28%
NEW
OLD
Scenario
Pre-sale
Transp


October - pre-sale vs. transp costs
9%
27%
9%
26%
NEW
OLD
Pre-sale
Transp


November - pre-sale vs. transportation costs
7%
27%
6%
23%
NEW
OLD
Pre-sale
Transp


December - pre-sale vs. transp costs
6%
25%
6%
22%
NEW
OLD
Pre-sale
Transp

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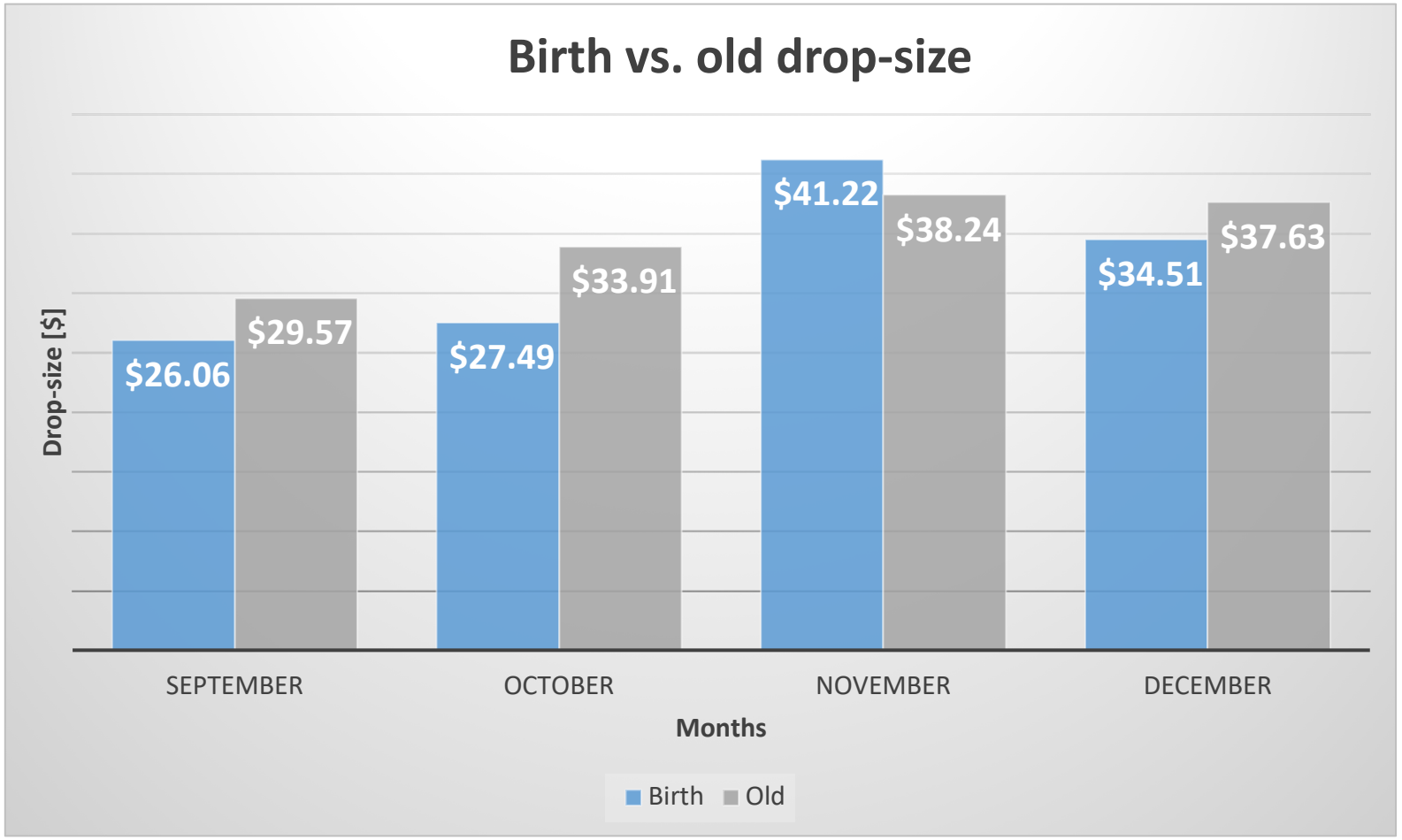

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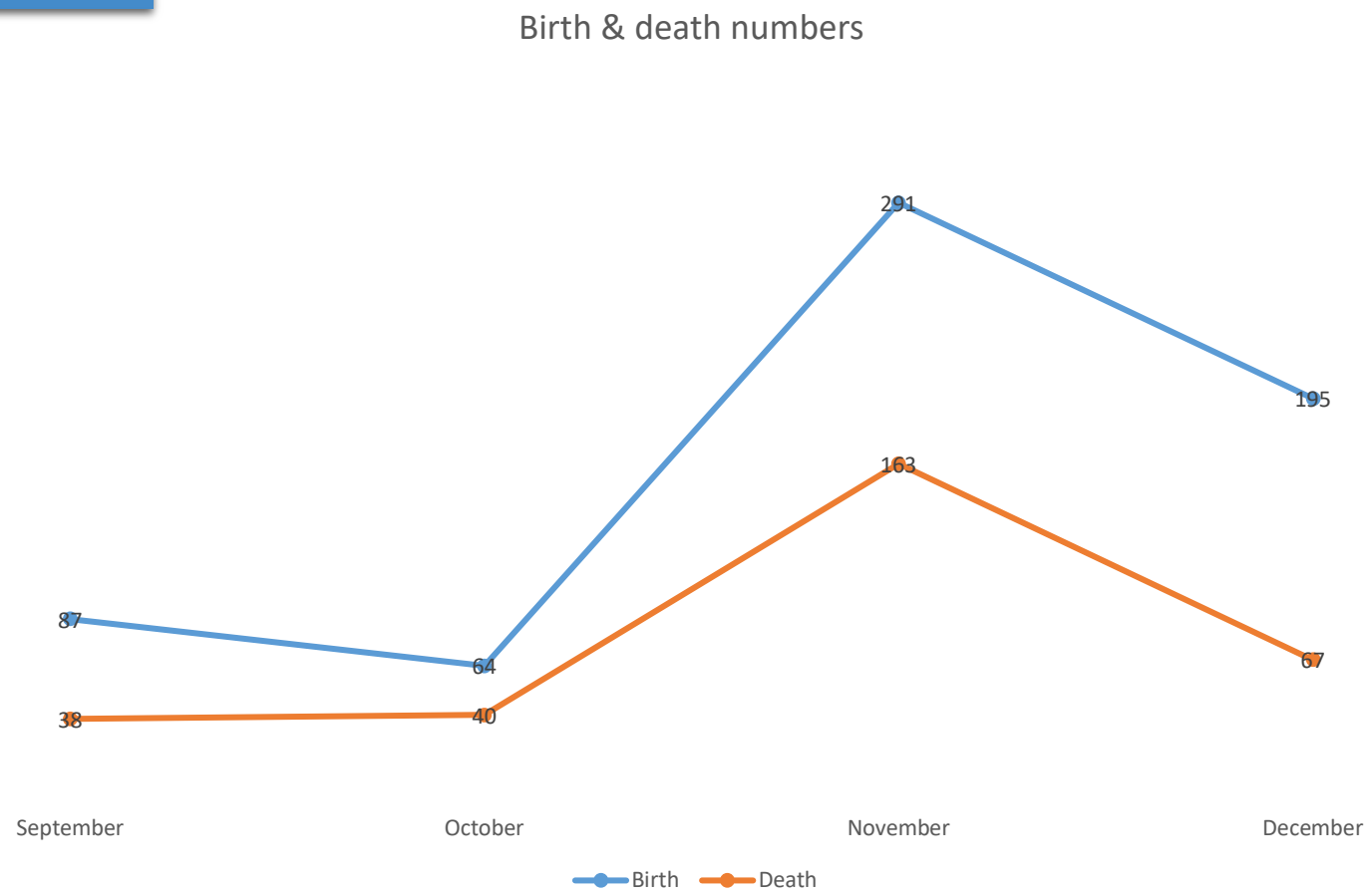

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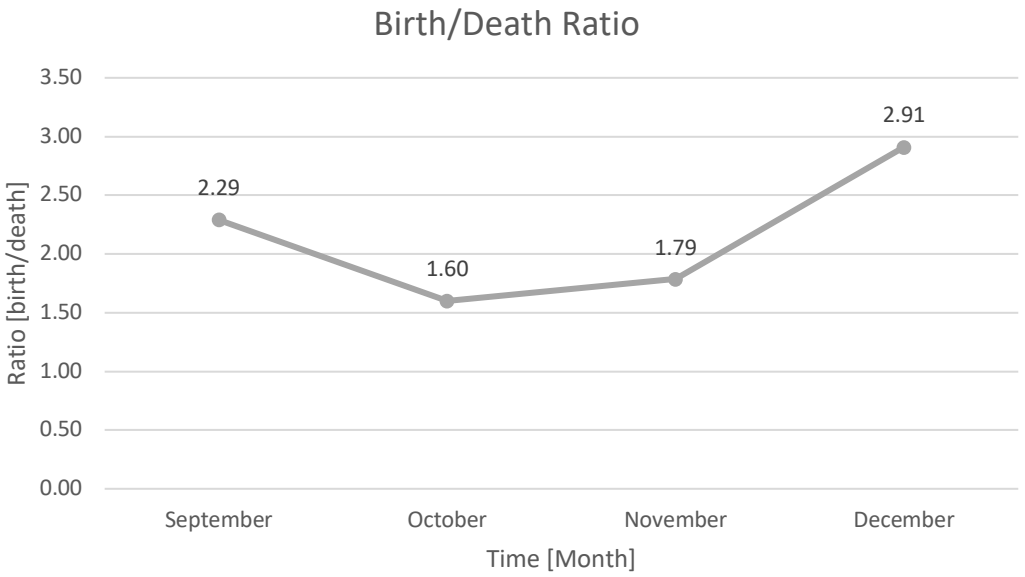

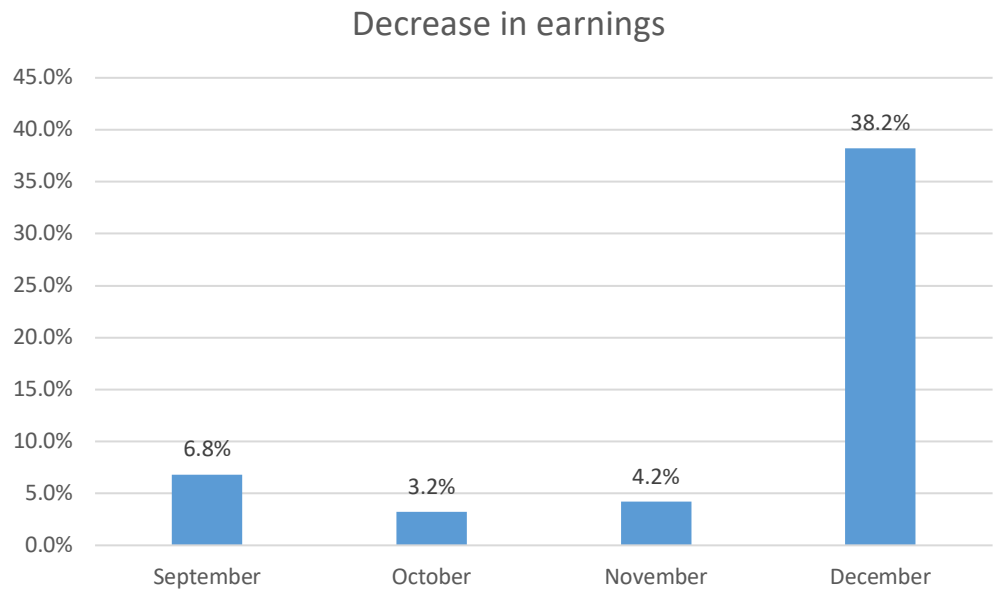

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Conclusions

- ✓ New customers increase the transportation cost up to 31% mainly due to the increase in the delivery time.
- ✓ New customers present a lower drop-size than old customers do because they do not have yet built loyalty with their supplier.
- ✓ The higher the birth/death ratio, the higher the cost because it is more expensive to serve new customers.

It’s better to deliver to a few nanostores with a high drop-size than to many with a low-dropsize.