



## **REDUCING SHIPMENT VARIABILITY THROUGH LEAN LEVELLING**

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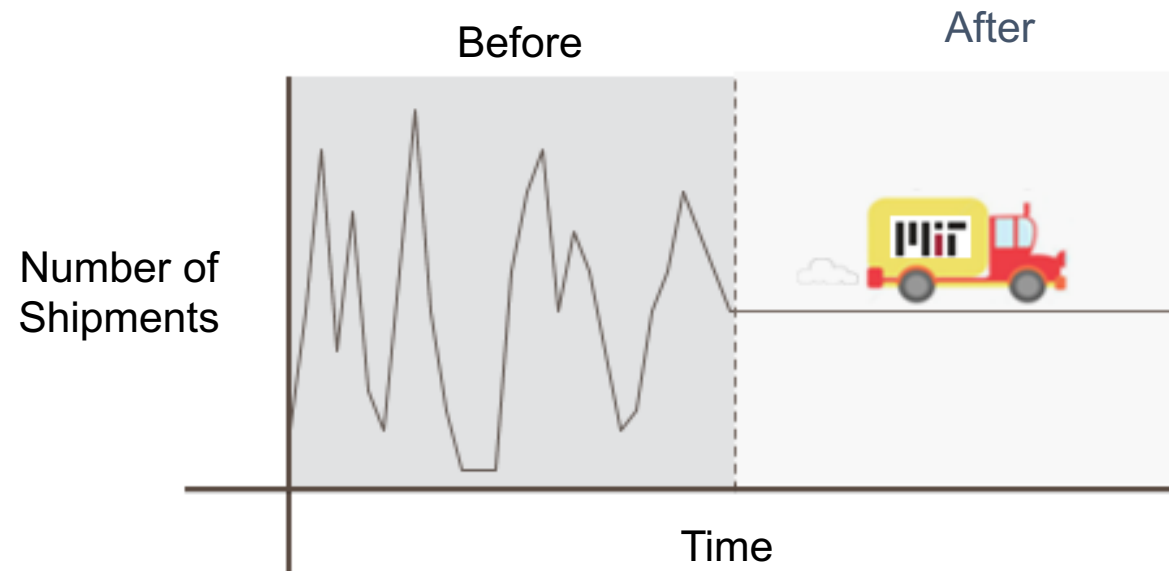
# AGENDA

1. Research Question and Context
2. Methodology
3. Results
  1. Variability
  2. Transportation Cost
  3. Service Level
  4. Inventory
4. Conclusion
5. Q&A

# 1. RESEARCH QUESTION

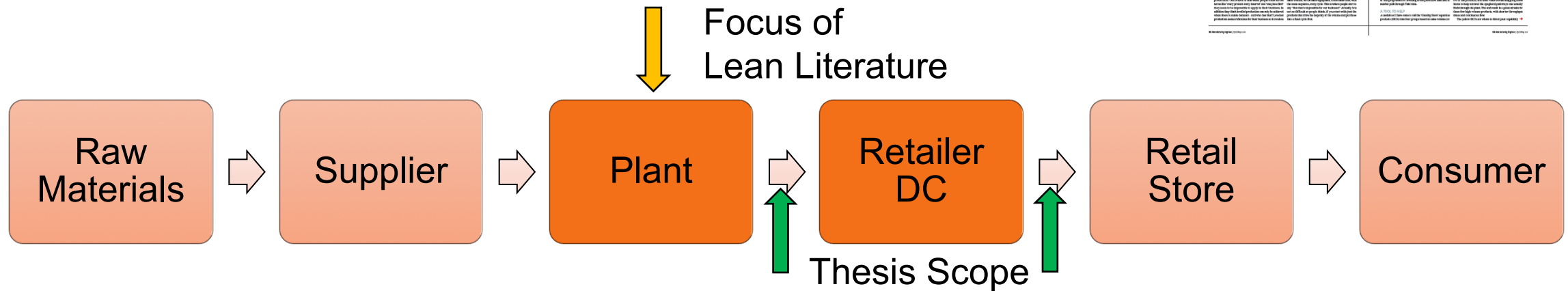
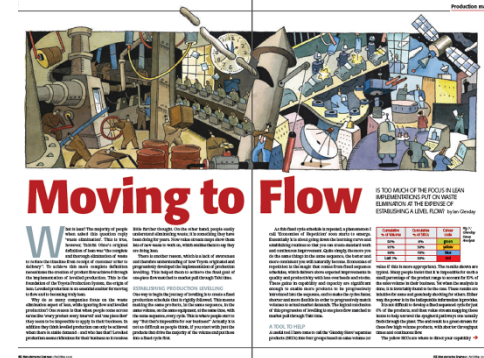
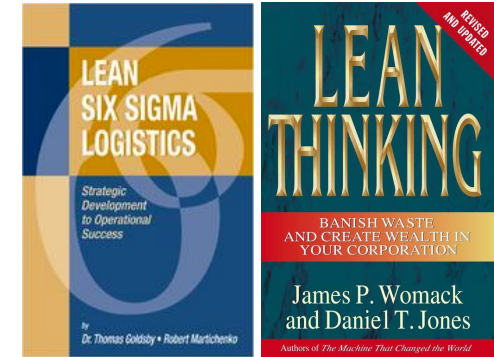
*Will a consistent, pre-determined customer shipment profile based on the Lean Levelling principle reduce variability and enable improvements in:*

- Transportation cost
- Inventory
- Service levels



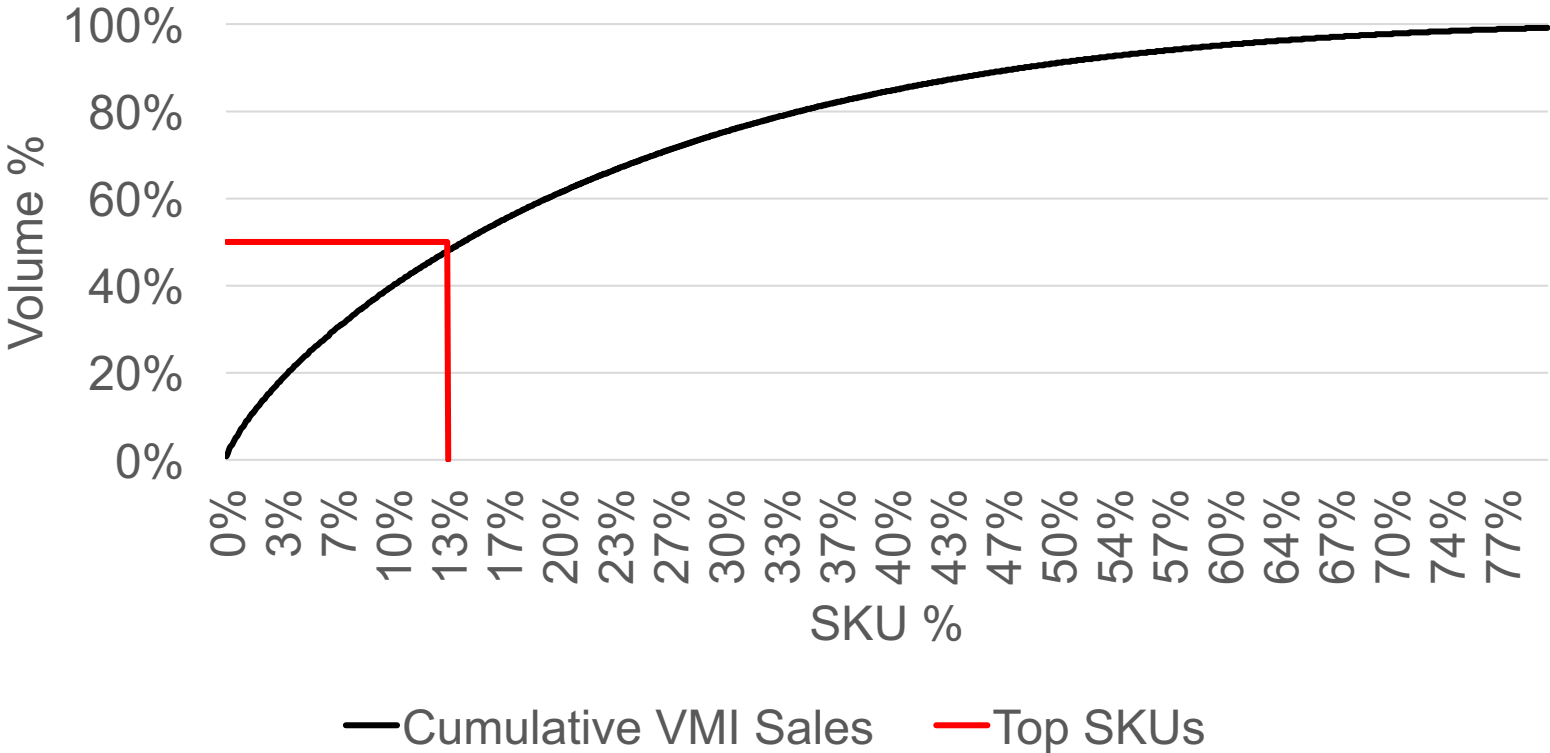
# 1. RESEARCH CONTEXT

- Consumer goods industry:
  - High shipment variability
  - Large number of SKUs
  - Frequent Promotions
- Scope: 1 VMI lane of a typical customer
- Lean Literature



# 2. METHODOLOGY / APPROACH

## 1. SKU Segmentation: By # of cases delivered Top 50% SKUs



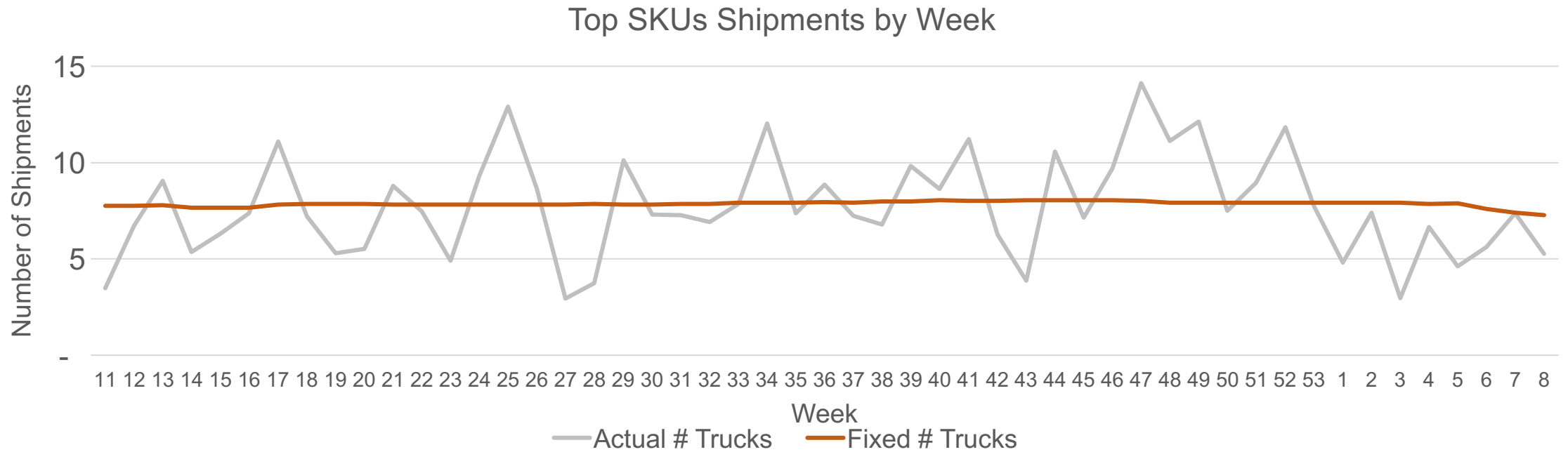
# 2. METHODOLOGY / APPROACH

## 2. Simulation

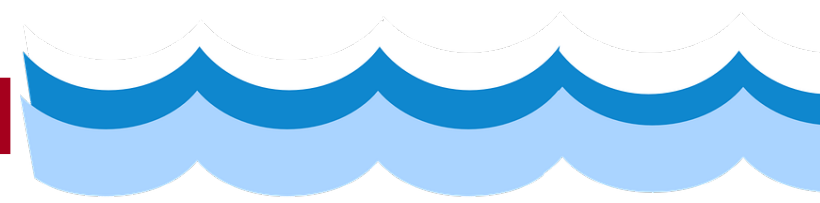
Various order policies based on fixed % of Top SKU demand

Fixed Trucks – Follow lean leveling principle

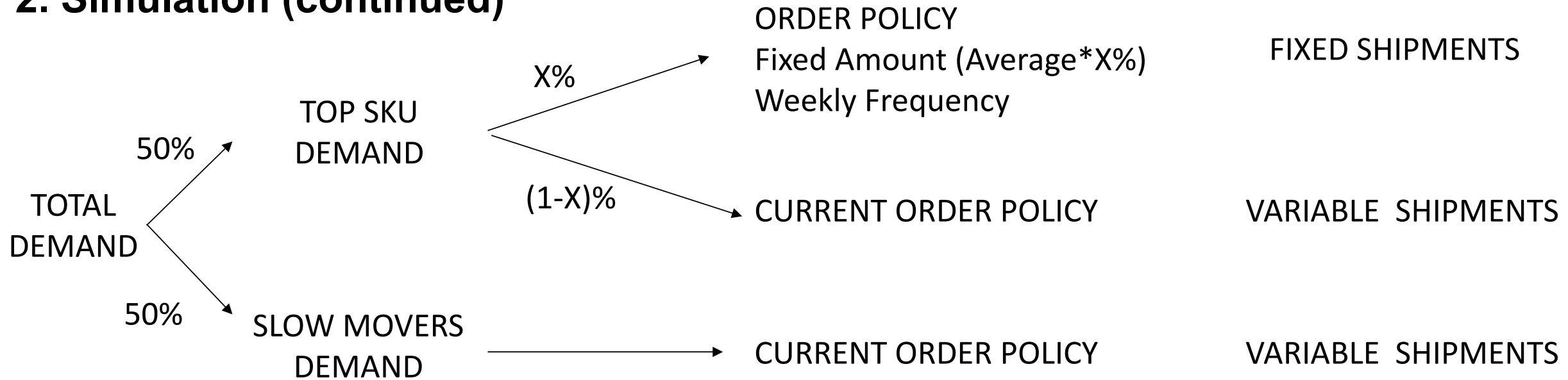
Variable Trucks – Follow the process logic of VMI system



# 2. METHODOLOGY / APPROACH



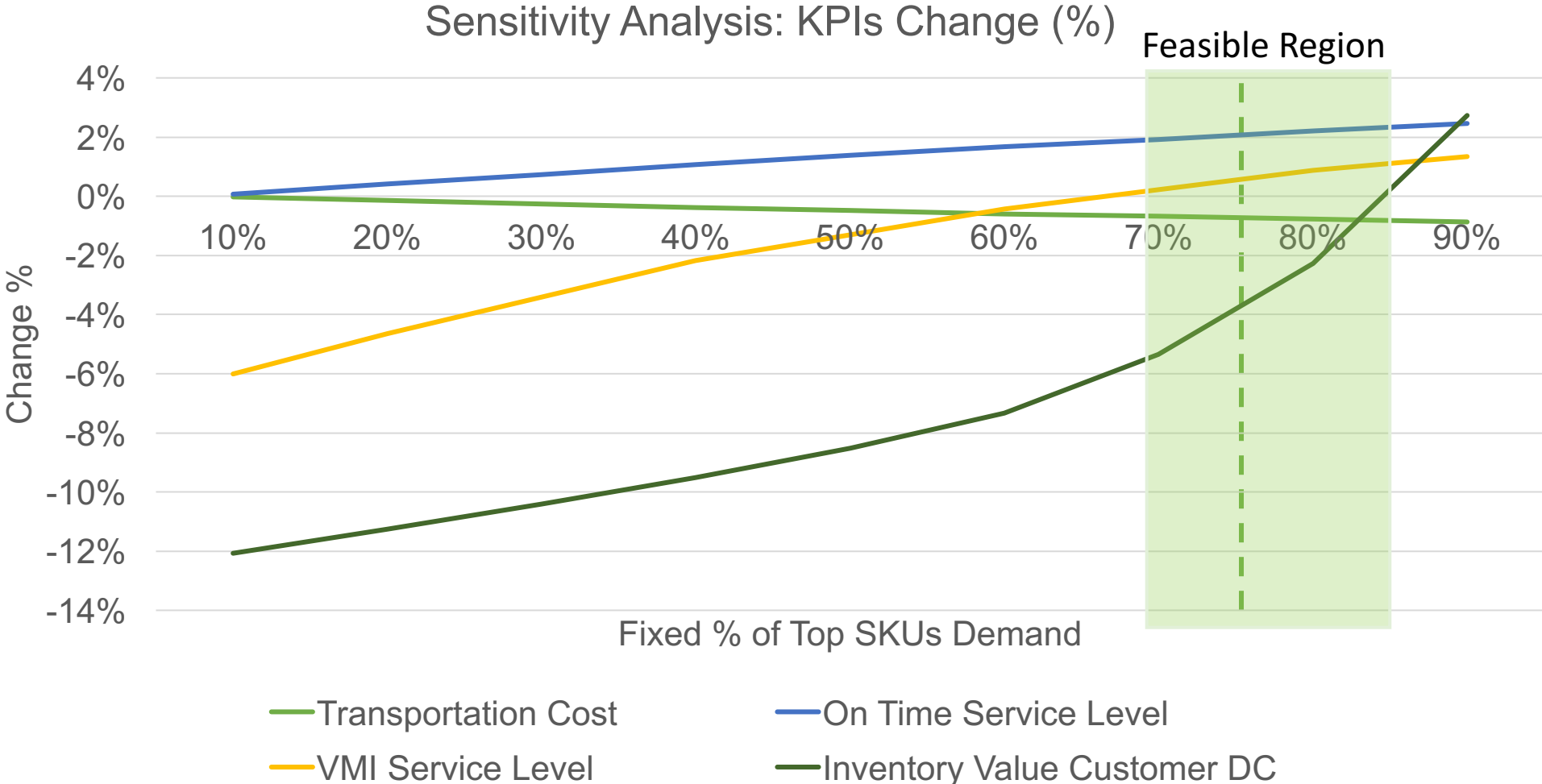
## 2. Simulation (continued)



## 3. Evaluation

Performance of different order policies vs actual (variability and 3 KPIs)

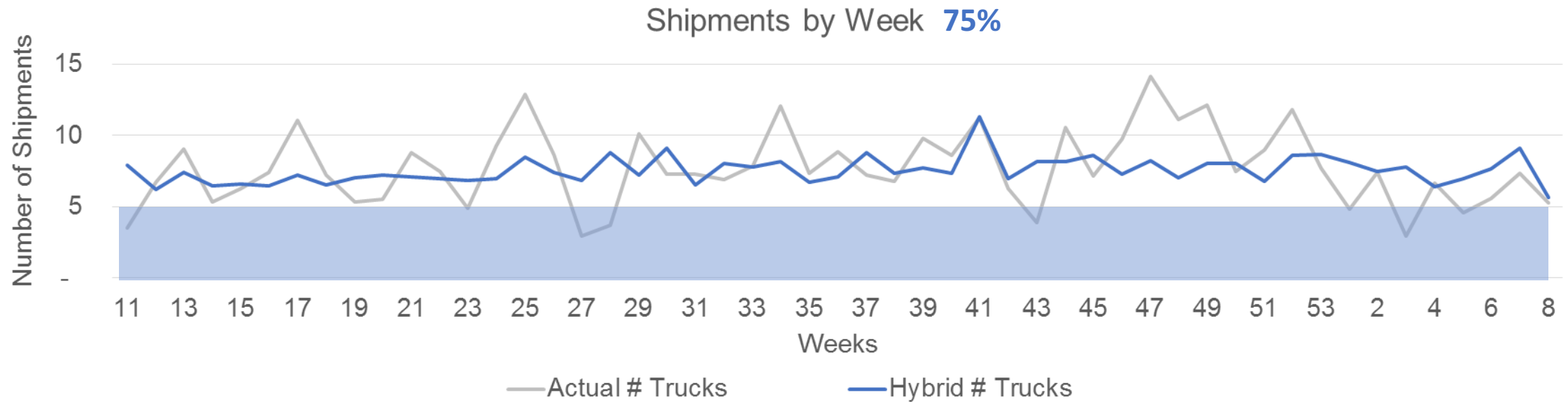
# 3. RESULTS





# 3.1 VARIABILITY

Top SKUs VARIABILITY (Fixed 75% of Top SKU Demand):



## DYNAMICS:

↑ % Fixed Shipments = ↓ Variability

## IMPROVEMENT (Fixed 75% Top SKU Demand):

Coefficient of variation: 31% → 16%

**50% Reduction**

# 3.2 TRANSPORTATION COST



## MAIN ASSUMPTION:

Contracted rate < Spot Market rate

Probability of spot market delivery is reduced by the same % of fixed shipments

## DYNAMICS

↑ % Fixed Shipments = ↑ Number of contracted shipments  
↓ Number of spot market deliveries

CONTRACTED TRANSPORTATION

VS.



= ↓ Average price per load

## POTENTIAL SAVINGS (Fixed 75% of Top SKU Demand):

Annual savings of 1% of total transportation costs

➤ Potential savings in contracted rates resulting from improved planning capabilities

# 3.3 SERVICE LEVEL: ON-TIME



## MAIN ASSUMPTION:

Fixed Shipments are more likely to arrive on-time

Improved Planning  
Economies of repetition

Probability on- time: Variable Shipments: 94% (current performance)

Fixed Shipments: 98% (root cause analysis)

## DYNAMICS:

↑ % Fixed Shipments = ↑ On-time Service Level

## RESULTING SERVICE LEVEL (Fixed 75% of Top SKU Demand):

96% (vs 94% actual)

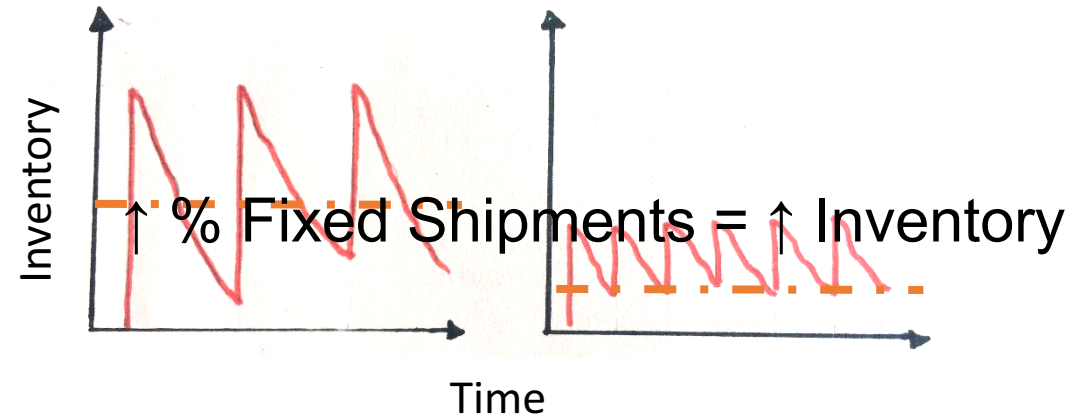
# 3.4 INVENTORY

## Customer DC

### **DYNAMICS:**

↑ Shipment Frequency = ↓ Inventory

VS.



### **POTENTIAL SAVINGS (Fixed 75% of Top SKU Demand):**

10% (\$940K) Inventory value reduction with the optimal policy

- Potential for additional inventory savings for sponsor company due to reduction in Top SKU's volatility

# 4. CONCLUSION

- Lean leveling reduces shipment variability
- Finding the right ratio of fixed vs variable shipments is crucial
- Evaluation criteria should be balanced to benefit both buyer and seller

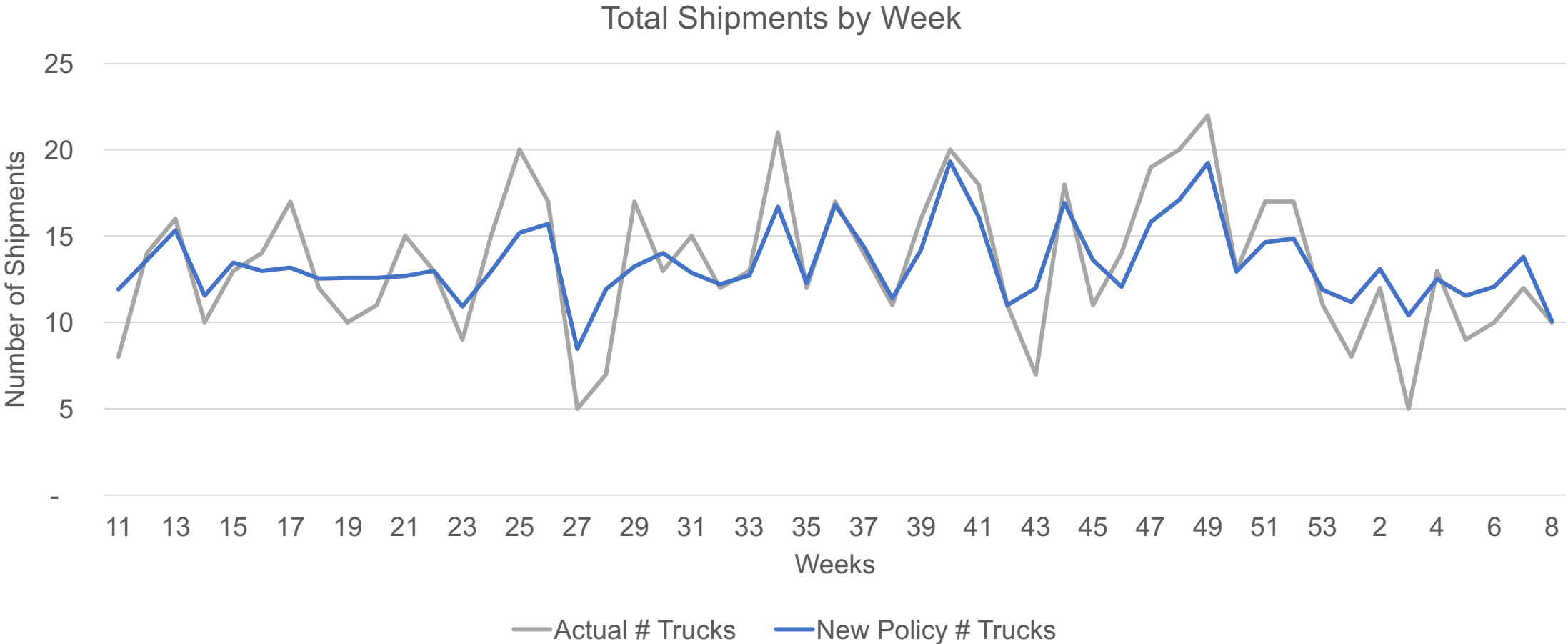
Optimal solution	75% fixed Top SKU shipments
Transportation Cost	1% Reduction - \$6,500 per year
Inventory Customer DC	10% Reduction - \$940 K
Service Level	2% Improvement - 96%

- Potential additional savings: freight rate and sponsor company inventory

# Q&A

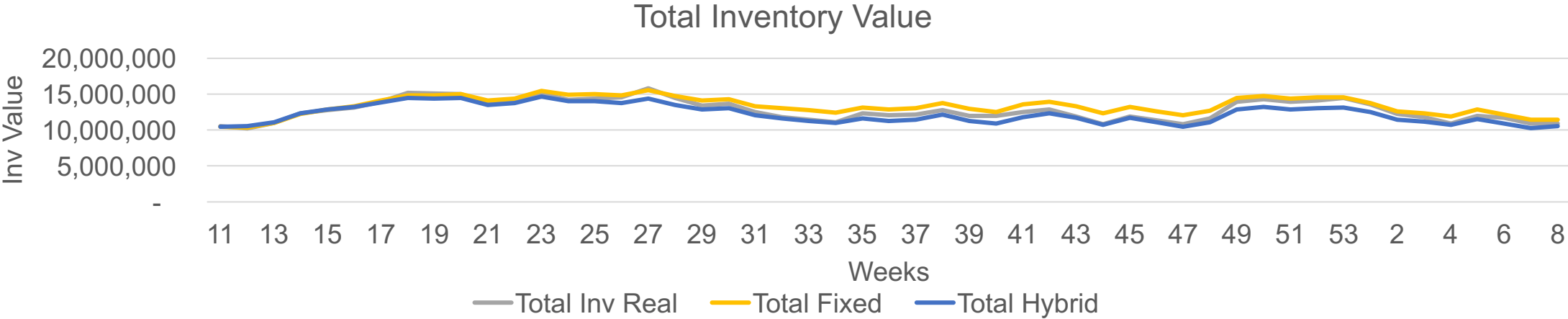
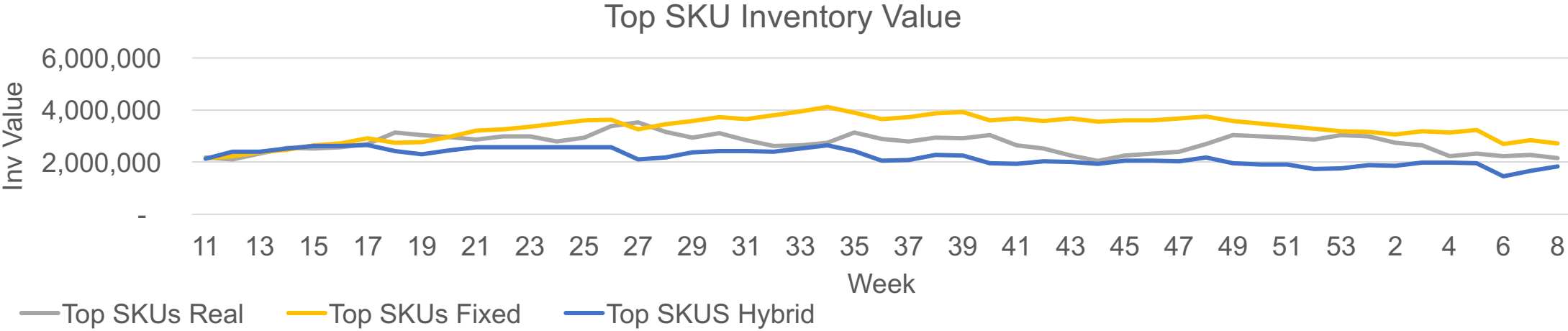
# APPENDIX

# Variability Total Shipments





# Inventory Levels



# Scenario Evaluation

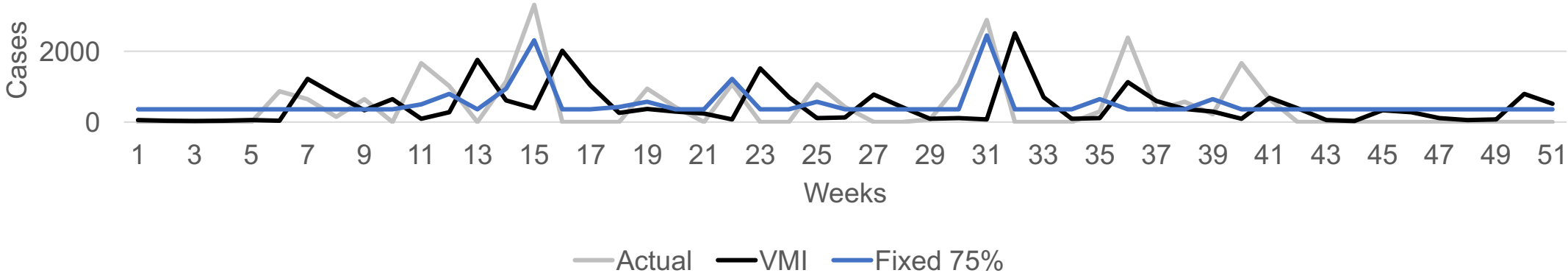
KPI	Actual Shipments	Fixed 100% Average	Hybrid 75% Average	Fixed Model Vs Actual	Hybrid Model Vs Actual	Fixed vs Hybrid
<b>Number of Shipments</b>						
Shipments/Year	684	702	684	18	-	18
Percentage of fixed shipments/Year	0%	57%	43%	57%	43%	14%
<b>COV of weekly shipments</b>	<b>31%</b>	<b>15%</b>	<b>16%</b>	<b>-15%</b>	<b>-14%</b>	<b>-1%</b>
<b>Transportation Costs</b>						
Total Transportation Cost/Year	896,216	910,841	889,676	\$ 14,625	\$ (6,541)	\$ 21,165
<b>Average Transportation Cost/Ship</b>	<b>1,310</b>	<b>1,297</b>	<b>1,301</b>	<b>\$ (12.8)</b>	<b>\$ (9.6)</b>	<b>\$ (3.2)</b>
<b>Service Level</b>						
<b>On-Time Service Level</b>	<b>93.9%</b>	<b>96.5%</b>	<b>95.9%</b>	<b>2.6%</b>	<b>1.9%</b>	<b>0.6%</b>
<b>VMI Service Level</b>	<b>98.1%</b>	<b>98.6%</b>	<b>98.5%</b>	<b>0.6%</b>	<b>0.5%</b>	<b>0.1%</b>
<b>Inventory at Customer DC</b>						
<b>Average (cases/week)</b>	<b>202,619</b>	<b>207,428</b>	<b>179,281</b>	<b>4,809</b>	<b>(23,338)</b>	<b>28,147</b>
COV of inventory level (cases)	12%	8%	9%	-3%	-3%	0%
Total Number of Top SKU cases deliv	1,433,457	1,534,358	1,372,753	100,901	(60,704)	161,605
Min (USD/week)	10,237,380	10,347,589	10,276,272	\$ 110,209	\$ 38,892	\$ 71,317
<b>Average (USD/week)</b>	<b>12,782,906</b>	<b>13,367,597</b>	<b>12,259,533</b>	<b>\$ 584,691</b>	<b>\$ (523,373)</b>	<b>\$ 1,108,064</b>
Max (USD/week)	15,829,899	15,569,052	14,669,825	\$ (260,847)	\$ (1,160,074)	\$ 899,226

# Sensitivity Analysis

% Fixed Average:	Sensitivity Analysis New Order Policy									
	10%	20%	30%	40%	50%	60%	70%	80%	90%	75%
<b>Shipments</b>										
Percentage of fixed shipments /Year	1.4%	8.7%	15.3%	22.3%	28.7%	34.8%	39.9%	45.6%	51.0%	42.8%
COV of weekly shipments (Difference: Hybrid - Actual)	-9.8%	-10.0%	-11.2%	-11.9%	-12.7%	-13.1%	-13.6%	-14.4%	-15.2%	-14.1%
<b>Transportation Costs</b>										
Cost/Shipment (Difference: Hybrid - Actual) \$	(0.3)	(1.9)	(3.4)	(5.0)	(6.4)	(7.8)	(8.9)	(10.2)	(11.4)	(9.6)
<b>Service Level</b>										
On-Time Service Level	94.0%	94.3%	94.6%	95.0%	95.2%	95.5%	95.8%	96.0%	96.3%	95.9%
VMI Service Level	92.2%	93.5%	94.7%	95.9%	96.8%	97.6%	98.3%	98.9%	99.4%	98.5%
<b>Inventory at Customer DC</b>										
Average cases/week (Difference: Hybrid - Actual)	(56,598)	(52,985)	(49,398)	(45,523)	(40,956)	(36,418)	(28,162)	(16,804)	2,810	(23,338)
COV of inventory leve in cases (Difference: Hybrid - Actual)	-2.0%	-2.3%	-2.2%	-2.3%	-2.3%	-2.5%	-2.7%	-3.4%	-3.4%	-3.1%
Average Change USD/week (Difference: Hybrid - Actual)	(1,543,143)	(1,439,280)	(1,330,705)	(1,216,336)	(1,089,559)	(938,712)	(683,955)	(291,235)	348,971	(523,373)

# Top SKU

### Top SKU's Shipments



### Top SKU Inventory Value

