A Sourcing Strategy Evaluation Framework

For Complex Multi-Tier Supply Chains

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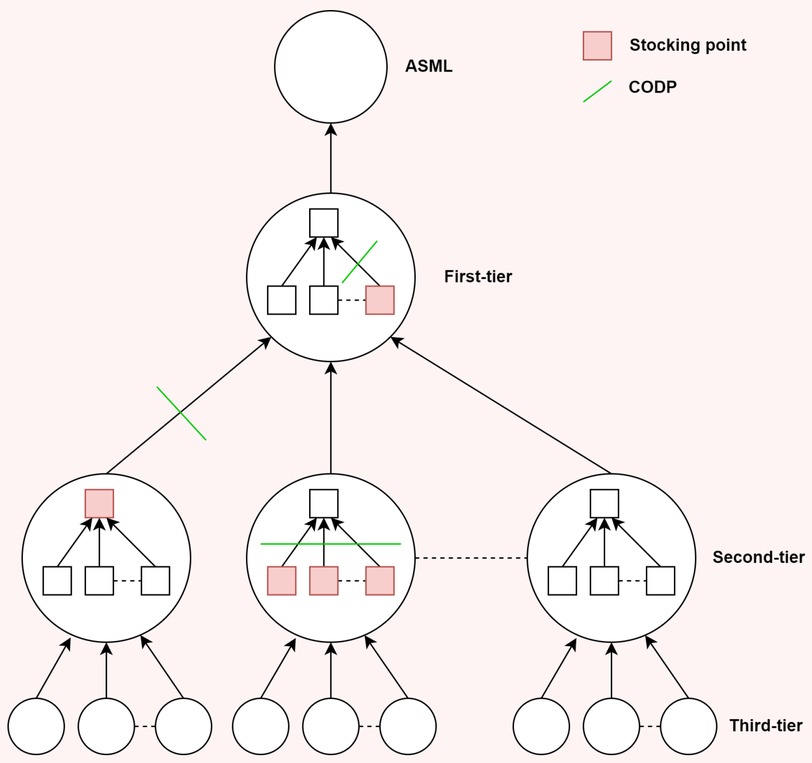
Introduction

ASML manufactures advanced lithography machines in a global, high-mix, low-volume, multi-tier supply chain. To ensure component quality, ASML often **prescribes parts**, meaning suppliers must source them from designated manufacturers. While this supports quality**, it restricts sourcing flexibility** and can create **forced single sourcing**, increasing vulnerability to disruptions, lead-time delays, and higher costs. ASML currently lacks a quantitative framework to determine when single or dual sourcing is most effective for such components. Therefore, the main research question of this thesis is:

"What is the effect of single or dual sourcing on the performance of a complex multi-tier supply chain?"

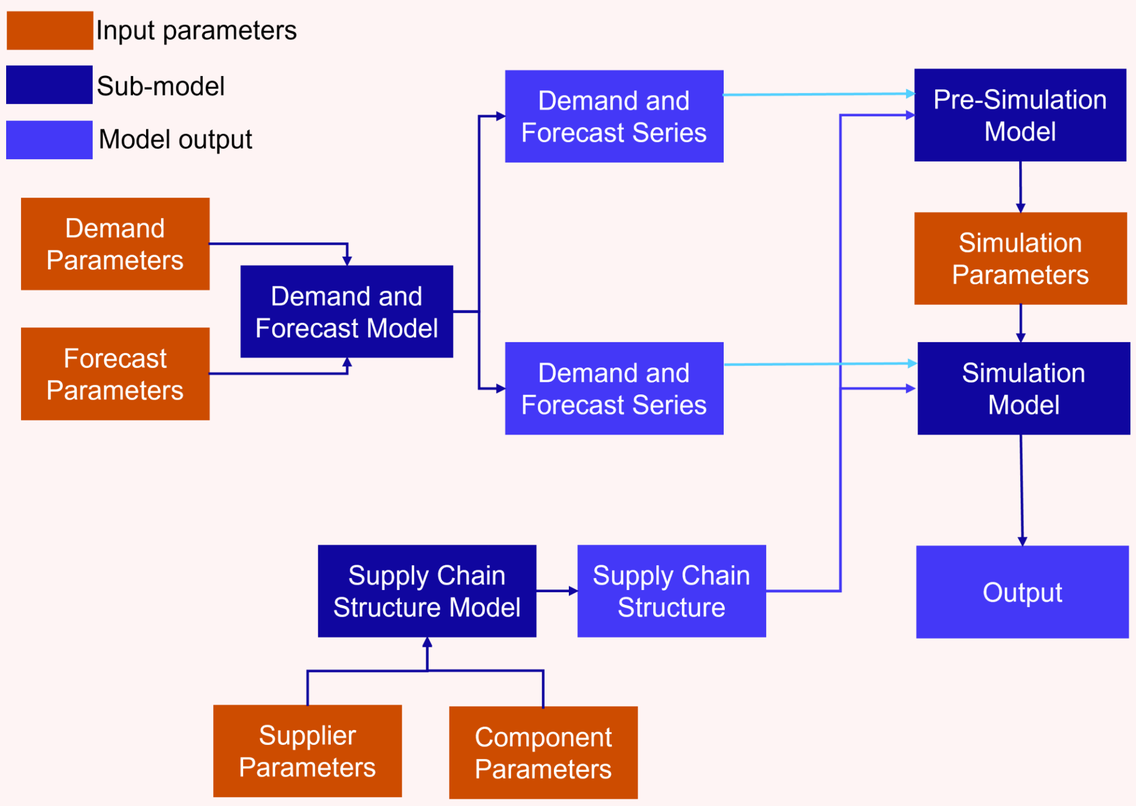
Supply Chain Structure

The suppliers in the supply chain are categorized as **first-tier** or **second-tier** and as **make-to-order** or **make-to-stock**

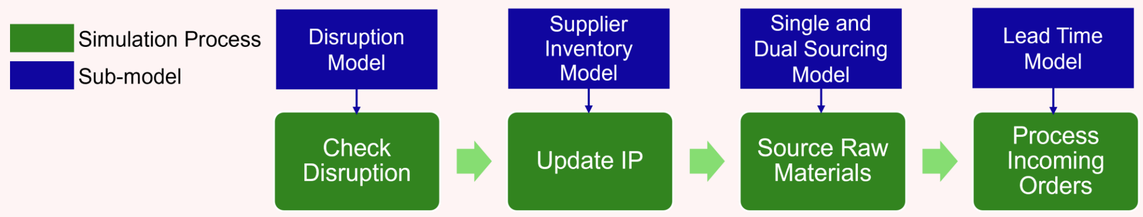


Methods

An **agent-based simulation model** is developed to compare single and dual sourcing in prescribed multi-tier supply chains using stochastic demand, weekly forecasts, and different supply chain structures.



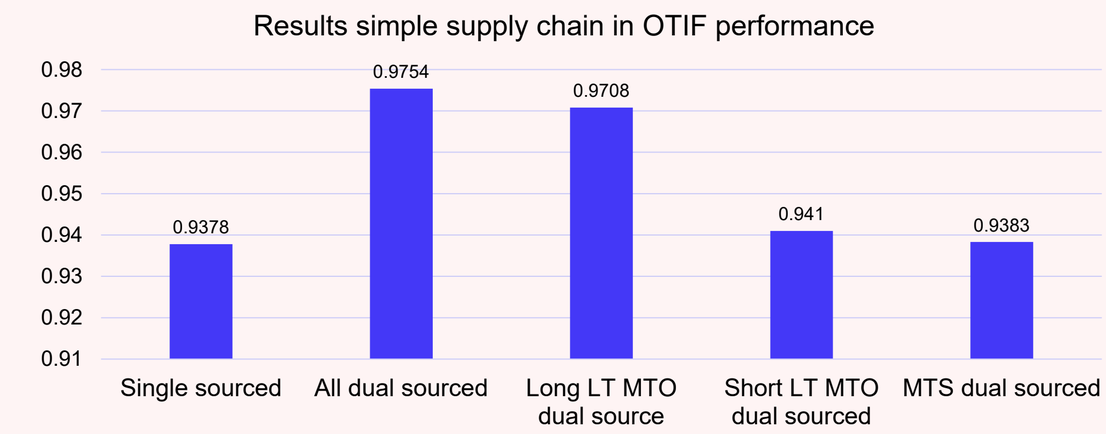
Each week, suppliers update their disruption state and inventory position, source raw materials, and process incoming orders.



The model measures **logistical and cost KPIs** to evaluate supply chain performance. The most important KPI is On-Time-In-Full (OTIF), which measures the percentage of orders which have been delivered within the agreed lead time.

Results

Results from a **simple supply chain** with three second-tier suppliers show that dual sourcing does **not always** lead to a performance increase



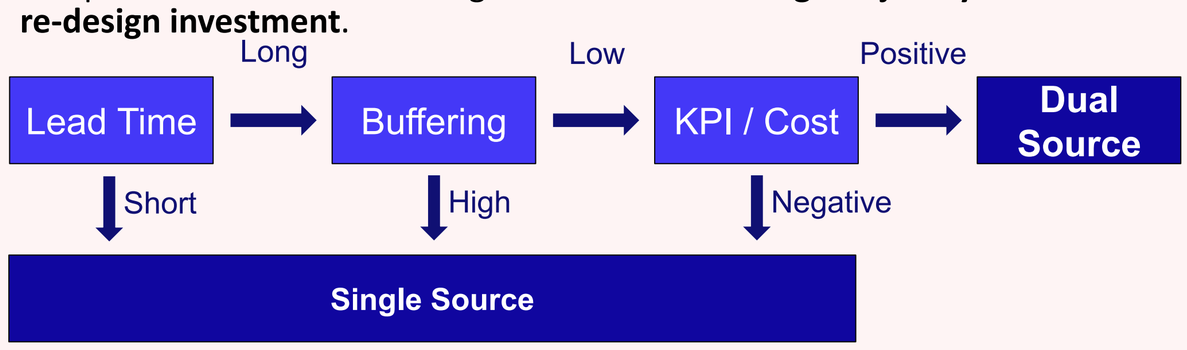
Results across various supply chain structures show that **targeted dual sourcing** the most constraining components leads to the following changes in KPIs:

On Time In Full	↑ OTIF increases (most for long LT components)
Order Lead Time	↓ OLT decreases (less waiting time)
Time To Recovery	↓ Supply chains recover faster
Holding	↑ Holding costs increase
Unit Costs	↓ Unit costs decrease due to competition
Re-design Costs	● Re-design costs are very high (ASML specific)

Conclusion

This thesis shows that the effect of **single or dual sourcing** in a prescribed multi-tier supply chain is very **case specific**.

ASML should apply selective dual sourcing, to long lead time, low-buffered components. Use dual sourcing when **OTIF and TTR gains justify the re-design investment**.



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