Summary Concepts: Facilities Strategy and Globalization

Lecture 12

MITSloan MANAGEMENT

Summary lecture on facilities strategy and globalization

- Conclusions from ITT, Applichem, etc.
- Strategic and other factors
- An integrated approach
- Impacts of globalization
- New paradigms for the global environment

Issues from BYD and Applichem

- **Fit with strategy**
- **Focus of plants**
- **Scale and cost**
- **Standardization and labor costs**
- **Means of evaluation and plant roles**
- **Sourcing and allocation models**
- **Access to R&D**

Product/Market-Process Focus

- **Mean of focus**
  - Volume
  - Product
  - Market
  - Process

Example

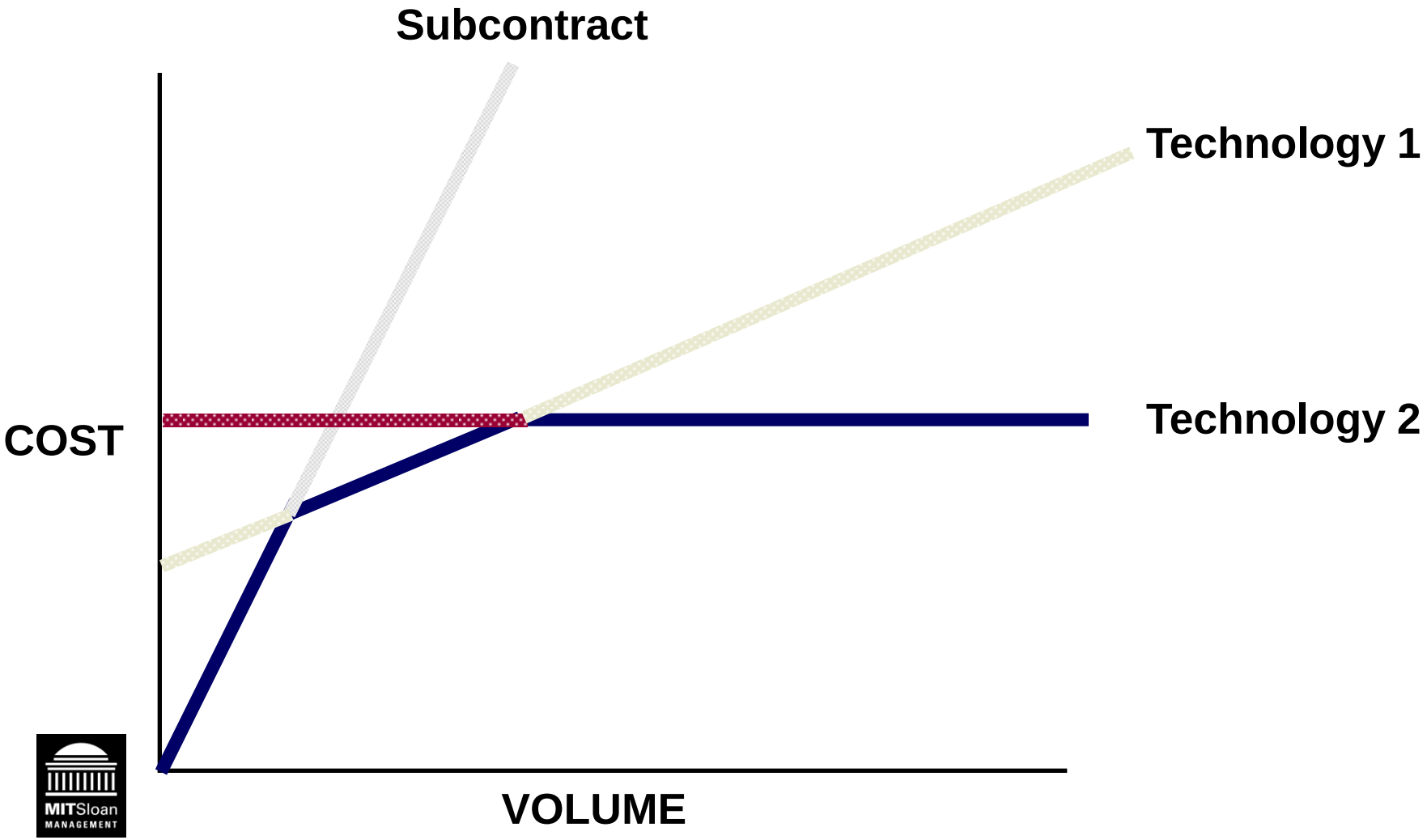
Off

	Volume Low	Volume High
Job	- Detroit	
Batch		- Saginaw
Line		- Lima

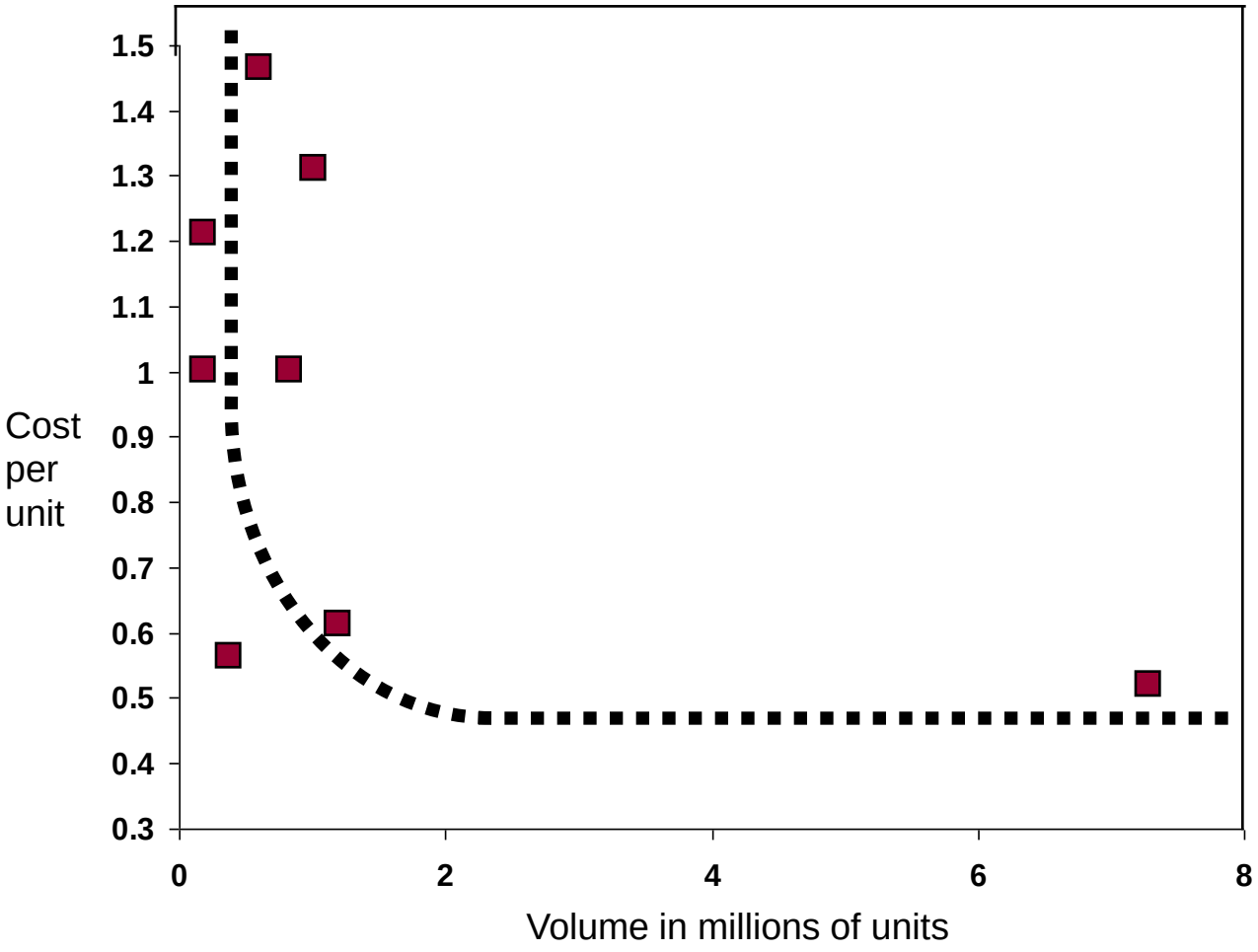
On

	Volume Low	Volume High
Job	- Detroit	
Batch		- Fremont - Lancaster
Line		- Mayesville

Scale Analysis



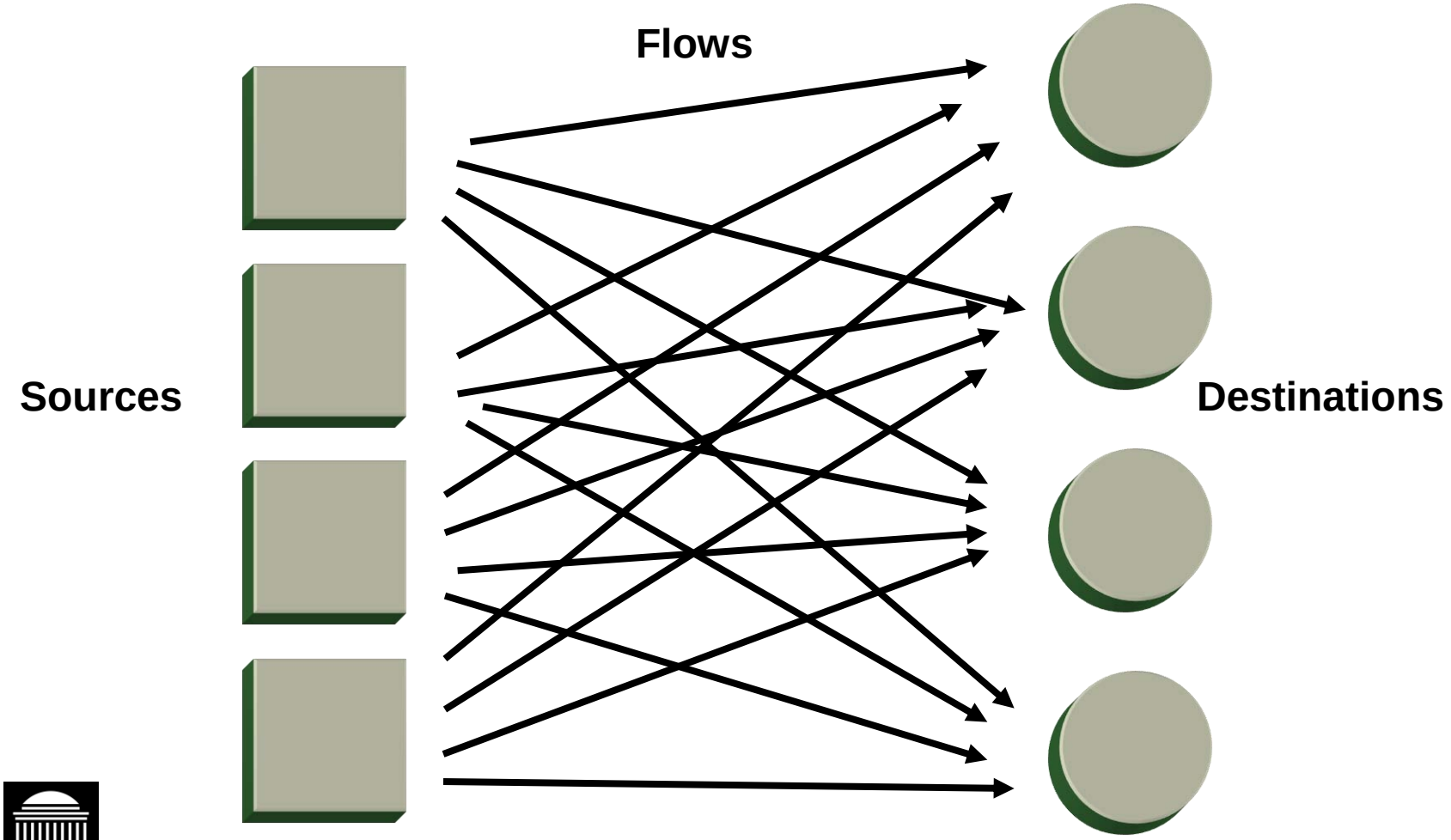
Consumer Goods Example



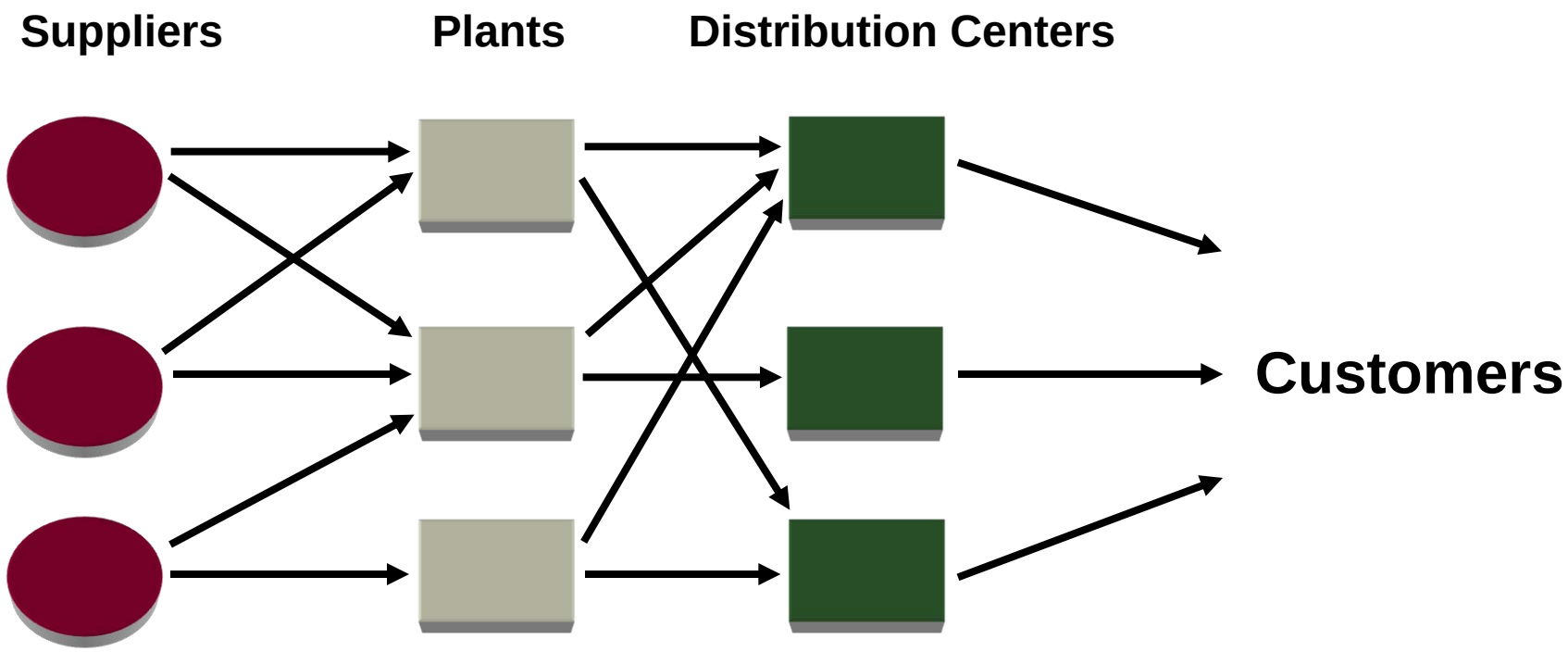
Additional logistics drivers

- Raw material access (e.g.wood products)
- Distributed production for heavy products
- Warehouses for commodities because of transportation scale
- Customer service requirements

Supply Chain Flow: Simple Two-Stage LP



Network for Multi-Location Supply Chain



General Manufacturing Models (shared capacity, warehouses or two stages, fixed costs – details in extra slide)

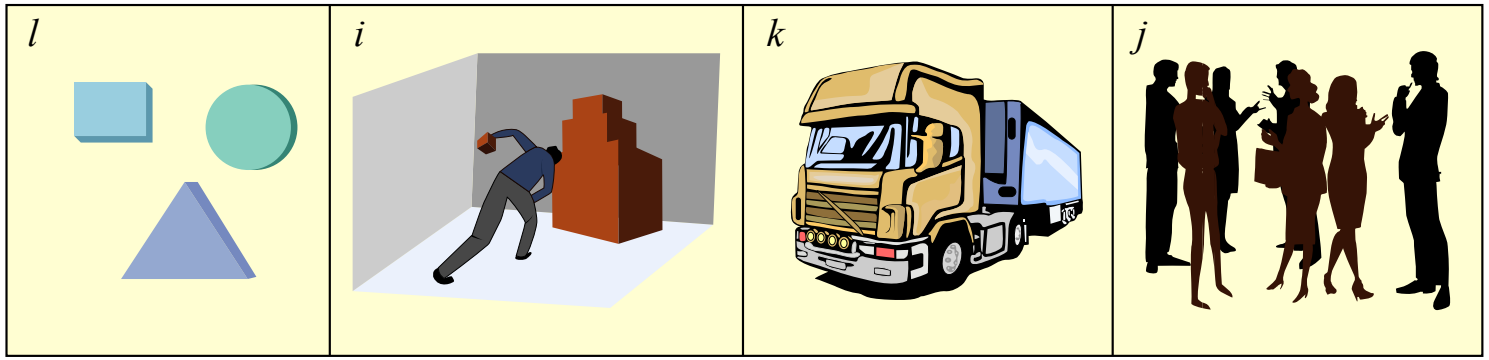


Image by MIT OpenCourseWare.

x_{lkj} = Total flow of l from k to customer j

y_{ikl} = Total flow of type l from i to k

D_{lj} = Demand of l at customer j

$$D_j = \sum D_{lj}$$

A_k = Capacity at warehouse k

A_{il} = Capacity at plant i for product l

Some Examples of Strategies

1. **Different process steps and scale, significant logistics**
   - Central stage 1, decentralized stage 2
2. **Significant central R&D**
   - Central plant for at least early life cycle
3. **Significant product flexibility**
   - Decentralized satellite plants for some stages

A General Approach

- **Develop a strategy and appropriate means of focus**
- **Using data, benchmarking, and analysis of technology, develop scale curves**
- **Identify major decision choices and service requirements covering plant and process options**
- **Do the analysis**

Case Study:
Worldwide Consumer Goods Manufacturer

- **25 product groups**
- **10 production locations**
- **Variety of product values and weights**
- **Over capacity**
- **Lack of focus**
- **Significant tax issues**

Case Study

Why Separate?

- Scale
- Capacity
- Tax laws
- Focus
- Relative technological complexity

Approach

- Cross sectional analysis
- Tax analysis
- Model of variable costs
- Detailed analysis of actual fixed costs

Solution:

- Move “light” products to tax havens
- Better focus facilities by product group

Globalization Adds Some Additional Complexities

- **Increase in worldwide exports**
- **Business level trends**
  - New technologies such lower-scale, higher-skill level manufacturing systems including FMS systems
  - JIT systems that also underscore the need for sophisticated vendor infrastructure
  - TQM and organizational learning
  - Competitive factors that focus on customization, rapid product development, and quick response
  - The breakdown of intercompany barriers

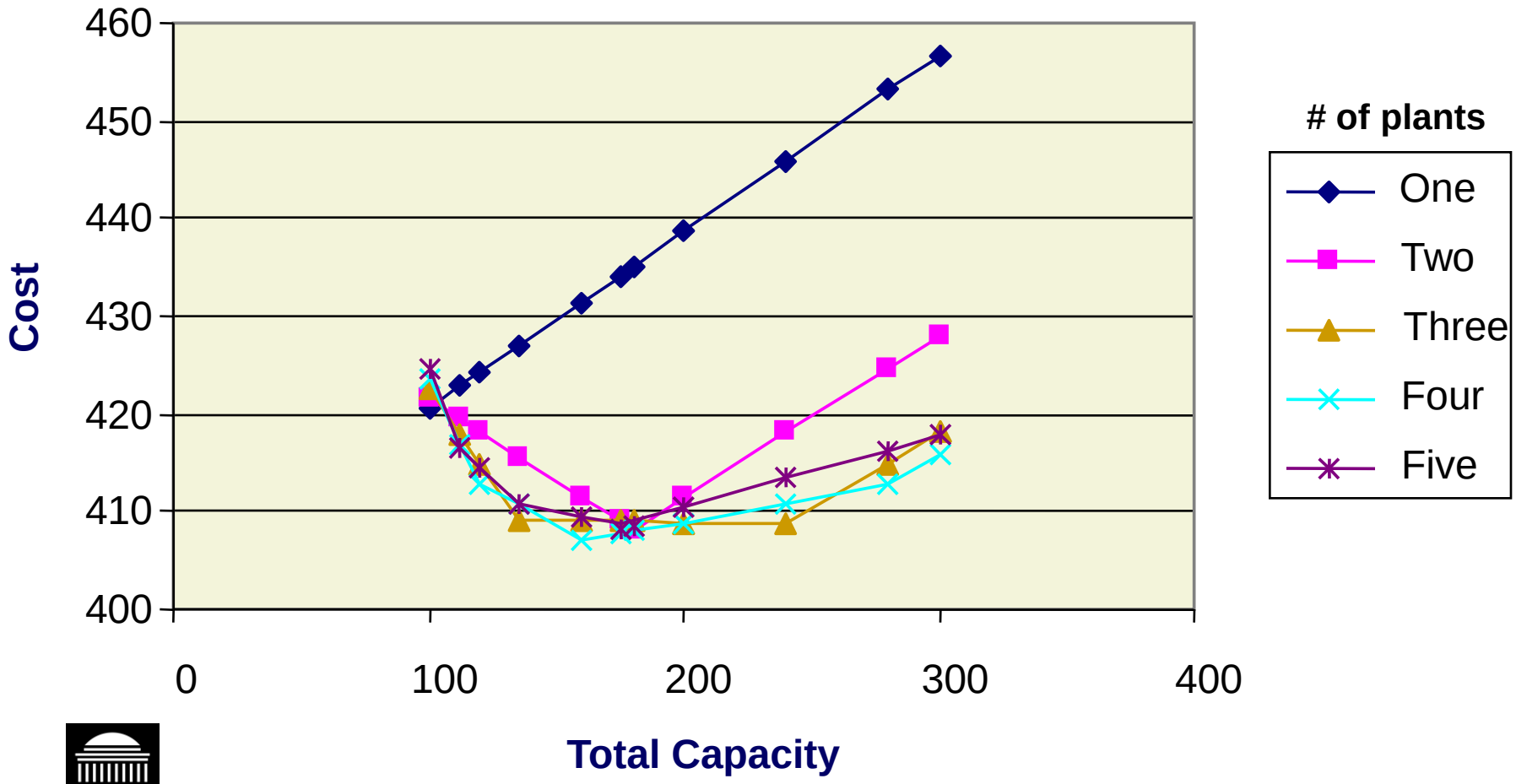
Globalization Complexities (cont'd)

- **Macro level trends**
  - Large, sophisticated overseas markets with local needs
  - Non-tariff barriers
  - Regionalized trading economies
- **Variable factor costs – Static and Dynamic differences**
- **Longer lead times**

Global Strategies Emphasize Some Additional Factors

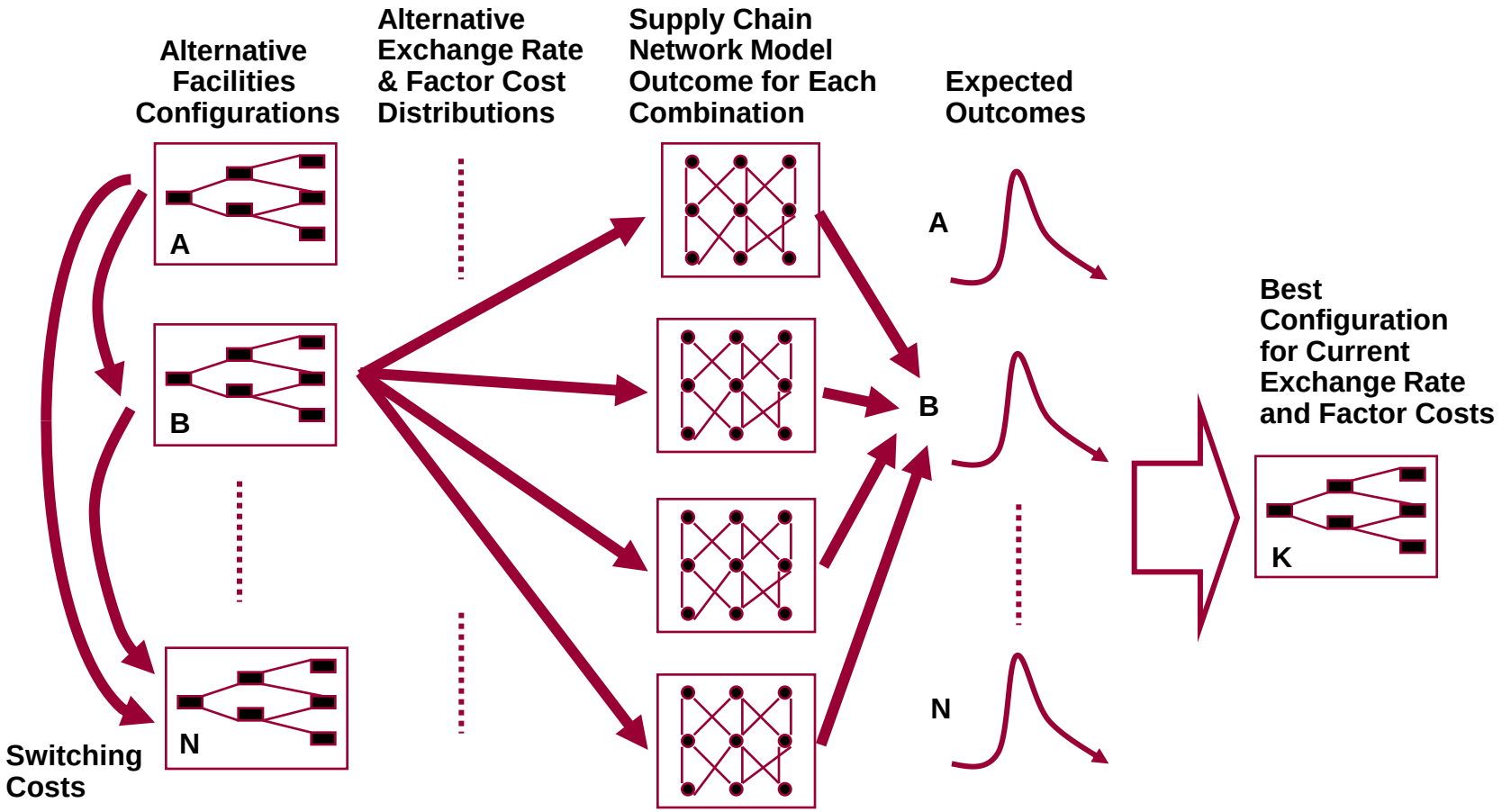
- **Global product volumes and life cycles**
- **Decentralized network based on regional presence**
- **Infrastructure versus cost**
  - Work force capabilities
  - Vendors
  - Transportation and communication
- **Extra plants and capacity to build flexibility for exchange rate risks**
- **Flexibility in short, medium, and long term**

Exchange Rate Model



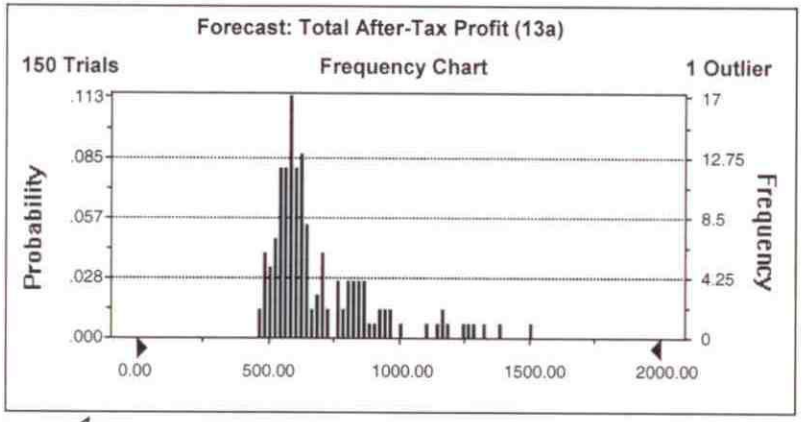
Facilities Strategy Given Uncertainty

(adapted from Huchzermeir and Cohen)

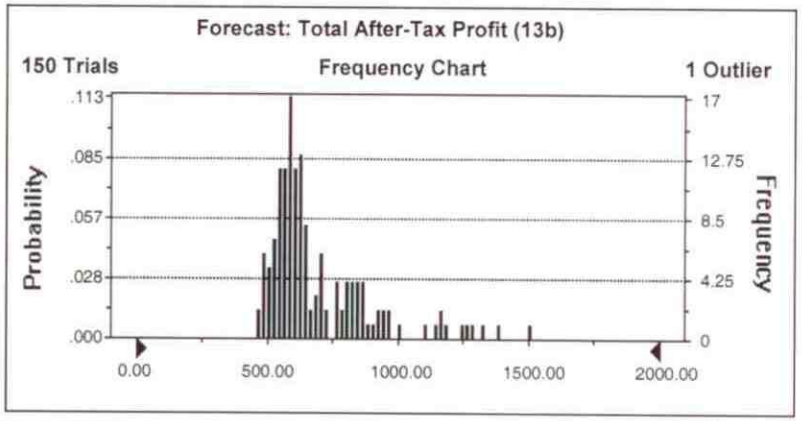


Local Pricing Strategy

Accounting for risk in both market demand and prices/exchange rate risk, the option value of managerial flexibility can be captured

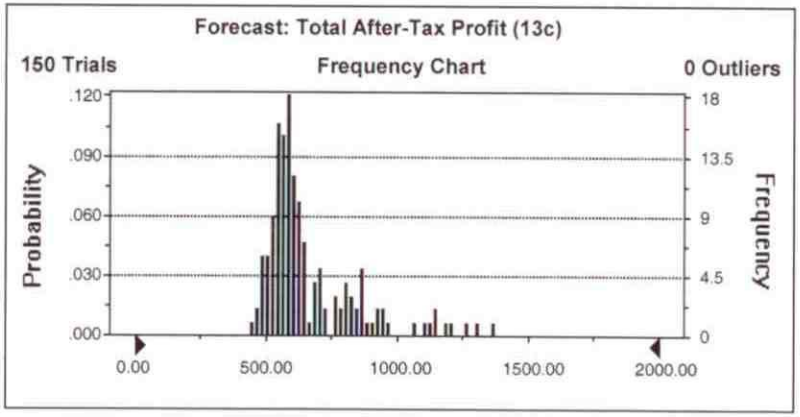


6 plants open



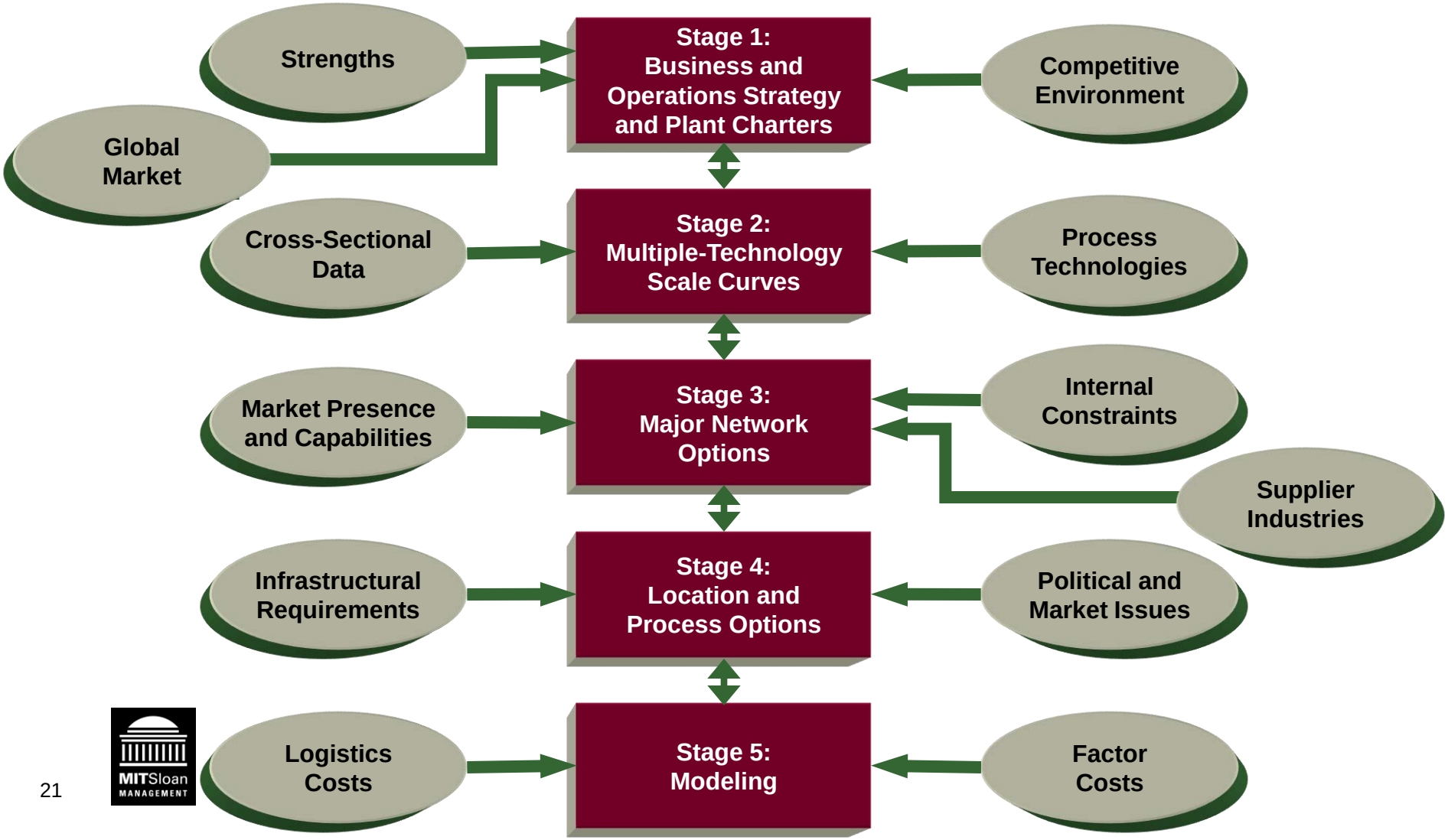
5 plants open

Optimal !



3 plants open

Five-Stage Approach to Strategy Development



Summary

- **Methods for analyzing focus, scale flow, etc.**
- **Impact of new markets and technologies**
- **Global product design and flow patterns**
- **Flexibility**
- **Factor costs**
- **Other things we need to consider in more detail**
  - Outsourcing and offshoring questions in globalization
  - Longer lead times

For those of you interested in details, formulation for general case

$$\sum_{k} y_{ikl} \leq A_{il}$$

$$\sum_{j,l} x_{lkj} f_l \leq A_k$$

where f is the unit usage of product *l*

$$\sum_{k} x_{lkj} \geq D_{lj}$$

$$\sum_{i} y_{ikl} \geq \sum_{j} x_{lkj}$$

$$\sum_{lj} x_{lkj} \leq k z_{kj},\ z_{kj}$$

is zero or one, forcing constraint

Could also have shared cap at plants. With no warehouses, define plant variables to go to customers directly. Can add another level for sourcing or two stages of plants.

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