

The Impact of Supply Chain and Logistics Decisions on Transportation Demand and the Location of Economic Activity

Garland Chow

Associate Professor, Sauder School of Business

Director, Bureau of Intelligent Transportation Systems and Freight Security (BITSAFS)

The University of British Columbia

garland.chow@sauder.ubc.ca

National Urban Freight Conference

Long Beach, CA

Dec. 5, 2007



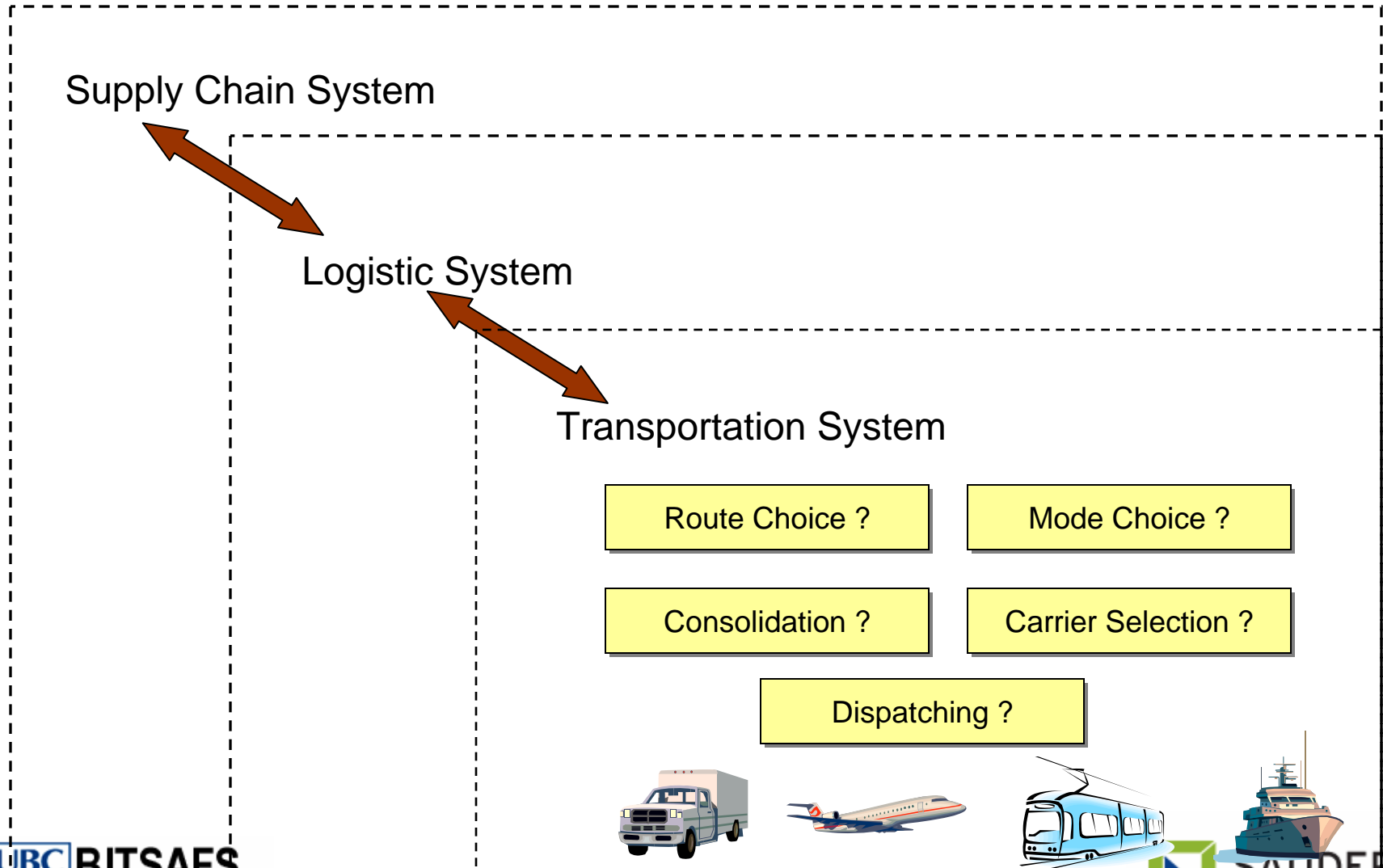
Freight Transportation Planning Data Needs

- How much needs to be moved
- Where: O-D locations
- In what form: size of shipment and cargo type
- By which route: gateway used
- By what mode
- When and frequency

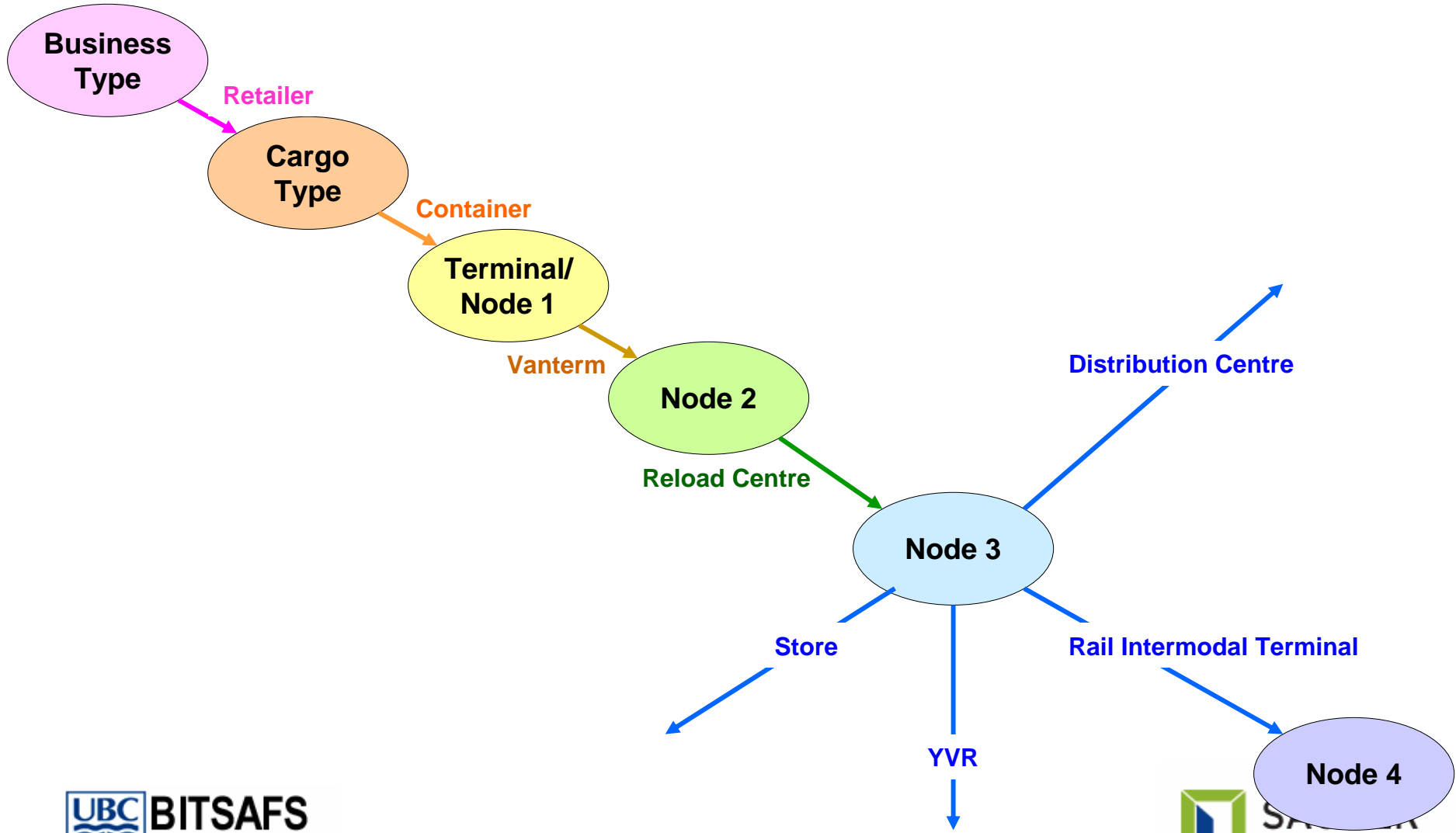
Rationale

- Existing freight and trip forecasting models may not reflect long term trends in logistics and supply chain of firms
- Structural changes may make current forecasting model obsolete or in need of adjustment
- Structural changes and trends are especially volatile in transportation corridors and gateways for global freight movement.
- Existing models insufficient for freight planning without sensitivity to such changes

The Larger System



Structure of Inbound Container Supply chain – Logistics Choices

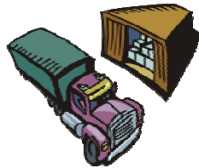


Modal Links in Greater Vancouver Container Supply Chain

Port Container Terminal



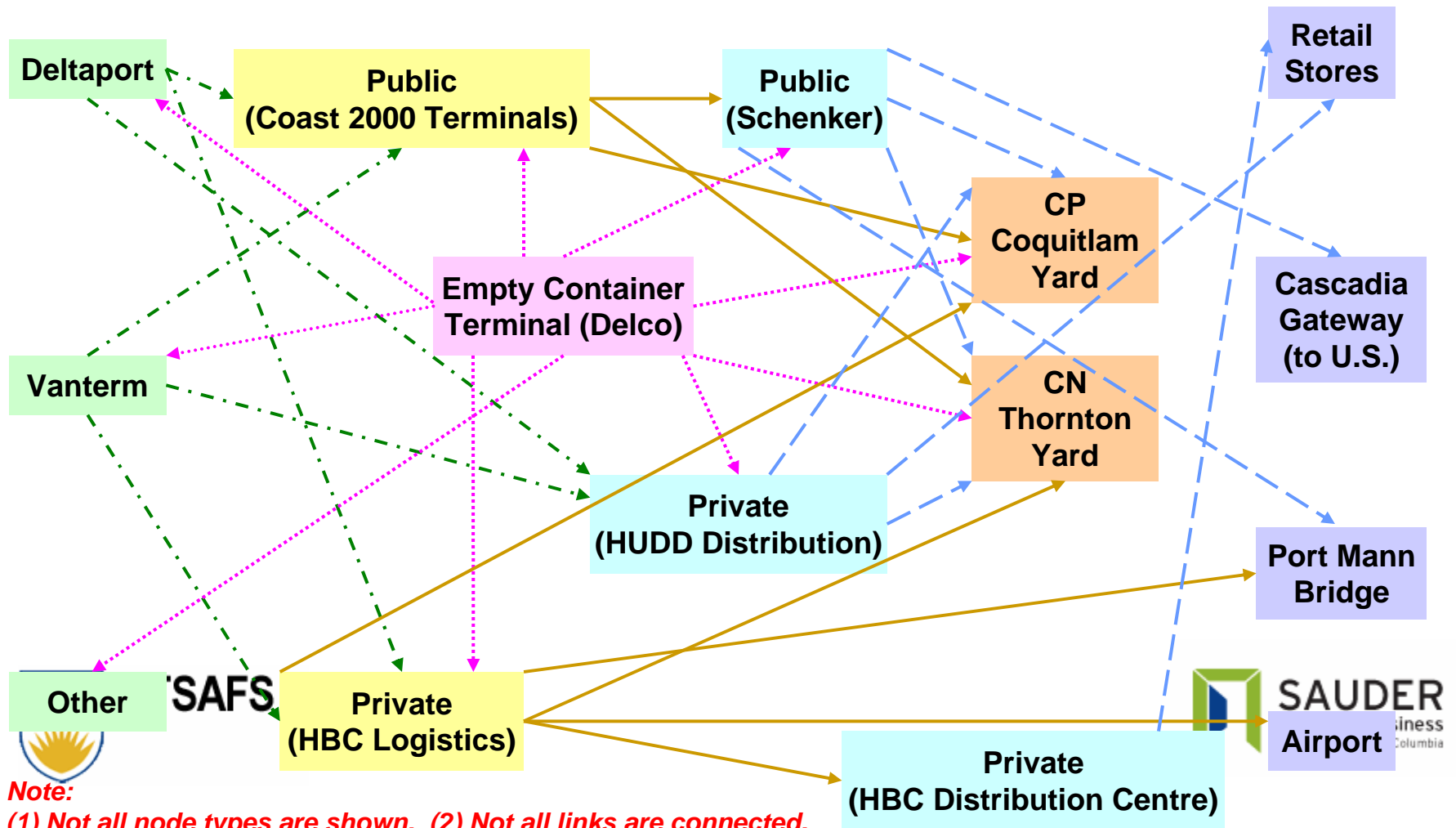
Reload Centre Distribution Centre



Intermodal Rail Yard



Other



Note:
 (1) Not all node types are shown. (2) Not all links are connected.

Production Networks in Consumer Electronics Supply chain

Supply Chain Decision – Industrial Location

- Production location shifts with life cycle of product
- Introduction - in Korea
- Acceptance and Mass production in China – push supply chain
- Maturity and Quick Response production in Mexico – pull supply chain

Logistics and Transportation Implication:

- O-D from Asia-Canada to Mexico-Canada
- Mode shift: from ship for Asia-West Coast and rail intermodal to Eastern Canada to.....
- Rail intermodal from Mexico to a point in US or Canada and truck onward to DC s.
- Routing shift - from one gateway into Canada (Vancouver) to multiple land border crossings into Canada.



Distribution Networks in Imported Beer Industry

Supply Chain and Marketing Channel Decision – consolidate relationships

- Corona “had” two distributors in Canada, one for western Canada and one for eastern half of Canada.
- Recently, Molson's was awarded the whole contract

Implications:

- Distribution network: - Molsons will leverage its existing distribution network and receive and process all of Canada bound Corona in its eastern Canada DC

- Routing and mode choice:

Inbound beer shifted from ocean to Vancouver to rail to eastern Canada

Now all of the product will come into Canada by rail, via surface border points and once in Canada, the western destined product moves west not east.

This has implications for the Vancouver gateway system - product movements have shifted



Centralization of Spare Parts in Office Machine Industry

Supply and Logistics Decision – centralize spare parts nationally

- Traditional approach was to stock spare parts in the office machine market locally
- FedEx provided overnight service alternative
- Centralize spare parts inventory nationally and sent needed parts overnight.

Implications

- Intercity mode shift from LTL to air parcel
- Significant increase in pick up trips to the airport to pick up the parts flown overnight.
- Freight movement identification shifted to household or workplace traveler surveys.



Supply Chain Strategy in the Footwear Sector

- Kodiak Group repatriated its flagship work boots from South East Asia where it had been producing it for the last 6 years. The boots are made in its Markham plant as it was quicker to get the boots to the customers and the “made in Canada” label has a reputation for craftsmanship.
- Firms in demand driven markets must locate production closer to market in order to be responsive without incurring significant inventories of finished goods.

Supply Chain Strategy in the Footwear Sector

- With Asian production, contract for long production runs -- more than 1,200 pairs -- and have to carry a lot of inventory.
- With domestic manufacturing, the plant keeps enough materials around for relatively short runs. Because of automation and location, it can turn around Canadian production orders in 21 days, compared with 90 days for orders from Asia.

Implications:

- Shift of import of finished product from Asia to raw materials globally (eg leather from S. America).
- Different transportation and routing pattern

Inbound Container Supply Chains

Logistics Decision: Direct versus reloading and transloading imported freight

- Traditionally full load direct to DC in eastern Canada (Toronto) for de stuffing and forwarding to inventory locations or consumption including West
- Trend to transload at port of entry:

Economics of international containers different from domestic containers

- SSL s want international containers for front haul
- Floor stacked international containers cause inefficient handling of freight down steam
- Standard size of international container inefficiently moved in domestic rail system.

Implications:

- The degree to which importers shift to this strategy impacts:
 - intercity freight pattern - less circuitous movement, more direct movement
- local freight patterns - reduces rail direct and shifts to rail to local truck to reload to local truck to either DC or back to rail.
- Creation and need for inland freight or off dock freight complexes



Risk Management in the Supply Chain

Supply Chain Decision – Increase port gateway alternatives and redundancy

- Port stoppages, congestion and security called for risk mitigation and reduction measures in supply chain/logistics strategy
- Short run flexibility is dependent on logistics infrastructure and capacity to handle freight eg loading and unloading handling equipment for bulk shippers
- Major shippers have established threshold rehandling facilities or capabilities (both for importing and exporting) at alternative ports of entry or exit

Implications:

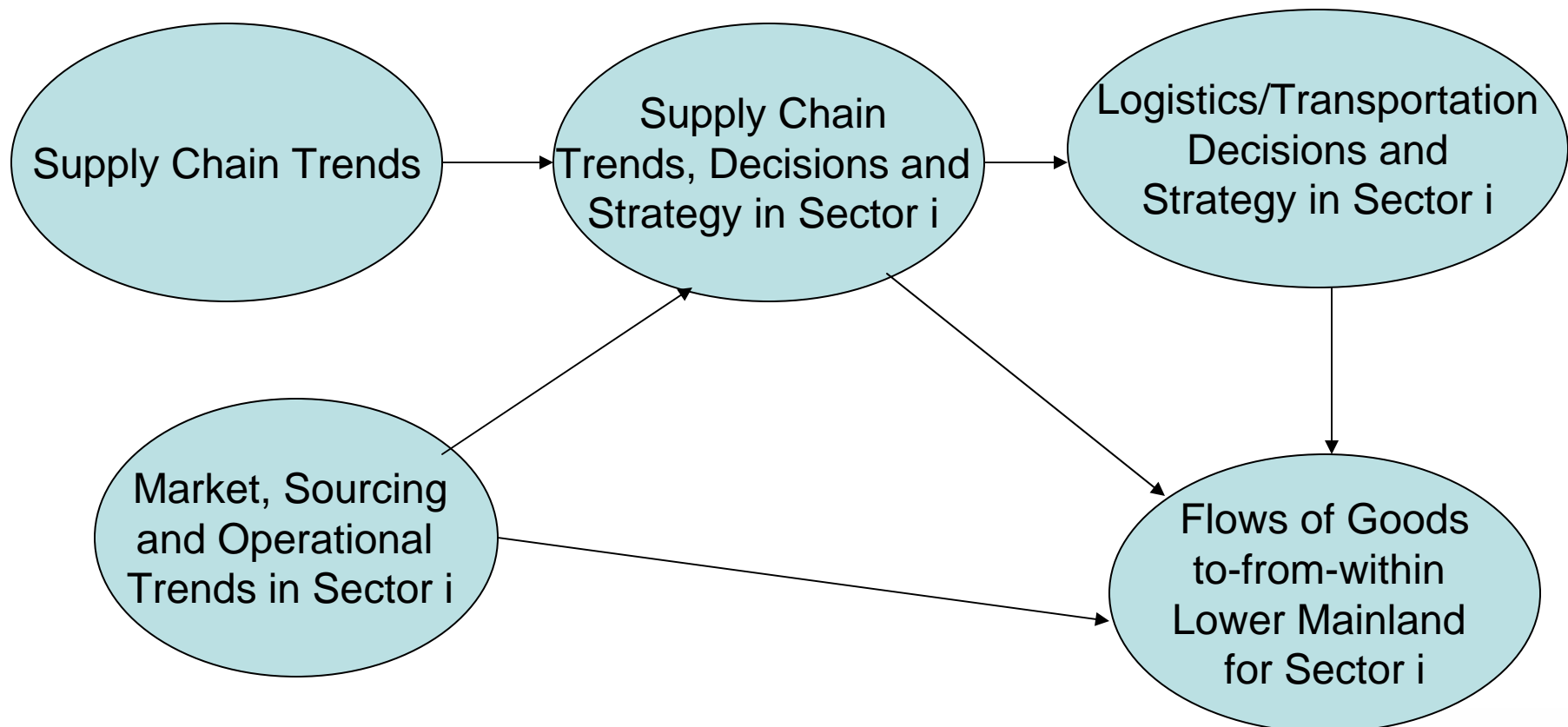
- shippers have known backup plans for diverting freight
- Shippers can respond in shorter time than in past
- Permanent diversion, can't build capacity that is unused



Other

- JIT in auto industry and computer industry
- Rationalization of production system – Fuji Film
- Low Cost Country Sourcing

Template for Linking Supply Chain Trends to Gateway Transportation Infrastructure Demand



Supply Chain Trends

- Global sourcing (and global distribution)
- Concentration and specialization of production (rationalization across N.A)
- Centralization of stock location and inventory
- Rationalization of distribution network, shift to transship and cross docking and Direct deliveries
- Integrated logistics management, optimization, tradeoffs
- Outsourcing – manufacturing and logistics and transportation
- Supply chain collaboration, partnerships, supplier reduction
- Pull versus push supply chain flow

Logistics and Transportation Decisions

- Spatial pattern of movement, e.g. North South versus East West
- Length of haul
- Demand for high speed and reliable transport service
- Shipment frequency
- Shipment size changes
- Number of transfers or handling of freight
- Mode split (shifts to any mode including intermodal)
- Load utilization and empty vehicle routing

Link Supply Chain Trend(s) with Logistics Decisions

| Table 1.45 Impact of Pull Supply Chain on Transportation Demand, Location of Logistics Activity and Performance | |
|--|---|
| Efficiency of transportation such as load utilization or empty loads | High need for reliability and on time performance may require under utilization of vehicles, levels the utilization of fixed assets |
| Demand for high speed and reliable transport service | Increases need for reliable and fast transportation |
| Shipment size changes and vehicle trips | May reduce shipment size as product is more frequently delivered resulting in more vehicle trips. Ability to consolidate multiple products minimizes the increase in the number of vehicle trips. |
| Number of transfers and handling of freight | No significant impact |
| Mode split | Favors reliable and fast modes of transportation such as truck or air |
| Length of haul | No significant impact |
| Spatial Pattern of movement | No significant impact |
| Location of logistics activity | Often suppliers locate closer to plants when a pull type system utilized by customer. |
| Other | |

Demands on Logistics Infrastructure and Capacity For Efficient Goods Movement

- Overall capacity of highways
- Overall capacity of major intercity connectors
- Intermodal connections between rail and truck
- Port capacity
- Airport capacity
- Cross Border gateway capacity

Link Logistics Decisions to Transportation System Needs

Table 2-46
Likelihood of Transportation System Impact by Transportation Demand or Performance Change

| Transportation Demand or Performance Characteristic | Transportation System Demand Impact | | | | |
|--|---|---|--|---------------------------------------|---|
| | (-) decrease demand, (+) increase demand, depends on... Impacts demand but depends on situation Neutral: no impact by itself | | | | |
| | Overall capacity of right of ways | Overall capacity of intercity connectors | Intermodal railway - highway connections | Cross Border Gateway Capacity | Airport capacity |
| Efficiency of transportation such as load utilization and empty vehicle miles. | - | - | - | - | - |
| Demand for high speed and reliable transport service | + | + | + if shift is to intermodal from rail | + if cross border traffic is involved | + if air transportation involved |
| Shipment size changes | + if smaller shipments sizes not consolidated effectively | + if smaller shipments sizes not consolidated effectively | - as intermodal not demanded as highly | Neutral | + if smaller shipments increased |
| Number of transfers or handling of freight | - from more effective consolidation | - from more effective consolidation | Neutral | Neutral | Neutral |
| Length of haul | + | + | + as intermodal more competitive over longer hauls | + if movement is transborder | + as air more competitive over longer distances |
| Mode split | Depends on split | Depends on split | Depends on split | Neutral | Depends on split |
| Spatial pattern of movement | Depend on spatial pattern | Depend on spatial pattern | Depend on spatial pattern | Depend on spatial pattern | Neutral |

Concluding Remarks - 1

- Many trends in supply chain and logistics are themselves the result of improvements in transportation and communications.
- Freight planning would benefit from knowing what supply chain network, product flow and process changes are forthcoming in the future in order to plan transportation capacity or how to change transportation capacity to enable favorable changes in supply chain practices.

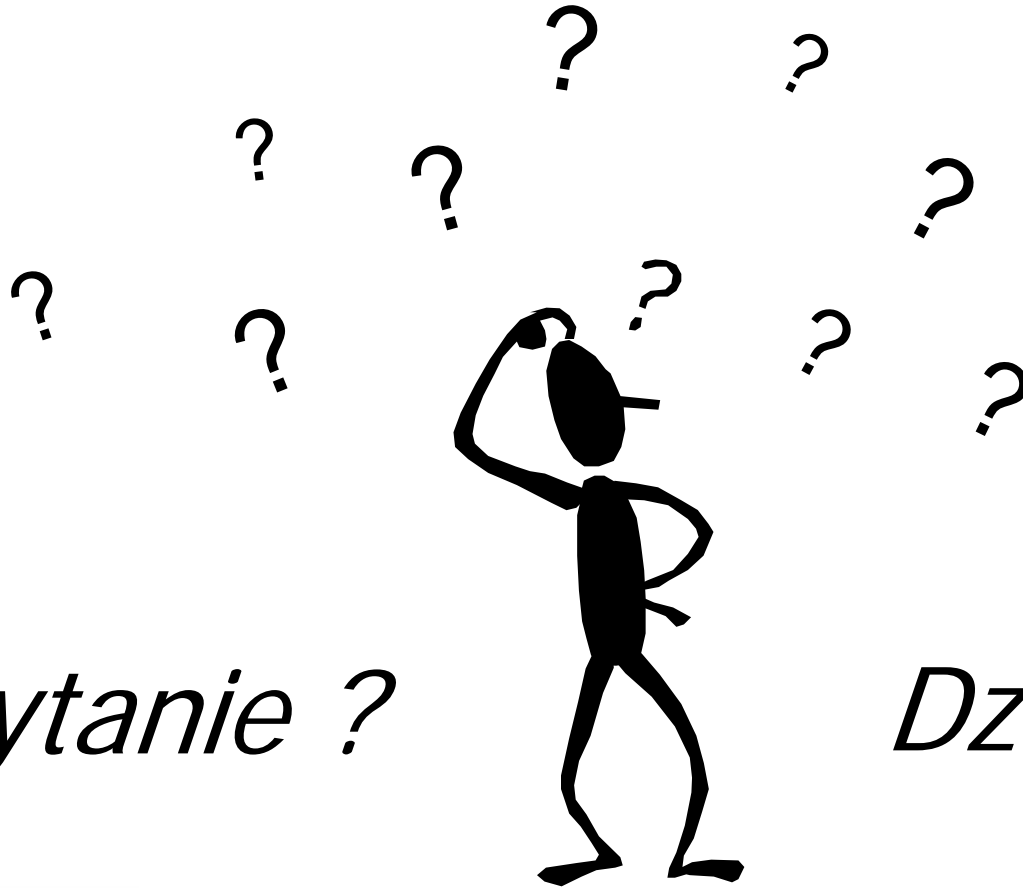
Concluding Remarks (2)

- No unified theory that would enable the prediction of the exact changes in the supply chain that are going to occur in one industry, much less across industries
- Some factors explain general tendencies in an industry
- But even firms within any particular industry are not homogeneous so the right strategy is often firm specific.

Concluding Remarks (3)

- Paper suggests and demonstrates an approach for linking supply chain trends to logistics and transportation decisions and..
- Logistics and transportation changes to the demand for transportation
- Heterogeneity requires segmentation and identification of key industries or supply chains
- Conduct analysis at 3 levels:
 - Overall analysis for industry or supply chain
 - Analysis of key shippers
 - Focus on impact on specific gateway or corridor

Preguntas? 題 ? *Questions?*



Pytanie ?

Dziękuję!