“The Future of Freight Data Collection and Analysis”
(Strategies To Improve Freight Data and Tools)

by

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To Improve Freight Analysis & Forecasting We Need:

A> BETTER DATA ON FREIGHT VOLUMES

On the **TONNAGE, DOLLAR VALUE, NUMBER AND SIZE OF VEHICLE LOADS** – How much is generated, received and transported between places.

B> BETTER DATA ON FREIGHT COSTS

On the **FULL TRANSCATION COSTS** of moving freight between places – by commodity type, mode/service/vehicle type, region/corridor, season – i.e. the costs of line haul, plus handling, transfers, inventory holding, …
Avenues Towards Better Freight Volume Data

1. DATA COLLECTION
   NEW DATA COLLECTION INITIATIVES

2. DATA EXTRACTION
   GETTING MORE “TRANSPORTATION” INFORMATION FROM EXISTING DATA SOURCES

***3. DATA FUSION/ DATA MODELING***
   COMBINING DATA FROM DIFFERENT SOURCES USING STATISTICAL AND SIMULATION MODELS TO:

   FILL DATA GAPS

   DISAGGREGATE DATA TABLES
We often need to combine data on freight from different sources and from different types of data collection effort in order to answer policy questions.

This is especially true when we try to build comprehensive commodity and mode specific freight flow matrices (for planning and forecasting purposes).

A number of mathematical and statistical tools exist with which to accomplish this.

Development & application of these tools is often much less expensive than additional data collection.

These tools should be seen as a compliment to, not a substitute for, current data collection efforts
We Need to Develop Better Methods for Combining Very Different Types of Freight Data

Notably data from:

- Customs Forms ($) and Trans-Border Surveys (Vehicles)
- Shipper and Carrier Surveys (Tons, $, Commodity Mode)
- Traffic Counting Systems (Vehicles, Loads)
- Industry Activity Surveys ($ by Industry/Commodity)

Leading to:

- Better ways to combined import, export and domestic commodity flows data
- Better ways to combine economic activity and commodity movement data

Resulting in better translation of DOLLARS-> TONS-> VEHICLE LOADS
Methods for Estimating Missing Data Elements & Disaggregating Freight Movement Tables SHOULD SEE MORE USE.

Notably:

- Multi-dimensional iterative proportional fitting & Log-linear modeling of categorical data (handling “missing cell” problems)

- Synthetic origin-destination matrix generation (Using, for example, spatial interaction models)

- Inter-regional input-output (I-O) models (Freight trip ends based on economic activity modeling)

- Traffic count enhanced freight O-D matrices (using its and other facility specific data within “link-OD” models)
**FUNCTIONAL LINKAGES BETWEEN DATA TYPES, DATA MODELS, AND DATA PRODUCTS**

**TYPES OF DATA:**
- Large Sample Shipper Surveys (Multimodal)
- Carrier Activity Surveys (Single mode)
- Surrogate* Travel Generations and Attractions
- Traffic Monitoring of Specific Facilities (routes, terminals)

**TYPES OF DATA MODELING:**
- Categorical Log-Linear Modeling, Iterative Proportional Fitting
- Spatial Interaction** (SIA) Modeling, Interregional Input-Output (I-O) Modeling
- Link-OD Modeling

**TYPES OF DATA PRODUCT:**
- Regional and Sectoral Movement Activity Tables and Totals
- Synthetic Origin-Destination Movement Tables
- Corridor Flows, Network Flow Patterns

* Such as Economic Census data on industrial production, employment, etc. by geographic location.

** SIA models also require distance-based trip cost matrices, I-O models require inter-industry coefficients.
Example IPF Application: A 3-D National Freight Traffic Matrix

Table VM-1 (VMT)
Table VM-3 (VMT)

Key: v = vehicle class, r = highway class; s = region (State)
Avenues Towards Better Freight Cost Data

Data Collection, Extraction and Modeling Leading To:

- A more complete understanding of **FREIGHT TRANSACTION COSTS**, including
  - physical costs -- line haul, transfers, inventory holding…etc.
  - informational and financial costs – inc. Internet transactions
- A better understand **FREIGHT LOGISTIC SUPPLY CHAINS**
  - the changing nature of the transactional relationships between producers/warehousers/distributors/freight forwarders/3PLs/4PLs/retailers/final demand markets.
  - the roles, options and cost savings offered by new freight handling technologies, by intermodalism, and by containerization
- The development of improved, **CONGESTION SENSITIVE FREIGHT NETWORK MODELS** - improved methods for routing freight through intermodal terminals and ports, as well as routing long-distance freight through built-up urban areas
Supply Chain - Transportation Supernetwork Representation

Product Supply Chain ("Logistical") Network

Physical Transportation Network

Communications between nodes in the two networks
Development of Comprehensive Freight Databases Will Also Benefit Significantly From Institutional Cooperation.

Develop a Plan of Action for Combining Local, State and Federal Data Sources…

E.G. The “COOKiE CUTTER” approach to freight flow estimation and forecasting:
SUMMARY:

Strategies to Improve Federal, State and Local Freight Databases include:

1: Technical Advances.

- Invest in R&D that emphasizes the merging of different types of freight volume data (and in statistical methods for establishing the accuracy and robustness of these methods)

- Invest in R&D to better understand and measure freight logistics costs (and their impacts on mode selection and freight demand elasticities)

2: Institutional Cooperation

- Develop actions plans for combining (& where necessary supplementing) state & local data with federal freight data sources.