# Emerging Datasets Used in Advanced Freight Models

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## EXECUTIVE SUMMARY

Data is a vital element of a freight model. Limited availability of data on goods movement previously hampered freight models; however, recent sources of new data combined with new methods have allowed freight models to advance. Technological advances associated with collecting business information have been exponential, leading to a massive increase in the amount of data that is generated, stored, and distributed.

New data sources collected from mobile or navigational systems have provided opportunities for calibration and validation of advanced freight models. This poster details the emerging freight data sources utilized by behavioral/agent-based freight models developed in the United States.

## 1 Types of Data for Behavioral Freight Models

Behavioral supply chain freight models often use the following eight types of model input data:

- ❑ Zone Systems
- ❑ Network Systems
- ❑ Employment Data
- ❑ Economic Data
- ❑ Transfer Facilities
- ❑ Freight Flows
- ❑ Freight Surveys
- ❑ GPS Data

Available data for model calibration/validation typically fall into five categories:

- ❑ Freight Surveys
- ❑ Freight Flow Data
- ❑ Truck GPS Data
- ❑ Weight Data
- ❑ Modal Volumes

## 2 Emerging Data Sources

Acquiring the data and finding the resources required to support a behavioral supply chain model is often challenging, given the privacy and confidentiality issues surrounding supply chain data. Advanced freight travel demand modeling in the U.S. often use publicly available data sources along with emerging/big data to model freight movements. Emerging/big data often require some level of effort to process and clean before it is available for use.

**CFS PUM**

This is the first public-use microdata that BTS and Census released in 2015. It includes approximately 4.5 million individual shipments reported by business establishments captured from the 2012 CFS.

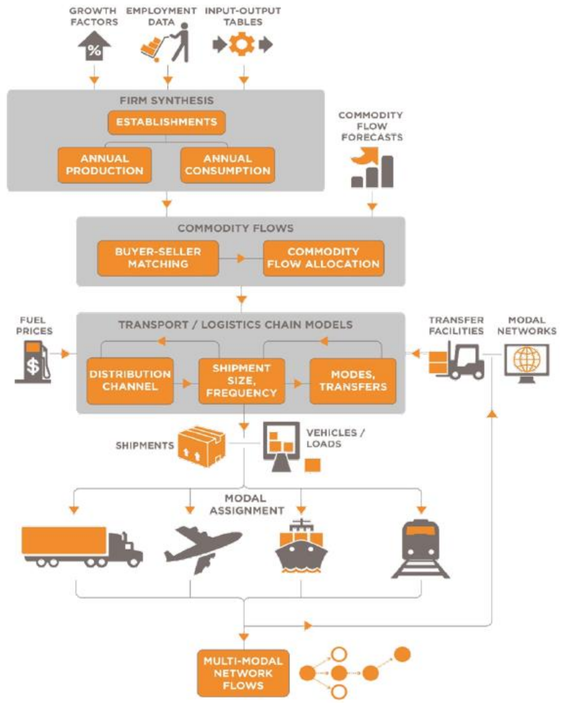
**Truck GPS Data**

It typically includes data on travel time, origin-destination, and time of travel. Passively collected GPS data offer a partial solution to the challenge of collecting data on commercial vehicles. Private vendors (e.g., ATRI, Streetlight) offer large samples of GPS data. Also, private vendors (e.g. EROADS, INRIX) provide additional attributes on commercial vehicle travel, such as truck type, commodity or industry group, and weight.

## 2 Primary Data Sources and Modeling Needs

There are multiple data sources used by agencies to estimate, calibrate, validate and forecast a freight modeling system. Primary data sources used for behavioral supply chain freight models are summarized below including details on each data. The first table does not include observed data (e.g., truck counts, Weigh-in-Motion [WIM] data) or local survey data available from local agencies.

## 3 Behavioral Supply Chain Modeling Process




## 4 Truck GPS Data and Freight Surveys

Several states and regional transportation agencies have conducted freight surveys and have used the results to estimate model parameters for behavioral supply chain freight models. The following types of surveys have been used in advanced freight models:

- The Ohio statewide survey (2004)
- Five regional surveys conducted in Texas (2001–2006)
- The Maricopa Association of Governments (MAG) regional survey (2016)
- The Portland Metro regional survey (2016)

Truck surveys is an emerging data source used in advanced freight models development. See sample screenshots of the truck survey (rMove) done in Portland, OR and used in developing its freight model.

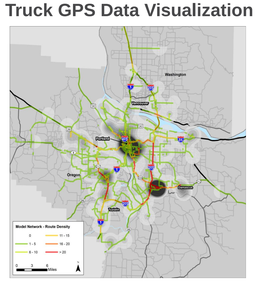
**Primary Data Sources by Modeling Needs and Availability**

| Data Source | Spatial | Temporal | Modes | Model Inputs | Model Estimation | Model Calibration | Model Validation |
|---|---|---|---|---|---|---|---|
| CBP | County | Annual | N/A | ✓ | ✓ | ✓ | ✓ |
| BEA IO Accounts | National | Annual | N/A | ✓ | ✓ | - | - |
| FAF | FAF Zone | Annual | All Modes | ✓ | ✓ | ✓ | ✓ |
| Transearch | County | Annual | All Modes | ✓ | ✓ | ✓ | ✓ |
| T-100 | Airport | Annual | Air | - | - | ✓ | ✓ |
| VIUS | State | 2002 | Truck | ✓ | ✓ | - | - |
| CFS | CFS Area | Every five years | All Modes | - | ✓ | ✓ | ✓ |
| ATRI | Truck O-D | Daily | Truck | - | - | ✓ | ✓ |

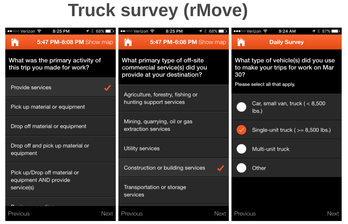
**Supply Chain Behavioral Freight Forecasting Models and Emerging Data Sources**

| Model | Region | Context | Inputs | Data Used for Estimation | Data Used for Calibration/Validation |
|---|---|---|---|---|---|
| Chicago | Chicago Metro | Freight | CBP, CFS | BEA IO, CFS PUM, FAME | CFS, FAME, FAF, VIUS, Counts |
| Florida | State of Florida | Freight | CBP, FAF, InfoGroup | BEA IO, CFS, FAME, Survey | ATRI, T-100, PIERS, WIM, Transearch, FAF, Counts |
| Baltimore/Maryland | Baltimore | Freight and Services | CBP, FAF | BEA IO, FAME, Surveys | ATRI, CFS, FAME, FAF, VIUS, Counts |
| Portland | Portland Metro | Freight and Services | CBP, FAF, USDA | BEA IO, INRIX, EROAD, FAME, Surveys | CFS, FAME, FAF, VIUS, Surveys, Counts |
| Phoenix | Phoenix | Freight and Services | CBP, IMPLAN, FAF, Transearch, CFS | BEA IO, CFS PUM,NETS, ATRI, Streetlight, Survey | FAF, Transearch, NETS, InfoGroup, Counts |
| Oregon | State of Oregon | Integrated Model | USACE, T-100, Waybill | BEA IO, CFS, FAF | FAF, Counts, HERE, Survey, CFS |
| Wisconsin | State of Wisconsin | Freight and Services | CBP, FAF | ATRI, FAME | Transearch, Counts |

**Truck GPS Data Visualization**



**Truck survey (rMove)**




## Publication

FHWA recently published "Behavioral/Agent-Based Supply Chain Modeling Research Synthesis and Guide" report. This report and guide evaluates recent advancements in behavioral freight models and supports the broader application of these methods to forecast future freight flows. Public agencies interested in developing these models can use this synthesis to assess the feasibility and practicality of developing similar models for their own regions based on the experiences of other agencies.