Development of a Method to Forecast Freight Demand Arising from the Final Demand Sector and Examination of Federal Data to Analyze Transportation Demand for Local Area Through Trips

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Introduction

This study had two primary objectives:

1. Create a method & database to forecast freight demand from the household sector.

Understanding distribution networks → Improved freight forecasting → Better infrastructure decisions

2. Provide access to freight flow information for state/local governments through the use the Freight Analysis Framework Version 2 (FAF2) database

Filter data into useable information → Inclusion of freight in local planning → Better infrastructure decisions

Acknowledgments

Funding for this research was provided by the Alabama Department of Transportation Research Project 930-697.

Final Demand Freight Forecasting

1. Identify major distribution centers of finished goods
2. Identify shipping networks for distribution centers
3. Capture size and number of shipments at distribution centers
4. Create methodology to identify destinations for distribution centers
5. Create methodology to project final demand by destinations

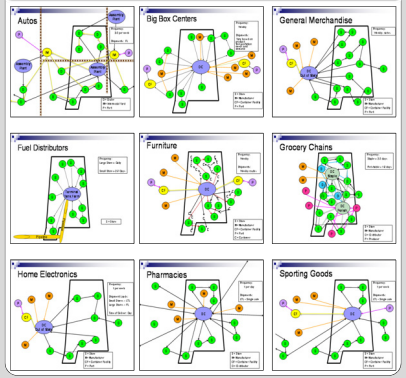
1. Major Distribution Centers

- Autos
- Big Box Supply Stores
- Furniture
- Fuel Distributors
- General Merchandise
- Grocery Chains
- Home Electronics
- Pharmacies
- Parcel Services
- Sporting Goods

Detailed location analysis was conducted on major distribution centers and retail stores :

- Retail & spatial analysis of cities with over 25,000 people
- Detailed site-by-site analysis of locations
- On-site and phone surveys of firm

2. & 3. Shipping Networks



4. Distribution Center Destinations

Eight attributes proved helpful in representing final demand freight:

1. Type of Network
2. Primary Mode Choice
3. Type of Management the Transportation Network
4. Origin of Distribution Center Freight
5. Destination of Final Demand Freight
6. How Freight Shipments are Built
7. Frequency of Shipment Delivery to the Retail Stores

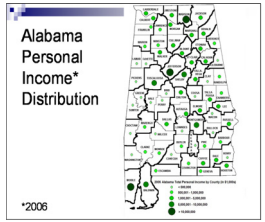
Industry Sector	Network Type	Mode Choice	Management Type	Dist. Ctr. Freight Origin	Freight Destination	Shipment Build	Frequency
Beverage Distributors	Hub	Truck	Manufac.	M,D,CF	Retail Store	Product Group	Weekly
Big Box Centers	Hub	Truck	Own/ Lease	M,D,CF, IM	Retail Store	Product Group	Weekly
Furniture	Hub	Truck	Own/ Lease	M,D,CF	Residence	Geography	Weekly
Fuel Distributors	Hub	Truck	Multi	Terminal	Retail Store	Product Group	1-2 Days
Pharmacies	Hub	Truck	CC, 3PL	M,D	Retail Store	Product Group	Daily
Automobiles	Route	Truck/Rail	Carrier	M,IM	Retail Dealer	Product Group	2-3 Weekly
General Merchandise	Route	Truck	Own/ Lease	M,D,CF	Retail Store	By Store	Weekly
Grocery Chains	Route	Truck	Manufac.	M,D,W	Retail Store	Product Group	1-3 Days
Home Electronics	Route	Truck	Own/ Lease	M,D,CF	Retail Store	By Store	Weekly
Sporting Goods	Route	Truck	Own/ Lease	M,D,CF	Retail Store	By Store	1-2 Weekly
Parcel Services	Route	Truck/Air	Own/ Lease	n/a	Residence	Route	Daily
	M=Manufacturer D=Distributor, CF=Container Facility, IM=Intermodal, W=Warehouse						

5. Final Demand Projection

Three variables were evaluated:

- Population size (too skewed to major cities)
- Population & Personal Income (also skewed to major cities)
- Personal Income only (reasonable)

Alabama data was extracted from FAF2 and allocated to freight zones then from freight zones to counties, based on personal income



Pass-through Freight Modeling

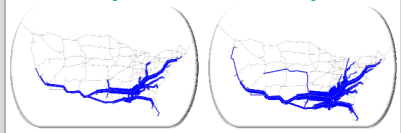
Tools and procedures were developed to use the FAF database to forecast and model pass-through freight:
National → Statewide → local

Extracting the data from FAF2 comprises the following :

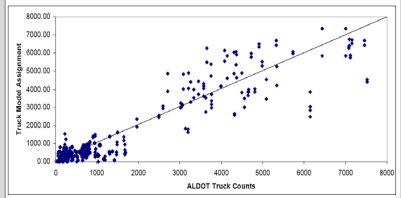
1. Develop a national travel demand network that includes all 114 zones defined by the FAF2 database.
2. Perform a select link analysis technique in a commonly used travel demand model to determine which origin/destination pairs use roadways in the desired study area or state.
3. Extract the relevant data from the FAF2 database based on the O/D pairs obtained in step 2, either in dollar value of shipment or tons shipped.
4. Use the O/D pairs and data in a travel forecasting model to determine external-external trips.

Alabama Pass-Through

Pass through 2010 | Pass through 2035



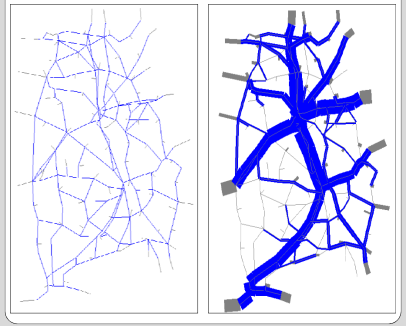
Validation of Model Output to Truck Counts



Local Pass-Through

Personal income was used to disaggregate the statewide value of shipments to Alabama counties.

Statewide Network | 2035 Output Model



Montgomery MPO Case Study

A study was conducted to determine truck traffic through the Montgomery MPO to demonstrate the applicability of the methodology.

	Daily Truck Volumes		
Origin Road	I-65 South of Montgomery	I-65 South of Montgomery	I-65 South of Montgomery
I-65 South of Montgomery	4,900	4,300	500
I-65 North of Montgomery	4,580	6,200	1,540
I-85 North of Montgomery	1,820	300	2,140

Conclusions

- Distribution centers no longer supply only retail stores but also deliver orders directly to the customer.
- The furniture sector appears to be a leader in using this model outside of parcel service companies.
- The methods developed produced reasonable results that can be repeated.
- Personal Income has merit as a predictor of final consumer demand.
- Determining the pass through freight in a local area is vital to the transportation planner since these trips cannot be surveyed using traditional methods.

Future Directions

1. Enhancements to the approach for final demand forecasting
   - A. more localized economic forecasting
   - B. using a larger sample size for industry sectors
   - C. estimating economic impact of economic developments
   - D. better understanding the impact of improved commuter transportation infrastructure on retail shopping behavior
2. The use of pass through data for planning at the MPO level.