8) Using Aggregated Federal Data to Model Freight in a Medium-Size Community

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Poster Summary:

The efficient movement of freight within and through a region is vital to its growth and economic development. Transportation planning involves the development of travel demand models to support a region's infrastructure investment decisions but modeling professionals face limitations in obtaining accurate freight data. This problem originates from issues with gathering and utilizing data that are at the appropriate granularity. Freight data at the local level is considered proprietary and companies are reluctant to share. One approach in overcoming this limitation is to use a non-proprietary, national freight flow database however; the high level of aggregation of the national freight flow data presents challenges for determining freight movements at the sub-state level. The publicly available data has to be supplemented by local information to provide reliable transportation demand forecasts suitable for planning purposes.

Investigating future freight flows requires a deep understanding of the economic and industrial base of a region. For Alabama, this includes major manufacturing industries, agriculture, logging, and mining. Retailing, wholesaling and warehousing activity also creates freight traffic. The base year for the economic database is 2002, the year corresponding to the FAF2 and also when the US Census Bureau surveyed industries for its series of state economic censuses.

Traditionally, freight forecasting models have used employment to generate forecasted freight flows. However this factor does not take into account productivity improvements that allow a company to increase production without increasing employment. Thus, value of sales/shipments is a better predictor of freight activity since it accounts for productivity improvements. In determining freight generated by households or wholesale to retail business, population and employment do not accurately reflect increases in goods/services purchased generated by greater spending power. Growth in personal income was chosen for inclusion in the database as an indication of growth of household consumption and consequently should give a more accurate forecast.

Value of sales data for manufacturing are published in the Census of Manufacturing produced by the U.S. Census Bureau. They are available at the county level but data points are suppressed to protect the privacy of companies if there are very few firms, which was the case in 19 out of the 67 Alabama counties. Estimates were used in this case.

Value of sales for agricultural commodities was estimated from the Census of Agriculture. The US Geological Survey produces the geological survey, and supplemented with data from the Census of Mining, was used to determine value of sales for the mineral industry. Sand and gravel operations are located in almost every county in Alabama and can be found using County Business Patterns from the U.S. Census Bureau. The Alabama Forestry Commission releases data on logs harvested by volume and was used with pricing data from the University of Georgia to determine value of sales for the logging industry. Personal income by county is released annually by the Bureau of Economic Analysis.

The data extracted from the FAF2 provide an estimate of the freight activity in the two Alabama zones and the Port of Mobile for the base year, 2002 and the 2035 forecast year. The compilation of value of sales data in the economic database provides an indication of the level of freight activity in Alabama counties. There are comparability issues between the datasets;

economic data is classified by the North American Industrial Classification System (NAICS) and commodities in the FAF2 database are identified by an abbreviated commodity name based on the 2-digit level of the Standard Classification of Transported Goods (SCTG). Of the 43 2-digit SCTG codes, only 14 have identical counterparts at the 3-digit level of the NAICS classification system. A cross-reference was developed to align the SCTG codes, NAICS codes and FAF2 commodity abbreviations.

The county value of sales data provided the input necessary to determine each county's contribution to the freight generation/attraction aspects of its FAF zone. A county's freight for each SCTG commodity was determined by dividing its value of sales by the total value of sales for all counties in its zone. Once the initial calculations were completed the values were examined to identify any inconsistencies with industrial activity known to exist within the counties. Inconsistencies were resolved with supplemental data from the County Business Patterns, state and local reports, and expert knowledge of the area.

The commodity flows from the FAF2 database for Alabama were apportioned to the 67 counties based on value of sales weight. Flows through the Port of Mobile posed additional challenges as there were questionable freight flow entries. Examination of results of the first iteration with Port personnel revealed several weaknesses in the dataset. Some origin-destination pairs seemed unlikely to use Mobile's port when there are other more convenient gateways available. Some mode choices also seemed unlikely for certain commodities based on preferences known to exist at the Port, as provided by Port personnel. For example, the FAF2 data showed relatively large tonnages of coal transported by truck to and from the Port whereas this commodity is known to travel to the Port mostly by rail and from the Port mostly by water. Adjustments were made in a second iteration to overcome those weaknesses and refine the data.

Examination of the results led to one additional adjustment as there was considerable tonnage of SCTG 41, waste and scrap, imported through the Port of Mobile. This does not refer to garbage but includes iron/steel and precious metal scrap, glass scrap, paper and other recyclables. Waste and scrap flows were combined with SCTG 42 – mixed freight and added to Mobile County's flows to ensure Port traffic was accounted for within the county. The result was a set of matrices with county-level freight origin and destination commodity tonnages for the state of Alabama.

This research has shown that, with the proper adjustment, local economic and industrial data can be employed to allocate freight flows to sub-state regions from the commodity volumes provided by highly-aggregated national databases. This methodology can easily be replicated by other states and metropolitan planning organizations.