Commercial use represents about a third of urban area land-use.

Commercial uses require 1,000-1,500 square feet of land per capita.

The type and distribution of commercial and residential land-use gives each city its unique character.

Travel on the system to move people and freight between residences and establishments gives each city its unique traffic patterns.

Source: Chicago Areas Transportation Study, 1956
Commercial sites attract freight and truck trips

Percent of Cargo by Type by Land-use at Destination

Source: North Carolina Commercial Vehicle Survey, author’s analysis
But delivery of services is a large (and growing) portion of urban VMT

Proportion of Urban VMT by Commercial Vehicles

Source: “Accounting for Commercial Vehicles in Urban Transportation Models”, FHWA, 2004
Commercial sites also attract person trips

Source: Averages from DFW, ARC, Cleveland and Pittsburgh Establishment Surveys, Author’s analysis
A LOT of person trips

Number of Employees by Type and Vehicle Trips Generated--Atlanta, GA

Source: ARC Establishment Survey, author’s analysis
Shopping and errands are half of all trips; and increase non-home-based travel

PMT and VMT for shopping has doubled since 1983

Source: NHTS data series
But internet shopping may be changing the vehicle type, time, and destinations of “freight” delivery.
How do we use Employment Data?

- TAZ to TAZ Worker "Flows"
- Balancing Productions and Attractions
- Non-Home Based Trip Estimation
- Commercial Vehicle Travel
- Site Analysis
- Economic Forecasts for Future Scenarios
- Daytime Populations for Security Planning
Commercial Vehicle Activity

- Background data: Commercial business lists
- Economic activity location and clustering
- Commercial vehicle activity visualized as part of the vehicle mix on the roadway (Nathan)
- Potential to understand the effect of vehicle mixing: system use, safety, congestion, design implications, etc.
Worker “Flows”

- Background data: Census JTW workplace location
- Potential ‘flows’ between home and work (HBW)
- Trip length frequency distribution
- Time of day, usual mode, etc.

Source: JTW in the Context of Daily Travel, McGuckin and Srinivasan

Legend

<table>
<thead>
<tr>
<th>Census (CTPP) Flows</th>
<th>31 - 200</th>
<th>201 - 400</th>
<th>401 - 600</th>
<th>601 - 800</th>
<th>801 - 1800</th>
</tr>
</thead>
<tbody>
<tr>
<td>F0</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

Major CTPP Tract Journey to Work Flows
Site Analysis
Traffic Impact Studies

- Background data: ITE Trip Generation Rates
- How many vehicles/trips will be added to the mix when a new development is built?
- How many parking spaces will be required for employees and visitors?
- Will special traffic facilities (right turn lanes, signalized intersections) be required to help the flow of traffic around the site?
ITE Trip Generation Rates by Employment Type

Vehicle Trips Attracted by Land-use

Vehicle Trips per Employee

- Supermarket
- Convenience store
- Fast Food w/ Drive Thru
- Fast Food w/o Drive Thru
- Day Care Center
- General Hospital
- Large Office
- Warehouse
- General Light Industry
Non-Home Based (NHB) Trips

- Background data: Attraction survey (sample from commercial business list)
  - Employee, visitor, and commercial trips by purpose, time of day, mode, auto occupancy
  - Employer TDM measures
  - Parking usage and cost
  - Transit accessibility
  - Special generators

![Auto Occupancy for Fast Food Restaurants](chart.png)
Balancing Productions and Attractions

- Trips are ‘produced’ at residences and ‘attracted’ to commercial sites
- Travel demand is a function of the amount, location, and intensity of activity (commercial/gov’t/recreation) in a region
- Measured as land-use by type (including sales, employment, square foot of development, and other measures of amount)
- Ideally, trips generated on the network are balanced against attractions
Estimating Daytime Populations

Number of workers at work, visitors, people in motion and people at home

2:00 pm Tuesday

Memphis, TN
Socio-economic forecasts: Where will people live and work in the future? (for future scenario planning)

- Background data: Number of workers by industry type by State/region
- Assigned to land-use inventory locally based on land requirements
- Combined with pipeline development and developable land in local areas
- Most MPOs are responsible for assigning SE data to TAZ (Spielberg’s work)
Which features are most in need of improvement?

27% of all MPOs stated that land use forecasting was the feature of their model that was most in need of improvement.

<table>
<thead>
<tr>
<th>Response</th>
<th>All</th>
<th>Large</th>
<th>Medium</th>
<th>Small</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. LU Forecasting</td>
<td>38</td>
<td>4</td>
<td>12</td>
<td>22</td>
</tr>
<tr>
<td>2. Lack of Detail/Quality in Mode Choice Model</td>
<td>30</td>
<td>5</td>
<td>16</td>
<td>9</td>
</tr>
<tr>
<td>3. Trip Generation</td>
<td>24</td>
<td>3</td>
<td>10</td>
<td>11</td>
</tr>
<tr>
<td>4. Lack of Time of Day</td>
<td>15</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>5. Lack of Travel Survey Data</td>
<td>14</td>
<td>4</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>6. Lack of Recent Quality Calibration</td>
<td>12</td>
<td>5</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>7. Lack of Toll/HOT Lane Modeling</td>
<td>11</td>
<td>3</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>8. Lack of Commercial/Truck Vehicle/Freight Modeling</td>
<td>9</td>
<td>3</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>9. No Mode Choice Model</td>
<td>9</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>10. Lack of Tour Based/Activity Based Model</td>
<td>8</td>
<td>5</td>
<td>2</td>
<td>1</td>
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<tr>
<td>Other</td>
<td>66</td>
<td>21</td>
<td>22</td>
<td>23</td>
</tr>
</tbody>
</table>

Frank Spielberg & Phil Shapiro  
Metropolitan Planning Organization  
Travel Forecasting: State of the Practice  
Transportation Research Board Committee B0090
Forecast Requirements
FHWA Certification Checklist for Travel Demand Forecasting Models

**Population change** - Population assumptions should be compared to past trends, and to statewide demographic control totals.

**Employment change** - expected change in regional employment over the duration of the Transportation Plan. Employment assumptions should be compared to past trends, and to statewide economic growth control totals.

**Regional distribution** of future population, employment and land use - Are the land use forecasts consistent with local jurisdictions' Master Plans? If land use models were employed, these should also be documented under forecasting methods.

**Demographic changes** - Demographic changes might include, auto ownership, household income, household size, multi-worker households, minority households, etc.

**Travel behavior changes** - Travel behavior changes might include telecommuting, Internet shopping, trip chaining, etc.
Some Challenges
Which source is the “best” estimate?

<table>
<thead>
<tr>
<th>Data Source</th>
<th>Employment in thousands</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPS - April 2000</td>
<td>137,264</td>
</tr>
<tr>
<td>CES - April 2000</td>
<td>131,677</td>
</tr>
<tr>
<td>Census 2000 (April 2000)</td>
<td>129,722</td>
</tr>
<tr>
<td>CTPP 2000</td>
<td>128,279</td>
</tr>
</tbody>
</table>

CAVEATS: CTPP Workers are different from C2000 Employment

http://www.fhwa.dot.gov/ctpp/pt2compare.htm

C2000 Employment is different from CPS data


Source: Nanda Srinivasan, CS
What differences appear between NAICS and SIC?

<table>
<thead>
<tr>
<th>Montgomery County, MD</th>
<th>Retail Trade</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NAICS</td>
</tr>
<tr>
<td>Total Employment</td>
<td>49,723</td>
</tr>
<tr>
<td>Net Job Flows</td>
<td>426</td>
</tr>
<tr>
<td>Job Creation</td>
<td>3,106</td>
</tr>
<tr>
<td>New Hires</td>
<td>10,839</td>
</tr>
<tr>
<td>Separations</td>
<td>12,574</td>
</tr>
<tr>
<td>Turnover</td>
<td>12.70%</td>
</tr>
<tr>
<td>Avg Monthly Earnings</td>
<td>$2,575.00</td>
</tr>
<tr>
<td>Avg New Hire Earnings</td>
<td>$1,612.00</td>
</tr>
</tbody>
</table>

For correspondence between NAICS and SIC, please visit:
http://www.census.gov/epcd/www/naicstab.htm

Source: Nanda Srinivasan, CS
How does seasonality affect employment estimates?

Graph showing employment in Broward County, Florida, across quarters 1 to 4, with data sources ACS - 3-year Average 1999-2001 and LEHD - ES-2020 data for 2001.

Source: Nanda Srinivasan, CS
Land-use/Employment is important

- Understanding the economics of the area
- Tracking commercial vehicle travel
- Tracking changes in non-work travel
- Site analysis
- Worker ‘flows’
- Non-home-based trips
- Balancing productions and attraction
- Estimating daytime populations
- Forecasting future travel
Thank You!

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