A Brief Introduction to the LUSTRE Model

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A Work in Transit
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LUTI Literature Overview

- DRAM/EMPAL
- TRANUS & MEPLAN
- Urban Futures Model
- MUSSA
- UrbanSim
- New approaches: dynamics; agent-based; activity-based
LUTI Agenda

“When there has been some progress in linking together aggregate transportation models with aggregate spatial-interaction or spatial-input-output models of land use, no disaggregate framework has yet been developed that explain land use and travel behavior in an integrated way”

Paul Waddell. “Towards Behavioral Integration of Land Use and Transportation Modeling”. In Travel Behavior Research – The leading edge, p.65
What is LUSTRE?
Theoretical Foundations

- Spatially Distributed Households
- Spatially Disaggregated Transportation Sector
- Industry Modeling
- General equilibrium and “closed” model
- Various taxes
Why is LUSTRE Unique?

- Consistent spatial disaggregation
- Non-monocentricity
- Agent heterogeneity
- Unemployment
- Frictions
  - Income and real estate taxes
  - Congestible alternative modes
RELU Model Features

- Spatially disaggregated general equilibrium model of economic activity without predetermined location of residents and firms
- Some extras
  - 4 income classes
  - Employed and unemployed
  - Explicit modeling of housing
  - Developers’ and landlords’ decisions
  - Income and property taxes
Individuals
Discrete Choices:
- Choice of Work Status
- Choice of Work Location
- Choice of Residence
Continuous Choices:
- Housing Consumption
- Retail Goods & Services

Producers
Retail
Agriculture
Manufacturing
Services

Developers

Landlords

Rent
Rent
Rent
Rent

I/O* Freight
I/O*

Dividend

Labor Supply/Wage

Price

Labor
Capital

Rent

Stock
Washington-START Model

- Transportation simulation model
- Developed by RFF researchers using START modeling suite
- Designed for quick policy analysis
- Evaluation of policies using a consistent economic framework
- Not politically constrained
- Calibrated for Washington, DC metro area
Washington-START Model

**Supply-Side Module**
Route Network, Rail Systems, Bus System & Parking Facilities

Generalized Costs of Travel

**Demand-Side Module**
Logit Tree:
Purpose-Origin (exogenous)
Trip Generation

Destination

Mode

Time

Route
**LUSTRE Model Overview**

*LUSTRE*

**START**

Supply-Side Module
- Route Network
- Rail Systems
- Bus System
- Parking Facilities

Demand-Side Module
- Logit Tree: Purpose/Origin (given)
- Trip Generation
  - Destination
  - Mode
  - Time
  - Route

**RELU**

Individuals
- Discrete Choices:
  - Choice of Work Status
  - Choice of Work Location
  - Choice of Residence
- Continuous Choices:
  - Housing Consumption
  - Retail Goods & Services

Producers
- Retail
- Agriculture
- Manufacturing
- Business Services
- Constr/Demo
- Labor
- I/O*
- Rent
- Capital
- Space

Developers
- Stock
- Rent

Landlords
- Rent

* Generalized Costs of Travel
* Intermediate demand for finished goods and services, also referred as Input/Output (I/O) tables.
Data Sources

- 2000 Census
  - SF1A & SF3A
  - CTPP
- BEA production data
- Consumer Expenditure Survey
- MWCOG transportation data
- Land use data
What is LUSTRE good at?

- “Fast” Policy Analysis
- Welfare and Distributional Implications
- Uncovering Unintended Consequences
What have we used it for?

- Evaluation of selected congestion pricing schemes
- Application to urban energy consumption
- Application to emissions
- Selected infill policies
- Intercounty connector
Future Development Plans

- Add dynamics
- Household decision-making process
- Vehicle choice
- Extensions to incorporate other critical elements of urban spatial structure (e.g. schools)
Future Application Plans

• Calibrate for another city
• Specific pricing policies of interest to policy-makers
• Specific land use policies of interest to policy-makers
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