H2 Where Are You?

Spatially Viewing the Distribution of Passenger Vehicles in Maine

Presented By: Gregory Gould

December 9, 2004

University of Maine / Department of Resource Economics and Policy

The Project

- View the spatial distribution of different classes of passenger vehicles in Maine
  - No evidence in the literature that this has been done before anywhere in the US
- Analyze apparent trends and use a model to help explain significant factors involved

Americans and Their Cars

- 23% of the cars on Earth are in the US!
- Average distance driven in a year:
  - 1975 = 11,900 miles
  - 2000 = 17,000 miles
- Trucks and SUVs account for:
  - 14% of US Cars in 1975
  - 32% of US Cars in 2000
  - 50.5% of New US Cars in 2001
- US Passenger Vehicles account for:
  - 40% of US Petroleum use
  - 62% of transport CO_2 emissions
  - 20% of total US green house gas emissions

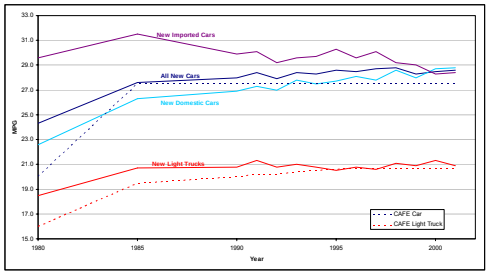
Data from US-DOT Transportation Statistics Annual Report 2004
& National Research Council/Transportation Research Board

Motivation for Research

Current Policies Do Not Do Enough!

- Trends in the US
  - Americans are driving further then ever
  - Consumers are buying more trucks and SUVs
  - Little improvement in average fuel economy in the past 15 years
- Energy & Environment
  - Increasing evidence of global warming
  - US dependant on foreign (& finite) petroleum sources
  - Pressure to drill in sensitive ecological reserves
    - Artic National Wildlife Refuge
    - Federal Lands Surrounding National Parks

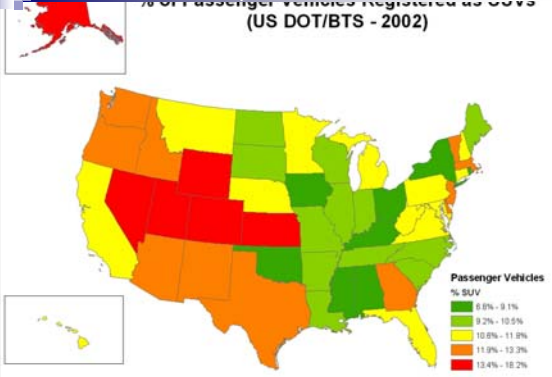
US New Car Fuel Economy



Data from US Dept of Transportation

How a Spatial View Can Help

- View the spatial effects of current and future polices
- View neighborhood effects and clustering phenomena of certain types of vehicles
- Create policies that target areas with the highest proportions of undesirable vehicles
- Help create a model to forecast consumer's future vehicle choice by taking into account spatial variables



Data Sources

- 2003/04 Maine Vehicle Registrations
  - Make, Model, Body, Year, Address, VIN#
- State Transportation Profile – US DOT
  - US passenger vehicles by state
- US Census
  - Population Density, Median Household Income
- Maine Office of GIS – Shape Files
  - Towns, Census Blocks, Contours, E911 Roads

Methods

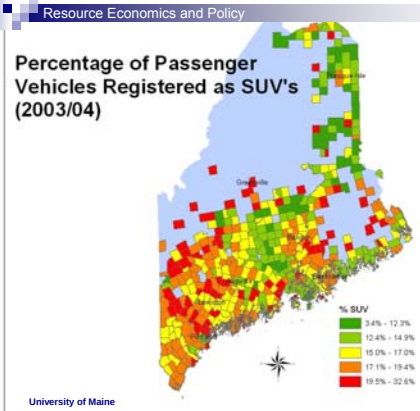
For Town Level Data

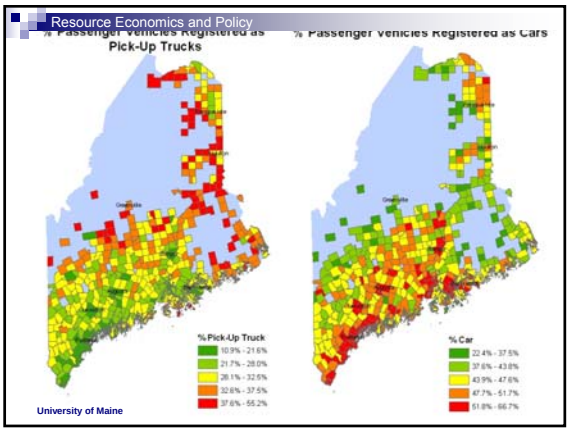
- Code Registration Data as SUV, Truck, Car or Van
- Aggregate Registration Data by Town
- Join Registration data in ArcMap
  - Town Shape files
  - US Census Data
- Export Joined Data for Modeling in Systat

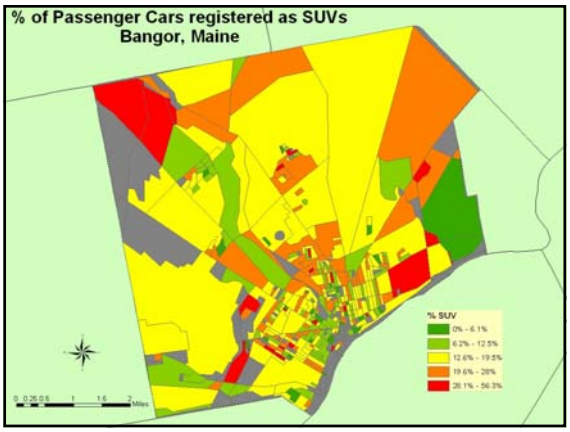
Methods

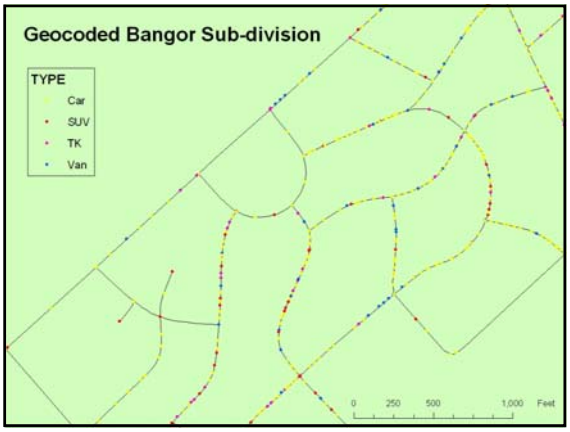
For Street Level Data

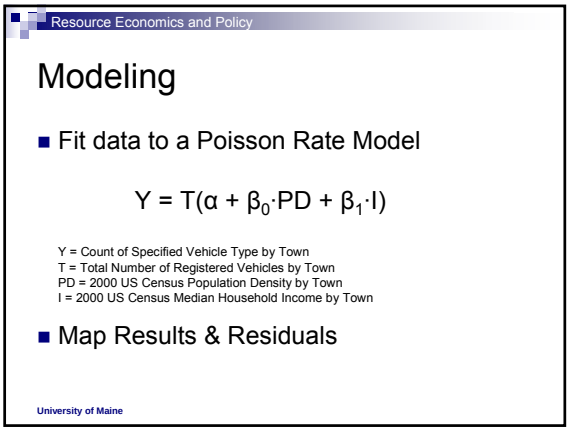
- Code data as previously described
- Add Registration data and E911 Roads Data to ArcMap
- Use ArcMap geocoding service to assign registration addresses to point locations based on E911 data
- Aggregate point locations into census blocks with a spatial join.

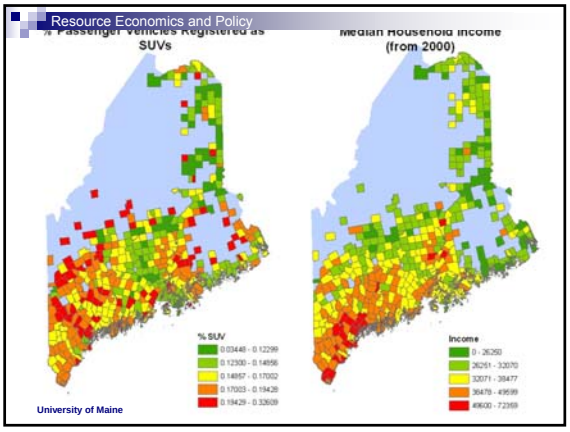


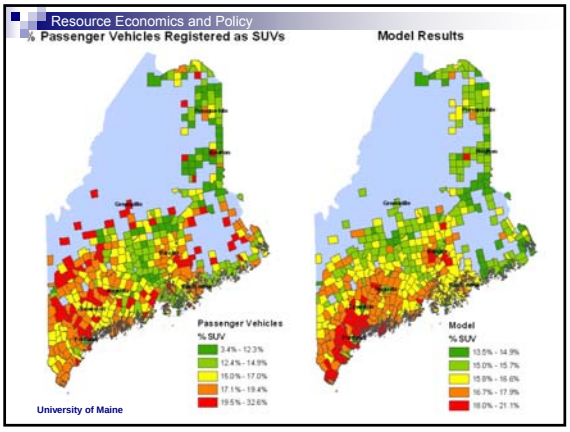

Resource Economics and Policy
% Passenger Vehicles Registered as Pick-Up Trucks
% Passenger Vehicles Registered as Cars
% Pick-Up Truck
10.9% - 21.6%
21.7% - 28.0%
28.1% - 32.5%
32.6% - 37.5%
37.6% - 55.2%
% Car
22.4% - 37.5%
37.6% - 43.8%
43.9% - 47.6%
47.7% - 51.7%
51.8% - 66.7%
University of Maine

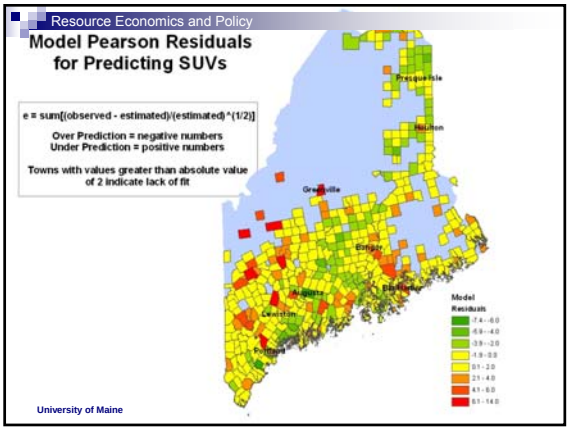

% of Passenger Cars registered as SUVs
Bangor, Maine
% SUV
0% - 6.1%
6.2% - 12.5%
12.6% - 19.5%
19.6% - 28%
28.1% - 56.3%


Geocoded Bangor Sub-division
TYPE
Car
SUV
TK
Van
0 250 500 1,000 Feet


Resource Economics and Policy
Modeling
Fit data to a Poisson Rate Model
$Y = T(\alpha + \beta_0 \cdot PD + \beta_1 \cdot I)$
Y = Count of Specified Vehicle Type by Town
T = Total Number of Registered Vehicles by Town
PD = 2000 US Census Population Density by Town
I = 2000 US Census Median Household Income by Town
Map Results & Residuals
University of Maine


Resource Economics and Policy
% Passenger Vehicles Registered as SUVs
Median Household Income (from 2000)
% SUV
Income
University of Maine


Resource Economics and Policy
% Passenger Vehicles Registered as SUVs
Model Results
Passenger Vehicles
% SUV
3.4% - 12.3%
12.4% - 14.9%
15.0% - 17.0%
17.1% - 19.4%
19.5% - 32.6%
Model
% SUV
13.5% - 14.9%
15.0% - 15.7%
15.8% - 16.6%
16.7% - 17.9%
18.0% - 21.1%
University of Maine



Conclusions

- Town level data
  - Provides evidence that the distribution of vehicle classes is not homogeneous across the state
  - Spatial patterns are apparent and seem to relate to…
    - Urban/Rural Areas
    - Income levels
  - Model provides some quantification of the effects of population density and income
    - Residuals show areas were additional factors need to be considered
- Street level data
  - Provides some visual evidence of neighborhood clustering of vehicle classes

What's Next…

- Quantify the spatial relationships
- Geocode more neighborhoods
  - Look at clustering of specific makes and models
  - Quantify clustering effects/spatial statistics
  - Include household level demographics
- Using Geocoded data, map emissions and fuel usage
- Map the potential results of new transportation policies
  - Use a more robust form of the model presented