Conspicuous Consumption: Geospatial Trends in Vehicle Choice

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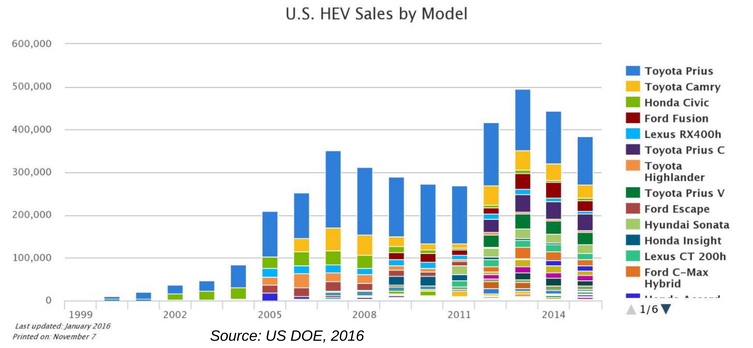
Vehicle Ownership in the US

- 17.47 million vehicles sold in 2015 in the US (AutoData Corp, 2016)
- Roughly 3% of these sales were of hybrid electric vehicles (DOE, 2016)

Characteristics of HEVs

- Limited number of makes and models available compared to traditional internal combustion engine (ICE) vehicles
- Typically more expensive than comparable models of ICE vehicles

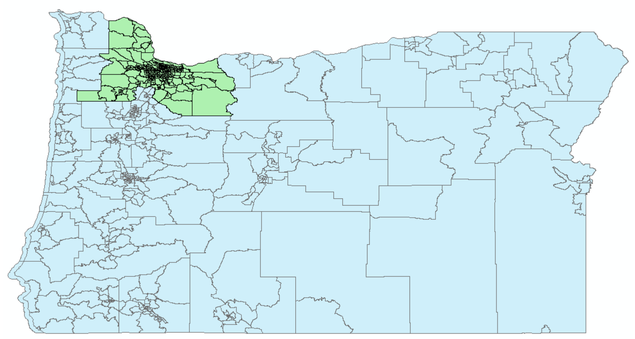


Source: US DOE, 2016

Motivation and Research Question

- Theory of Conspicuous Consumption says consumers purchase expensive items to demonstrate wealth or power rather than cover their real needs
- Consumers do this to maintain/gain social status, which causes others to emulate their behavior to maintain their respective social statuses
- **Do people who own HEVs do so because of unobserved personal preferences or because their peers also own hybrids (e.g., keeping up with the Jones's)?**

Portland MSA, Oregon



- 380 census block groups in 2015
- Population 2.3 Million with 1.7 million vehicles registered (2015)

Data

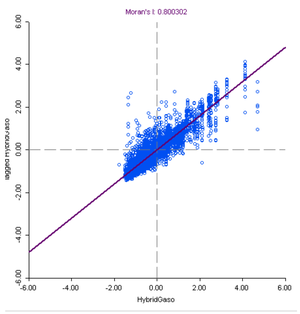
- Oregon Department of Environmental Quality and Division of Motor Vehicles data included all registered vehicles in Portland Metro area at the census tract level
  - 940,430 vehicles with fuel types listed
  - 29,238 of those were electric/HEVs
- US Census American Communities Survey provided household demographics information at the census tract level
- Calculated percentage of HEVs per census tract (dependent variable)

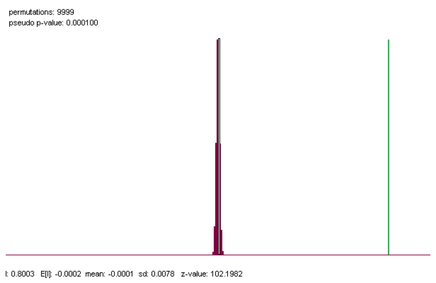
Summary Statistics of Selected Variables

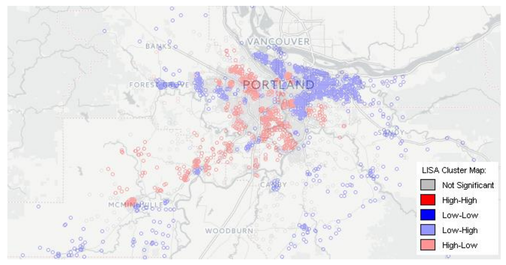
Variable	Average	Std. Dev
Proportion of HEVs	11%	0.3
Rode the bus to work/school	21.2%	0.5
HH Size	2.5	1.3
Number of bikes per HH	1.7	6.2
Income	$84,736.30	$52,325.60
Number of students	0.6	1.0
Number of licensed drivers	1.9	0.7
Age of HH Head	57.4	14.9
Number of HH Vehicles	2.0	1.0
Number of HH Workers	1.5	0.8
HH Daily VMT	40.8	45.7

Methodology

- OLS Regression to establish baseline using variables from above
- Test for need of spatially-explicit model using Moran's I
- Sparse Spatial Weights Matrix based on Rook Method
- Use Robust Lagrange Multiplier Tests to determine correct specification







Test Results

Test	MI/DF	Value	Prob
Robust LM (lag)	1	248.83	0.0000
Robust LM (error)	1	7.4495	0.0064

Regression Results

	OLS		Spatial Lag	
	Estimate	Std.Err	Estimate	Std.Err
Constant	-2097.49	856.967**	-241.757	387.681
RIBUS	4.104	1.308**	0.616	0.592
HHSIZ	2.935	1.203**	-0.006	0.544
BIKES	0.213	0.101**	0.087	0.046*
INCOME	0.055	0.026**	0.015	0.012
HHSTU	4.406	1.237**	0.593	0.559
HHLIC	3.919	1.510**	-0.571	0.683
HOHH	3.375	1.092**	0.877	0.494*
HHVEH	1.907	0.786**	0.640	0.355*
HHWRK	1.983	1.022*	0.684	0.462
HTRIPS	0.020	0.114	-0.008	0.052
W_HEV	--	--	0.920	0.006**
rho	--	--	0.920	0.006**
R^2	0.141		0.824	
AIC	55401.3		48287.3	

*Signif. Codes: 0.05 '**' 0.1 '*'*

- Spatial lag model is better fit based on AIC and R2 statistics
- W_HEV, the spatial lag term is statistically significant and positive, indicating that to some extent the decision to own an HEV is due to the influence of their neighbors
- HHWRK, HHSTU, and HTRIPS is not significant, further supporting conspicuous consumption theory (i.e., owning HEV doesn't necessarily cover real need of transportation)
- Number of bikes owned, age of household head, and number of household vehicles weakly significant

Further Work

- Control for heteroscedasticity; Jarque-Bera test suggest its present
- Incorporate new version of National Household Travel Survey data to better account for household travel preferences to see if travel behavior is also subject to "peer pressure" or conspicuous consumption