Household **Energy Use & Travel**: Opportunities for Behavioral Change

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Survey Design & Distribution

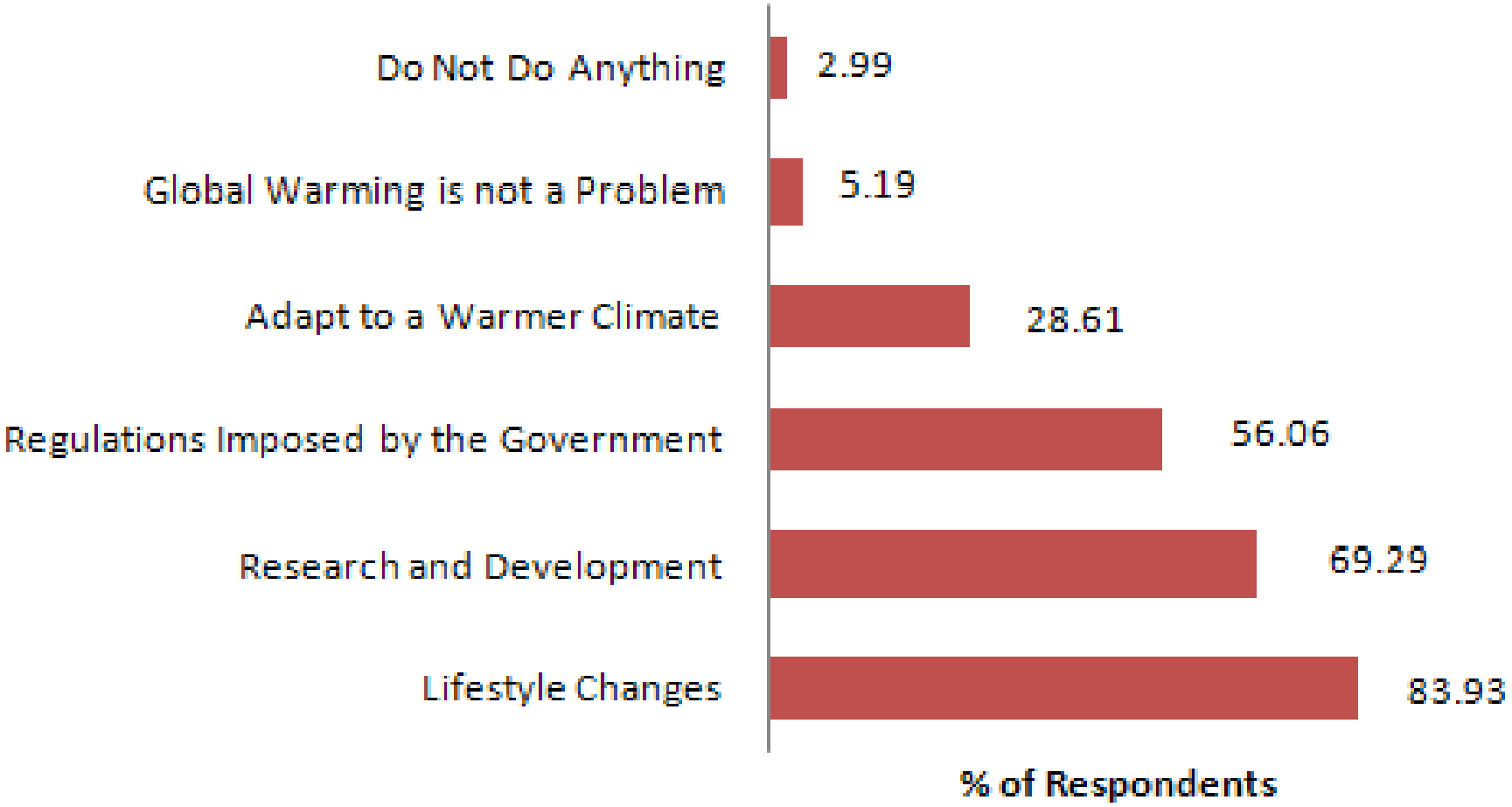
Hard copy & Online versions

Five sections: Travel Choices, Vehicle Ownership, Home Design & Energy Use, Energy Policy Opinions, & Demographic Attributes

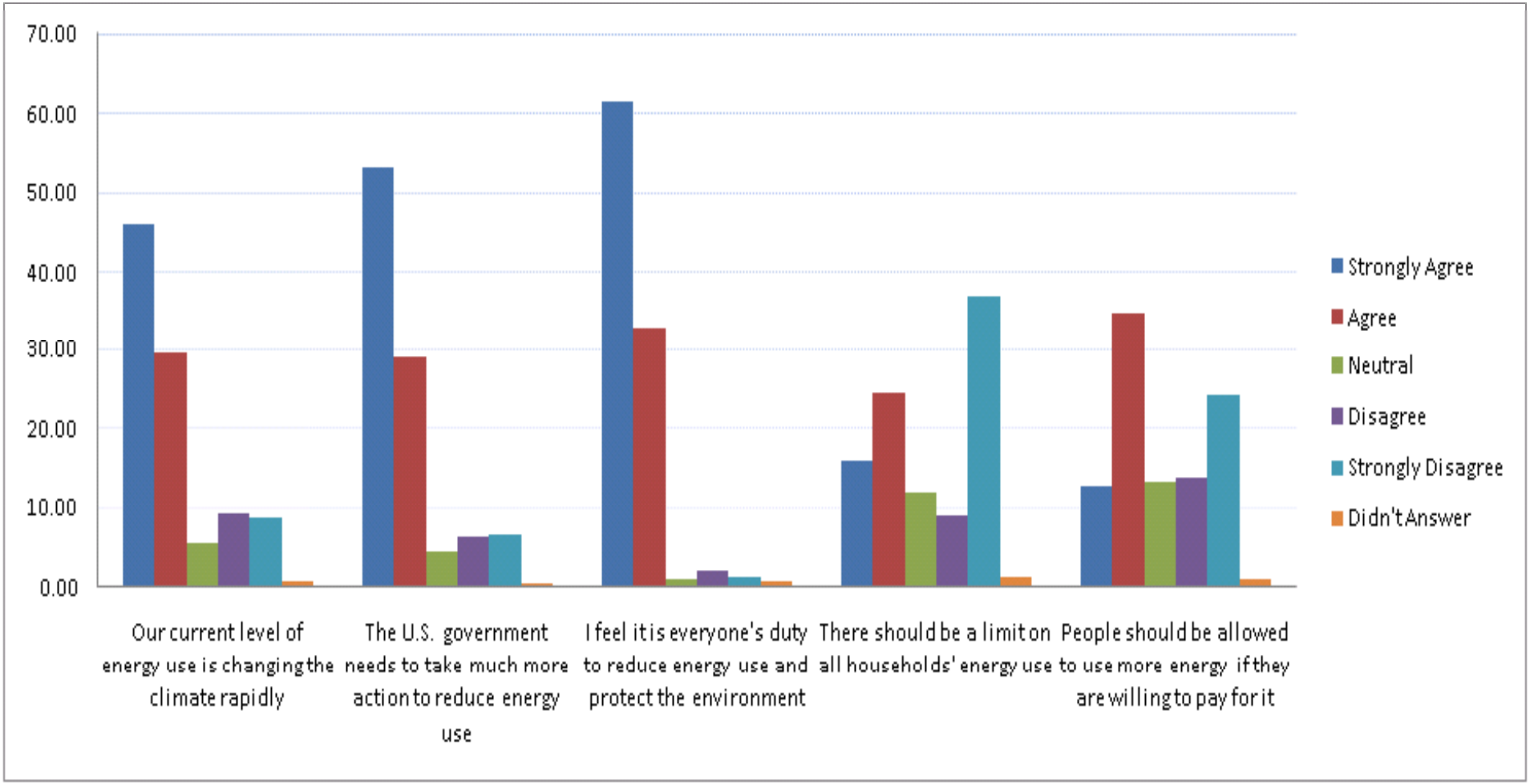
Distribution: Central Grocery, Flyers & URL Cards, Community Newsletters & Websites, Web Links via Transit Authority & City Sites

Sample Attributes vs. Austin PUMS: Workers under-rep'd & students over-rep'd → **Sample corrected** via **weights** across income, gender, age, hhsize, & worker & student status, status

What Should We Do
about Climate Change?



Where Do We Stand
on Energy Policy?



Other Meaningful Findings

- **Policy of adaptation** (to climate change) more often preferred by workers & households owning many vehicles.
- **Regulation of energy use** more often preferred by women & homeowners.
- **Caps on household energy use** preferred to taxes.
- **Long-term behavioral changes** are difficult to implement.
- Most agree that climate change is a concern, but are **unwilling to change their own behavior**.
- Increasing **income** & **education** levels lead to greater (stated) concern about one's impact on the environment.

Conclusions

- A household's **average fuel economy** falls with longer annual driving distances.
- **Fuel efficiency** of the fleet increases as education level rises.
- **Yearly VMT** per person rise as per mile added driving distance (from home) to the CBD.
- **Home size** and **electricity usage** increase as income and household size increases.
- Average **electricity consumption** can be reduced by moving into newer, smaller homes.

Thank You for your kind attention.

Questions & Suggestions?

Paper available at

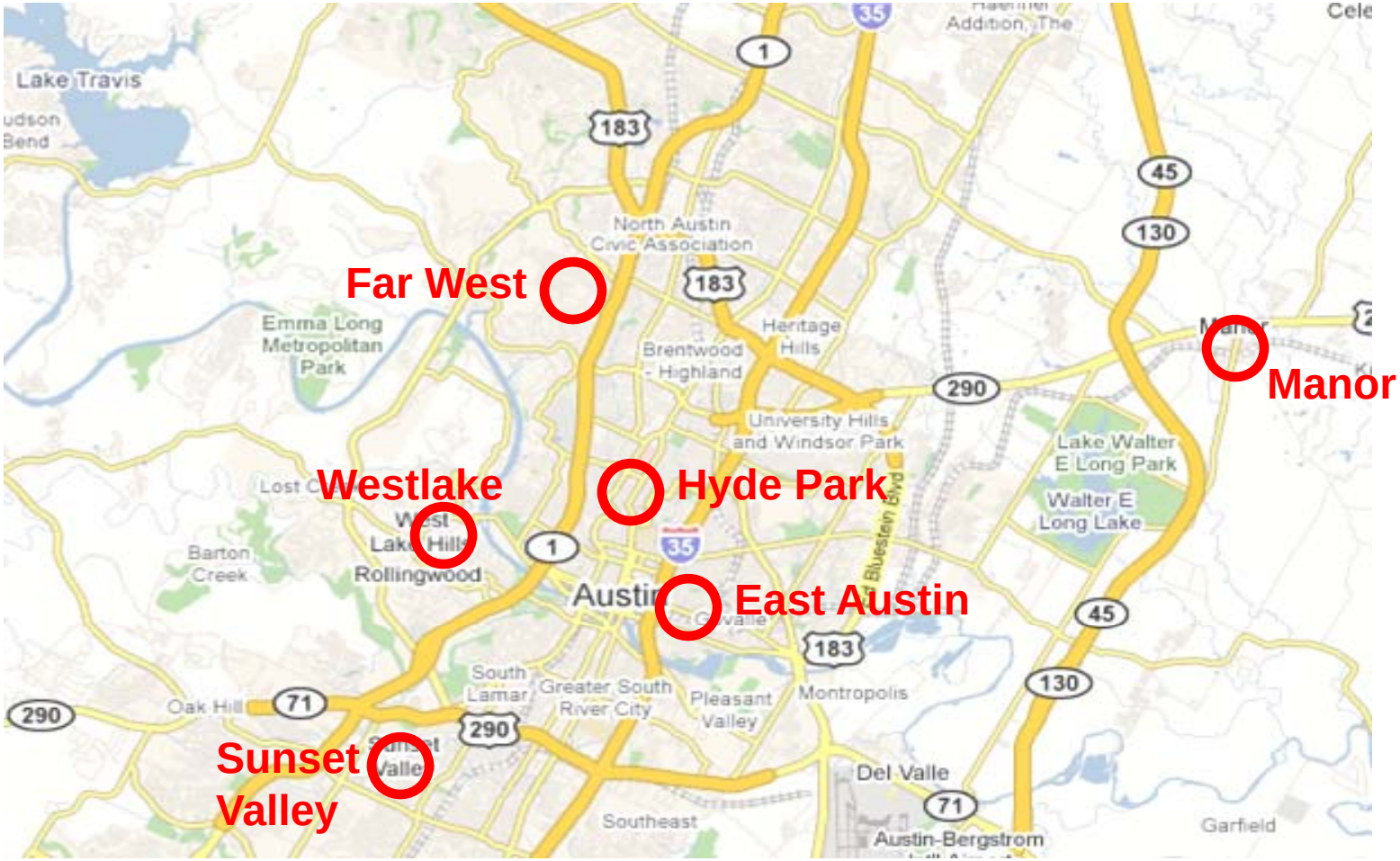
www.ce.utexas.edu/prof/kockelman

Sample vs. Austin PUMS

- Workers under-represented & students over-represented

Variables	Sample	Austin
Female	49.6%	50.4%
Age 45+	37.5%	38.7%
High income households	46.6%	39.5%
Employed	37%	70.3%
Students	82%	13%

Survey Distribution



Data Weighting

- Sample was compared PUMS.
- Six control attributes $\rightarrow$ 720 categories
  - **Gender** (male, female)
  - **Student status** (student, non-student)
  - **Worker status** (worker, non-worker)
  - **Age** (18-24, 25-34, 35-44, 45-54, 55-64, 65+)
  - **Household size** (1, 2, 3, 4, 5+)
  - **Income** (<$30k, $30k-$75k, >$75k)
- Categories with few observations combined.

Average Household Fuel Economy & Annual VMT per Person (WLS)

	Household Average Fuel Economy			Annual VMT per Person		
Independent Variables	**Coefficient**	**T-statistic**	**Mean Elasticity**	**Coefficient**	**T-statistic**	**Mean Elasticity**
Constant	17.907	44.92	-	5903	5.30	-
Age of respondent	-0.0069	-1.15	-0.0203	25.46	1.46	0.127
Female indicator	1.135	5.97	0.0382	-	-	-
College educated (has attained Bachelor's degree or higher)	0.7312	3.50	0.0055	-1437	-2.67	-0.135
Income of household	-3.70E-06	-1.96	-0.0159			
Income per person	-	-	-	0.0203	1.77	0.099
Number of adults	0.1219	2.21	0.0182	-	-	-
Number of Children	-	-	-	-1385	-5.48	-0.071
Presence of children x Urban indicator	-1.277	-4.04	-0.0050			
Rural indicator	-0.6004	-1.69	-0.0064			
Distance to CBD	-0.7558	-2.53	-0.3060	314.4	5.42	0.231
Number of transit stops in a TAZ	-	-	-	-16.34	-2.18	-0.054
Population density of zone if more than 6 miles from CBD	-	-	-	-209.49	-1.68	-0.023
Population density	-	-	-	124.6	1.71	0.069
R^2	0.1272			0.1289		
Adjusted R^2	0.1165			0.1191		
Number of observations	661			601		

Home Size & Monthly kWh (OLS)

	Square Footage of Home (SF)			Monthly Electricity (kWh)		
Independent Variables	**Coefficient**	**T-statistic**	**Mean Elasticity**	**Coefficient**	**T-statistic**	**Mean Elasticity**
Constant	1006	8.28	-	701.9	4.15	-
Household size	44.16	1.55	0.0669	77.30	2.95	0.1109
Worker status	143.1	1.80	0.0316	-	-	-
Income of household ($1,000)	3.9E-03	6.39	0.1897	1.164E-03	1.13	0.0540
College-educated	-221.8	-3.72	-0.097	-	-	-
Age of home	-9.09	-5.77	-0.1754	2.70	1.05	0.0491
Own home	424.5	5.41	0.1654	-186.7	-1.42	-0.0688
Number of vehicles	222.7	5.28	0.1946	-	-	-
Number of adults	65.15	1.98	0.0849	-	-	-
Job density	-1.718	-1.83	-0.0077	-	-	-
Population density	-21.19	-2.94	-0.0544	-25.05	-0.98	-0.0608
Two- & three-story detached home indicator	-	-	-	355.2	3.26	0.05
Home size	-	-	-	0.4918	6.46	0.4687
R^2	0.3646			0.1958		
Adjusted R^2	0.3542			0.1844		

Opinions on Climate Change
(Binary Probit)

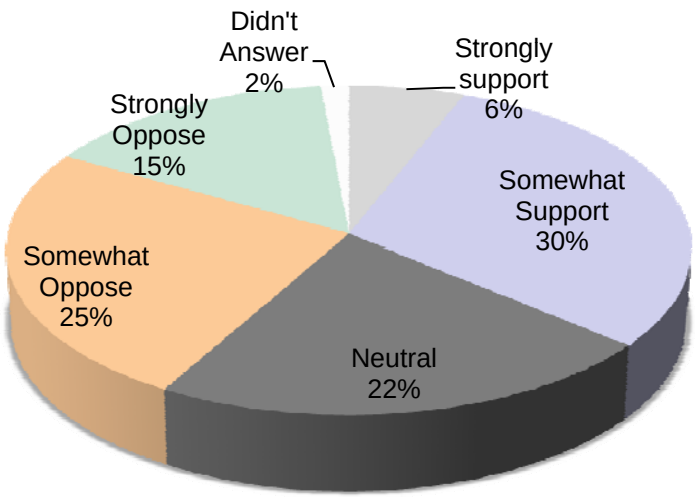
	Adapt to a Warmer Climate			Regulations Should be Imposed		
Explanatory Variables	**Coefficient**	**T-statistic**	**Mean elasticity for agreement**	**Coefficient**	**T-statistic**	**Mean elasticity for agreement**
Constant	-1.842	-5.30	-	0.9243	3.43	-
Age of respondent	-	-	-	-0.1468	-3.63	-0.9650
Female indicator	-0.5626	-5.26	-0.9414	0.2725	2.73	1.3418
Worker status	0.2709	1.92	0.1378	-0.3179	-2.11	-0.7459
Number of vehicles owned by household	0.3563	4.33	0.8934	-0.1085	-1.42	-0.0752
Income per person (total income/household size)	-	-	-	4.20E-06	1.79	0.0946
Square footage of home	-3.47E-04	-4.34	-1.036	-2.03E-04	-3.18	0.4580
Own home	0.4909	3.30	0.3876	0.2267	1.70	0.0959
Distance to CBD	-0.0293	-2.48	-0.3244	-0.0236	-2.23	-1.457
Household density (households per acre in TAZ)	0.1097	3.25	0.3379	0.1095	3.20	0.8541
Median income of zone	8.48E-06	5.37	0.6724	-	-	-
Log Likelihood at Convergence	-383.9			-449.9		
Pseudo R^2	0.1267			0.0895		

Energy Reduction Strategies
(Bivariate Ordered Probit)

	Cap on Maximum Energy Use		Taxing all Energy Use	
Explanatory Variables	**Coefficient**	**T-statistic**	**Coefficient**	**T-statistic**
Number of vehicles owned by household	-0.1174	-2.37	0.0772	1.39
Age of respondent	-	-	0.2137	7.14
Female	0.1739	2.36	-0.1587	-2.11
Worker status	-	-	0.2591	2.38
Income per person (total income/household size)	-3.47E-06	-2.13	-	-
Household size	0.0338	1.74	-0.0319	-1.54
Own home	-	-	-0.2032	-2.02
Age of home	-3.52E-03	-1.84	-6.13E-03	-2.99
Square footage of home	-	-	2.39E-04	4.64
Threshold 1	-1.786	-12.49	-0.1828	0.97
Threshold 2	-0.5681	-4.30	0.9261	4.89
Threshold 3	0.0223	0.17	1.352	7.07
Threshold 4	0.8272	6.23	2.122	10.78
Log Likelihood at Convergence	-2430			
Log Likelihood at Constants	-2467			
Covariance across equations' residuals	0.1792	4.63	-	
Adjusted LRI	0.02067			

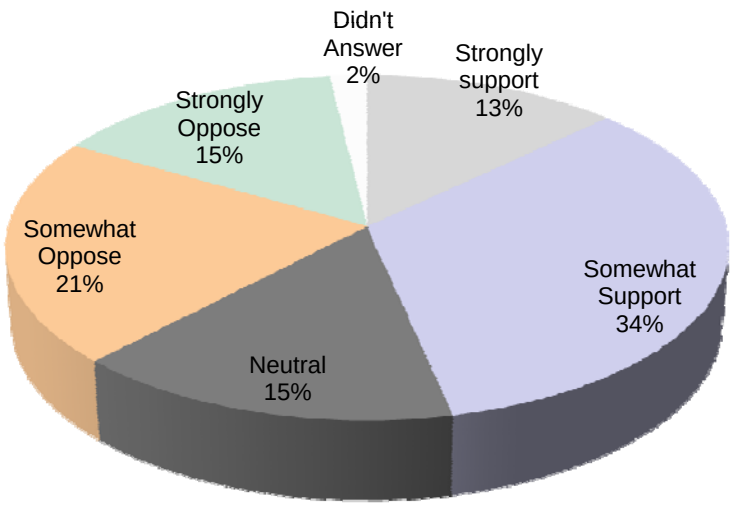
Opinion on Cap Vs Tax

Support for Taxes
on All Energy Use?



Mean : 3.16 (1 =Strongly Support, 5 = Strongly Oppose)

Support for Capping
Household Energy Use?



Mean: 2.79 (1 =Strongly Support, 5 = Strongly Oppose)

RESULT: Caps are preferred (over taxes).