



Sustainable Transportation Energy Pathways (STEPS)

Growing PEV Markets?

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Ken Kurani, Associate Researcher
Gil Tal, Professional Researcher

California Energy Commission

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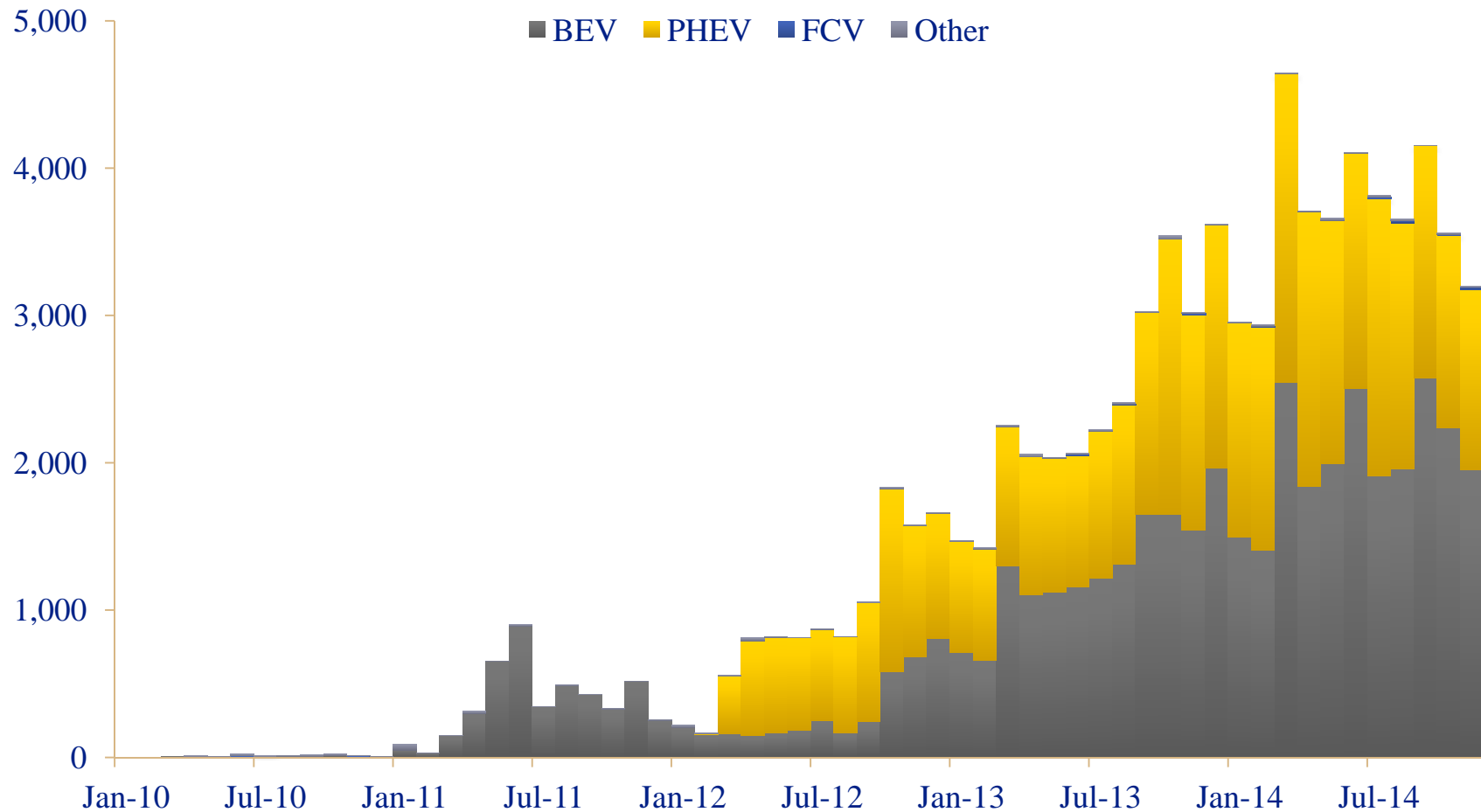
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What would grow PEV markets?

1. It would help if people knew
2. Even among new car buyers, barely half are (likely) able to charge a PEV at home
3. Transportation is a socio-technical system: charging etiquette
4. Are we paying enough attention to women?
 - Might be worth another ~25% PEV sales
5. Co-market PEVs and renewable electricity
 - We estimate this to be worth ~25% more PEV sales
6. Observed charging behavior is far more complex than prior analytical assumptions

PEV BUYERS AND CONSIDERERS

California PEV Market, monthly Clean Vehicle Rebates



Totals as of: July 1, 2014 # rebates = 67,046; \$140,582,066
Dec 1, 2014 85,360; \$178,742,266

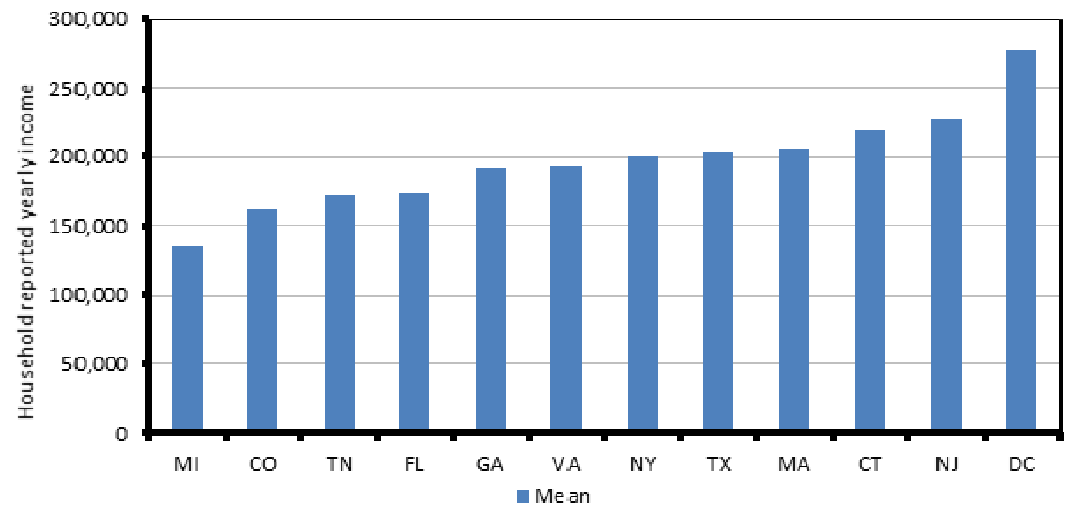
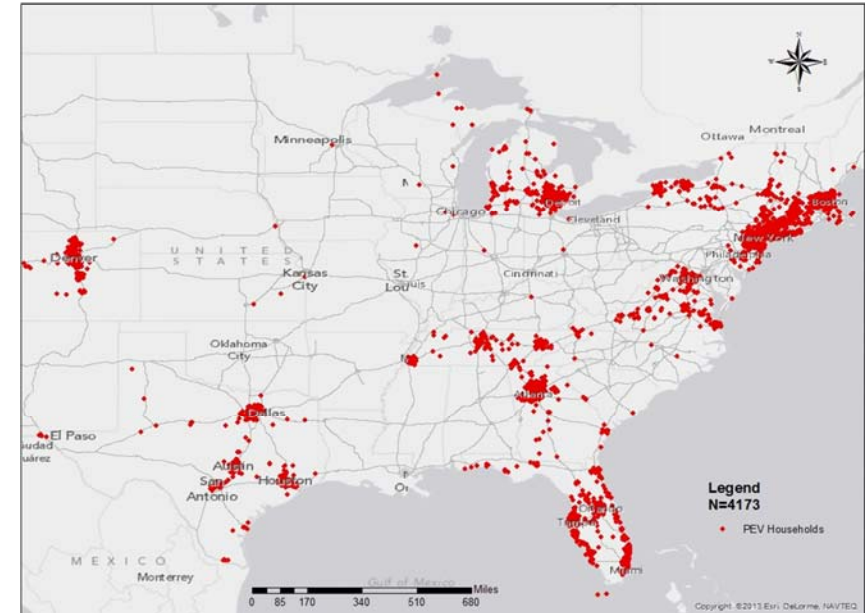
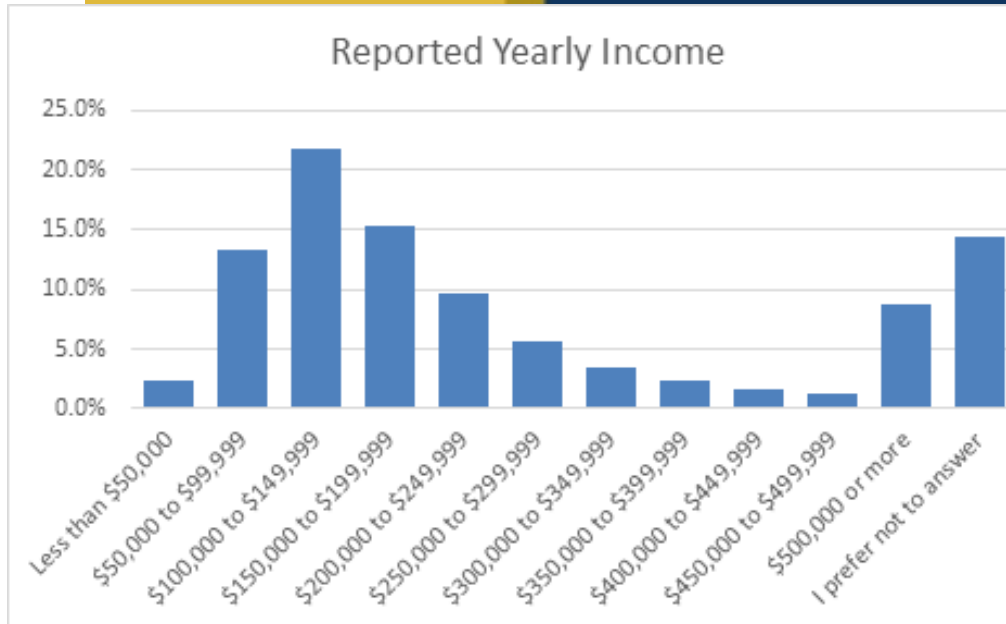
PEVs, Infrastructure, Socio-Demographics

	“Fresno”	“Sacramento”	“San Jose”	California
PEV/1000 people	0.49	0.97	5.54	1.80
Public Level 2 and Quick charge infrastructure: locations	Level 2: 5 locations Quick charge: 0 locations	Level 2: 74 locations Quick charge: 4 locations	Level 2: 142 locations Quick charge: 18 locations	Level 2: 1,703 locations Quick charge: 162 locations
Median income, 2008-2012	\$45,741	\$55,846	\$90,747	State: \$61,400
Bachelor's degree or higher, % of persons age 25+, 2008-2012	19.4 CVR recipients: 71	27.9 CVR recipients: 81	46.0 CVR recipients: 90	State: 30.5 CVR recipients: 83
Homeownership, 2008-2012, %	54.2 CVR recipients: 92	57.6 CVR recipients: 93	58.1 CVR recipients: 89	State: 56.0 CVR recipients: 87
Female, %	50.0 CVR recipients: 23	51.1 CVR recipients: 24	49.7 CVR recipients: 24	State: 50.3 CVR recipients: 24

PEV Incentives

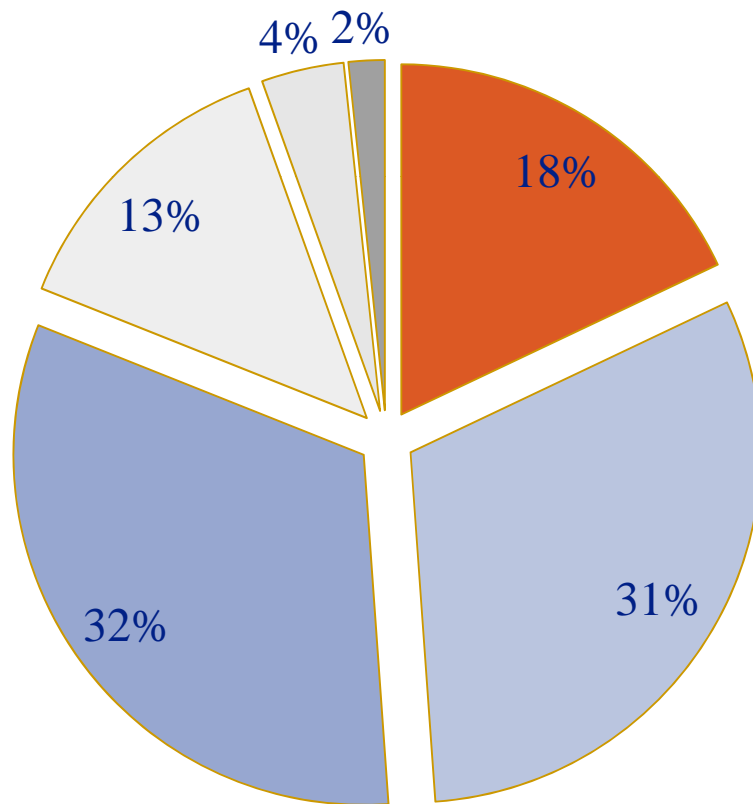
	California	“Fresno”	“Sacramento”	“San Jose”
	<ol style="list-style-type: none"> 1. Federal income tax credit: \$2,500-\$7,500 2. California Clean Vehicle Rebate: \$1,500 (PHEV) or \$2,500 (EV) 3. California HOV lane access to single occupant vehicles 	California, plus: San Joaquin Valley Air Pollution Control District PEV purchase rebate: \$2,000 (PHEV) or \$3,000 (EV)	California, plus: City of Sacramento: Free parking and charging in a city-operated parking garage downtown. Parking: \$200 per month Charging: variable	California, plus: Home EVSE purchase and installation rebate: up to \$1,500. (Available during the period these PEV owners acquired their PEVs. This program is now over.)
HOV definition			2 or more people	3 or more people
HOV lane miles	1,552.7	0	69.8	174.9

Who are PEV Buyers: It's not all about California



CA Households Seeing PEVs? (June 2014, n = 1,681)

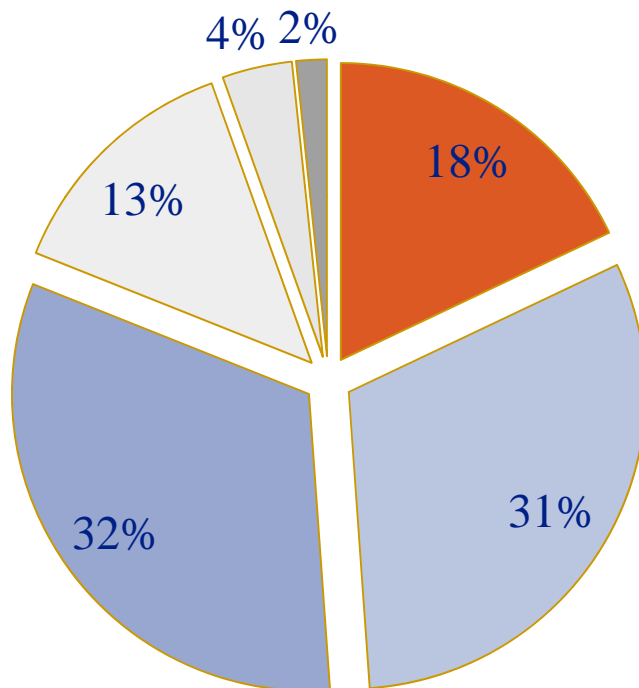
Have you considered buying a vehicle that runs on electricity for your household?



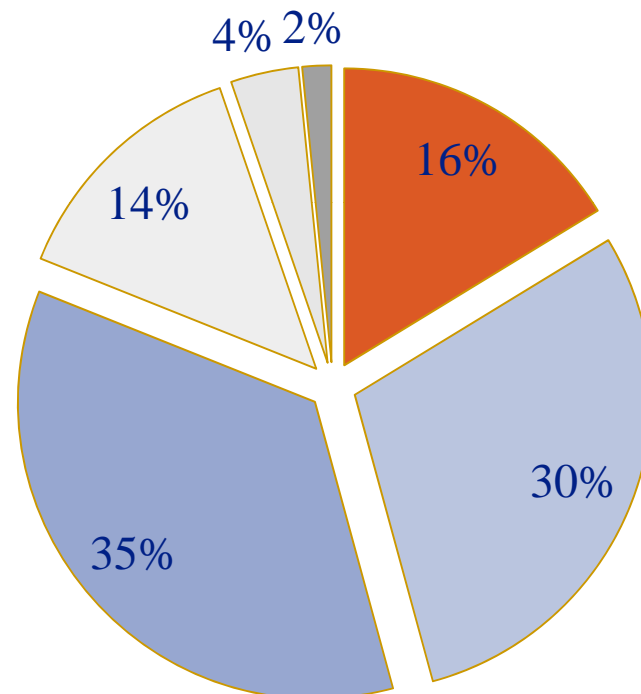
- ...have not and would not...
- ...have not ...but maybe some day we will
- ...idea has occurred, but no real steps have been taken...
- ...gathered information, but haven't really gotten serious
- ...shopped for one, visited a dealership...
- ...already have a vehicle powered by electricity

CA Households Seeing PEVs?

(June 2014, n = 1,681)



(Nov. 2014; n = 1,652)

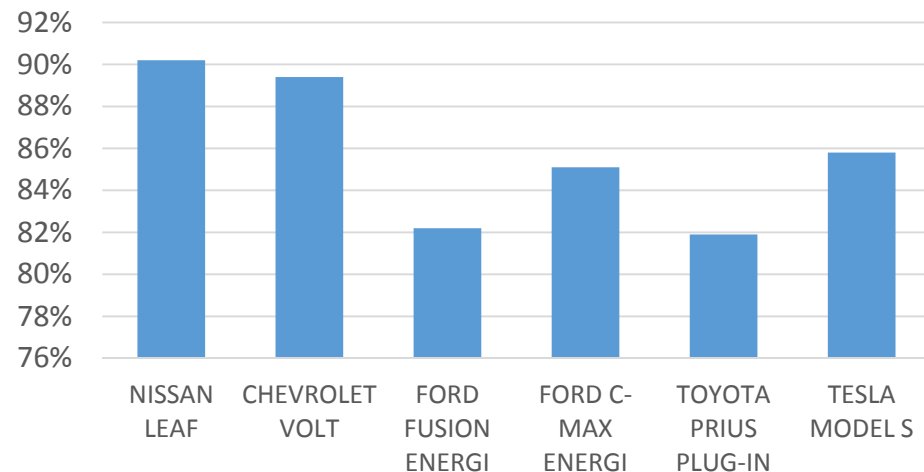


INCENTIVES AND PEV BUYERS

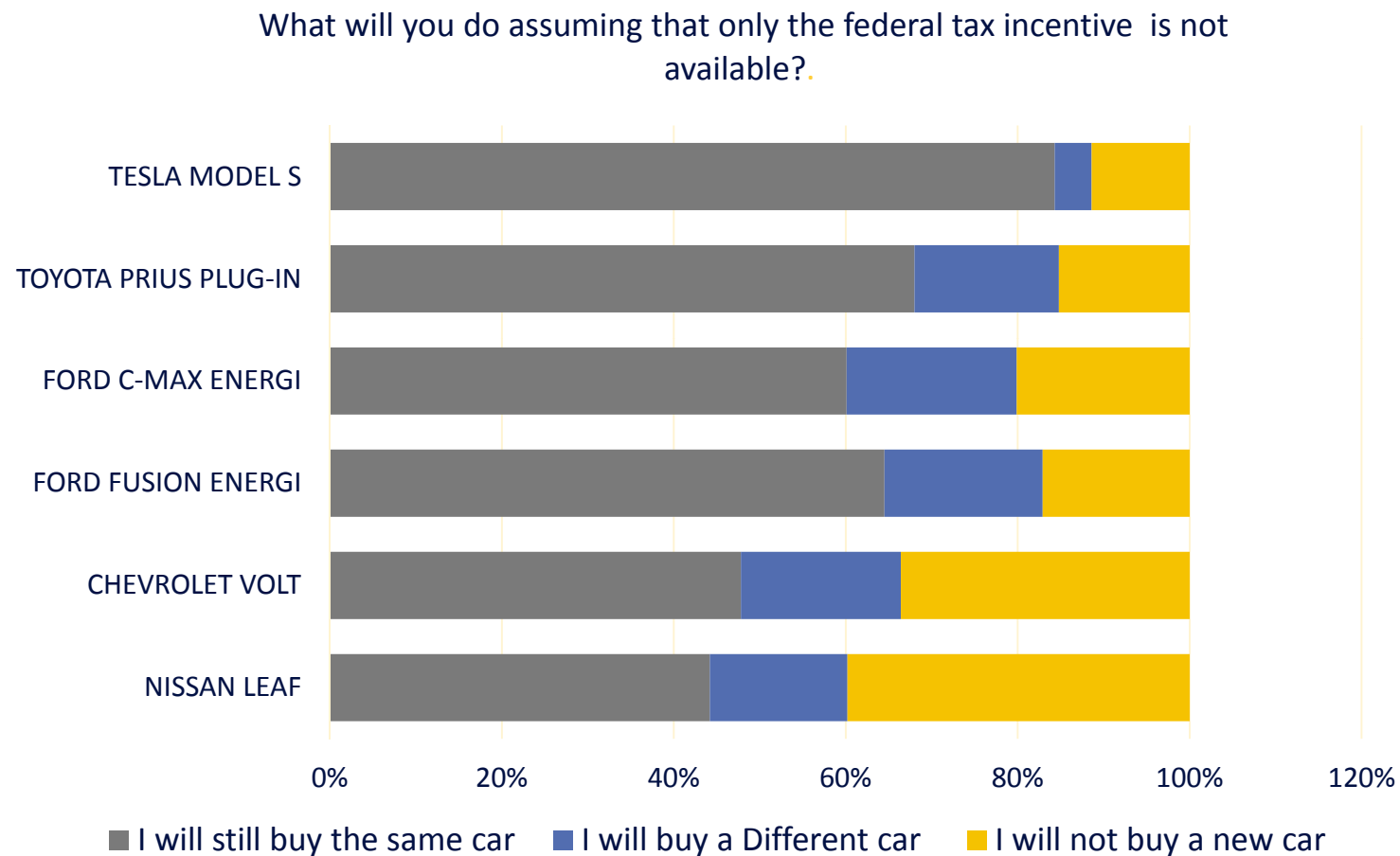
All incentives are important but some are more important

<i>Incentives</i>	Federal Tax		State Rebate		Local Rebate		Home Charger Subsidy		Workplace Charging		HOV Access	
	Applicable	Importance	Applicable	Importance	Applicable	Importance	Applicable	Importance	Applicable	Importance	Applicable	Importance
NISSAN LEAF	98.8%	2.21	49%	1.81	22.7%	-0.44	59.6%	0.57	52.5%	0.04	48.1%	-0.75
VOLT	97.8%	2.06	33%	1.35	20.5%	-0.31	46.2%	0.56	53.4%	0.42	41.7%	-0.62
FORD FUSION	90.2%	1.74	27%	0.45	22.7%	0.73	34.9%	0.99	50.9%	1.15	42.9%	-0.18
FORD C-MAX	92.6%	1.63	29%	0.77	19.8%	-0.60	36.7%	0.77	44.1%	0.90	35.2%	-0.40
TOYOTA PRIUS	86.7%	1.55	26%	0.23	24.5%	0.32	31.1%	-0.39	41.8%	0.41	38.9%	0.13
TESLA MODEL S	97.7%	1.00	40%	0.76	21.5%	-0.91	32.7%	-0.78	47.4%	-0.93	48.1%	-0.83
All Purchased vehicles	95.6%	1.65	54%	1.06	21.5%	-0.33	40.4%	0.27	49.1%	0.09	43.1%	-1.29

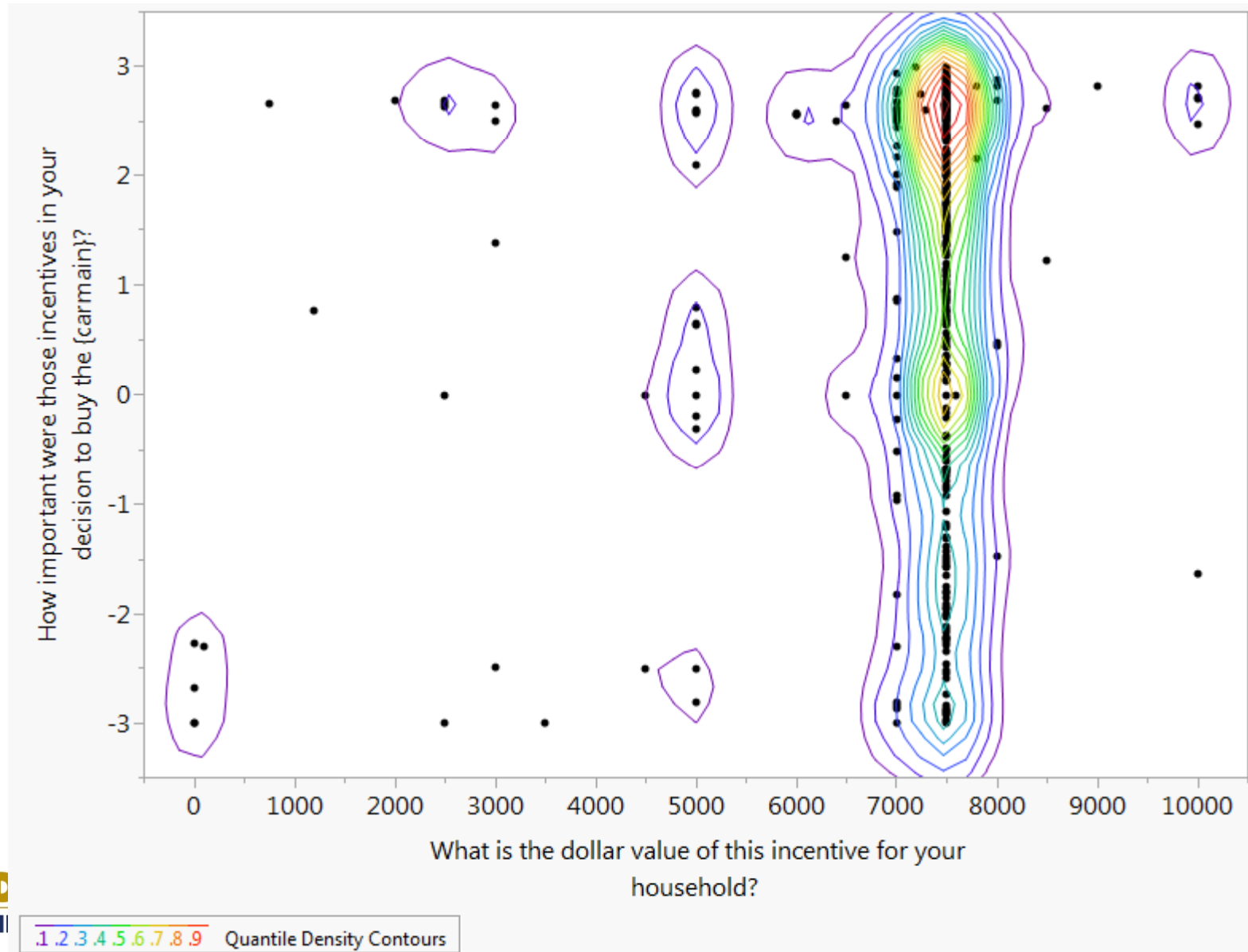
Share Federal Tax Incentive Rank #1



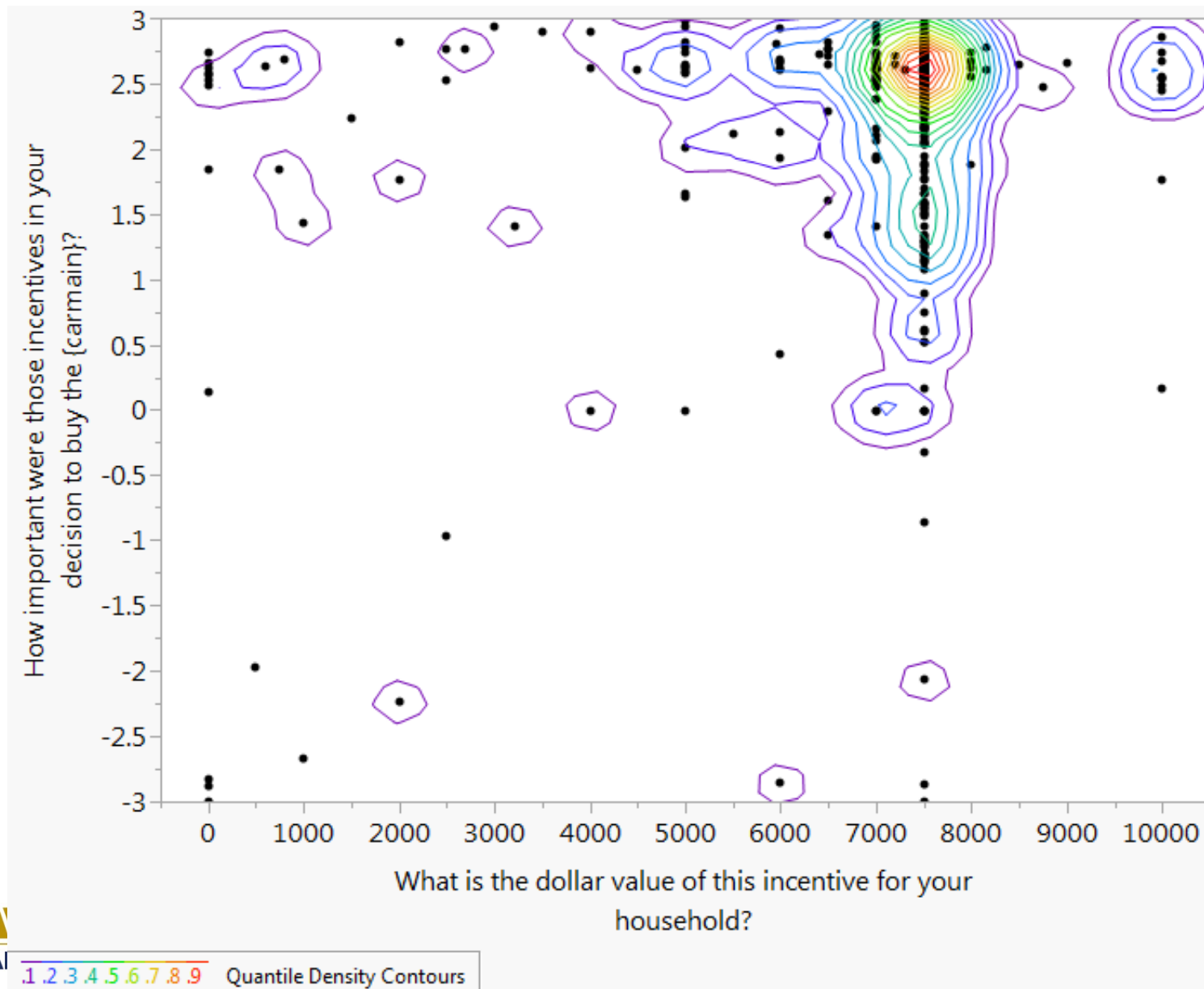
Estimating the effect of the Federal tax incentive



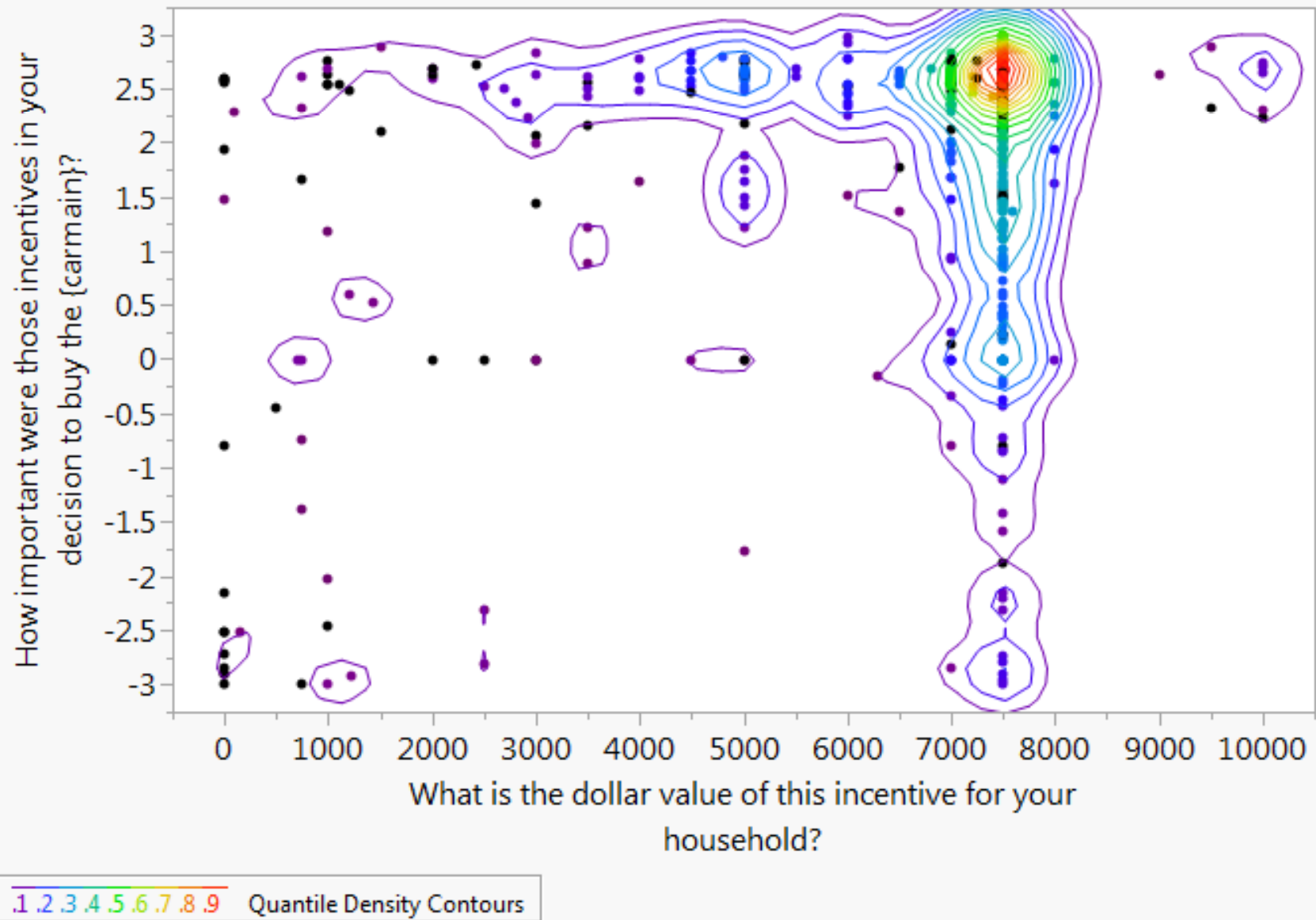
Federal Tax Credit TESLA MODEL S



Federal Tax Credit Nissan LEAF



Federal Tax Credit Chevrolet Volt



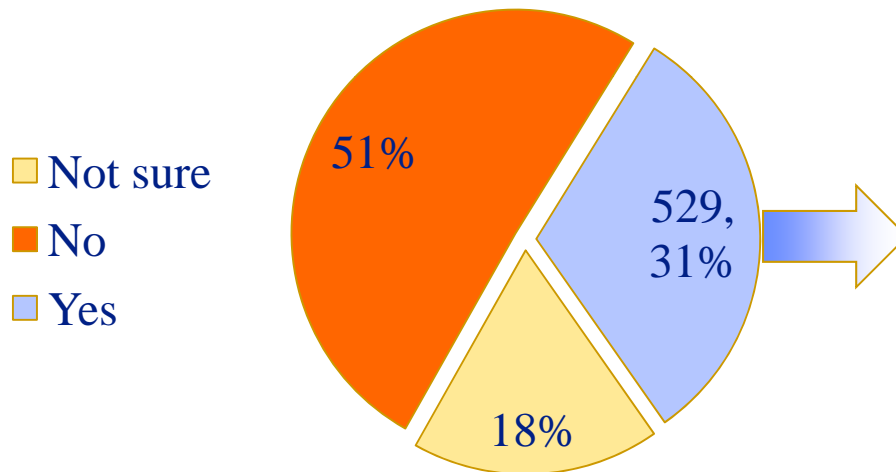
CONSUMERS' AWARENESS AND KNOWLEDGE GAPS

Convening conversations among PEV and ICEV owners

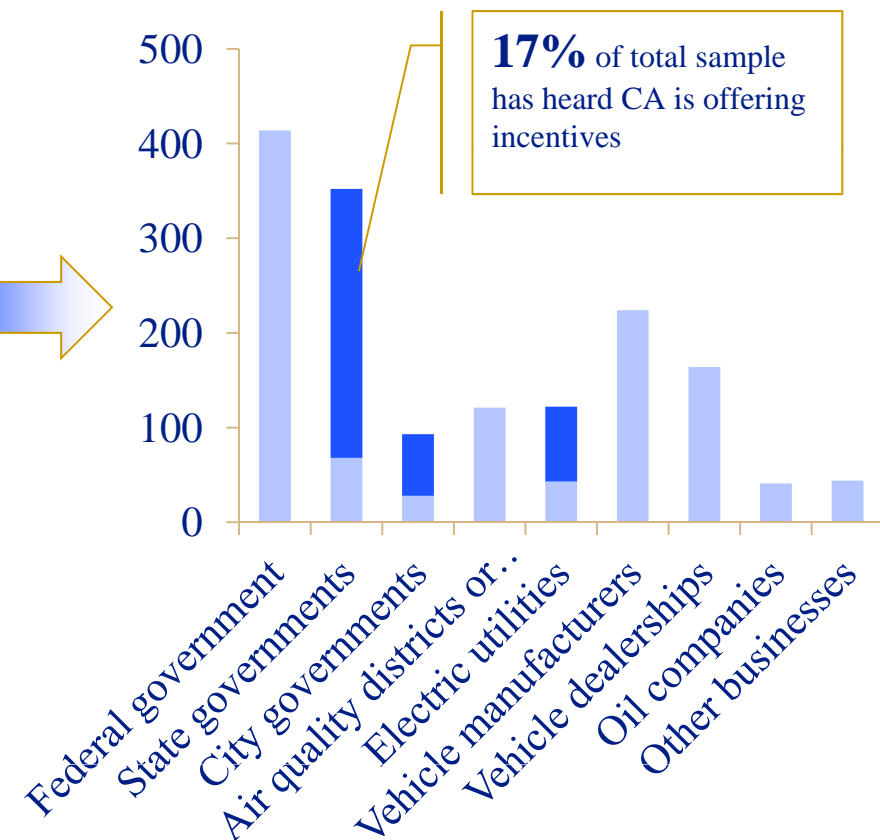
- Despite living in the same geographic region, PEV and ICEV drivers experience a different landscape
 - PEV drivers see signs of everywhere;
 - ICEV drivers don't see them anywhere
- ICEV Drivers' questions included:
 - Purchase costs; benefits of driving a PEV
 - No questions about incentives; few questions about infrastructure
- PEV Drivers respond
 - Accounts of saving money
 - Incentives and rebates; Free public charging; Electricity less than gasoline
 - Social benefits
 - Air pollution; Dependence on foreign oil
 - Disavowal of environmental motivations by PEV owners in Fresno

CA households' awareness of incentives, June 2014

Have you heard incentives are being offered to consumers to buy vehicles that don't run on gasoline or diesel?

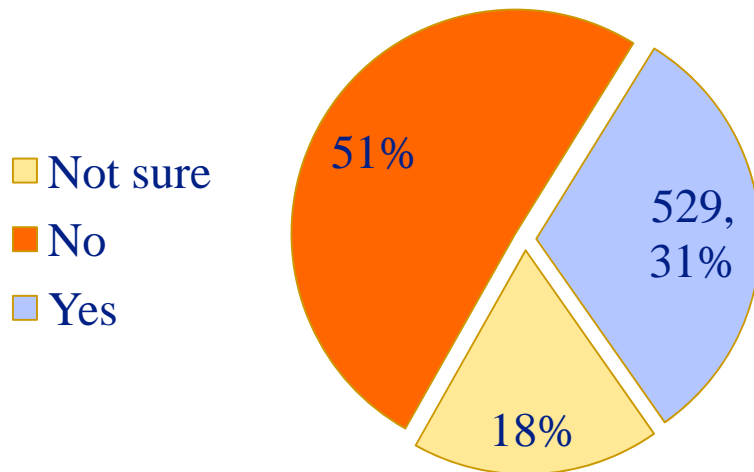


Of those who say "Yes," how many have heard of incentives from each of these sources?



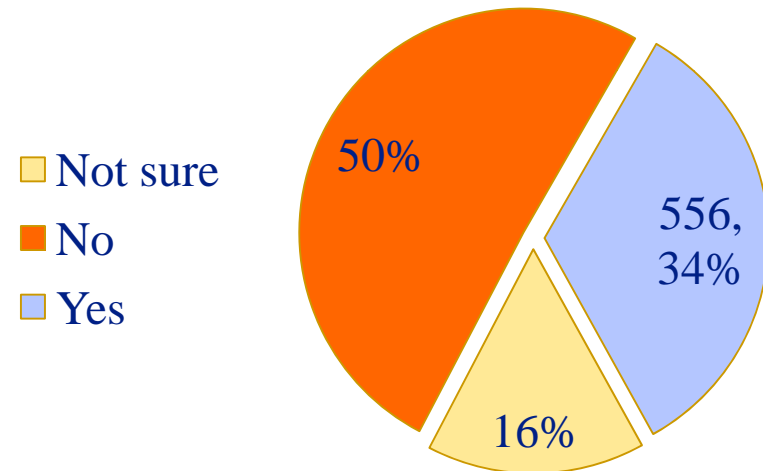
Awareness did not increase from June to Nov.

June 2014



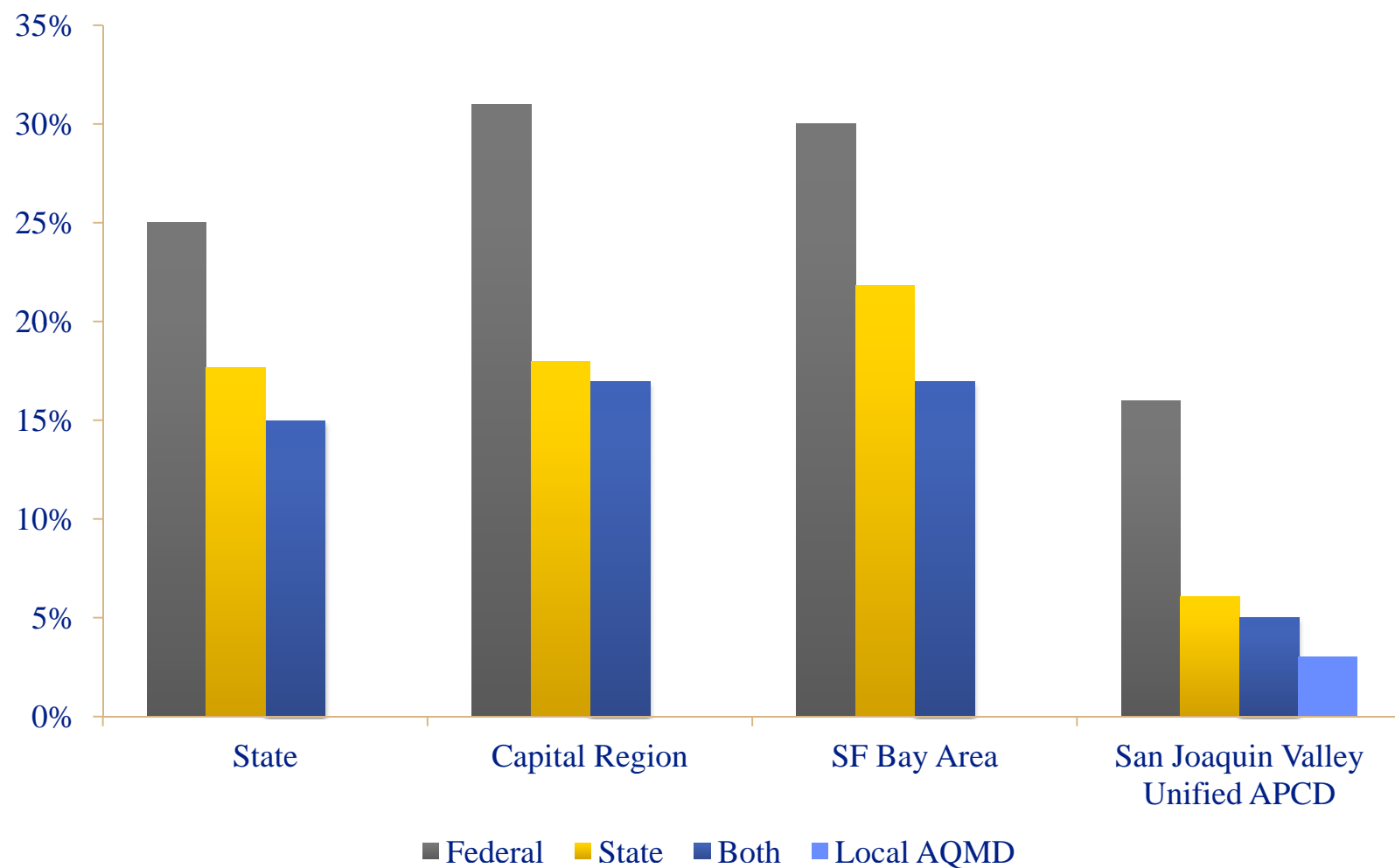
17% of total sample has heard CA is offering incentives

November 2014

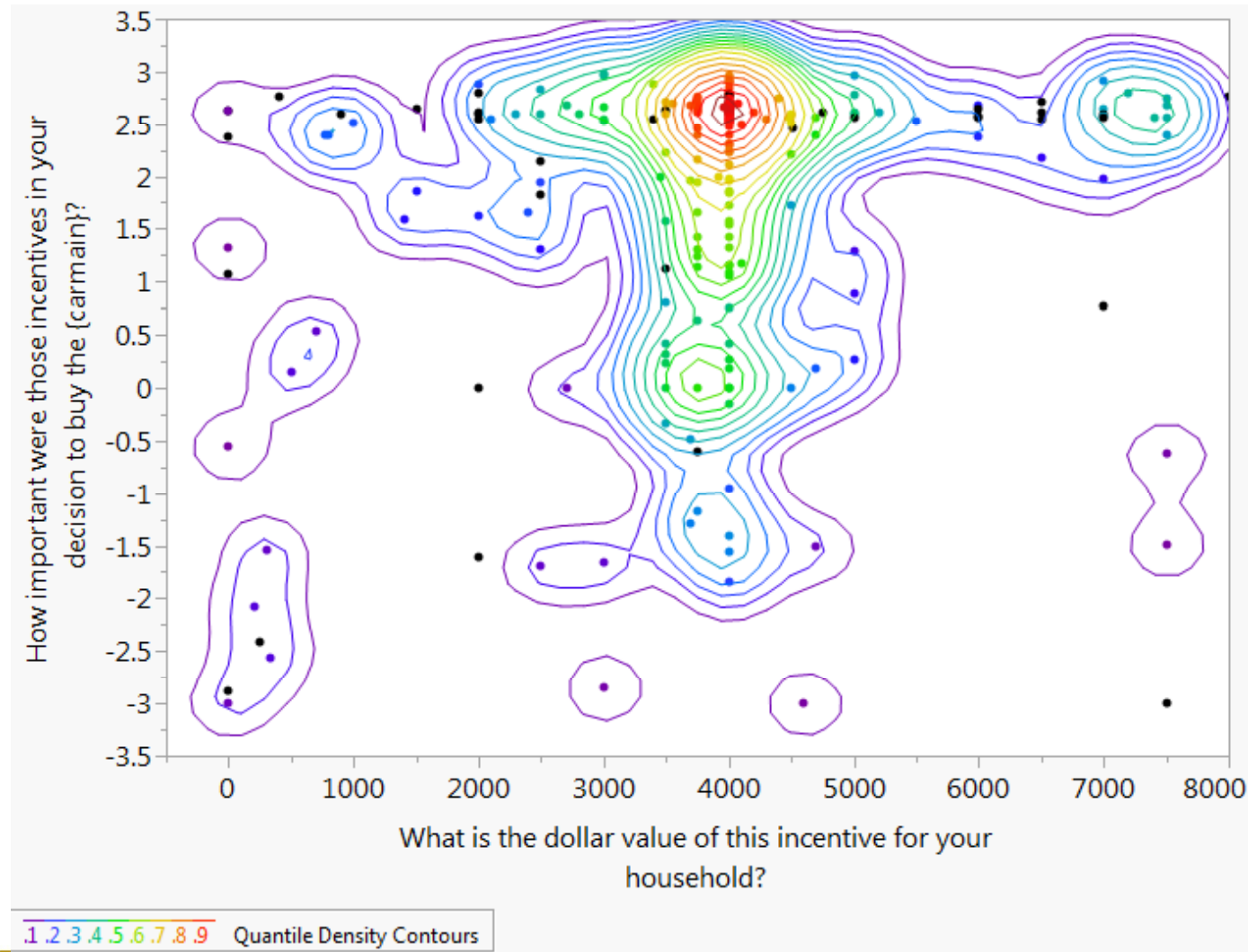


18%

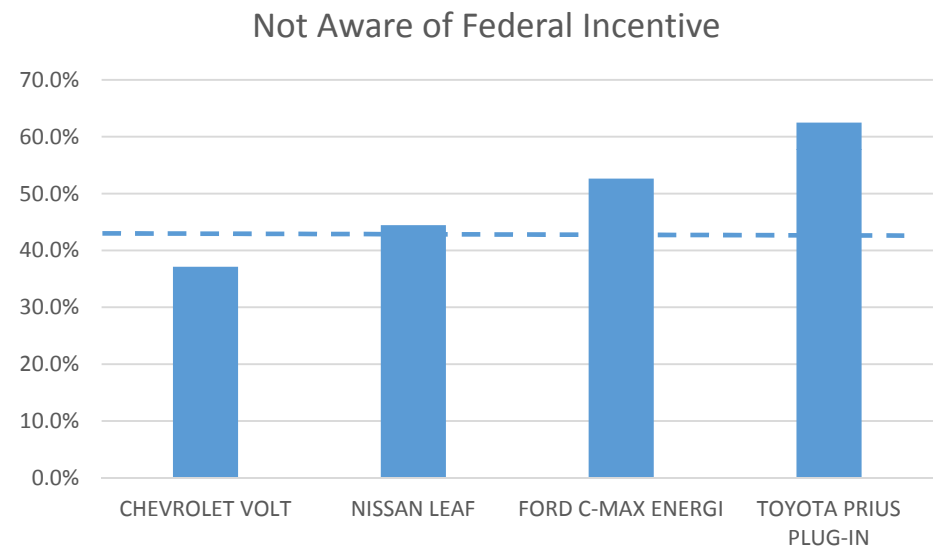
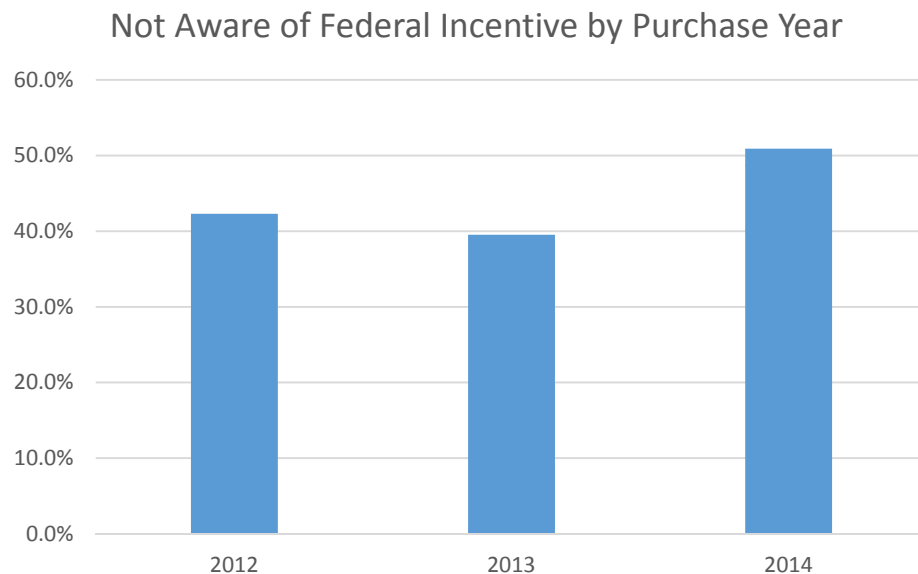
Incentive awareness by region, June 2014



Federal Tax Credit Ford C-Max



Used PEV Buyers Knowledge Gaps



N=167

GROWING THE MARKET

Implications: Strengthen Narratives; Create Value

- As constructed and told in the ICEV/PEV driver workshops, PEV drivers' accounts are fragile.
 - Policy, in the form of financial incentives, contributes to this fragility
 - What other accounts would PEV drivers give and under what conditions?
- Social Marketing
 - Create awareness of vehicles and incentives
 - Multiply the different narratives about why to buy a PEV
 - Leverage social networks to multiply and amplify the experience of PEV drivers
 - Create electric-drive experience to create value
 - Allows (requires) targeted marketing
- If you want a transition that depends on consumer behavior, you have to let people know

Research Team/Acknowledgments

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 - California Center for Sustainable Energy (CCSE)*

Key Publications

- Caperello, N., J. TyreeHageman, K.S. Kurani, (2014) Engendering the Future of Plug-in Electric Vehicles Institute of Transportation Studies Working Paper UCD-ITS-WP-14-02: http://www.its.ucdavis.edu/wp-content/themes/ucdavis/pubs/download_pdf.php?id=2095
- Kurani, K.S., J. TyreeHageman, N. Caperello (2013) Potential Consumer Response to Electricity Demand Response Mechanisms: Early Plug-in Electric Vehicle Drivers in San Diego, California. Institute of Transportation Studies Research Report UCD-ITS-RR-13-12. http://www.its.ucdavis.edu/wp-content/themes/ucdavis/pubs/download_pdf.php?id=1950
- TyreeHageman, J., K. S. Kurani, N. Caperello (2014) What does community and social media use look like among early PEV drivers? Exploring how drivers build an online resource through community relations and social media tools. Transportation Research Part D: Transport and Environment, V. 33, pp. 125-34.
- Davies, J. and K.S. Kurani (2013) Moving from Assumption to Observation: Implications for Energy and Emissions Impacts of Plug-in Hybrid Electric Vehicles. *Energy Policy* 62, 550 – 560
- Axsen, J. and K.S. Kurani (2013) Hybrid, Plug-in Hybrid, or Electric: What do car buyers want? *Energy Policy*, 61, 532-43. Available online: <http://dx.doi.org/10.1016/j.enpol.2013.05.122>
- Caperello, N., K.S. Kurani, J. TyreeHageman (2013) Do You Mind if I Plug-in My Car? How Etiquette Shapes PEV Drivers' Vehicle Charging Behavior. *Transportation Research Part A* 54, 155 – 163
- Axsen, J. and K.S. Kurani (2013) Connecting plug-in vehicles with green electricity through consumer demand. *Environmental Research Letters* v. 8, n. 1. <http://dx.doi.org/10.1088/1748-9326/8/1/014045>
- Tal, Gil, Michael A. Nicholas., Exploring the Impact of High Occupancy Vehicle (HOV) Lane Access on Plug-in Vehicle Sales and Usage in California. Research Report, UCD-ITS-RR-14-16.
- Gil Tal, Michael Nicholas (2013) Studying the PEV Market in California: Comparing the PEV, PHEV and Hybrid Markets. Presented at the EVS 27 Electric Vehicle Symposium (November 2013) Barcelona, Spain .