

Analysis of the Impact of Tax Incentives on the Consumption of Electric Vehicles

By Laura Wheeler and Mels de Zeeuw





Motivation for Research

Atlanta's Incentives Lift Electric Car Sales Tax Credit, Cheap Power Help Make Georgia Capitol a Hotbed for Battery Buggies

How Georgia became the biggest electric vehicle market in the US

Why Are Electric Vehicle Sales Booming in

Atlanta?





Define Electric Vehicles

PEV – Plug-in Electric Vehicles

- BEVs Battery-only propulsion
- PHEV may have a backup combustion engine, as well as a battery power source













And in some cases this...



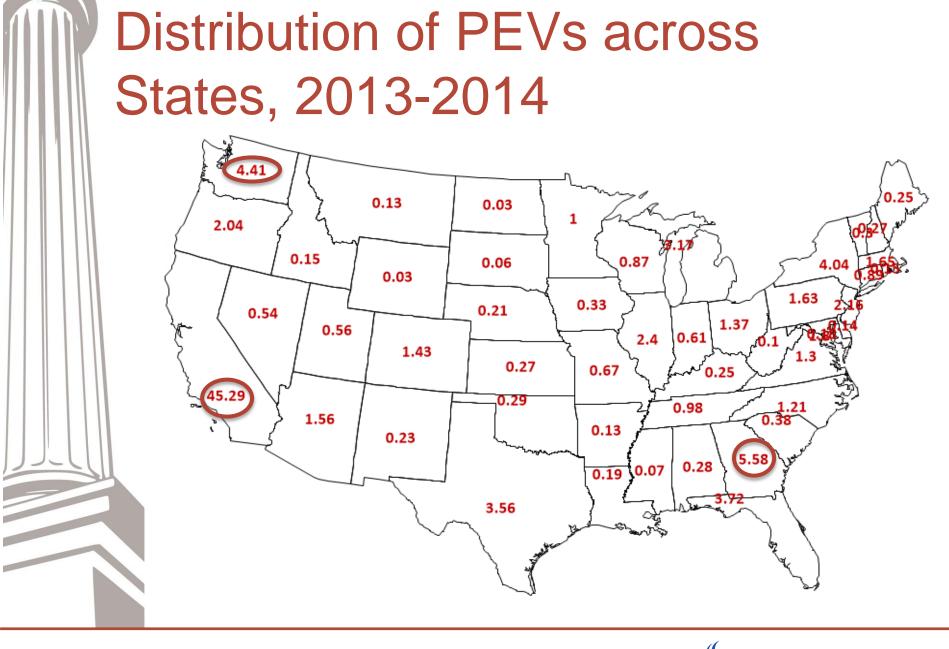
And this...



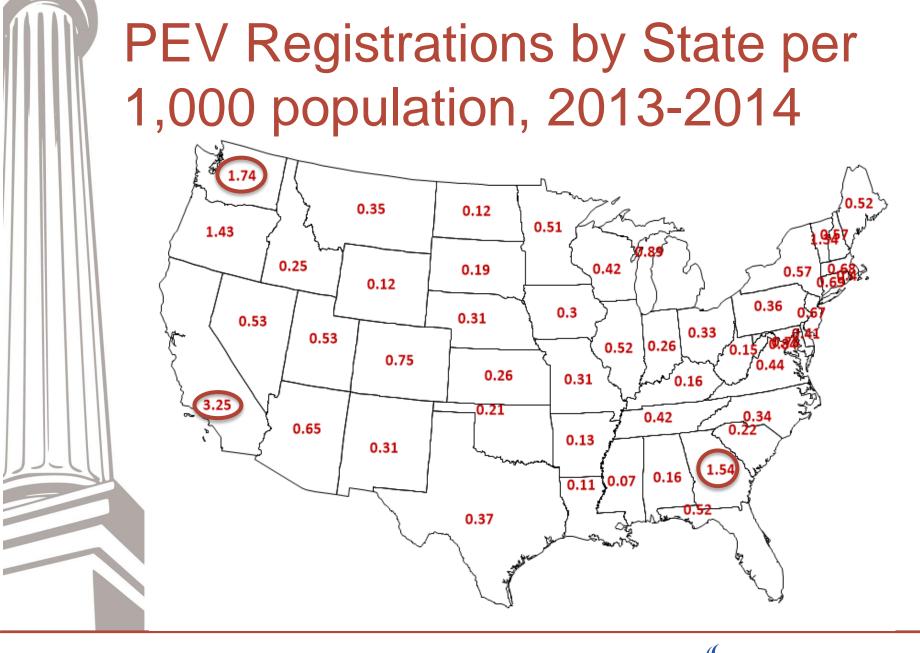


But not that...









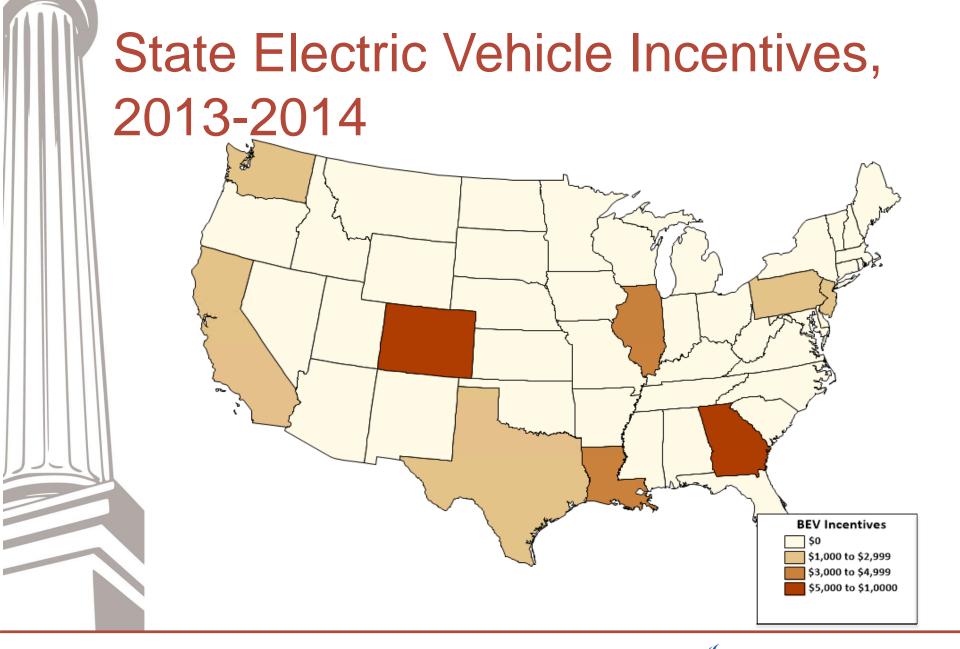




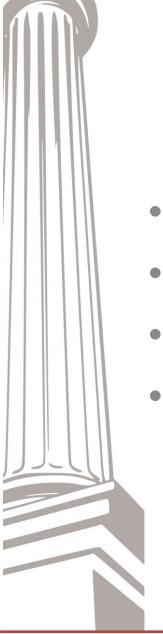
Federal & State Electric Vehicles Incentives

- Up to \$7,500 federal incentive
- State Financial Incentives –
 income tax credits, sales tax
 exemptions
- HOV access
- Discount on electricity usage
- Emission testing exemption
- Parking fee exemptions









Previous Studies

- Sierzchula, Bakker, Maat, van Wee (2014)
- Gallagher and Muehlegger (2011)
- Diamond (2009)
- Chandra, Gulati, and Kandlikar (2010)





Models

National –

BEVs/PHEVs = f(tax incentive, personal income, population, liberal voters, commuting distance, HOV exemption, gasoline prices, electricity prices)

GA County -

BEVs = f(personal income, population, liberal voters, commuting distance, population density, gasoline prices)





Data Sources

- Alternative Fuels Data Center
- National Auto Dealers Association
- GA Department of Revenue
- Gallup State of the States
- Bureau of Economic Analysis
- Census Bureau
- Federal Highway Administration
- Energy Information Administration



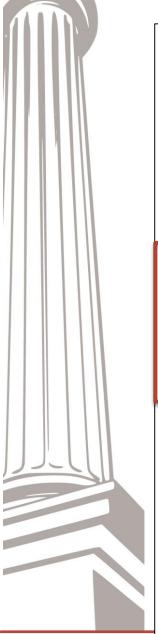


VARIABLES	(1)	(2)	(3)	(4)
	Model 1	Model 2	Model 3	Model 4
Tax Incentive	2.76e-06***	2.26e-06***	2.47e-06***	2.51e-06***
	(7.24e-07)	(7.43e-07)	(7.25e-07)	(7.12e-07)
Personal Income		-1.51e-08 (2.82e-08)	-2.17e-08 (2.74e-08)	-3.44e-08 (2.12e-08)
Population		9.64e-07 (1.37e-06)	1.36e-06 (1.34e-06)	1.94e-06* (1.03e-06)
Liberal	0.000108	-3.64e-05	-0.000147	-0.000184
	(0.000356)	(0.000354)	(0.000347)	(0.000316)
Commute<20	-0.00144 (0.00319)	-0.00209 (0.00309)	0.000308 (0.00323)	
Commute>30	-0.00247 (0.00429)	-0.00439 (0.00482)	-0.00470 (0.00466)	
HOV	0.000172	-0.000542	-0.000500	-0.000424
	(0.00216)	(0.00226)	(0.00218)	(0.00213)
Gasoline Price	0.0300***	0.0297***	0.0348***	0.0360***
	(0.00786)	(0.00791)	(0.00808)	(0.00786)
Electricity Price	0.000373	0.000345	0.000374	0.000378
	(0.000247)	(0.000245)	(0.000238)	(0.000235)
Per capita personal income	-0.000278 (0.000190)		,	
Land area			-2.45e-08* (1.26e-08)	-2.30e-08* (1.14e-08)
Constant	-0.102***	-0.111***	-0.127***	-0.131***
	(0.0258)	(0.0255)	(0.0261)	(0.0254)
Observations	50	50	50	50
R-squared	0.564	0.570	0.608	0.598
		rs in parentheses * p<0.05, * p<0.1		

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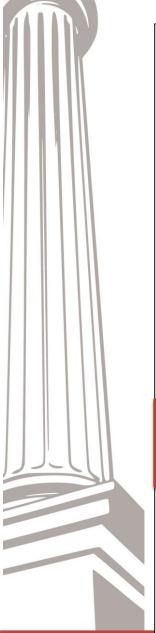
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Dependent Variable - BEVs/Total New	Vehicle Registrations
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Dependent Variable - BEVs/Total Nev	w Vehicle Registrations
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R-squared	0.564	0.570	0.608	0.598
N-squared	Standard erro	rs in parentheses * p<0.05, * p<0.1	0.008	0.376

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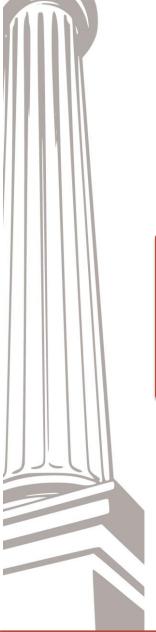


VARIABLES	Model 1	Model 2	Model 3	Model 4
Tax Incentive	2.78e-08	-5.27e-07	-4.03e-07	-1.95e-07
	(5.44e-07)	(4.61e-07)	(4.69e-07)	(4.68e-07)
Personal Income		2.83e-08* (1.53e-08)	2.54e-08 (1.54e-08)	1.02e-08 (1.22e-08)
Population		-1.03e-06 (7.41e-07)	-8.70e-07 (7.47e-07)	-1.78e-07 (5.96e-07)
Liberal	0.000601**	0.000477**	0.000435**	0.000377**
	(0.000234)	(0.000191)	(0.000193)	(0.000183)
Commute<20	-0.000974 (0.00207)	-0.000494 (0.00167)	0.000378 (0.00180)	
Commute>30	-0.00143 (0.00286)	-0.00561** (0.00266)	-0.00560** (0.00264)	
HOV	0.00241*	0.00101	0.00104	0.00113
	(0.00138)	(0.00120)	(0.00119)	(0.00122)
Gasoline Price	0.0116**	0.00974**	0.0118**	0.0137***
	(0.00524)	(0.00435)	(0.00461)	(0.00466)
Electricity Price	-0.000148	-0.000124	-0.000113	-0.000106
	(0.000160)	(0.000131)	(0.000131)	(0.000135)
Per capita personal income	1.71e-05 (0.000124)			
Land area			-8.79e-09 (7.04e-09)	-7.45e-09 (6.69e-09)
Constant	-0.0484***	-0.0394***	-0.0458***	-0.0525***
	(0.0171)	(0.0141)	(0.0149)	(0.0151)
Observations	50	50	50	50
R-squared	0.535	0.690	0.702	0.666

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1



Dependent Variable – PHEVs	Total New Vehic	le Registrations		
VARIABLES	Model 1	Model 2	Model 3	Model 4
Tax Incentive	2.78e-08 (5.44e-07)	-5.27e-07 (4.61e-07)	-4.03e-07 (4.69e-07)	-1.95e-07 (4.68e-07)
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Gasoline Price	0.0116** (0.00524)	0.00974** (0.00435)	0.0118** (0.00461)	0.0137*** (0.00466)
Electricity Price	-0.000148 (0.000160)	-0.000124 (0.000131)	-0.000113 (0.000131)	-0.000106 (0.000135)
Per capita personal income	1.71e-05 (0.000124)			
Land area			-8.79e-09 (7.04e-09)	-7.45e-09 (6.69e-09)
Constant	-0.0484*** (0.0171)	-0.0394*** (0.0141)	-0.0458*** (0.0149)	-0.0525*** (0.0151)
Observations R-squared	50 0.535	50 0.690	50 0.702	50 0.666
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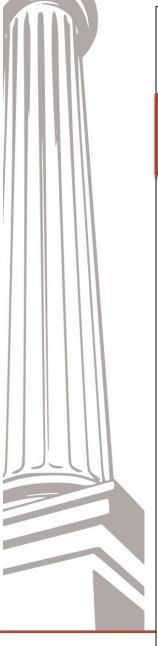
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	Standard errors *** p<0.01, ***	-		

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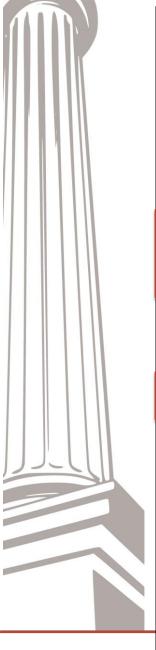


VARIABLES	Model 1	Model 2	Model 3
Commute<15	0.352	-3.197***	-2.810***
	(0.303)	(0.621)	(0.646)
Commute>40	-0.0210	-0.0575	-0.0480
	(0.0526)	(0.0525)	(0.0522)
Population Density			0.000156 (0.000174)
Democratic Vote Share	0.000269	-0.000187	-0.00102
	(0.00150)	(0.00156)	(0.00162)
HOV	0.328***	0.375***	0.305***
	(0.0732)	(0.0881)	(0.0915)
Personal Income		0.203***	0.185***
		(0.0294)	(0.0294)
Population		-0.00728***	-0.00686***
		(0.00122)	(0.00130)
Average Gasoline Price	-0.182*	-0.299***	-0.0586
	(0.109)	(0.113)	(0.127)
2012 dummy			0.0184
			(0.0625)
2013 dummy			0.0798
			(0.0619)
2014 dummy			0.264***
Per capita personal income	2.77e-05***		(0.0659)
Per capita personal income	(3.73e-06)		
Constant	-0.0863	1.216***	0.322
	(0.407)	(0.388)	(0.440)
Observations	636	636	636
R-squared	0.178	0.184	0.208

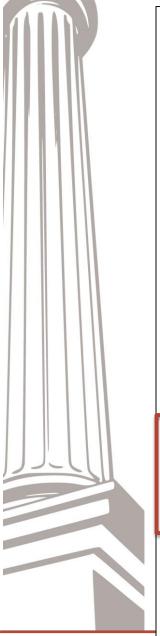
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1



VARIABLES	Model 1	Model 2	Model 3
Commute<15	0.352	-3.197***	-2.810***
Commute>40	(0.303) -0.0210	(0.621) -0.0575	(0.646) -0.0480
Population Density	(0.0526)	(0.0525)	(0.0522) 0.000156 (0.000174)
Democratic Vote Share	0.000269 (0.00150)	-0.000187 (0.00156)	-0.00102 (0.00162)
HOV	0.328***	0.375***	0.305***
Personal Income	, ,	0.203*** (0.0294)	0.185*** (0.0294)
Population		-0.00728*** (0.00122)	-0.00686*** (0.00130)
Average Gasoline Price	-0.182*	-0.299***	-0.0586
2012 dummy	(0.109)	(0.113)	(0.127) 0.0184
2013 dummy			(0.0625) 0.0798 (0.0619)
2014 dummy			0.264*** (0.0659)
Per capita personal income	2.77e-05*** (3.73e-06)		
Constant	-0.0863 (0.407)	1.216*** (0.388)	0.322 (0.440)
Observations	636 0.178	636 0.184	636 0.208



VARIABLES	Model 1	Model 2	Model 3
Commute<15	0.352	-3.197***	-2.810***
	(0.303)	(0.621)	(0.646)
Commute>40	-0.0210	-0.0575	-0.0480
	(0.0526)	(0.0525)	(0.0522)
Population Density			0.000156 (0.000174)
Democratic Vote Share	0.000269	-0.000187	-0.00102
	(0.00150)	(0.00156)	(0.00162)
HOV	0.328***	0.375***	0.305***
D 11	(0.0732)	(0.0881)	(0.0915)
Personal Income		0.203*** (0.0294)	0.185*** (0.0294)
Population		-0.00728***	-0.00686***
i opulation		(0.00122)	(0.00130)
Average Gasoline Price	-0.182*	-0.299***	-0.0586
	(0.109)	(0.113)	(0.127)
2012 dummy			0.0184
			(0.0625)
2013 dummy			0.0798
			(0.0619)
2014 dummy			0.264***
Per capita personal income	2.77e-05***		(0.0659)
a	(3.73e-06)	4.04.5***	0.000
Constant	-0.0863	1.216***	0.322
	(0.407)	(0.388)	(0.440)
Observations	636	636	636
R-squared	0.178	0.184	0.208



VARIABLES	Model 1	Model 2	Model 3
Commute<15	0.352	-3.197***	-2.810***
	(0.303)	(0.621)	(0.646)
Commute>40	-0.0210	-0.0575	-0.0480
	(0.0526)	(0.0525)	(0.0522)
Population Density			0.000156
			(0.000174)
Democratic Vote Share	0.000269	-0.000187	-0.00102
	(0.00150)	(0.00156)	(0.00162)
HOV	0.328***	0.375***	0.305***
	(0.0732)	(0.0881)	(0.0915)
Personal Income		0.203***	0.185***
		(0.0294)	(0.0294)
Population		-0.00728***	-0.00686***
		(0.00122)	(0.00130)
Average Gasoline Price	-0.182*	-0.299***	-0.0586
	(0.109)	(0.113)	(0.127)
2012 dummy			0.0184
			(0.0625)
2013 dummy			0.0798
-			(0.0619)
2014 dummy			0.264***
			(0.0659)
Per capita personal income	2.77e-05***		
a	(3.73e-06)	1 21/444	0.222
Constant	-0.0863	1.216***	0.322
	(0.407)	(0.388)	(0.440)
Observations	636	636	636
R-squared	0.178	0.184	0.208



Charging Station variable			
VARIABLES	Model 1	Model 2	
Charger Density	69.01*** (12.28)		
Commute<15	-2.283*** (0.638)	-0.00567*** (0.00204)	
Commute>40	-0.0414 (0.0509)	-6.30e-05 (0.000162)	
Population Density	-0.000202 (0.000181)	5.07e-06*** (5.41e-07)	
Democratic Vote Share	-0.00151 (0.00159)	7.79e-06 (5.05e-06)	
HOV	0.360*** (0.0898)	-0.00100*** (0.000287)	
Personal Income	0.146*** (0.0295)	0.000431*** (9.41e-05)	
Population	-0.00558*** (0.00129)	-1.38e-05*** (4.13e-06)	
Average gasoline price	-0.0300 (0.124)	-0.000373 (0.000394)	
2012 dummy	-0.0201 (0.0614)	0.000546*** (0.000194)	
2013 dummy	0.0366 (0.0609)	0.000569*** (0.000193)	
2014 dummy	0.187*** <i>(0.0658)</i>	0.000930*** (0.000208)	
BEV per capita registrations		0.000699*** <i>(0.000124)</i>	
Constant	0.285 (0.429)	0.000311 (0.00137)	
Observations	636	636	
	0.246	0.693	



Thank You.

This work is preliminary. Please do not cite with contacting the authors.

Laura Wheeler lwheeler2@gsu.edu

