

Starting at 5:10pm

Classes next week

- No class on Memorial Day (Monday May 30)
- Final day of class will be at West Village (parking lot behind 1605 Tilia St)
 - Come check out some EVs in person
 - 5 points of extra credit on homework
 - Free pizza

Course evaluations

- This is a new class: help improve it for the future!
- <https://eval.ucdavis.edu>
- Some extra questions that would be much appreciated if you answered:
 - Any material that you would have liked to see included? Or not included?
 - Were online recordings useful for you at all?
 - Were the extra readings useful for you at all?



Incentives and efficacy of subsidies

ECI 189G: Lecture 18

Dan Sperling

Alan Jenn

Spring 2022

What incentives do you get for buying an EV?

- We know that you get money from the government for buying an EV, but how does this actually work?
- It turns out that *how* you get the money can make a big difference in incentive efficacy (remember our discussion of discount rates)
- What other types of incentives exist?





Monetary incentives

Internal Revenue Code Section 30D

- One of the biggest monetary incentives is from the federal government, up to \$7500. Started at the end of 2009!
- Credit calculation:
 - Baseline \$2500 for EV
 - \$417 for the first 5 kWh battery capacity
 - Additional \$417 for each kWh thereafter
 - **Total** cannot exceed \$7500 (full credit amount as long as vehicle has
- Incentive is in the form of a tax credit, in other words when you file your taxes you get money back based on taxes paid. If you don't have \$7500 of liability, *you cannot claim the full credit!*

Phasing out the federal incentives

- After selling 200,000 EVs, the federal tax credit will begin to phase out according to the following schedule:

Example

200,000th plug-in electric drive vehicle produced by the manufacturer on February 12, 2010.

Phase out starts beginning of second calendar quarter after 200,000-vehicle mark reached.

Beginning of fourth calendar quarter after 200,000-vehicle mark reached, credit decreases again.

Credit ends beginning sixth calendar quarter.

Full Credit Amount			50% of Full Amount			25% of Full Amount			No Credit											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
2010						2011														

Countdown to 200,000 EV Sales - Starting the Federal EV Tax Credit Phase Out						
Parent Brand (for Federal Tax Credit Purposes)	*MFG 2010+	To Reach 200,000	**Total By Brand YTD	Monthly Avg. Run Rate - YTD	Max # Quarters to Reach 200,000	Quarter Likely to Reach 200,000
Audi	6,652	193,348	2,238	320	202	N/A
BMW	46,793	153,207	9,943	1,420	36	N/A
Fiat Chrysler Automotive (FCA)	24,801	175,199	5,835	834	70	N/A
Ford Motor Company	95,891	104,109	12,190	1,741	20	2021-2022
General Motors	146,397	53,603	22,107	3,158	6	Q4 2018-Q1 2019
Honda Motors	2,142	197,858	34	5	13,578	N/A
Hyundai	5,075	194,925	1,820	260	250	N/A
Kia	4,603	195,397	1,501	214	304	N/A
Daimler (Mercedes-Benz)	11,628	188,372	1,685	241	261	N/A
Mitsubishi	2,108	197,892	6	1	76,958	N/A
Nissan	112,128	87,872	8,531	1,219	24	2022-2023
Porsche	6,429	193,571	1,147	164	394	N/A
Tesla	134,144	65,856	23,245	3,321	7	Q1-Q2 2018
Toyota Motor Corporation	58,576	141,424	11,337	1,620	29	2024
Volvo	3,050	196,950	949	136	484	N/A
Volkswagen	10,721	189,279	2,195	314	201	N/A

*Manufacturer sales count beginning Jan 1, 2010; **Through July 2017 | Auto sales data: InsideEVs; Wikipedia | Research and chart: EVAdoption.com

Infrastructure Bill (...failed)

Proposed Changes to Plug-In Electric Drive Vehicle Credit IRC 30D

Proposed Change	Effective Date	Notes / Potential Impact
Manufacturer sales cap phaseout at 200,000 EVs sold is eliminated.	May 25, 2021	Purchasers of a qualifying EV after May 24, 2021 can apply the tax credit on their 2021 tax return for GM and Tesla EVs, which currently do not qualify.
MSRP must be less than \$80,000 to qualify for any tax credit.	January 1, 2022	Cap is based on MSRP. Unclear if it refers to model variants or lines. Actual purchase price of EV may be well north of \$80,000. MSRP likely does not include the cost of delivery fees.
Electric vehicles with final assembly in China are not eligible for any tax credits.	January 1, 2022	Would affect models imported from China by OEMs. Could impact OEMs including Volvo, Kandi, Polestar, Byton, BYD, NIO, Xpeng, and others.
Tax credit becomes refundable.	January 1, 2022	If taxpayer owes less than the amount of EV tax credit, IRS will reduce the owed taxes to zero and pay the remaining amount of the credit to taxpayer.
\$2,500 additional tax credit for qualifying EVs with final assembly in the US.	January 1, 2022	Currently only 14 of the 55 EVs available in the US also have final assembly in the US, but this could nearly triple to ~23 by the end of 2022.
\$2,500 additional credit for vehicles assembled in a US facility where workers are represented by a labor organization	January 1, 2022	5 EVs available today are assembled in US plants with union representation and will likely only increase to 9 by YE 2022.
EVs without final assembly in US will not qualify for ANY tax credit.	January 1, 2026	Currently roughly 25% of EVs have final assembly in the US, which could increase to 35% to 50% by 2026.
Base credit increases to \$5,000 from current \$2,500.	January 1, 2026	Under the current formula (which is not proposed to change), any EV with a 10 kWh battery or larger would qualify for the maximum \$7,500 tax credit.
OEM EV sales cap eliminated and replaced with tax credit phaseout after US government certifies new EV sales represent 50% of total annual sales of new passenger vehicles.	TBD / Likely ~2030-2033	New credit phaseout would affect all OEMs equally. Credit phased out entirely 4 years after US reaches 50% of new vehicle sales being BEVs and PHEVs. Credit likely disappears completely in 2035 at the earliest.

Regulations Source: Technical Explanation of the "Clean Energy for America Act," As Voted On by the Senate Committee on Finance on May 26, 2021 | Research & Chart: Loren McDonald / EVAdoption

- Two infrastructure bills in Congress last year, the first passed but the second that was going to update incentives did not
- Some of the changes that were discussed can be seen in the table (though the final version is slightly different)
- Labor issues were particularly contentious!



California Clean Vehicle Rebate Program (CVRP)

- California provides incentives on top of the federal tax credit
- The CVRP is a tax rebate program – once you buy the car you apply for the rebate which is mailed to you sometime later
- No tax liability required!

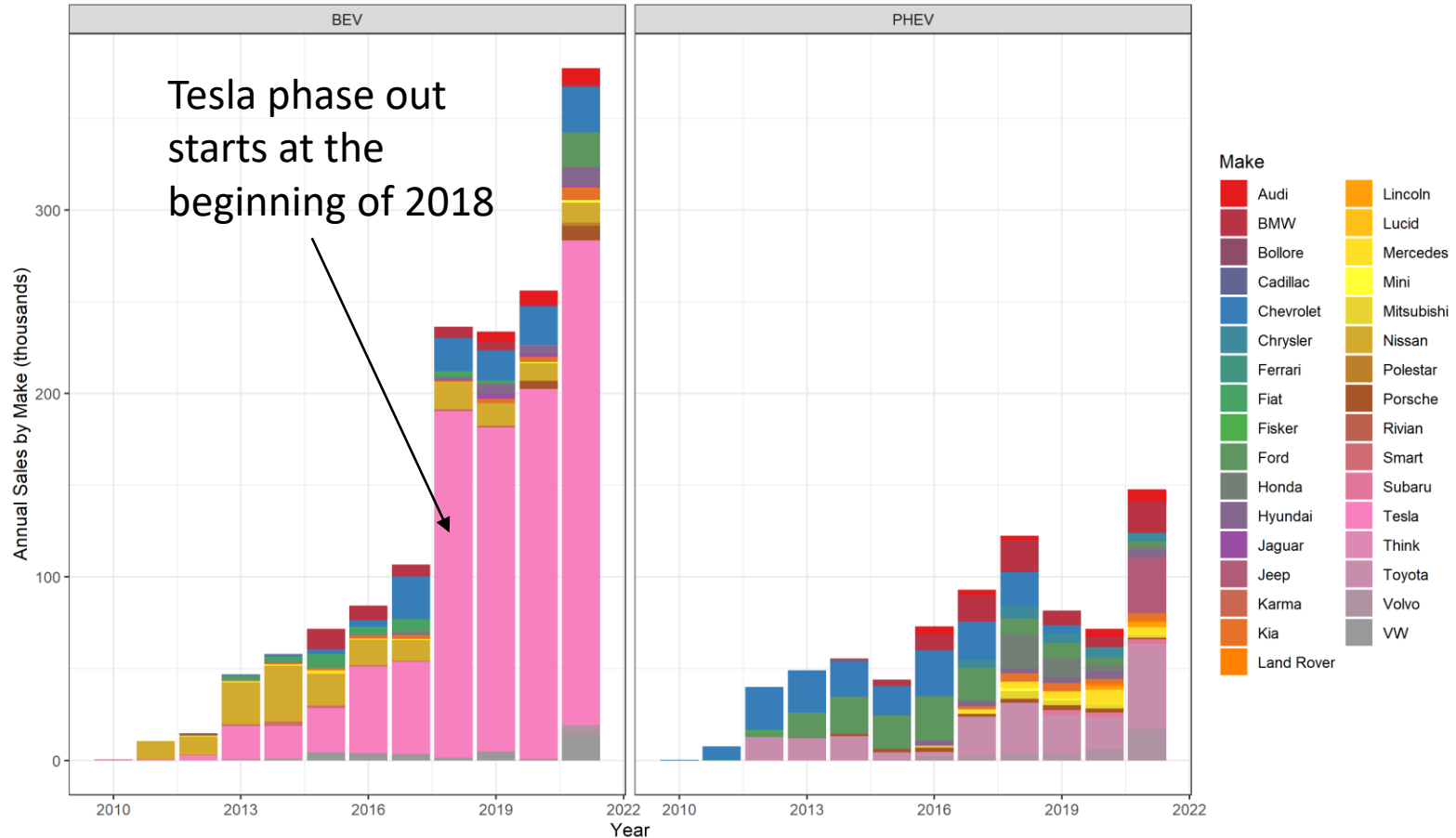
Table 1: Rebates Over Time

Vehicle Types	Effective Dates					
	3/1/2010	6/18/2011	7/4/2013	6/1/2014	3/29/2016	11/1/2016
Plug-in Hybrid Electric (PHEV)	\$3,000	\$1,500	\$1,500	\$1,500	\$1,500–\$3,000*	\$1,500–\$3,500**
Battery Electric (BEV)	\$3,000–\$5,000***	\$1,500–\$2,500***	\$2,500	\$2,500	\$2,500–\$4,000*	\$2,500–\$4,500**
Fuel Cell Electric (FCEV)	\$3,000–\$5,000***	\$1,500–\$2,500***	\$2,500	\$5,000	\$5,000–\$6,500*	\$5,000–\$7,000**
Zero-Emission Motorcycle (ZEM)	\$1,500	\$900	\$900	\$900	\$900	\$900
Neighborhood Electric Vehicle (NEV)	\$1,500	\$900	\$900	\$900	\$900	\$900
Commercial Zero-Emission Vehicle (CZEV)	\$20,000	\$0	\$0	\$0	\$0	\$0

* Lower-income consumers eligible for an additional \$1,500.
 ** Lower-income consumers eligible for an additional \$2,000.
 *** Amounts varied by ZEV type. For definitions, see CCR 1962.1.

Do buyers actually need incentives?

- If you give incentives to an EV buyer who would have bought the vehicle anyways:
 - Providing an unnecessary windfall (...to some rich Silicon Valley kid?!?!)
 - Taking hard earned tax dollars and giving it to those who don't need it?



Income restrictions

Table 2: Income Criteria

	March 29, 2016 – October 31, 2016	November 1, 2016 – Present
Consumer Income Cap*		
Single filers	\$250,000	\$150,000
Head-of-household filers	\$340,000	\$204,000
Joint filers	\$500,000	\$300,000
Increased Rebate for Low-to-Moderate Income Consumers**		
Standard rebate amount increased by	\$1,500	\$2,000
<p><i>* Income cap is deferred for consumers of fuel-cell electric vehicles (although receipt of a rebate above the income cap precludes receipt of a high-occupancy-vehicle-lane sticker, per Assembly Bill 544 of 2017).</i></p> <p><i>** For consumers in households with income \leq 300% of the federal poverty level.</i></p>		

- In response to these concerns, California added income criteria
- Income brackets are still pretty high! But also lower income consumers get extra benefits from the rebate

EFMP and CC4A

- Enhanced Fleet Modernization Program (EFMP) – low-income residents living in low air quality districts can scrap older, higher polluting vehicles and purchase clean vehicles with a large incentive
- Clean Cars 4 All (CC4A) – a similar program, replacing old, polluting cars with clean, efficient vehicles in select air districts.
- Combined these programs provide up to \$9500! That's on top of the federal incentive, CVRP, and Clean Fuel Reward programs
- Funding comes from Volkswagen Environmental Mitigation Trust for California (the settlement fund)

Connecticut Hydrogen and Electric Automobile Purchase Rebate (CHEAPR)

- Other states have taken a slightly different approach by limiting incentives for really expensive cars
- Similar justification: if you can afford a \$100k car, you don't need an extra few thousand dollars!

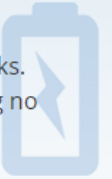
Battery Electric Vehicles (BEVs)

A BEV is a vehicle that obtains all its power from energy stored in rechargeable battery packs. BEVs use electric motors and do not use an internal combustion engine...therefore burning no gasoline.

MSRP Cap: \$42,000

Standard Rebate: \$2,250

Rebate+ New Incentive: \$2,000



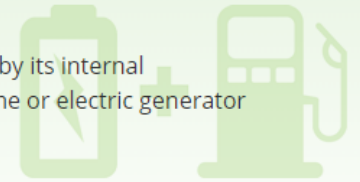
Plug-In Hybrid Electric Vehicles (PHEVs)

A PHEV is a vehicle that can be driven solely on electricity, powered by its internal rechargeable battery but also includes an internal combustion engine or electric generator powered by gasoline to extend the range of the vehicle.

MSRP Cap: \$42,000

Standard Rebate: \$750

Rebate+ New Incentive: \$1,500



Fuel Cell Electric Vehicles (FCEVs)

A FCEV is a vehicle that is fueled with hydrogen but emits no pollutants, only water and heat. A fuel cell located in the car converts hydrogen to electricity which powers the electric motor to drive the vehicle.

MSRP Cap: \$60,000

Standard Rebate: \$7,500

Rebate+ New Incentive: \$2,000



California Clean Fuel Reward

- Anyone who buys or leases an EV with more than 5 kWh is also eligible for an additional \$750
- Must register vehicle in CA and reside in CA as well
- Why do we have both the CVRP and the Clean Fuel Reward?
 - Comes from different pots of money:
 - CVRP funding is from Low Carbon Transportation Investments and Air Quality Improvement Program (administered by CARB)
 - Clean Fuel Reward funding is from the Low Carbon Fuel Standards
 - Experiment for “on-the-hood” incentives, keep this in mind for later!

Washington State EV Infrastructure Tax Exemption

- Washington state provides a tax exemption – in other words you don't have to pay a large portion of the sales tax for the purchase of a new (qualifying) EV
- \$1300 is somewhat lower than other state incentives, but similar to California's Clean Fuel Reward it is applied immediately at the point-of-sale

TAX EXEMPTION

**Up to
\$1,300**

Washington State
EV Tax Exemption

New passenger cars, light-duty trucks, and medium-duty passenger vehicles that are dedicated AFVs and under \$45,000 are exempt from state motor vehicle sales and use taxes. For used vehicles, the price must be below

Low Carbon Fuel Standards

All Electric Utilities must use credit revenues...

- “to benefit current or future EV customers” **AND**
 - “to educate the public on the benefits of EV transportation”
- + must provide rate options that “encourage off-peak charging and minimize adverse impacts to the electrical grid”



Investor-Owned Utilities must use credit revenues...

- to reduce the purchase/lease cost of PEVS **OR**
- to apply an annual credit against a customers' bills

(NOT)

To pay for charging infrastructure (Separate application process)
Or to lower volumetric rates for PEV drivers



Utility incentives



For a limited time starting in fall 2022, PG&E's Empower EV program can offer income-eligible households up to \$2,500 in financial incentives. The program extends to qualifying customers in single-family households who have recently purchased or leased an EV within six months prior to applying to the program.

Program details

- PG&E will cover the cost of up to \$500 for one Level 2 charger (hardwires or plugs in to 220+ Volt outlet).
- PG&E will cover up to \$2,000 per single-family household for panel upgrades completed by licensed electricians.
- No cost to enroll.
- Goal is to assist 2,000 households through this program.



1



Purchase or lease an eligible pre-owned EV

2



Submit application within 180 days

3



If eligible, receive a \$1,000 rebate

4



Eligible Rebate Plus applicants receive a \$4,000 rebate



Get up to \$1,000 toward EV charging equipment and installation costs.*

SMUD's new Charge@Home incentive program will help you lower the cost of installing a qualified Level 2 charger at your home and/or home electrical costs needed to install a Level 2 charger.

Eligibility

If you've purchased a new or used electric vehicle on or after July 1, 2021, you are eligible for up to **\$500** towards the purchase of a Level 2 charger and/or up to **\$500** towards electrical work needed to accommodate your new charger.

- Eligible EV Charger specifications
- Tips on working with a contractor and installation of a home charger

[Learn more and apply](#)

[Find an electrician](#)





Non-monetary incentives

High-occupancy vehicle lanes

- HOV lane stickers allow vehicles to drive in carpool lanes even with just a single occupant in the car
- Program began in the 2000s with HEVs but was later extended to BEVs and PHEVs
- Eventually decided that HOV access should sunset over time
- We're back to yellow as of this year!

Clean Air Vehicle decals through the years

Red: In March, the California Department of Motor Vehicles began issuing a new, single-color red decal for qualifying vehicles. The red decal is valid until Jan. 1, 2022.



White and green: White and green clean air vehicle decals are valid only until Jan. 1, 2019. New white and green CAV decals are no longer issued. If the state issued your white or green sticker in 2017 or later, you're eligible for a red one.



Yellow: This decal program ended on July 1, 2011. Owners displaying yellow CAV decals are no longer allowed to operate their vehicle in a HOV lane unless the minimum passenger requirements are met. These vehicles do not qualify for any other type of decals.



Charging benefits

- Many automakers offer free charging programs after purchasing a new EV:
 - Audi, Lucid, Porsche: 3 years free charging on Electrify America
 - BMW, Mercedes-Benz, Polestar: 2 years, 30 minutes free charging on Electrify America
 - Chevrolet: \$500 free charging on EVGo
 - Ford, Hyundai, Volvo: 250 kWh free charging (~3-5 full charges) at Electrify America
 - Kia: 1000 kWh free charging at Electrify America
 - Mazda: \$500 free charging at ChargePoint
 - Nissan: \$250 free charging at EVGo
 - Toyota: 1 year free charging on EVGo
 - Volkswagen: 3 years free at Electrify America

Parking incentives

- A minor perk, but oftentimes you get to park at the “front of the line”
- Some benefits may come after the fact, they might not directly influence purchase behavior





Analyzing efficacy of incentives

Why do we care how important incentives are?

- Are incentives doing anything? Or are they a waste of taxpayer money?
- Understanding the importance of incentives can help inform policymakers on whether or not they should exist – and if they should, how to best structure them

Tax credit vs tax rebate vs “on-the-hood”

- Not all monetary incentives are created equal!
- Would you prefer to get your incentive:
 - When you file your taxes next year (federal tax credit)
 - After a 6-8 week time period (CVRP)
 - At the point-of-sale when you buy the EV (CCFP, sales tax exemption)
- Some studies have shown that the *timing* of the incentive can have a huge effect. If you want to improve the efficacy of the incentive, a \$1 point-of-sale incentive can be as effective as a \$2 tax credit (double the value!)

Incentives don't always come right away

Table 3: CVRP Waitlists

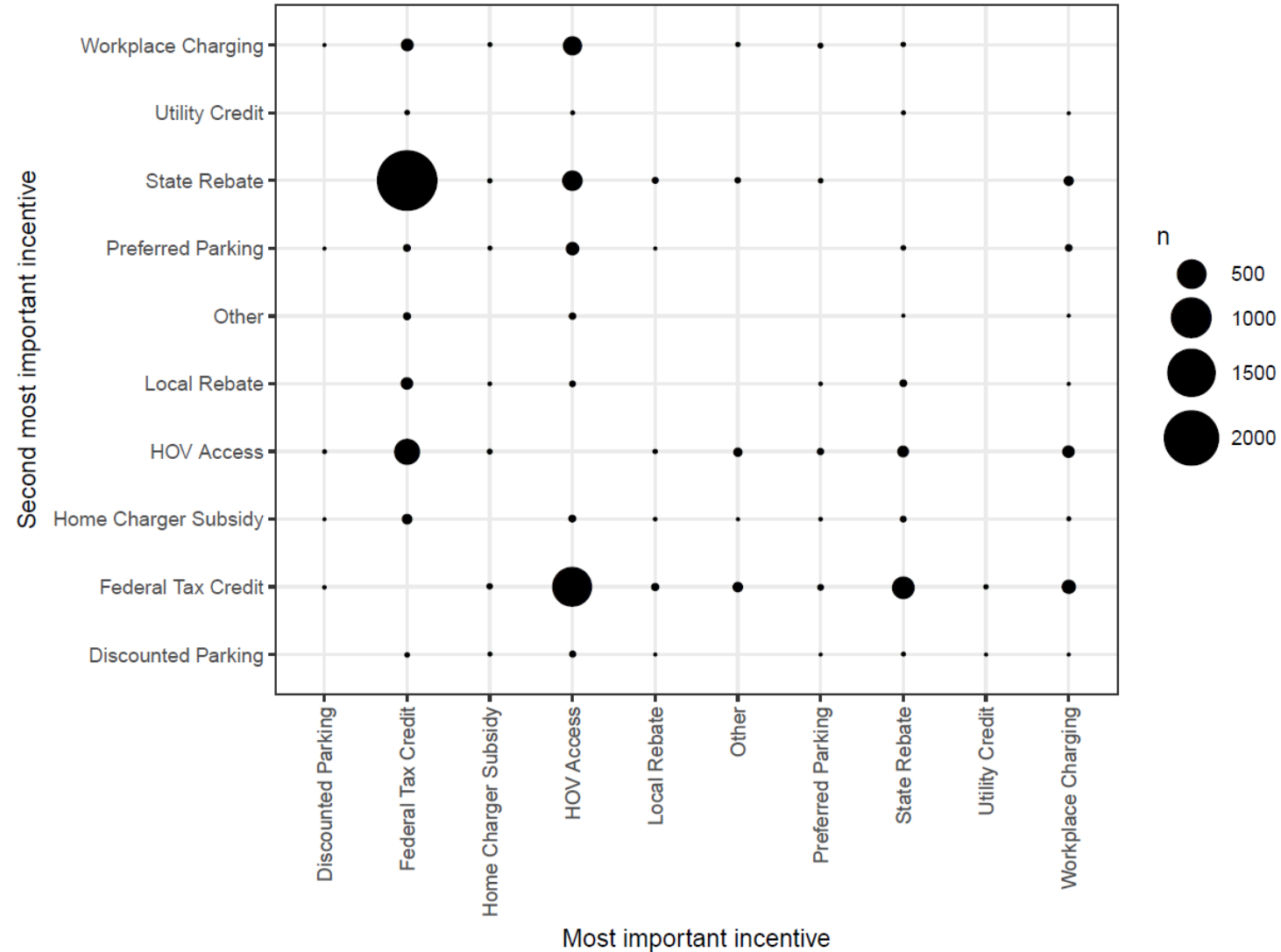
Waitlist Year	Start Date	End Date	Length in Days
2011*	6/20	9/30	102
2013*	5/1	6/30	60
2014	3/28	7/22	116
2016	6/11	9/28	109
2017**	6/30	11/20	143
2019**	6/5	9/23	110

* Dates approximate.
** For standard applications only; no waitlist for income-qualified increased rebates.

- If there isn't enough funding allocated for CVRP, customers may have to wait quite some time to receive the rebate

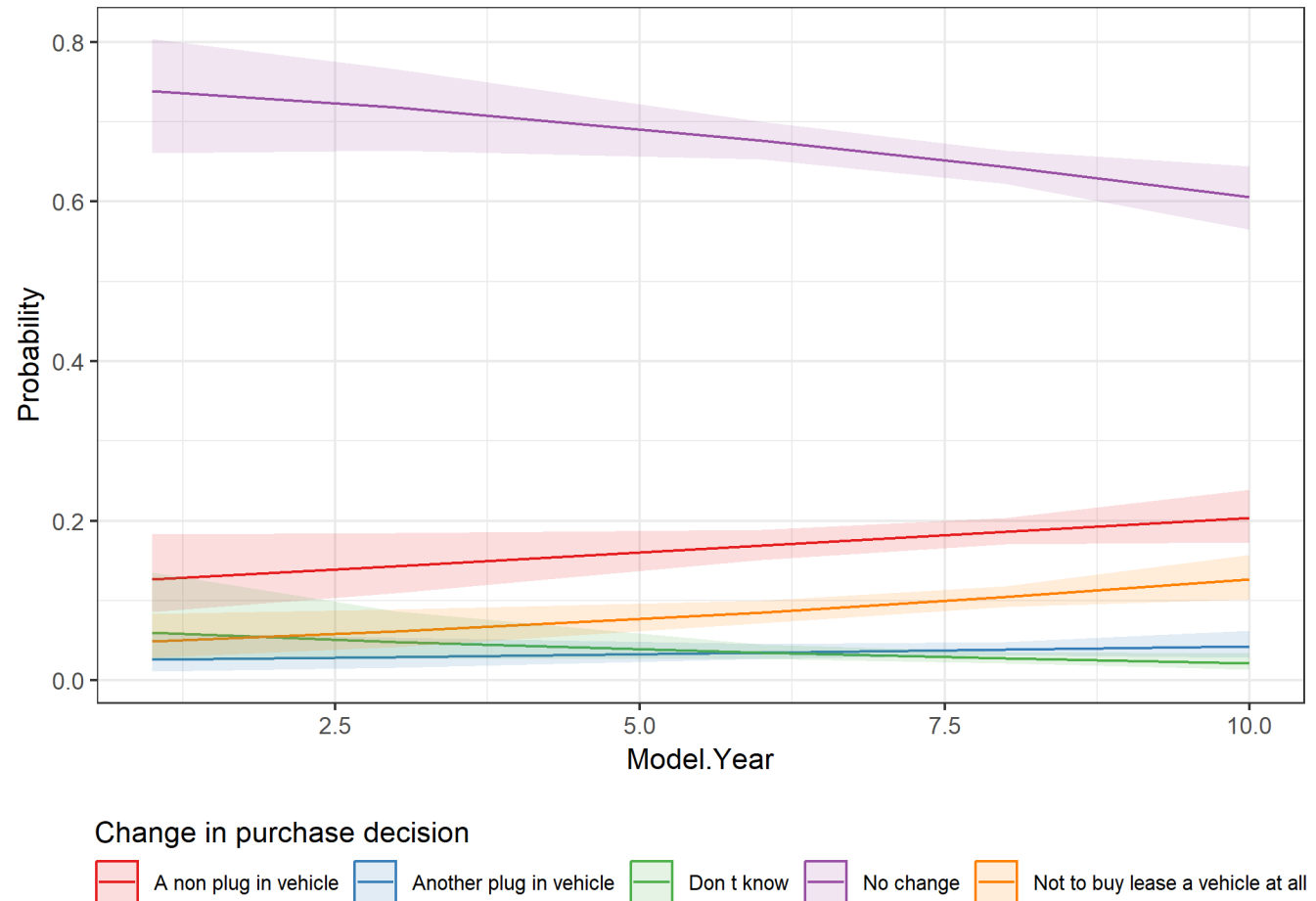
What incentives do people care about?

- In a large-scale survey of EV purchasers, we asked what were the two most important incentives
- Far and away, consumers prefer monetary incentives – followed by HOV lane access



When should we phase out incentives?

- Deciding when to phase-out incentives is not a straightforward decision
- Studies have actually shown that the importance of incentives for EV buyers is actually *increasing* over time
- This makes sense qualitatively: as more adopters enter the market, you start penetrating lower income populations who need the incentive



How valuable are HOV lane stickers?

- More than you might think!
- Several studies have investigated this:
 - Sales of used HEVs with and without the sticker (\$10000 difference!)
 - Survey by UC Davis found savings as high as \$540 per year



In early years, HOV was the primary motivation for purchase!

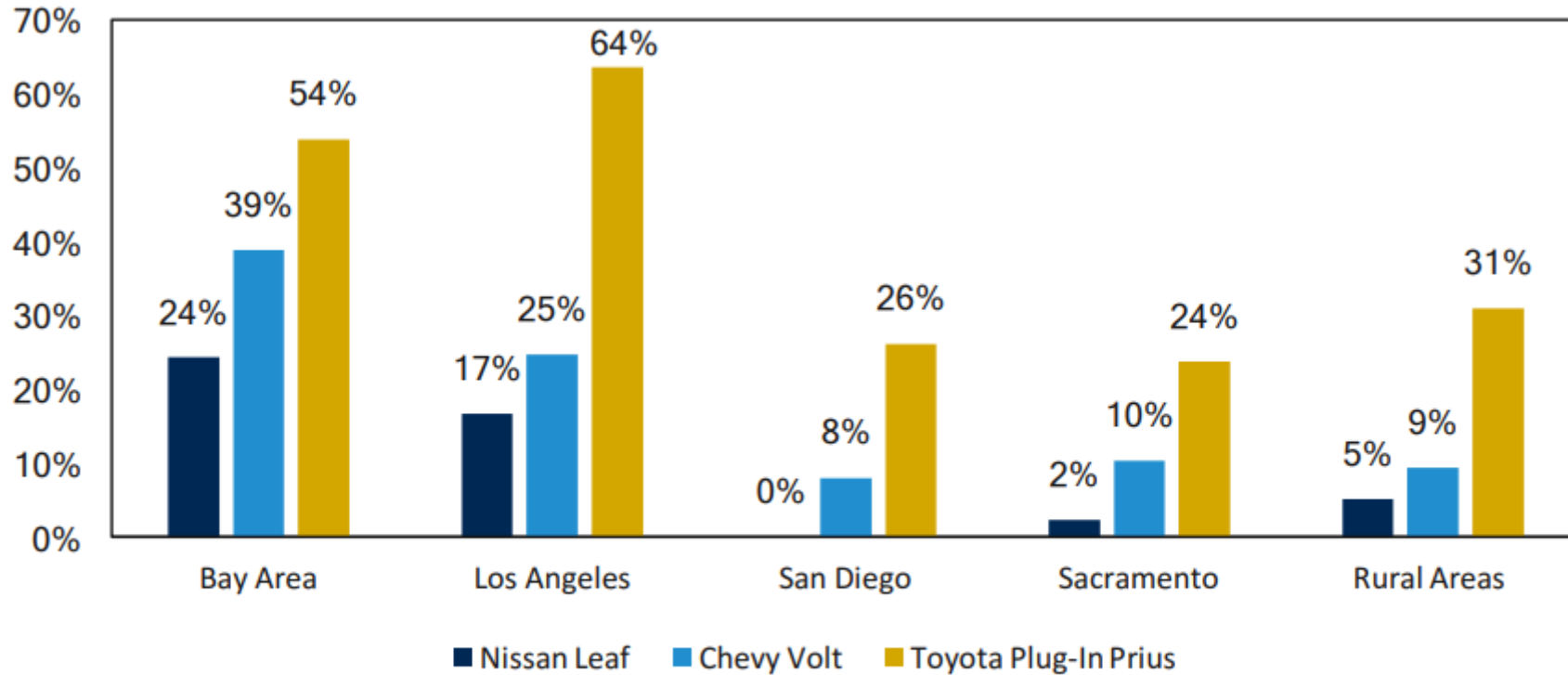


Figure 1: Percentage of respondents by location and vehicle type that state HOV access was a primary purchasing motivation (Tal and Nicholas, 2014).

Do incentives lead to more EVs being sold?

- The million-dollar question! ...but also very difficult to analyze correctly
- This specific topic has been heavily studied in the academic literature...let's take a look:

Table 1
Overview of econometric studies on the effect of incentives on AFV market penetration.

Author (year)	Observations	Time resolution	Vehicle type	N	Method	Dependent variable				Incentives			Controls				
						Absolute sales	Sales share	Sales per capita	Stock per capita	Monetary incentives	Non-monetary incentives	Changing infrastructure	Income	Education	Gasoline price	Electricity price	Environmentalism
Clinton & Steinberg (2016)	US states	2010–2014, quarterly	BEV	2461	FE panel data regression			✓		+/-	-	+/-	+	+	+	-	+
Jenn et al. (2018)	US states	2010–2015, monthly	PEV	18644	FE panel data regression/LDV with GMM estimator	✓				+/-	+/-				0		
Jin et al. (2014)	US states	2013, yearly	BEV	50	Stepwise linear regression		✓			0	0	0	+				
Hall & Lutsey (2017)	Global metropolitan areas	2016, yearly	PEV, PHEV, BEV	350	Stepwise linear regression		✓			0		0					
Li et al. (2017)	US metro areas	2011–2013, yearly	PEV	14,563	OLS and GMM regression	✓				+		+	+		+		+
Mersky et al. (2016)	Norwegian municipalities	2000–2013, yearly	BEV	163/20	Stepwise linear regression			✓		0	+	+	+/-				
Plötz et al. (2016)	European countries/US states	2010–2014, yearly	PEV	35/125	Pooled OLS regression		✓		✓	+/-	+	+	+/-		+	-	
Sierzchula et al. (2014)	Global countries	2012, yearly	PEV	30	Pooled OLS regression		✓			+		+	-	+	-	-	+
Slowik & Lutsey (2017)	US metropolitan areas	2016, yearly	BEV, PHEV	200/50	Stepwise linear regression		✓			0	0	0					
Vergis & Chen (2015)	US states	2013, yearly	BEV, PHEV	50	Stepwise linear regression		✓			+	+	+		+	+	-	+
Wang et al. (2017)	Chinese cities	2013–2014, yearly	PEV, BEV, PHEV	41	Stepwise linear regression			✓		0	0	+	0				
Wee et al. (2018)	US states	2010–2015, yearly	PEV, BEV, PHEV	1952–4287	Multi-level FE regression (<i>reghdife</i>)	✓				+	-	-	+		+	-	
Beresteanu & Li (2008)	US metropolitan areas	1999–2006, yearly	HEV	172	Pooled OLS regression		✓			+	+		+	+	+		
Chandra et al. (2010)	Canadian provinces	1989–2006, yearly	HEV	38110	FE panel data regression		✓			+							
Diamond (2009)	US states	2001–2006, yearly	HEV	297	Pooled OLS/FE panel regression		✓			+/-	-		+		+		+
Gallagher & Muehlegger (2011)	US states	2000–2006, quarterly	HEV	4781	FE panel data regression			✓		+	-		+	+/-	+		
Jenn et al. (2013)	US national data	2000–2010, monthly	HEV	20787	FE panel data regression/LDV with GMM estimator	✓				+/-					+/-		
Sprei (2013, 2018)	Swedish municipalities/national data	2006–2011, yearly/2002–2011, monthly	FFV	120/1740	Pooled OLS/FE panel regression		✓			+	+/-	+/-	+		+	-	

Notes: Signs connote the direction of the relationship reported by the study: "+" : positive relationship, "-" : negative relationship, "+/-" : inconclusive relationship, "0" : direction not reported. Colours indicate significance of respective coefficient: dark grey: significant at the 5% or lower level, light grey: significant at 5% in some models of the publication; no shading: never significant.

Table 2
Breakdown of literature that investigates the relationship between PEV or HEV adoption and financial incentives.

Authors	Methods	Vehicle Type	Region	Incentive Type	Total Incentive Value	Conclusions	Are incentives effective?
[1]	PEV Market Analysis	BEV	Norway	VAT Exemption, Registration Tax Exemption		VAT and registration tax exemptions are effective in increasing PEV sales. Toll fee waivers, free parking and bus lane access are also a factor.	Yes
[3]	PEV Market Analysis	HEV	USA	Federal Tax Credit	US\$3400	Financial incentives did increase rates of adoption for HEVs. Petrol prices are also an important factor.	Yes
[4]	Questionnaire Survey	BEV	Norway	Vehicle Registration Tax Exemption and VAT Exemption	US\$6000–70,000	VAT and purchase price reductions are the strongest incentives for encouraging BEV adoption. Bus lane access and toll exemptions are also important factors.	Yes
[7]	Questionnaire Survey	BEV	California	Federal Tax Credit and California State Rebate	US\$10,000	The federal tax credit and the state rebate have been effective in promoting PEV market development.	Yes
[8]	PEV Market Analysis	BEV	USA	Federal Tax Credit and State Rebates	US\$10,000	Financial incentives and the presence of recharging infrastructure both correlated to BEV market uptake.	Yes
[9]	Review	BEV & PHEV	USA	Federal Tax Credit and State Rebates	US\$10,000	Financial incentives are effective in supporting the early market, however they need to be properly designed and communicated to consumers.	Yes
[11]	Review	BEV, PHEV & HEV	California	Federal Tax Credit and California State Rebate	US\$10,000	Incentives are effective, but inefficient. Incentives should be applied at point of sale, rather than as a rebate or tax credit. Incentives should be higher for BEVs than PHEVs.	Yes
[10]	Questionnaire Survey	BEV & PHEV	California	California State Rebate	US\$2500	Current incentives are inefficient. It is possible to design more efficient incentives that reduce budget costs but maintain the size of the BEV market. It is also possible to maintain budget size but develop more effective incentives to increase rates of adoption.	Yes
[12]	PEV Market Analysis	HEV	USA	Federal Tax Credit and State Rebates	US\$2000–6000	No relationship between incentives and HEV adoption. Adoption is related to vehicle mileage, petrol prices and income. Incentives that provide money upfront may be more effective.	No
[13]	Questionnaire Survey	BEV	Norway and Austria	VAT Exemption, Registration Tax Exemption		Incentives are effective in increasing electric vehicle markets Bus lane access is also effective and low cost but can have a negative impact on bus journey times.	Yes
[14]	Questionnaire Survey	BEV	Norway	VAT Exemption, Registration Tax Exemption		Incentives have played a large role in the diffusion of BEVs in Norway. Free parking, bus lane use, free toll road use and reduced rates on ferries have also had an impact.	Yes
[15]	PEV Market Analysis	HEV	USA	Federal Tax Credit and State Rebates	US\$2000–6500	Financial incentives did increase rates of adoption for HEVs. Petrol prices are also an important factor.	Yes
[16]	Communication	BEV & PHEV	USA			Incentives are inefficient and costly at present. They need to be more targeted.	Yes
[20]	Interviews	BEV	California	Federal Tax Credit and California State Rebate	US\$10,000	Incentives not important for purchases or high end BEVs. They are effective for low-end BEVs though.	Yes
[22]	Questionnaire Survey	BEV & PHEV	USA & China	Hypothetical Subsidies	US\$0–20,000	Subsidies increase rates of adoption for PHEVs and BEVs. BEVs may need larger subsidies than PHEVs.	Yes
[23]	Review	BEV & PHEV	Global			The presence of financial purchase incentives is correlated to high BEV market shares. The presence of charging infrastructure is also an important factor.	Yes
[24]	PEV Market Analysis	HEV	USA	Federal Tax Credit	US\$7500	Financial incentives have increased rates of adoption for HEVs. Incentives are only effective if they are larger than US\$1000.	Yes
[25]	PEV Market Analysis	BEV & PHEV	USA	State Rebates	US\$2000–6000	Financial incentives increase rates of adoption of BEVs. However, some regions have high incentives but low market shares of BEVs.	Yes
[27]	Questionnaire Survey	BEV & PHEV	USA	Federal Tax Credit	US\$7500	Purchase incentives increase likelihood of purchase only for consumers who are aware of PEVs.	Yes
[26]	Questionnaire Survey	BEV & PHEV	USA	Federal Tax Credit and State Rebates	US\$10,000	Most consumers are not aware of the current policies and incentives that are available. This means policies have a negligible impact on mainstream vehicle buyers.	No
[29]	Questionnaire Survey	BEV	Sweden	Various hypothetical incentives	US\$4340 (40,000 SEK)	Financial Incentives do increase rates of adoption. Free parking and bus lane access also has an impact.	Yes
[30]	Questionnaire Survey	BEV	Canada			Financial incentives are important in reducing purchase prices for consumers.	Yes
[32]	PEV Market Analysis	BEV & PHEV	USA	State Rebates	US\$2000–6000	Financial incentives do increase rates of adoption. Automotive OEM marketing activities may also be a factor.	Yes
[34]	PEV Market Analysis	BEV	Norway	Vehicle Registration Tax Exemption and VAT Exemption	US\$6000–70,000	Access to charging infrastructure, being near to major cities and household income are related to the adoption of BEVs.	No
[35]	PEV Market Analysis	BEV & PHEV	Global			Incentives are a powerful tool to entice people to purchase a BEV or PHEV. They	Yes

Table 2 (continued)

Authors	Methods	Vehicle Type	Region	Incentive Type	Total Incentive Value	Conclusions	Are incentives effective?
[37]	Modelling	BEV				are effective for both private car buyers and company car buyers. Incentives, experience and familiarisation are all key factors in driving the transition to BEVs.	Yes
[42]	Questionnaire Survey	BEV & PHEV	USA			Incentives enable the gap between willingness to pay for a PHEV or BEV and their actual purchase price to be reduced. Existing incentives may encourage more PHEV adoption rather than BEV adoption.	Yes
[43]	PEV Market Analysis	BEV & PHEV	Global			Financial Incentives do increase rates of adoption. Access to infrastructure is also related to adoption rates.	Yes
[44]	Modelling	BEV & PHEV	USA			Financial incentives have increased rates of adoption of BEVs by 300%.	Yes
[45]	PEV Market Analysis	BEV & PHEV	Global			Incentives have been successful in increasing early market growth. Incentives should be phased out over time as vehicle costs fall. Feebate or polluter pays schemes may be preferential.	Yes
[47]	Questionnaire Survey	BEV & PHEV	USA	Federal Tax Credit	US\$7500	More than 30% of PHEV and BEV sales can be attributed to the federal tax credit. Some vehicles not reliant on tax credit though, especially Tesla BEVs and some PHEVs.	Yes
[49]	Review	BEV, PHEV & HEV	Not specified			Financial incentives are important are effective policy interventions. Fuel prices may be more important though.	Yes
[51]	PEV Market Analysis	BEV & PHEV	USA	State Rebates	US\$2000–6000	Incentives are more important for buyers of PHEVs than BEVs. BEV market is related to education and awareness of BEVs, the presence of recharging infrastructure and gas and electricity costs.	Yes
[53]	Review of Policies	HEV, BEV & PHEV	Global			Countries with higher BEV adoption rates have higher purchase incentives. Non-financial incentives are also important though.	Yes
[54]	Review	BEV & PHEV	Global			Financial incentives are effective in increasing PEV markets. They should be paired with other incentives. Developing charging infrastructure is critical for PEV market development.	Yes

Incentives are [probably] important, but the devil is in the details

- There's generally agreement that incentives have an effect, but lots of ongoing debate about whether we should still have them
- Its hard to keep track of incentives! There are federal, state, and even local level incentives (not to mention those offered by utilities or automakers or other organizations). These incentives are also constantly changing over time
- Take advantage of these incentives while you can!