

Policies for Electrifying the Light-Duty Vehicle Fleet in the United States: Online Appendix

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March 26, 2023

Table A1: Benchmark Parameter Values and Sources

Name	Value	Notes
A. Vehicle Demand Parameters		
η_p	-2.5	Price elasticity of EV demand at initial market share s_0 (see text)
η_2	0.37	Elasticity of EV demand w.r.t. level-2 charging
η_3	0.37	Elasticity of EV demand w.r.t. level-3 charging
ρ_c	0.1072	Charging station (annual) exit rate; BEA depreciation rate for general industrial equipment
ρ_v	$\frac{1}{11.5}$	Vehicle (annual) scrappage rate; Based on Polk data average age of vehicles on the road
\bar{Q}	17	FRED light weight vehicle sales, millions annually
ψ_g	-	Calibrated: drift in unobserved EV attributes and tastes
B. Charging Station Supply Parameters		
γ	0.671	Elasticity of charging station supply with respect to EV stock
C_0^2	4,000	Level 2 charging station cost in 2020 (\$), 2 ports (see text)
C_0^3	400,000	Level 3 charging station cost in 2020 (\$), 4 ports (see text)
ζ	-0.04	Charging station cost growth (see text)
r	0.03	Annual discount rate
κ_2	-	Calibrated: full penetration L2/EV ratio = 0.1
κ_3	-	Calibrated: full penetration L3 chargers = 60k 4-plug chargers
C. Price Forecast Parameters		
e_{car}	3.2	Mi/kWh EV car avg: Chevy Bolt, adjusted down for cold weather
e_{suv}	2	Mi/kWh EV suv/lt truck average
f_{car}	27.5	EPA estimate of real-world fuel economy for cars
f_{suv}	22.4	EPA estimate of real-world fuel economy for SUVs
v	2,924,053	Million vehicle miles traveled (VMT) for LDVs, 2019; FHWA
B_g	-0.09	Battery cost growth (see text)
v_g	0.0091	Growth of VMT (AEO 2021 reference case)
Gas prices	-	Energy Information Administration Annual Energy Outlook 2021

Notes: This table describes the baseline calibrated parameters in our model. Parameter values are drawn from existing academic literature and professional forecasts.

Table A2: Main simulation results

	Station subsidies		Policies		EV sales rebate Expenditures (4)	EV Sales Share by 2030 (5)	EV share & Emissions		Cost per ton CO ₂ avoided (7)	Fiscal costs through 2031 (\$B, not discounted)			
	Budget (\$B) (1)	IRA (2)	IRA (2)	Rebate (3)			EV share by 2030 (5)	Δ CO ₂ in 2030 (mmt) (6)		Total (8)	Chargers (9)	Rebates (10)	Inframarginal Rebates (11)
0	-	-	-	-	-	0.366	-	-	-	-	-	-	-
I1	5	-	-	-	-	0.442	-31	97	6	6	-	-	
I2	7.5	-	-	-	-	0.439	-40	107	9	9	-	-	
I3	-	0.3	-	-	-	0.422	-15	90	4	4	-	-	
I4	5	0.3	-	-	-	0.469	-42	102	10	10	-	-	
I5	-	-	-	3604	6872	0.433	-20	63	-	-	286	123	
I6	-	-	-	6410	6872	0.490	-37	66	-	-	332	219	
I7	-	-	-	7208	10476	0.506	-43	67	-	-	528	246	
I8	-	-	-	10014	10476	0.565	-63	71	-	-	608	342	
I9	-	0.3	-	6410	6872	0.546	-54	80	6	6	376	219	
I10	5	0.3	-	6410	6872	0.577	-80	95	11	11	440	219	
E1	8	-	-	4400	4400	0.480	-64	100	10	10	252	150	
E2	15	-	-	3900	3900	0.561	-86	107	18	18	256	133	
E3	25	-	-	3500	3500	0.643	-99	110	275	28	248	120	
E4	28	-	-	3400	3400	0.658	-100	110	273	30	243	116	
E5	30	-	-	3250	3250	0.665	-100	111	265	32	233	111	
E6	40	-	-	3100	3100	0.679	-110	113	263	40	223	106	

Note: In I2, budget is split between \$5 billion for level-3 stations and \$2.5 billion for level-2 chargers.

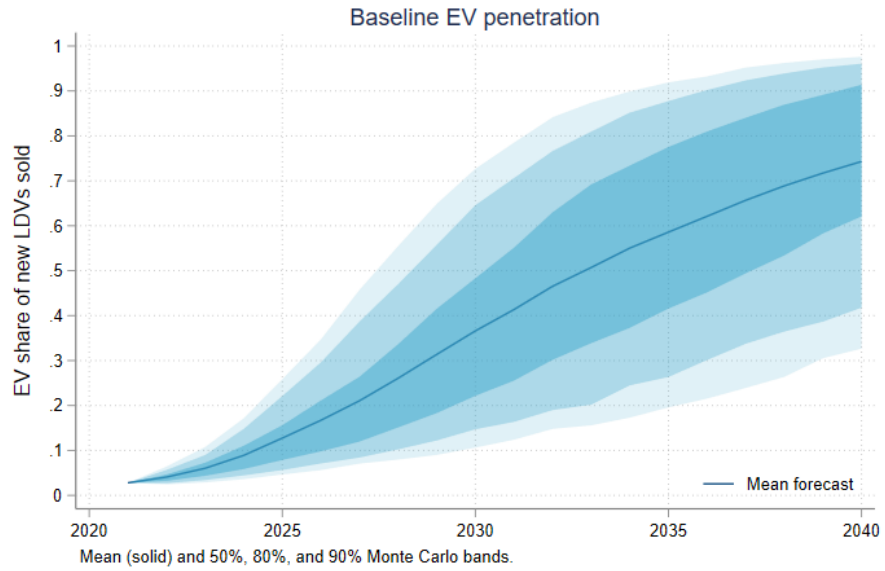


Figure A1: No-policy baseline EV share under benchmark specification

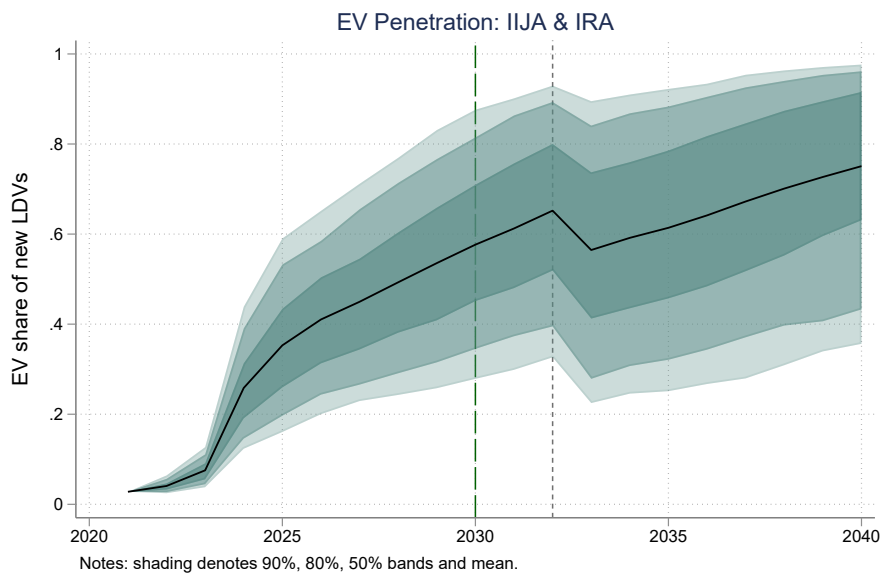


Figure A2: IIJA & IRA EV share under benchmark specification

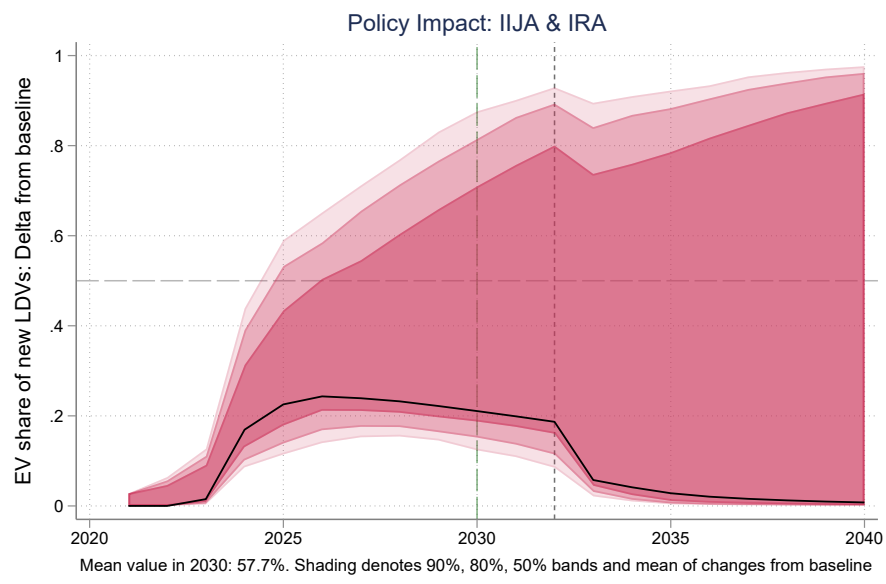


Figure A3: Policy impacts of IIJA & IRA under benchmark specification

Table A3: Results under EIA Baseline

	Station subsidies		Policies		EV sales rebate		EV Sales Share by 2030		EV share & Emissions		Fiscal costs through 2031 (\$B, not discounted)		
	Budget (\$B)	IRA	IRA	Rebate	EV sales rebate Expenditures	EV Sales Share by 2030	EV Sales Share by 2030	Δ CO ₂ in 2030 (mmt)	Cost per ton CO ₂ avoided	Total	Chargers	Rebates	Inframarginal Rebates
	(1)	(2)	(2)	(3)	(4)	(5)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
0	-	-	-	-	-	0.038	-	-	-	-	-	-	-
I1	5	-	-	-	-	0.063	-10	97	97	3	3	-	-
I2	7.5	-	-	-	-	0.071	-18	109	109	7	7	-	-
I3	-	0.3	-	-	-	0.049	-4	41	41	1	1	-	-
I4	5	0.3	-	-	-	0.074	-15	103	103	6	6	-	-
I5	-	-	-	3604	6872	0.052	-6	36	36	54	-	54	21
I6	-	-	-	6410	6872	0.068	-12	32	32	70	-	70	37
I7	-	-	-	7208	10476	0.074	-14	31	31	114	-	114	42
I8	-	-	-	10014	10476	0.097	-23	28	28	148	-	148	58
I9	-	0.3	-	6410	6872	0.085	-18	46	46	86	2	84	37
I10	5	0.3	-	6410	6872	0.115	-33	71	71	130	7	123	37
E1	8	-	-	4700	4700	0.092	-30	90	90	81	8	73	26
E2	15	-	-	4000	4000	0.122	-37	95	95	88	13	75	23
E3	25	-	-	3500	3500	0.137	-38	97	97	85	16	69	20
E4	28	-	-	3300	3300	0.138	-38	97	97	83	16	67	20
E5	30	-	-	3150	3150	0.137	-37	97	97	80	16	64	19
E6	40	-	-	2750	2750	0.136	-37	98	98	77	17	60	18

Note: In I2, budget is split between \$5 billion for level-3 stations and \$2.5 billion for level-2 chargers.

Table A.4: Results under 20% Baseline

	Station subsidies Budget (\$B)		Policies		EV sales rebate Expenditures (4)	EV Sales Share by 2030 (5)	EV share & Emissions		Cost per ton CO ₂ avoided (7)	Fiscal costs through 2031 (\$B, not discounted)		
	(1)	(2)	(3)	(4)			IRA Rebate (3)	EV share (2)		Δ CO ₂ in 2030 (mnt) (6)	Total (8)	Chargers (9)
0	-	-	-	-	-	0.201	-	-	-	-	-	-
I1	5	-	-	-	-	0.286	-28	65	6	6	-	-
I2	7.5	-	-	-	-	0.285	-38	77	9	9	-	-
I3	-	0.3	-	-	-	0.248	-12	60	3	3	-	-
I4	5	0.3	-	-	-	0.309	-39	71	9	9	-	-
I5	-	-	3604	-	6872	0.261	-16	36	-	-	180	72
I6	-	-	6410	-	6872	0.318	-32	38	-	-	222	128
I7	-	-	7208	-	10476	0.336	-37	38	-	-	359	144
I8	-	-	10014	-	10476	0.401	-57	42	-	-	439	199
I9	-	0.3	6410	-	6872	0.376	-48	50	4	4	264	128
I10	5	0.3	6410	-	6872	0.423	-76	66	10	10	333	128
E1	8	-	4400	-	4400	0.317	-58	74	9	9	180	88
E2	15	-	3900	-	3900	0.418	-84	76	17	17	197	78
E3	25	-	3500	-	3500	0.508	-94	74	27	27	194	70
E4	28	-	3400	-	3400	0.523	-95	73	30	30	190	68
E5	30	-	3250	-	3250	0.526	-94	73	32	32	182	65
E6	40	-	3100	-	3100	0.527	-93	72	37	37	173	62

Note: In I2, budget is split between \$5 billion for level-3 stations and \$2.5 billion for level-2 chargers.

Table A5: Results under low charging station elasticity & high price elasticity

	Station subsidies			Policies		EV share & Emissions			Fiscal costs through 2031 (\$B, not discounted)			
	Budget (\$B)	IRA	EV sales rebate	Rebate	EV sales rebate	EV Sales Share	Δ CO ₂ in 2030	Cost per ton	Total	Chargers	Rebates	Inframarginal
	(1)	(2)	Expenditures	(3)	(4)	by 2030	(mmt)	CO ₂ avoided	(8)	(9)	(10)	(11)
0	-	-	-	-	-	0.366	-	-	-	-	-	-
I1	5	-	-	-	-	0.409	-16	101	6	6	-	-
I2	7.5	-	-	-	-	0.408	-21	108	9	9	-	-
I3	-	0.3	-	-	-	0.396	-8	96	4	4	-	-
I4	5	0.3	-	-	-	0.424	-22	105	9	9	-	-
I5	-	-	6872	3604	6872	0.459	-27	65	311	-	311	125
I6	-	-	6872	6410	6872	0.537	-53	70	376	-	376	222
I7	-	-	10476	7208	10476	0.559	-60	71	604	-	604	250
I8	-	-	10476	10014	10476	0.636	-89	78	715	-	715	347
I9	-	0.3	6872	6410	6872	0.567	-62	78	406	6	400	222
I10	5	0.3	6872	6410	6872	0.581	-76	88	444	11	433	222
E1	8	-	4400	4400	4400	0.494	-55	88	252	10	242	152
E2	15	-	3900	3900	3900	0.539	-66	97	247	17	230	135
E3	25	-	3500	3500	3500	0.580	-70	103	240	27	213	121
E4	28	-	3400	3400	3400	0.586	-69	104	237	30	207	118
E5	30	-	3250	3250	3250	0.586	-68	105	228	32	197	113
E6	40	-	3100	3100	3100	0.586	-67	108	225	37	187	107

Note: In I2, budget is split between \$5 billion for level-3 stations and \$2.5 billion for level-2 chargers.