Development Studies Series DS25-01

Tradeoffs between the time and cost of electric vehicle charging in Korea

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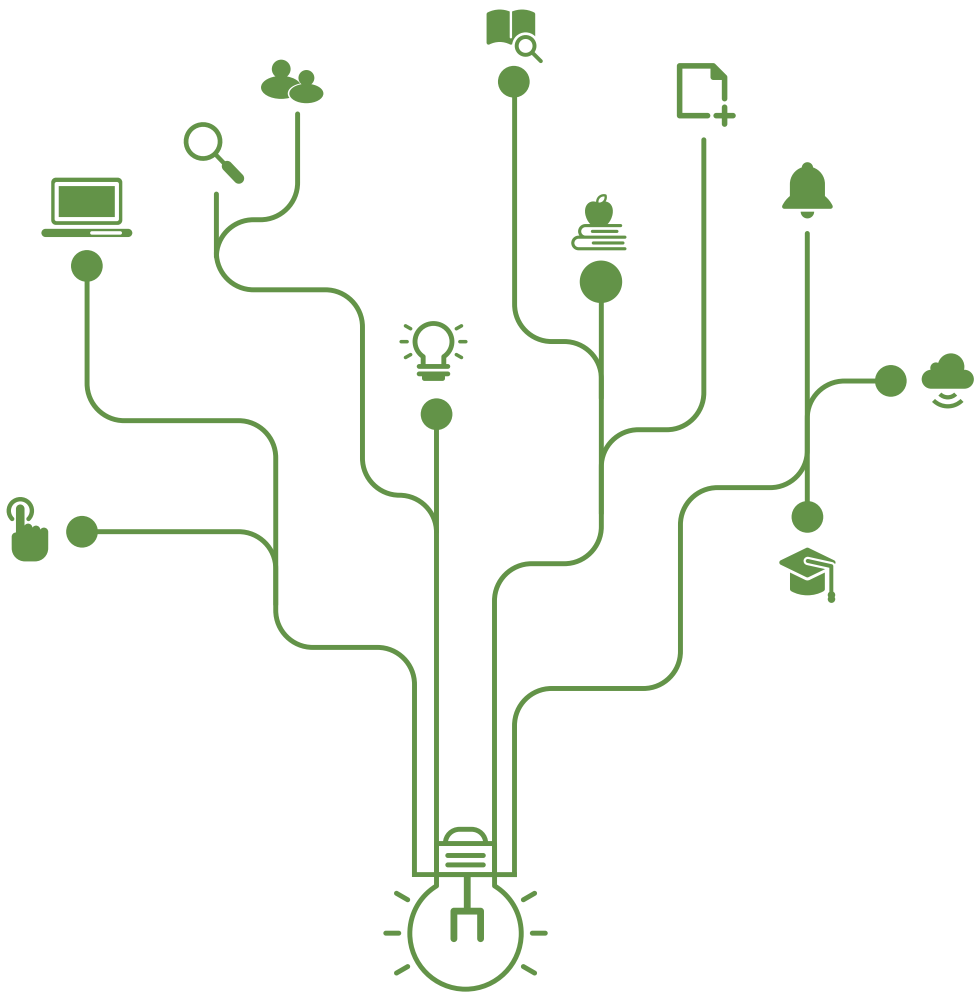

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Abstract

We explore how varying charging costs and speeds shape the decisions of electric vehicle (EV) owners in South Korea, a setting challenged by dense urban environments and limited charger expansion. Drawing on survey responses from 1,600 EV users in July 2023 and 2024, we employ logistic regression across both grouped and individual cost–speed scenarios. Our results indicate that each 1 KRW shift in price can lead to a 0.2–0.4% change in the likelihood of choosing a particular charger type. Although respondents generally favor slow charging - especially at home - this preference diminishes as cost gaps narrow, revealing a material balance between affordability and speed. These findings highlight the need for tailored pricing and infrastructure strategies to manage local charger usage efficiently. Policymakers and industry stakeholders can leverage these insights to inform infrastructure investments and encourage balanced utilization of both slow and fast charging options in areas with varying charger availability.

Keywords

Korea; electric vehicles; charging; cost; speed; tradeoff; willingness-to-pay

Highlights

1. Affordable charging and robust infrastructure are key to a successful EV transition
2. Slow chargers are consistently preferred across all presented charging scenarios
3. Each 1 KRW charging cost difference shifts charger selection probability by 0.2%–0.4%
4. Findings can inform policies to manage demand and support charger utilization
5. Fast charger investments in areas like residential facilities may be questionable

1. Introduction

Widespread electric vehicle (EV) adoption is critical for advancing sustainable transportation and reducing carbon emissions compared to internal combustion engine vehicles (ICEVs) (IEA, 2024). However, EVs introduce new challenges for consumers, particularly involving charging time and cost trade-offs (Noel et al., 2020). Unlike the relatively uniform and rapid refueling process of ICEVs, EV charging duration can vary widely—from a few minutes to over 24 hours—due to charger power output, the vehicle's current state of charge, location, time of use, and vehicle-specific technical specifications. This prolonged and variable charging time can be inconvenient for certain journeys, especially in dense urban environments or during long-distance travel (Mahmud et al., 2023).

Charging costs also differ significantly depending on speed, location, and the presence or absence of subsidies. While one kilowatt-hour of energy is essentially the same product regardless of how it is delivered, the total cost and time can differ drastically. Consumers must thus navigate a complex decision landscape, balancing cost savings against time saved. This trade-off can also exacerbate "range anxiety," as charging may not just be about securing enough energy, but also about doing so within acceptable time and cost parameters (Pevec et al., 2020).

These complexities are evident in South Korea, where high population density and extensive vehicle ownership (Statistics Korea, 2024a, 2024b) have led to compact residential areas with limited capacity to expand charging infrastructure. The country's current robust network of both fast and slow chargers helps meet diverse consumer needs. Slow chargers—often installed at home—are cheaper but require more time, while fast chargers—commonly found in public or highway locations—are more expensive but save time (Mahmud et al., 2023).

For contextual purposes, in recent history, EV charging costs in Korea were heavily influenced by government subsidies, which started at 100% coverage and were gradually phased out between 2020 and 2022 (Ministry of Environment, 2022). KEPCO, Korea's largest electric utility company, has raised electricity prices six times within the last two years, but continues to accumulate operation deficits (Jo, 2024). Private operators have increased their own charging rates in response to this, and to support business operations (Chaevi, 2023; PlugLink, 2024b, 2024a; PowerCube, 2023a, 2023b, 2024; SK Electlink, 2023). As of October 2024, Korea's 661,141 EVs represented only 2.52% of the nation's total vehicle fleet (Ministry of Land, Infrastructure and Transportation, 2024), leaving considerable room for growth and infrastructure adjustment.

Existing literature consistently identifies charging infrastructure as a key factor in EV adoption (Hardman et al., 2018; Li et al., 2017; Sommer & Vance, 2021; Springel, 2021; Xing et al., 2021; Zhou & Li, 2018), yet the relationship between charging cost and time—and the magnitude of their combined influence on consumer decisions—is not fully understood. While many studies highlight time and cost as important considerations, few have quantitatively explored how consumers weigh these factors against each other. Better understanding this trade-off would help policymakers and stakeholders optimize infrastructure investments and policy interventions.

This study uses survey data from 2023 and 2024 in Korea to examine how EV owners respond to varying time-cost charging scenarios. By analyzing preferences across multiple hypothetical charging options, we investigate how cost and time (in the form of charging speed) influence charger selection decisions. We control for demographic variables as well as the presence of EV chargers in specific locations, in addition to year and regional fixed effects.

Common economic reasoning suggests cheaper options generally dominate if the good (in this case, 1 kW of electric energy) is identical. However, the strong time component and extended charging durations in EV contexts (US Department of Transportation, 2023) complicate this assumption. Our analysis contributes to a more nuanced understanding of EV charging economics and provides insights for policies aimed at accelerating EV adoption.

2.1 Data & Methodologies

We administered two surveys in South Korea: one in July 2023 and another in July 2024 via a professional survey company. Each survey yielded 800 valid respondents after excluding ineligible, erroneous, or incomplete cases. Respondents were required to own a Battery Electric Vehicle (BEV) or Plug-in Hybrid Electric Vehicle (PHEV) for at least six months. This minimum ownership period was decided at the authors' discretion to ensure familiarity with charging routines and reduce the influence of early adoption novelty.

Survey questions covered demographic profiles followed by various EV-related topics, including charging behaviors, perceptions of safety, overall satisfaction, and future intentions to repurchase EVs. We also asked respondents to choose between slow and fast chargers at nine hypothetical price points to capture how price and speed preferences interact.

Table 1 summarizes the key variables and lists their potential responses. Demographic information (e.g., gender, age, income, etc.) has been well established in both EV and non-EV research, with other factors (e.g., political alignment, environmental consciousness, annual driving distance) serving as additional relevant controls drawn from past works (Davis et al., 2023; Javid & Nejat, 2017; Jung et al., 2021; Noel et al., 2020; Park et al., 2019; Pevec et al., 2020; Sintov et al., 2020; Sovacool et al., 2018, 2019; Visaria et al., 2022; Wang et al., 2021). The variables employed in this research and their respective cited works are available in Appendix 1. To understand the role of charging infrastructure availability, we included binary indicators for slow and chargers in different physical areas (facility types). The core outcome variables are binary choices between slow and fast charging under specific price scenarios.

The speed-price scenarios were constructed based on charging rates set by the government (Korea Environment Corporation, 2024b; Ministry of Environment, 2022) and private sector to ensure amounts that were grounded in present-day reality (Chaevi, 2023; Everon, 2024; GS ChargEV, 2024; PlugLink, 2024b; PowerCube, 2024; SK Electlink, 2023; Starkoff, 2024; VoltUp, 2024). As these costs were not uniform among the different charging providers, we created various price scenarios that fell within the known range for both slow and fast chargers. By doing so, we aimed to identify how strongly price differences influence charging speed preferences.

Table 1. Survey Questions and Summary Statistics

General Category	#	Year / Questions & Stats	2023 Mean	2023 SD	2024 Mean	2024 SD	Total Mean	Total SD	Description
Scenario Choices	**1**	**Slow 150 vs. Fast 340**	0.81	0.4	0.8	0.4	0.8	0.4	0 = Fast; 1 = Slow
	2	**Slow 180 vs. Fast 340**	0.74	0.44	0.69	0.46	0.72	0.45	
	3	**Slow 220 vs. Fast 340**	0.58	0.49	0.57	0.5	0.57	0.49	
	4	**Slow 250 vs. Fast 340**	0.45	0.5	0.5	0.5	0.48	0.5	
	5	**Slow 250 vs. Fast 375**	0.57	0.49	0.56	0.5	0.56	0.5	
	6	**Slow 250 vs. Fast 400**	0.7	0.46	0.67	0.47	0.69	0.46	
	7	**Slow 250 vs. Fast 430**	0.71	0.45	0.69	0.46	0.7	0.46	
	8	**Slow 100 vs. Fast 250**	0.59	0.49	0.59	0.49	0.59	0.49	
	9	**Slow 150 vs. Fast 250**	0.45	0.5	0.5	0.5	0.48	0.5	
Local Charger Access	**10**	**Home, Slow**	0.83	0.38	0.82	0.39	0.82	0.38	0 = No; 1 = Yes
	11	**Home, Fast**	0.36	0.48	0.52	0.5	0.44	0.5	
	12	**Office, Fast**	0.45	0.5	0.49	0.5	0.47	0.5	
	13	**Public, Fast**	0.69	0.46	0.64	0.48	0.67	0.47	
Demographics	**14**	**Gender**	0.57	0.5	0.56	0.5	0.56	0.5	0 = Female; 1 = Male
	15	**Age Range**	3.71	0.92	2.8	1.01	3.25	1.07	1 = 10s; 2 = 20s; 3 = 30s; 4 = 40s; 5 = 50s; 6 = 60s+
	16	**Region**	Nominal Variable (17 Total)						1 = Seoul; 2 = Busan; …; 16 = Jeju; 17 = Sejong
	17	**Household Members**	3.11	1.12	3.13	1.05	3.12	1.09	Discrete Numbers (1 to 6)
	18	**Household Income**	3.46	1.09	3.41	1.11	3.44	1.1	1 = < 30mil; 2 = 30mil - 50 mil; 3 = 50 mil - 70 mil; 4 = 70mil - 100mil; 5 = > 100mil
Other Inputs	**19**	**Political Alignment**	3.92	1.31	4.02	1.27	3.97	1.29	1-7 Likert Scale; 1 = Very Liberal; 4 = Neutral; 7 = Very Conservative
	20	**Environmental Consciousness**	5.74	1.25	5.61	1.19	5.68	1.22	1-7 Likert Scale; 1 = No Concern; 7 = Very Concerned
	21	**Yearly Distance Driven**	4.96	1.95	4.48	1.99	4.72	1.98	1 = < 3,000km; 2 = 3,000km - 5,000km; 3 = 5,000km - 7,000km; 4 = 7,000km - 10,000km; 5 = 10,000km - 12,000km; 6 = 12,000km - 15,000km; 7 = > 15,000km
	22	**Year**	Based on Survey Year						2023 and 2024

Notes: 1,600 total observations. All currency values are in Korean Won (KRW). Full list of plain text Region variables are as follows: [1] Seoul; [2] Busan; [3] Daegu; [4] Incheon; [5] Gwangju; [6] Daejeon; [7] Ulsan; [8] Gyeonggi; [9] Gangwon; [10] Chungbuk; [11] Chungnam; [12] Jeonbuk; [13] Jeonnam; [14] Gyeongbuk; [15] Gyeongnam; [16] Jeju; [17] Sejong.

2.2 Methodology

This study evaluates how differences in slow- and fast-charging prices influence EV owners' decision on which charger to use located in what facility type (e.g., residential, office, and public area). We employ two sets of logistic regressions - one (1) based on grouped charging cost scenarios, and another (2) based on individual charging cost scenarios - to capture how varying price levels, charger types, and charger locations, considering other contextual factors, jointly shape consumer decisions. We detail each modeling approach and outline our robustness checks below.

2.2.1 Grouped Charging Time-Cost Scenarios

In the first approach, we group observations by charging scenarios in which one charger's price (either slow or fast) remains fixed while the alternative charger's price varies. This design allows us to analyze the incremental impact of each additional price point on the probability of selecting slow versus fast charging. The dependent variable is a binary indicator coded 1 if the respondent chooses the variable-cost charger (of one speed type) and 0 if they choose the fixed-cost charger (of the other speed type) - thus, we use logistic regression. The model is expressed as follows:

$$P_{it} = \alpha_1 + \alpha \times K_{it} + \alpha \times \tau_{it} + \alpha \times (K_{it} \times \tau_{it}) + \alpha \times X_{it} + \gamma_i + \theta_t + \varepsilon_{it} \qquad (1)$$

Where *P* is charger selection at a given price of the variable-cost charger, *K* includes four types of chargers (slow chargers at home and fast chargers at home, office, and public facilities), τ represents two types of charging costs (slow and fast charging costs). We then create and include interaction terms based on *K* and τ. *X* includes control variables such as gender, age range, household members, household income, political alignment, environmental concern, and yearly distance driven. We also include regional (γ_i) and year (θ_t) fixed effects to control for any constant factors that could influence the relationship between charger location and choice over fast chargers over slow chargers. ε_{it} is an error term.

Because each grouped scenario contains multiple price points for one charger type (and a single fixed price for the other), we can observe how consumer choice evolves as the relative cost gap widens or narrows. Our central coefficients of interest are the interaction terms ($\tau_{it} \times K_{it}$), which measures how cost changes for each charger type and location influence the probability of choosing a slow charger.

We anticipate that, if costs rise for slow charging, respondents become less likely to select a slow charger (i.e., a negative effect). Similarly, if fast charging becomes more expensive, we expect a positive effect on choosing slow chargers. These effects are anticipated due to simple economic theory: cheaper is better. We also believe slow chargers will generally remain preferred against narrowing price gaps, though we are unable to anticipate when the break-even point may be, nor the impact caused by 1 KRW of price differences.

2.2.2 Individual Charging Time-Cost Scenarios

To complement the grouped-scenario analysis, the second approach examines each charging scenario in isolation. That is, for each combination of slow and fast charging costs, respondents face a binary choice: “Would you use this charger at the specified price, or opt for the alternative charger?” By analyzing each scenario on its own, we can probe more specific effects. For example, how having a home fast charger might alter decisions when slow chargers reach certain price thresholds. We employ the logistic model as follows:

$$P_{it} = \beta_1 + \beta_2 \times H\_S_{it} + \beta_3 \times H\_F_{it} + \beta_4 \times O\_F_{it} + \beta_5 \times P\_F_{it} + \beta \times X_{it} + \gamma_i + \theta_t + \varepsilon_{it} \qquad (2)$$

Where *P* is charger selection at price slow charger over fast charger, H_S is the presence of a slow charger at home, *H_F*, *O_F*, and *P_F* indicate the presence of a fast charger at home, office, and public area, respectively, and the remaining variables are analogous to those in equation (1).

Our primary focus is on how location-specific charger availability (β_2 through β_5) interacts with actual price differences in driving charger selection decisions. In general, we expect positive coefficient values for slow home chargers (β_2) that would diminish as the price gap between this variable and fast chargers installed in other accessible facility types narrows. There may be a price point where slow home chargers produce a negative coefficient with fast chargers exhibiting a positive one, but we are unable to anticipate in which scenario this might happen.

2.2.3 Robustness Checks

To reinforce confidence in our logistic regression results, we conduct two main robustness checks. First, we cluster standard errors at the region level to account for potential within-region correlations in unobserved factors. Different areas may have distinct policies, infrastructure, and other shared characteristics, such as varying subsidies or eligible vehicle counts (Korea Environment Corporation, 2024c), which could produce correlated errors among respondents from the same region. Second, we re-estimate our models using the probit approach. Although probit and logit both model binary outcomes, they differ in assuming a normal versus logistic distribution for the error term. If the direction, magnitude, and significance of our key variables remain consistent with the baseline logistic model, we interpret this as evidence of robustness.

3. Descriptive Analysis

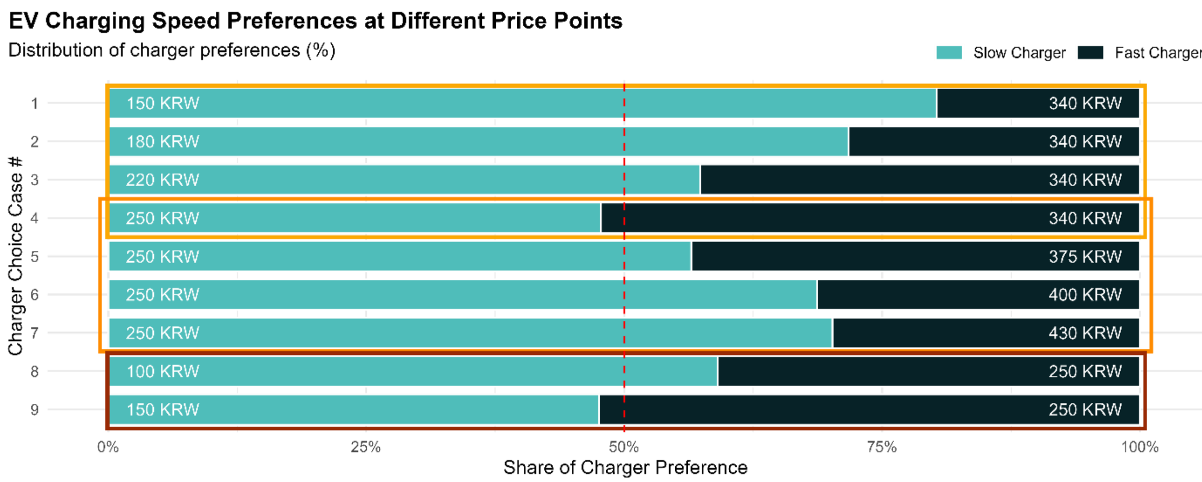
Figure 1 illustrates the tallied results for slow and fast charger preferences given at certain price points. Respondents were instructed to focus exclusively on the convenience of charging time and speed and the price that charging quality demands.

In Korea, slow chargers predominantly operate at ≤ 7 kW while fast chargers are categorized at ≥ 50 kW (Korea Environment Corporation, 2024a). Fast-charging costs are announced by the Korean Government, which are currently at 324 KRW ($0.23 USD)[1] for ≤ 50

[1] USD Conversion: Based on the exchange rate reported by the Bank of Korea on December 2, 2024, of 1,401.3 KRW per 1 USD, the equivalent of 324 KRW is approximately 0.231214 USD, rounded to 0.23 USD.

kWh chargers, and 347 KRW ($0.25 USD)[2] for chargers ≥ 100 kWh (Korea Environment Corporation, 2024b). Private charging service companies have the freedom to establish their prices but are often guided by government benchmarks. Our presented scenario price ranges reflect the realistic upper and lower boundaries of slow and fast charging options available to the public.

The analysis categorizes the scenarios into four groups to capture different price relationships. In the first group, fast charging costs are fixed at 340 KRW, while slow charging costs vary from 150 KRW to 250 KRW. This grouping, highlighted in a yellow-orange box in Figure 1, explores how increasing slow charging costs influences consumer preferences when the alternative fast charging rate remains constant. The second group, represented by a darker orange box, fixes slow charging costs at 250 KRW while varying fast charging rates between 340 KRW and 430 KRW. This set of scenarios examines how escalating fast-charging costs affect preferences when the slow charging cost is held steady. The third group, shown in a brown box, fixes fast charging costs at 250 KRW and compares slow charging costs of 100 KRW and 150 KRW to assess consumer behavior under these conditions. While not visually grouped in the figure, an additional comparison can be made between scenarios where the slow charging cost is fixed at 150 KRW, and the fast-charging cost varies between 250 KRW and 340 KRW. These comparisons highlight sensitivity to different price gaps across scenarios.



Notes: Each choice case contains 1,800 respondents. Numbers on the left side represent the slow charger cost, with those on the right side representing the corresponding fast charger cost for each respective scenario. The three shades of orange boxes represent groupings of one-sided fixed prices, in Korean Won, for comparison purposes: [1] slow 150, 180, 220, and 250 vs. fast 240; [2] slow 250 vs. fast 340, 375, 400, and 430; [3] slow 100 and 150 vs. fast 250; [4] slow 150 vs fast 340 and 250.

Figure 1. Consumer charging preferences at each presented price point scenario.

[2] USD Conversion: Based on the exchange rate reported by the Bank of Korea on December 2, 2024, of 1,401.3 KRW per 1 USD, the equivalent of 347 KRW is approximately 0.247627 USD, rounded to 0.25 USD.

4. Results

4.1 Grouped Cost-Speed Analysis

When observations with the same fixed charger speed and cost are grouped together, the resulting dataset helps track how charger preferences change across different price levels. Our analysis in Table 2 reveals significant results for the interaction between slow charger cost and the presence of slow chargers in Model 1 and for the interaction between fast charger costs and the presence of home fast chargers in Model 2. Models 3 and 4 reveal no statistically significant findings at the 1% or 5% levels and are attributed to a lack of comparison variables – Models 1 and 2 each have four different values within their models (e.g., Model 1 compares a fixed fast cost of 340 KRW against four varied slow charging costs of 150, 180, 220, and 250 KRW), whereas Models 3 and 4 only have two (e.g., Model 3 compares a fixed fast cost of 250 KRW against two varied slow charging costs of 100 and 150 KRW). These comparison values are also indicated in Table 2.

Figures 2 and 3 illustrate the relationship between fixed charger costs at one charging speed and a range of costs at an alternative charging speed for Models 1 and 2, the key models under consideration. The y-axis represents probabilities as decimal values, rather than regression coefficient values, to more clearly display the specific outcomes under changing cost scenarios. The axes in the two figures are not standardized because they represent fundamentally different scenarios. The minimum and maximum ranges vary due to differences in the fixed charging costs and the charging speeds being analyzed. Furthermore, the absolute and relative costs differ between the two models, reflecting their distinct assumptions and contextual factors. As a result, the models are best understood independently, with each figure interpreted within its context.

Table 2. Logistic Regression Output - Grouped Scenarios

Model # **Fixed Variable** **Comparison Variables**	**(1)** **fast 340** **slow 150; 180; 220; 250**	**(2)** **slow 250** **fast 340; 375; 400; 430**	**(3)** **fast 250** **slow 100; 150**	**(4)** **slow 150** **fast 250; 340**
Home Slow Charger x	-0.00421**		0.000921	
Slow Charging Cost	(0.00187)		(0.00388)	
Home Fast Charger x		0.00585***		-0.00363*
Fast Charging Cost		(0.00167)		(0.00189)
Office Slow Charger x	0.000517		0.00211	
Slow Charging Cost	(0.00154)		(0.00302)	
Office Fast Charger x		0.000857		-0.00113
Fast Charging Cost		(0.00169)		(0.00191)
Public Fast Charger x		-0.00146		0.000245
Fast Charging Cost		(0.00174)		(0.00195)
Home Slow Charger	1.459***	-0.580***	0.424	0.710***

	(0.385)	(0.0742)	(0.493)	(0.112)
Office Slow Charger	0.0362	-0.0575	-0.325	0.0399
	(0.324)	(0.0636)	(0.389)	(0.0967)
Home Fast Charger	-0.206***	-1.982***	-0.131	0.913*
	(0.0627)	(0.643)	(0.0826)	(0.545)
Office Fast Charger	-0.0761	-0.430	-0.0173	0.279
	(0.0666)	(0.651)	(0.0877)	(0.552)
Public Fast Charger	0.117*	0.423	0.221***	0.148
	(0.0606)	(0.670)	(0.0806)	(0.567)
Slow Charging Cost	-0.0128***		-0.0119***	
	(0.00188)		(0.00392)	
Fast Charging Cost		-0.0141***		0.0199***
		(0.00165)		(0.00186)
Control Variables	Yes	Yes	Yes	Yes
Region F.E.	Yes	Yes	Yes	Yes
Year F.E.	Yes	Yes	Yes	Yes
Observations	6,400	6,400	3,200	3,200
Pseudo R^2	0.0938	0.0592	0.0533	0.139

Notes: Control variables include gender, age range, number of members in the household, income, political alignment, environmental concern, and yearly driven miles. All monetary values (e.g., charging costs) are denoted in Korean Won (KRW). Note: The total observation count is calculated by the number of different variable values that exist within each model, multiplied by 2 surveys, and 800 respondents per survey. Each model has one respondent represented multiple (2 or 4) times, along with their associated demographic variables and other control responses. These representations are equal throughout the model. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

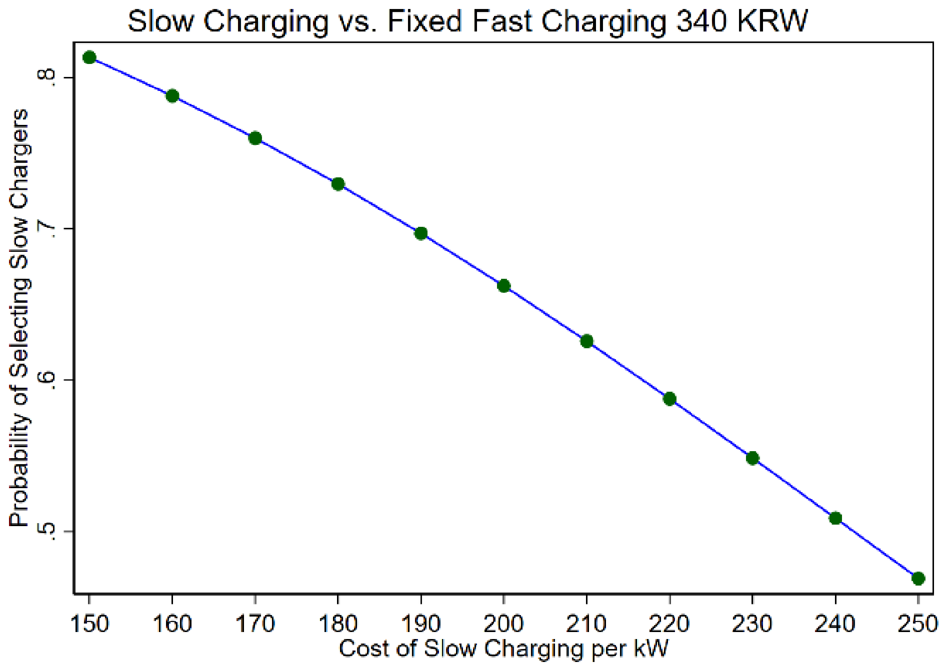


Figure 2. Fixed fast charging cost of 340 KRW vs. variable slow charging costs (Grouped Scenarios - Model 1)

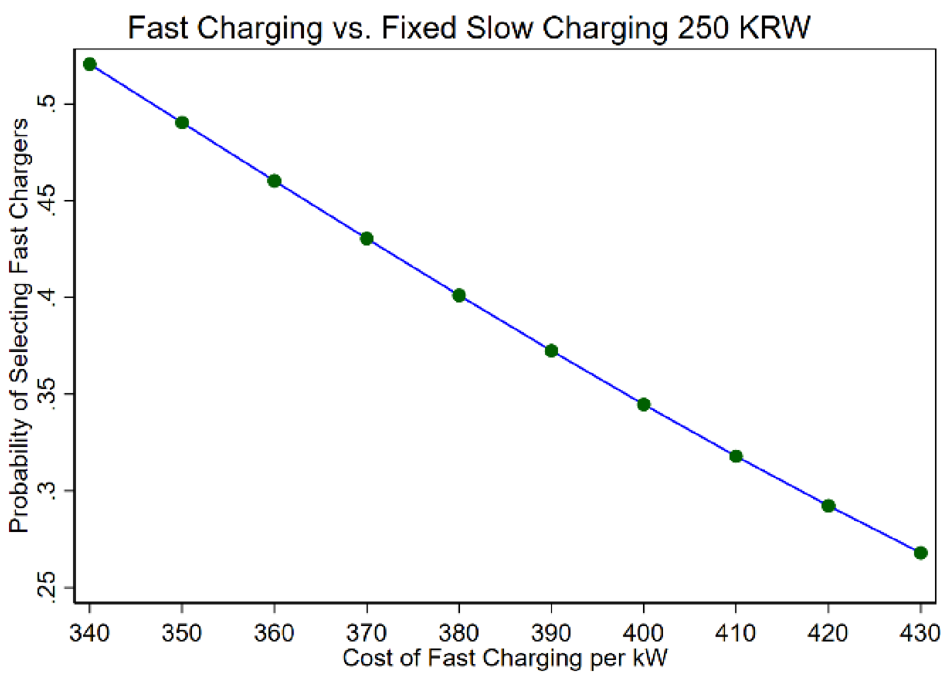


Figure 3. Fixed slow charging cost of 250 KRW vs. variable fast charging costs (Grouped Scenarios - Model 2)

Figure 2 depicts the decreasing probability of selecting a slow charger as its cost increases over the range of 150 KRW to 250 KRW, against a fixed fast charger with a cost of 340 KRW. At the lowest charging cost, the probability of slow chargers being selected is over 80% (0.8), interpreted as owing to the significant price gap against the fixed 340 KRW fast charging value. As the cost of slow charging increases, the probability decreases at approximately 0.421% per 1 KRW increase in cost. At the highest cost of slow charging analyzed, we find that approximately 47% (0.47) probability that slow chargers would be selected when presented with a 340 KRW fast charging alternative. This finding shows a stark contrast between the lowest and highest range of slow charging costs, which are representative of the current situation today.

Figure 3 considers an alternative scenario where slow chargers have a fixed cost of 250 KRW, with fast charging costs ranging from 340 KRW to 430 KRW. The lowest fast charging cost of 340 KRW reveals a probability of fast chargers being selected at approximately 53%, and this decreases to approximately 27%. According to our regression model, one KRW increase in fast charging costs is associated with a 0.587% decrease in the probability of it being selected. Overall, we find that fast charging costs do not vary as much as those in Model 1, but fast charging costs are inherently higher by default, and according to our analysis, started at a markedly lower probability – this may translate to an incrementally reducing marginal effect as cost goes up. Like Figure 2 (model 1), the fast-charging costs are representative of the current charging environment throughout Korea, though the concentration falls between 340 and 380 KRW.

To assess the reliability of these scenario-specific results, we present region-clustered logistic and probit regressions in Appendix Tables 4 and 5, respectively. Overall, the direction and magnitude of key coefficients remain consistent with the main findings in Table 3, though a few changes in significance occur. For instance, Office Fast Charger in Model (2) becomes marginally significant at the 10% level when region clustering is applied, despite being insignificant in the main table, while Public Fast Charger in Model (1) gains marginal significance under regional clustering. In the probit model, home charger effects largely retain their statistical strength, with some fast-charger coefficients shifting from the 1% to 5% level. Despite these fluctuations, Home Slow Charger remains reliably positive, and Home Fast Charger generally shows a negative relationship, including reflecting the reality of desirability when the cost gap widens, thus supporting our core conclusions against our two employed robustness checks.

4.2 Individual Analysis - Cost vs. Time Scenario Comparison

The grouped analysis highlighted certain patterns when one type of charger speed and cost was fixed while the others varied – this section analyzes the 9 scenarios individually. Figure 4 and Table 3 present the logistic regression results for each unique cost scenario, offering a more detailed view than the grouped models. In essence, they confirm the patterns observed in our broader grouped analyses, while also illustrating how certain cost shifts can affect charging decisions.

Table 3. Logistic Regression Output – Individual Scenarios

Model	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**
Scenario Specification	**slow 150**	**slow 180**	**slow 220**	**slow 250**	**slow 250**	**slow 250**	**slow 250**	**slow 100**	**slow 150**
Slow & Fast Charging Costs	**fast 340**	**fast 340**	**fast 340**	**fast 340**	**fast 375**	**fast 400**	**fast 430**	**fast 250**	**fast 250**
Home Slow Charger	0.972***	0.730***	0.457***	0.440***	0.672***	0.716***	0.516***	0.577***	0.507***
	(0.168)	(0.155)	(0.144)	(0.147)	(0.145)	(0.150)	(0.154)	(0.146)	(0.148)
Home Fast Charger	-0.403***	-0.434***	-0.140	0.017	-0.214*	-0.437***	-0.480***	-0.315***	0.043
	(0.151)	(0.131)	(0.116)	(0.115)	(0.116)	(0.126)	(0.128)	(0.119)	(0.116)
Office Fast Charger	-0.098	-0.195	0.052	0.140	0.222**	0.067	0.077	-0.117	0.022
	(0.138)	(0.122)	(0.109)	(0.108)	(0.109)	(0.117)	(0.119)	(0.111)	(0.109)
Public Fast Charger	0.225	0.073	0.069	0.137	0.047	0.160	0.217*	0.226**	0.220*
	(0.141)	(0.126)	(0.113)	(0.113)	(0.113)	(0.120)	(0.122)	(0.115)	(0.114)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600
Pseudo R^2	0.0814	0.0686	0.0292	0.0404	0.0352	0.0435	0.0518	0.0522	0.0434

Notes: Control variables include gender, age range, number of members in the household, income, political alignment, environmental concern, and yearly driven miles. All monetary values (e.g., charging costs) are denoted in Korean Won (KRW). Standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

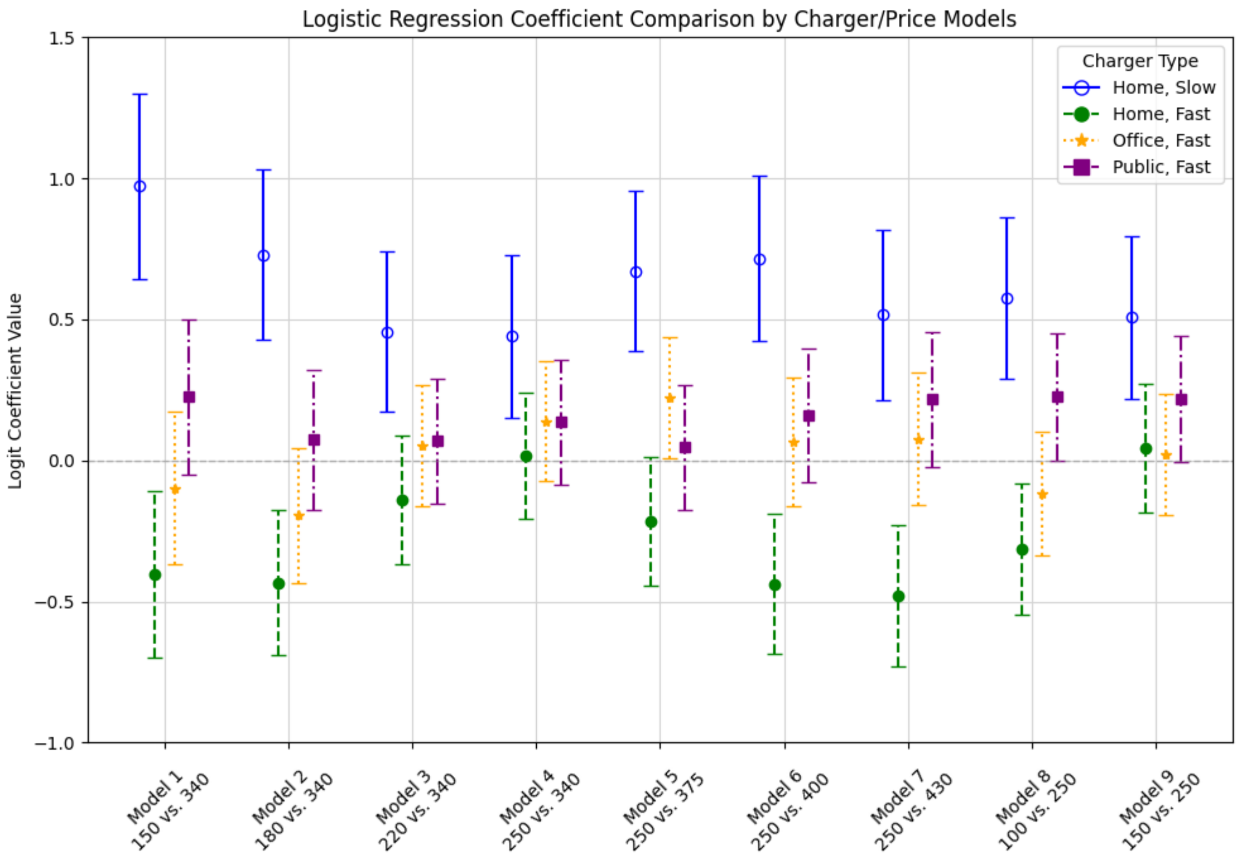


Figure 4. Logistic regression output visualization by models and chargers.

The regression coefficients represent changes in the log-odds of selecting slow or fast charging under each given price comparison. Converting these coefficients into odds ratios adds interpretive clarity. For instance, consider the effect of having a slow charger at home. Across multiple scenarios, these coefficients range from 0.440 to 0.972, all statistically significant at the 1% level. Interpreted as odds ratios, these values generally exceed 1.0, confirming that access to home-based slow charging markedly increases the likelihood of choosing slow charging—even when price differentials vary substantially.

In Model (1), for example, an odds ratio of approximately 2.64 emerges, indicating that respondents are more than twice as likely to opt for slow charging when they have a slow charger at home. By Model (4), as cost differences narrow, this advantage moderates to about 1.55, though it remains both statistically and practically significant. These results underscore the powerful role of home charging infrastructure: even as slow charging becomes relatively more expensive; its convenience and familiarity continues to anchor consumer preferences.

Fast home charging, in contrast, shows the opposite tendency. The largest negative coefficients occur when fast charging is at its steepest price disadvantage, suggesting that consumers are less inclined to choose fast charging at home when its cost is notably higher than the slow alternative. For example, in Model (1), a coefficient of -0.403 (odds ratio ~0.668) signifies that those respondents are about 33% less likely to select fast charging at these price points. As the gap narrows, this effect moderates in a non-linear fashion, reinforcing that consumers weigh these choices dynamically, rather than based solely on speed.

With fast home charging, an approximate inverse relationship is identified relative to slow home charging. The most significant negative values occur with the highest costs in fast charging with the largest gap to its presented slow charging costs. There were no coefficients of statistical significance that revealed a positive probability for slow charging. In Model (1), the coefficient of -0.403 is equated to an odds ratio of 0.668 or approximately 33.2% lower probability of selecting fast chargers at the presented price points. We find that this becomes more neutral as the price gap diminishes, indicating that fast chargers are generally an unpopular option for home charging at these prices.

The results for office and public fast chargers are more nuanced. Office-based fast chargers do not produce robustly significant or consistent effects across the presented scenarios, calling into question their effectiveness as a general solution. Public fast chargers, meanwhile, occasionally show significance, particularly in Models (7), (8), and (9), where having such access slightly increases the likelihood of choosing slow charging. Although this result may appear counterintuitive, it likely reflects the perceived inconvenience of public fast charging—such as the need to travel to the station, potential wait times, and mandatory vehicle relocation after charging—factors that can overshadow cost or convenience advantages. However, it is well established that fast chargers do serve an appreciable share of the EV-driving population, including those without home chargers and those in transit (e.g., work commuting, leisure, etc.). Our surveys may not have sufficiently captured these factors as a part of their design.

The robustness analysis findings align well with our main logistic regression estimates - slow home charging remains statistically significant and strong, but for the other charger types, their respective significance either stays the same or weakens by one level. This falls in line with our findings, where the utility of these non-slow-and-home chargers is called into question, even when favorable (within the context of realistic pricing) price options are presented. These findings are detailed in Appendix Tables 2 and 3.

5. Discussion and Policy Implications

The evidence presented in this study reveals that cost differentials and infrastructure availability jointly influence how EV owners make charging decisions. Our grouped cost-speed analyses show that as the relative costs of slow or fast charging shift, so do the probabilities of choosing one over the other. For example, in Group Model 1, where fast charging costs were fixed and slow charging costs varied, the probability of selecting slow charging dropped from over 80% to approximately 47% as slow charging became relatively more expensive. This pattern highlights that even a consistently favored option (slow charging) can lose ground, to a practical level, when its cost advantage narrows. Similarly, in Group Model 2, where slow charging costs remained constant and fast charging prices fluctuated, incremental cost increases for fast charging steadily reduced its appeal. While fast charging initially showed moderate favorability, rising costs diminished its apparent attractiveness, reinforcing the significant influence of price differentials on consumer preferences. Importantly, the charging rates employed in both models were rooted in real-world data and reflect practical scenarios, suggesting that the trade-off analysis situation may already be a commonplace occurrence for EV owners. These findings can inform strategies for optimizing charging infrastructure utilization, providing a basis for practical changes to pricing structures and deployment strategies aimed at better aligning infrastructure availability with consumer behavior.

Crucially, the analysis also indicates that infrastructure factors, notably the availability of a home slow charger or a home fast charger, interact with cost variables. Having a slow charger at home moderates the sensitivity to rising slow charging costs, helping maintain a preference for slow charging despite the diminishing cost gap. Likewise, when home fast charging is available, some degree of willingness to pay a premium for speed emerges, although this effect is less robust. By examining the data at a grouped level, we see that these infrastructural elements serve as anchors, shaping how consumers perceive and respond to different cost scenarios. While the overall findings seem obvious in that physically present and accessible infrastructure impacts choices on EV owners, the revealed degree of that impact can serve as important information when deciding what type of chargers, how many to install, and where.

For policymakers, these outcomes suggest that strategic investments in infrastructure can effectively influence how sensitive consumers are to cost changes. Supporting home slow charger installation, for instance, may not only be economically prudent—given the relatively low installation costs compared to fast chargers—but may also help stabilize consumer preferences. Even if slow charging becomes more expensive over time or relative to other options, widespread home access can temper the rate at which consumers switch away. This stability can be advantageous for encouraging a predictable, manageable growth in EV adoption, and to employ as a tool in mitigating sudden heavy and simultaneous demands that a greater number of fast chargers may theoretically make on the grid.

On the other hand, the findings challenge the assumption that simply providing additional fast chargers, especially in non-highway contexts, will simply lead to increased use if prices are not competitive or if convenience factors are lacking. This reflects aspects of one recent policy discussion in Korea that emphasized the strategic expansion of fast chargers primarily at key travel hubs, where the cost-time advantage is clear (Kim, 2024). However, that same report neglected to mention the nuances of charger installations and operations in other areas and contexts. While fast chargers can be essential in certain travel-oriented settings, their ability to draw consistent demand in everyday contexts appears limited unless they offer a clear cost-time advantage. In other words, expanding fast charging infrastructure should be done with careful consideration of location, user groups, and long-term operating costs. Providing fast chargers in places where users do not highly value speed or where cost differences become too large may lead to underutilization and inefficiencies. One example is at a national park, where visitors may be gone for several hours at a time. The current law limits parking and charging activities at fast chargers to a maximum of 1 hour (Ministry of Government Legislation, 2024). This runs counter to the patterns some visitors of that area may exhibit; thus, several slow chargers can logically serve to be better alternatives compared to one or a few fast chargers.

These results therefore encourage policymakers to adopt a more differentiated approach. Rather than pursuing uniform infrastructure expansion, decision-makers might focus on ensuring that slow chargers remain easily accessible and relatively affordable, especially in residential areas, and reserve more intensive investments in fast charging for settings where users demonstrably benefit from higher power output and are willing to pay for it. This is especially true in Korea’s current environment where charger installation subsidies may not fully account for current or future charging demands (e.g., heavy focus on supply-side expansion, generalized priority criteria that are vague and static, limited long-term consideration in determining eligibility, etc.) (Ministry of Environment, 2023b, 2023a), while support for charging fees has ended entirely (Ministry of Environment, 2022). Alternatively, if the country reaches a stage where renewable energy is generated in sufficient amounts, pushing charging behavior through pricing strategies could ensure that EV owners charge at a location or time that may be more advantageous to both them and the electrical grid. Such targeted strategies can help align public resources with consumer preferences, improving satisfaction and promoting broader EV acceptance.

The evidence shows how consumers’ choices are not solely about lower prices or quicker charging in isolation. Instead, decisions hinge on the interplay between cost differences, existing charging habits, and infrastructural support. By acknowledging the influence of these factors, policymakers and stakeholders can tailor infrastructure investments and pricing policies to reinforce desirable behaviors, optimize public spending, and ultimately foster a more stable and efficient EV charging ecosystem. These would be directly conducive to the adoption of EVs as the industry continues to develop, which by extension, also serves to reduce greenhouse gas emissions from the transportation sector.

6. Conclusion

While our results highlight how cost and time factors influence EV owners’ charging preferences, caution is warranted in applying these findings universally. In practice, many other considerations, such as battery longevity perceptions, safety concerns, and personal habits, inform everyday charging decisions. For example, the consistent preference for home slow charging may reflect more than just cost or time advantages: widespread availability of home chargers, established overnight charging routines, and the belief that slow charging imposes less thermal stress (thus reducing long-term battery degradation) all play a role. These less tangible elements do not appear in basic cost–time calculations but help sustain slow charging’s dominance, even when price differences narrow. Another key issue involves the timing of infrastructure expansion versus cost management, especially in nascent EV markets. In regions just beginning to offer electric mobility, prioritizing a robust charging network before widespread EV adoption makes sense. However, for countries with some infrastructure already in place, a more balanced approach between network growth and cost optimization may be prudent. In Korea, for instance, slow chargers comprise 88.9% of public chargers and see the highest utilization—occasionally leading to congestion—while EVs account for only 2.52% of vehicles (Woo & Kim, 2024). This points to an increasingly urgent need for active management, along with forward-looking measures to accommodate escalating demand as EV uptake accelerates.

Given these complexities, policymakers and stakeholders should consider that while price and speed matter, consumer preferences cannot be reduced to simple formulas. Investments in slow chargers, especially at residential locations, may remain an effective strategy not only because of their relative affordability and ease of installation but also because they align with established user behaviors, such as the convenience of re-energizing at home and doing so while sleeping. At the same time, a targeted approach to fast charger deployment—focusing on corridors where rapid charging is crucial—can maximize the impact of more expensive infrastructure. The complex interactions of costs, time, and infrastructural context suggest that a one-size-fits-all strategy is unlikely to succeed.

Future research might delve deeper into the roles that non-monetary and non-temporal factors play. Comparative studies examining consumer behavior in regions with differing charging traditions, infrastructure maturity, and prevalent EV technologies would help clarify how these preferences emerge and evolve. Longitudinal analyses, as EV uptake advances and newer, faster technologies appear, could reveal whether attitudes toward battery health and longevity persist or shift. Qualitative methods such as interviews and focus groups could further illuminate the subjective values and beliefs underpinning these preferences, providing a richer understanding that can guide more refined policy measures. The next generation of this current study, with additional scenarios and questions solely or highly focused on the price versus speed charging context, could result in even more detailed insights that could be applied in a myriad of different settings. This may be in the form of similar scenarios being inquired but specifically tailored to the context of a particular facility (e.g., parking, government, commercial, etc.), time of day (e.g., overnight, morning, afternoon), the purpose for charging (e.g., general life, leisure, work, and commuting), shelter availability (e.g., charger canopy, underground installation, open outdoors) and temperatures (e.g., extreme hot or cold, rain, wind) as examples. Some of these studies already exist using recent and present data, such as those conducted taking into account differences between countries (Noel et al., 2020; Sovacool et al., 2018) – which inherently would include infrastructure maturity and any region-specific charging characteristics – and others based on interviews and surveys (Pevec et al., 2020; Sovacool et al., 2018). However, given that EVs are still in the early stages of global adoption, we anticipate that the electrified mobility landscape will evolve significantly as it matures, including in ways that are currently unforeseen and unresearched.

Our study highlights the importance of cost and time considerations when it comes to how EV owners charge their vehicles, but it also highlights the need to consider, acknowledge, and integrate other potentially influential factors. Recognizing that patterns of preference may be grounded in both tangible (e.g., availability of home chargers, economic incentives) and intangible (e.g., perceived battery care, convenience, degree of necessity) elements can lead to more effective and consumer-aligned infrastructure planning.

Acknowledgments

This work was supported by KDI School of Public Policy and Management. It was also supported by the Korea Environment Industry & Technology Institute (KEITI) through the Climate Change R&D Project for the New Climate Regime, funded by the Korea Ministry of Environment (MOE: RS-2023-00218794).

Disclosure Statement

The authors report there are no competing interests to declare.

References

Chaevi. (2023). *Notice on the increase in Chaevi charging fees (effective 23.09.01)*. https://chaevi.com/kr/customer/notice.php?bgu=view&idx=153

Davis, L., Li, J., & Springel, K. (2023). Political Ideology and U.S. Electric Vehicle Adoption. *Energy Institute at Haas, Energy Institute WP 342*. https://haas.berkeley.edu/wp-content/uploads/WP342.pdf

Everon. (2024). *Charging Rates*. Charging Rates. https://www.everon.co.kr/

GS ChargEV. (2024). *Charging Cost Information*. Charging Cost Information. https://www.gschargev.co.kr/home

Hardman, S., Jenn, A., Tal, G., Axsen, J., Beard, G., Daina, N., Figenbaum, E., Jakobsson, N., Jochem, P., Kinnear, N., Plötz, P., Pontes, J., Refa, N., Sprei, F., Turrentine, T., & Witkamp, B. (2018). A review of consumer preferences of and interactions with electric vehicle charging infrastructure. *Transportation Research Part D: Transport and Environment*, *62*, 508–523. https://doi.org/10.1016/j.trd.2018.04.002

IEA. (2024). *Electric vehicles*. IEA. https://www.iea.org/energy-system/transport/electric-vehicles

Javid, R. J., & Nejat, A. (2017). A comprehensive model of regional electric vehicle adoption and penetration. *Transport Policy*, *54*, 30–42. https://doi.org/10.1016/j.tranpol.2016.11.003

Jo, T. (2024). *Industrial electricity tariff increased by 9.7%... Unchanged for residential, general use*. KTV National Broadcasting. http://m.ktv.go.kr/news/major/view?content_id=712764

Jung, J., Yeo, S., Lee, Y., Moon, S., & Lee, D.-J. (2021). Factors affecting consumers' preferences for electric vehicle: A Korean case. *Research in Transportation Business & Management*, *41*, 100666. https://doi.org/10.1016/j.rtbm.2021.100666

Kim, H. (2024). *Impact of Policy Incentives on Adoption of Electric Vehicles in South Korea*. Impact of Policy Incentives on Adoption of Electric Vehicles in South Korea. https://www.kdi.re.kr/eng/research/focusView?pub_no=18400

Korea Environment Corporation. (2024a). *EV Charger Information*. EV Charger Information. https://ev.or.kr/nportal/evcarInfo/initEvcarChargeInfoAction.do

Korea Environment Corporation. (2024b). *EV Charging Prices*. https://ev.or.kr/nportal/evcarInfo/initEvcarChargePrice.do

Korea Environment Corporation. (2024c). *Support for purchase subsidies for zero-emission vehicles > Purchase subsidy payment status*. Support for Purchase Subsidies for Zero-Emission Vehicles > Purchase Subsidy Payment Status. https://ev.or.kr/nportal/buySupprt/initSubsidyPaymentCheckAction.do

Li, S., Tong, L., Xing, J., & Zhou, Y. (2017). The Market for Electric Vehicles: Indirect Network Effects and Policy Design. *Journal of the Association of Environmental and Resource Economists*, *4*(1), 89–133. https://doi.org/10.1086/689702

Mahmud, I., Medha, M. B., & Hasanuzzaman, M. (2023). Global challenges of electric vehicle charging systems and its future prospects: A review. *Research in Transportation Business & Management*, *49*, 101011. https://doi.org/10.1016/j.rtbm.2023.101011

Ministry of Environment. (2022). *(Reference) Actual adjustment of electric vehicle fast charging fees.* http://www.me.go.kr/home/web/board/read.do?menuId=10525&boardMasterId=1&boardCategoryId=39&boardId=1539980

Ministry of Environment. (2023a). *2023 Electric Vehicle Rapid Charging Facility Subsidy Project Subsidy and Installation Operation Guidelines*. https://ev.or.kr/nportal/infoGarden/selectBBSListDtl.do?ARTC_ID=14644&BLBD_ID=guide&srecordCountPerPage=5&spageNo=1&spageSize=10&searchType=conAndtit&searchValue=%EA%B8%89%EC%86%8D

Ministry of Environment. (2023b). *2023 Electric Vehicle Slow Charging Facility Subsidy Project Subsidy and Installation Operation Guidelines*. https://ev.or.kr/nportal/infoGarden/selectBBSListDtl.do?title=%EB%B2%95%EB%A0%B9%2F%EC%A7%80%EC%B9%A8%2F%EA%B0%80%EC%9D%B4%EB%93%9C%EB%9D%BC%EC%9D%B8&ARTC_ID=14396&BLBD_ID=guide&replyYn=N&srecordCountPerPage=5&spageNo=3&spageSize=10&midMenuOn=1&searchType=conAndtit&searchValue=

Ministry of Government Legislation. (2024). *Enforcement Decree of the Act on Promotion of Development and Distribution of Environmentally Friendly Automobiles*. Enforcement Decree of the Act on Promotion of Development and Distribution of Environmentally Friendly Automobiles. https://www.law.go.kr/%25EB%25B2%2595%25EB%25A0%25B9/%25ED%2599%2598%25EA%25B2%25BD%25EC%25B9%259C%25ED%2599%2594%25EC%25A0%2581%25EC%259E%2590%25EB%258F%2599%25EC%25B0%25A8%25EC%259D%2598%25EA%25B0%259C%25EB%25B0%259C%25EB%25B0%258F%25EB%25B3%25B4%25EA%25B8%2589%25EC%25B4%2589%25EC%25A7%2584%25EC%2597%2590%25EA%25B4%2580%25ED%2595%259C%25EB%25B2%2595%25EB%25A5%25A0%25EC%258B%259C%25ED%2596%2589%25EB%25A0%25B9

Ministry of Land, Infrastructure and Transportation. (2024). *Total Registered Motor Vehicles*. Ministry of Land, Infrastructure and Transportation - Statistics. https://stat.molit.go.kr/portal/cate/statMetaView.do?hRsId=58&hFormId=5&hSelectId=5&sStyleNum=&sStart=&sEnd=&hPoint=&hAppr=&oFileName=&rFileName=&midpath=

Noel, L., Zarazua de Rubens, G., Kester, J., & Sovacool, B. K. (2020). Understanding the socio-technical nexus of Nordic electric vehicle (EV) barriers: A qualitative discussion of range, price, charging and knowledge. *Energy Policy*, *138*, 111292. https://doi.org/10.1016/j.enpol.2020.111292

Park, J., Kim, H., & Kim, C. (2019). Understanding Electric Vehicle Consumer in Korea Market Based Upon User and Prospective Survey. *Journal of the Korea Convergence Society*, *10*(6), 191–201. https://doi.org/10.15207/JKCS.2019.10.6.191

Pevec, D., Babic, J., Carvalho, A., Ghiassi-Farrokhfal, Y., Ketter, W., & Podobnik, V. (2020). A survey-based assessment of how existing and potential electric vehicle owners perceive range anxiety. *Journal of Cleaner Production*, *276*, 122779. https://doi.org/10.1016/j.jclepro.2020.122779

PlugLink. (2024a). *Notice of Pluglink Charging Fee Increase (Effective 24.12.23)*. https://pluglink.kr/notices/

PlugLink. (2024b). *Pluglink Charging Fee Information*. https://pluglink.kr/notices/

PowerCube. (2023a). *Notice on change in portable charger charging rates due to KEPCO electricity rate increase in 2023*. https://www.powercube.co.kr/noticedetail.php?idx=13153

PowerCube. (2023b). *Notice on change in public slow charger charging rates due to KEPCO electricity rate increase in 2023*. https://www.powercube.co.kr/noticedetail.php?idx=13152

PowerCube. (2024). *Charging Fee Increase Announcement (2024.08.01)*. https://www.powercube.co.kr/noticedetail.php?idx=13200

Sintov, N. D., Abou-Ghalioum, V., & White, L. V. (2020). The partisan politics of low-carbon transport: Why democrats are more likely to adopt electric vehicles than Republicans in the United States. *Energy Research & Social Science*, *68*, 101576. https://doi.org/10.1016/j.erss.2020.101576

SK Electlink. (2023). *SK Electlink Electric Vehicle Charging Fee Increase Notice*. SK Electlink Electric Vehicle Charging Fee Increase Notice. https://sscharger.co.kr

Sommer, S., & Vance, C. (2021). Do more chargers mean more electric cars? *Environmental Research Letters*, *16*(6), 064092. https://doi.org/10.1088/1748-9326/ac05f0

Sovacool, B. K., Kester, J., Noel, L., & de Rubens, G. Z. (2018). The demographics of decarbonizing transport: The influence of gender, education, occupation, age, and household size on electric mobility preferences in the Nordic region. *Global Environmental Change*, *52*, 86–100. https://doi.org/10.1016/j.gloenvcha.2018.06.008

Sovacool, B. K., Kester, J., Noel, L., & de Rubens, G. Z. (2019). Income, political affiliation, urbanism and geography in stated preferences for electric vehicles (EVs) and vehicle-to-grid (V2G) technologies in Northern Europe. *Journal of Transport Geography*, *78*, 214–229. https://doi.org/10.1016/j.jtrangeo.2019.06.006

Springel, K. (2021). Network Externality and Subsidy Structure in Two-Sided Markets: Evidence from Electric Vehicle Incentives. *American Economic Journal: Economic Policy*, *13*(4), 393–432. https://doi.org/10.1257/pol.20190131

Starkoff. (2024). *Charging Fee Increase Notice (2024.03.16)*. Charging Fee Increase Notice (2024.03.16). https://www.starkoff.co.kr/article?idx=64

Statistics Korea. (2024a). *Population and population density by region*. Population and Population Density by Region. https://www.index.go.kr/unity/potal/main/EachDtlPageDetail.do?idx_cd=1007

Statistics Korea. (2024b). *Vehicle mileage by purpose, vehicle type, city, county and district*. https://kosis.kr/statHtml/statHtml.do?orgId=426&tblId=DT_426001_N004&conn_path=I2

US Department of Transportation. (2023). *Charger Types and Speeds*. Charger Types and Speeds. https://www.transportation.gov/rural/ev/toolkit/ev-basics/charging-speeds

Visaria, A. A., Jensen, A. F., Thorhauge, M., & Mabit, S. E. (2022). User preferences for EV charging, pricing schemes, and charging infrastructure. *Transportation Research Part A: Policy and Practice*, *165*, 120–143. https://doi.org/10.1016/j.tra.2022.08.013

VoltUp. (2024). *Announcements*. Announcements. https://voltup.co.kr/html/sub/sub04.html

Wang, Y., Yao, E., & Pan, L. (2021). Electric vehicle drivers' charging behavior analysis considering heterogeneity and satisfaction. *Journal of Cleaner Production*, *286*, 124982. https://doi.org/10.1016/j.jclepro.2020.124982

Woo, D., & Kim, Y. J. (2024). *Data-driven Insights into South Korea's National Utilization of the EV Charging Infrastructure* (SSRN Scholarly Paper No. 5032930). Social Science Research Network. https://doi.org/10.2139/ssrn.5032930

Xing, J., Leard, B., & Li, S. (2021). What does an electric vehicle replace? *Journal of Environmental Economics and Management*, *107*, 102432. https://doi.org/10.1016/j.jeem.2021.102432

Zhou, Y., & Li, S. (2018). Technology Adoption and Critical Mass: The Case of the U.S. Electric Vehicle Market. *The Journal of Industrial Economics*, *66*(2), 423–480. https://doi.org/10.1111/joie.12176

Appendix

1. Employed Variables and Referred Works
   A summary of the variables and their linked references used in this research by category, variable name, and references.

2. Group Scenario Robustness Check – Clustered Regions

3. Group Scenario Robustness Check – Probit Model

4. Individual Scenario Robustness Check – Clustered Regions

5. Individual Scenario Robustness Check – Probit Model

Table A.1. Employed Variables and Referred Works

General Category	#	Questions & Stats	References
Scenario Choices	**1**	**Slow 150 vs. Fast 340**	Source: Authors Based on public and private operator charging costs. (Chaevi, 2023; Everon, 2024; GS ChargEV, 2024; Korea Environment Corporation, 2024b; Ministry of Environment, 2022; PlugLink, 2024b; PowerCube, 2024; SK Electlink, 2023; Starkoff, 2024; VoltUp, 2024)
	2	**Slow 180 vs. Fast 340**	
	3	**Slow 220 vs. Fast 340**	
	4	**Slow 250 vs. Fast 340**	
	5	**Slow 250 vs. Fast 375**	
	6	**Slow 250 vs. Fast 400**	
	7	**Slow 250 vs. Fast 430**	
	8	**Slow 100 vs. Fast 250**	
	9	**Slow 150 vs. Fast 250**	
Local Charger Access	**10**	**Home, Slow**	Source: Authors
	11	**Home, Fast**	
	12	**Office, Fast**	
	13	**Public, Fast**	
Demographics	**14**	**Gender**	(Javid & Nejat, 2017; Jung et al., 2021; Park et al., 2019; Pevec et al., 2020; Sovacool et al., 2018, 2019; Visaria et al., 2022; Wang et al., 2021)
	15	**Age Range**	(Javid & Nejat, 2017; Jung et al., 2021; Park et al., 2019; Pevec et al., 2020; Sovacool et al., 2018, 2019; Visaria et al., 2022; Wang et al., 2021)
	16	**Region**	(Davis et al., 2023; Javid & Nejat, 2017; Noel et al., 2020; Pevec et al., 2020; Sovacool et al., 2018, 2019)
	17	**Household Members**	(Javid & Nejat, 2017; Sovacool et al., 2018)
	18	**Household Income**	(Davis et al., 2023; Javid & Nejat, 2017; Jung et al., 2021; Park et al., 2019; Pevec et al., 2020; Sovacool et al., 2018, 2019; Visaria et al., 2022; Wang et al., 2021)
Other Inputs	**19**	**Political Alignment**	(Davis et al., 2023; Sintov et al., 2020; Sovacool et al., 2019)
	20	**Environmental Consciousness**	(Jung et al., 2021; Noel et al., 2020; Park et al., 2019; Sovacool et al., 2018, 2019)
	21	**Yearly Distance Driven**	(Noel et al., 2020; Park et al., 2019; Pevec et al., 2020; Sovacool et al., 2018, 2019)
	22	**Year**	Source: Authors

Notes: The variables employed in referred works are adapted to the Korean-national context and may not be used exactly as-is. For example, Pevec et al. (2020) permitted user-entered continuous values for the variable 'Income', whereas we employed discrete income brackets.

Table A.2. Logistic Regression Output - Grouped Scenarios with Regional Clustering

Model #	**(1)**	**(2)**	**(3)**	**(4)**
Fixed Variable	**fast 340**	**slow 250**	**fast 250**	**slow 150**
Comparison Variables	**slow 150; 180; 220; 250**	**fast 340; 375; 400; 430**	**slow 100; 150**	**fast 250; 340**
Home Slow Charger x Slow Charging Cost	-0.00421*		0.000921	
	(0.00217)		(0.00165)	
Home Fast Charger x Fast Charging Cost		0.00585***		-0.00363***
		(0.00118)		(0.00117)
Office Slow Charger x Slow Charging Cost	0.000517		0.00211	
	(0.00112)		(0.00148)	
Office Fast Charger x Fast Charging Cost		0.000857		-0.00113
		(0.000828)		(0.00151)
Public Fast Charger x Fast Charging Cost		-0.00146		0.000245
		(0.00223)		(0.00161)
Home Slow Charger	1.459***	-0.580***	0.424*	0.710***
	(0.470)	(0.0944)	(0.244)	(0.156)
Office Slow Charger	0.0362	-0.0575	-0.325	0.0399
	(0.239)	(0.0668)	(0.260)	(0.0821)
Home Fast Charger	-0.206***	-1.982***	-0.131**	0.913***
	(0.0599)	(0.459)	(0.0649)	(0.331)
Office Fast Charger	-0.0761	-0.430	-0.0173	0.279
	(0.0947)	(0.303)	(0.166)	(0.437)
Public Fast Charger	0.117	0.423	0.221**	0.148
	(0.0887)	(0.804)	(0.0895)	(0.452)
Slow Charging Cost	-0.0128***		-0.0119***	
	(0.00148)		(0.00216)	
Fast Charging Cost		-0.0141***		0.0199***
		(0.00201)		(0.00112)
Control Variables	Yes	Yes	Yes	Yes
Region F.E.	Yes	Yes	Yes	Yes
Year F.E.	Yes	Yes	Yes	Yes
Observations	6,400	6,400	3,200	3,200
Pseudo R^2	0.0938	0.0592	0.0533	0.139

Notes: Control variables include gender, age range, number of members in the household, income, political alignment, environmental concern, and yearly driven miles. All monetary values (e.g., charging costs) are denoted in Korean Won (KRW). Note: The total observation count is calculated by the number of different variable values that exist within each model, multiplied by 2 surveys, and 800 respondents per survey. Each model has one respondent represented multiple (2 or 4) times, along with their associated demographic variables and other control responses. These representations are equal throughout the model. Standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table A.3. Probit Regression Output - Grouped Scenarios

Model #	**(1)**	**(2)**	**(3)**	**(4)**
Fixed Variable	**fast 340**	**slow 250**	**fast 250**	**slow 150**
Comparison Variables	**slow 150; 180; 220; 250**	**fast 340; 375; 400; 430**	**slow 100; 150**	**fast 250; 340**
Home Slow Charger x Slow Charging Cost	-0.00243**		0.000555	
	(0.00113)		(0.00239)	
Home Fast Charger x Fast Charging Cost		0.00353***		-0.00222**
		(0.00102)		(0.00111)
Office Slow Charger x Slow Charging Cost	0.000342		0.00129	
	(0.000917)		(0.00186)	
Office Fast Charger x Fast Charging Cost		0.000523		-0.000607
		(0.00103)		(0.00113)
Public Fast Charger x Fast Charging Cost		-0.000893		1.46e-05
		(0.00106)		(0.00116)
Home Slow Charger	0.862***	-0.356***	0.264	0.429***
	(0.233)	(0.0455)	(0.304)	(0.0669)
Office Slow Charger	0.0163	-0.0364	-0.198	0.0252
	(0.192)	(0.0388)	(0.240)	(0.0577)
Home Fast Charger	-0.133***	-1.195***	-0.0818	0.557*
	(0.0378)	(0.392)	(0.0510)	(0.326)
Office Fast Charger	-0.0470	-0.261	-0.0102	0.148
	(0.0401)	(0.397)	(0.0541)	(0.330)
Public Fast Charger	0.0720**	0.259	0.136***	0.127
	(0.0366)	(0.409)	(0.0498)	(0.339)
Slow Charging Cost	-0.00789***		-0.00735***	
	(0.00114)		(0.00242)	
Fast Charging Cost		-0.00860***		0.0121***
		(0.000999)		(0.00110)
Control Variables	Yes	Yes	Yes	Yes
Region F.E.	Yes	Yes	Yes	Yes
Year F.E.	Yes	Yes	Yes	Yes
Observations	6,400	6,400	3,200	3,200
Pseudo R^2	0.0944	0.0594	0.0534	0.140

Notes: Control variables include gender, age range, number of members in the household, income, political alignment, environmental concern, and yearly driven miles. All monetary values (e.g., charging costs) are denoted in Korean Won (KRW). Note: The total observation count is calculated by the number of different variable values that exist within each model, multiplied by 2 surveys, and 800 respondents per survey. Each model has one respondent represented multiple (2 or 4) times, along with their associated demographic variables and other control responses. These representations are equal throughout the model. Standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table A.4. Logistic Regression Output - Individual Scenarios with Regional Clustering

Model	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**
Scenario Specification	**slow 150**	**slow 180**	**slow 220**	**slow 250**	**slow 250**	**slow 250**	**slow 250**	**slow 100**	**slow 150**
Slow & Fast Charging Costs	**fast 340**	**fast 340**	**fast 340**	**fast 340**	**fast 375**	**fast 400**	**fast 430**	**fast 250**	**fast 250**
Home Slow Charger	0.972***	0.730***	0.457***	0.440***	0.672***	0.716***	0.516***	0.577***	0.507***
	(0.140)	(0.140)	(0.125)	(0.097)	(0.098)	(0.148)	(0.128)	(0.166)	(0.192)
Home Fast Charger	-0.403***	-0.434***	-0.140	0.017	-0.214	-0.437***	-0.480***	-0.315***	0.043
	(0.114)	(0.082)	(0.103)	(0.109)	(0.139)	(0.076)	(0.103)	(0.099)	(0.059)
Office Fast Charger	-0.098	-0.195*	0.052	0.140	0.222**	0.067	0.077	-0.117	0.022
	(0.133)	(0.114)	(0.108)	(0.091)	(0.087)	(0.107)	(0.087)	(0.146)	(0.114)
Public Fast Charger	0.225*	0.073	0.069	0.137	0.047	0.160	0.217	0.226*	0.220**
	(0.135)	(0.109)	(0.110)	(0.108)	(0.088)	(0.152)	(0.171)	(0.129)	(0.086)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600
Pseudo R^2	0.0814	0.0686	0.0292	0.0404	0.0352	0.0435	0.0518	0.0522	0.0434

Notes: Control variables include gender, age range, number of members in the household, income, political alignment, environmental concern, and yearly driven miles. All monetary values (e.g., charging costs) are denoted in Korean Won (KRW). Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A.5. Probit Regression Output - Individual Scenarios

Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Scenario Specification	**slow 150**	**slow 180**	**slow 220**	**slow 250**	**slow 250**	**slow 250**	**slow 250**	**slow 100**	**slow 150**
Slow & Fast Charging Costs	**fast 340**	**fast 340**	**fast 340**	**fast 340**	**fast 375**	**fast 400**	**fast 430**	**fast 250**	**fast 250**
Home Slow Charger	0.569***	0.437***	0.286***	0.271***	0.418***	0.436***	0.312***	0.354***	0.313***
	(0.098)	(0.093)	(0.089)	(0.090)	(0.090)	(0.092)	(0.093)	(0.090)	(0.091)
Home Fast Charger	-0.240***	-0.262***	-0.089	0.009	-0.135*	-0.268***	-0.294***	-0.193***	0.026
	(0.085)	(0.078)	(0.072)	(0.071)	(0.072)	(0.076)	(0.076)	(0.073)	(0.072)
Office Fast Charger	-0.053	-0.115	0.033	0.084	0.136**	0.042	0.045	-0.069	0.013
	(0.079)	(0.072)	(0.067)	(0.067)	(0.067)	(0.070)	(0.071)	(0.068)	(0.067)
Public Fast Charger	0.131	0.047	0.043	0.085	0.029	0.099	0.136*	0.138*	0.138*
	(0.081)	(0.075)	(0.070)	(0.070)	(0.070)	(0.073)	(0.073)	(0.071)	(0.070)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600
Pseudo R^2	0.0827	0.0691	0.0293	0.0403	0.0353	0.044	0.0523	0.0524	0.0433

Notes: Control variables include gender, age range, number of members in the household, income, political alignment, environmental concern, and yearly driven miles. All monetary values (e.g., charging costs) are denoted in Korean Won (KRW). Standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$