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Electric Mobility in Sweden: Analyzing Consumer Behavior and Regional Spread of BEVs

Mikael Levin[1], Krister Sandberg, Anette Myhr

[1] *Transport Analysis Forskarens väg 13, Östersund, Sweden, mikael.levin@trafa.se*

Executive Summary

This study examines the adoption of Battery Electric Vehicles (BEVs) in Sweden, focusing on socio-economic factors and consumer behavior from 2020 to 2024. Using official data, it reveals an uneven geographic spread, with BEVs concentrated in metropolitan areas and limited in rural regions. A decline in private leasing, driven by economic challenges, particularly impacts younger, lower-income groups. These findings highlight the need for targeted policies to address regional disparities and economic vulnerabilities.

Keywords: Electric Vehicles, Consumer behavior, Consumer demand, Trends & and Forecasting of e-mobility, Social equity.

1 Introduction

The global transition to electric vehicles (EVs) has gained momentum in recent years, and Sweden has emerged as a significant case study due to its ambitious climate goals and policies supporting EV adoption. Since 2020, the sales of Battery Electric Vehicles (BEVs) in Sweden have grown rapidly, with batteries becoming the predominant energy source for newly registered vehicles by 2022. Despite this impressive growth we know little about the distribution of electric car (EV) ownership among different household groups. In this study, utilizing data from Sweden to shed light on the burgeoning EV market, we investigate the demographics of predominantly early EV adopters[1]. The aim of this study is to provide a better understanding of which Swedish households have been early adopters of EVs, and examine how these differ from those who choose internal combustion engine (ICE) cars. We will also investigate potential differences between private purchases and private leasing, as well as how the geographic distribution of BEVs across the country has evolved over time.

The literature on the interest in buying EVs' goes back to about 2010, coinciding with the broader market introduction of EVs. Most of the previous studies, especially the earlier ones at the time when the market for EVs was still small, have focused on attitudes and interests, of individuals or households, towards the possibility of buying an EV in the near future, e.g.[1]. The literature has since then evolved into a broader palette of research questions concerning EVs. The main method is still to this day studies of stated preference. Some studies have also combined various data sources—such as interviews and surveys—with GPS data from vehicles and charging infrastructure to gain a better understanding of how the vehicles are used [2]. Revealed preference studies are rare and registry data are very seldom used.

[1] The private individuals who have opted for an EV early on are often described as 'early adopters' in the literature, e.g.; they are generally characterized as being interested in technology, climate/the environment, and as having the financial means to be able to be the first to try out new technologies. However, such people constitute a very limited customer group, and the question is therefore also which households will be next in line as the market for EVs broadens and a greater share of the new cars sold are EVs.

A common feat in literature is to divide influential factors into a few larger categories, i.e., socio-economic, demographic, geographic, fuel type, offering and capacity, EV performance, interests, and influence. Almost all previous studies are limited to investigations of certain groups of individuals. The sample sizes ranges from several hundred to a few thousand respondents, which is why the results are usually reported for a single country, or for the specific area being studied [3–5]. Although found important, socioeconomic factors have often merely been used as control factors.

In later years, the research has evolved into more data driven studies, although the literature continues to be dominated by surveys and interview studies on intended future purchases. We have found only a few studies that are based on more extensive data, from Sweden and Norway [6–9].

In our literature review we have also found a few studies [6,10] with a particular focus on identifying 'early adopters', i.e. individuals who are interested in new technologies and willing to opt for an electric vehicle early on. Plötz et al. [10] used revealed preference and found some interesting discrepancies between the common assumption that EVs attract especially younger, environmentally interested and technically savvy people [11]. Instead, Plötz [10] found that the group of early EV purchasers in Germany mainly consisted of men aged 40–50 who live in a house with multiple family members, enjoying a high financial standard of living.

In this study, we aim to identify the primary consumer segments contributing to BEV adoption in Sweden and examine how the geographic distribution of these vehicles has evolved over time. By analyzing the behavior of both private individuals and companies, we explore the purchasing and leasing patterns of BEVs, offering insights into the evolution of electric mobility in the context of socio-economic factors. Specifically, in our regression analysis we extend earlier research on the adoption of new BEVs in 2016 and 2020, incorporating a broader dataset from 2020 to 2022, also distinguishing between new and used BEVs. This expanded scope allows us to investigate whether distinct household characteristics influence the choice of new versus used BEVs and the implications for market saturation and policy intervention. The study aims to further develop previous research findings on the driving mechanisms behind households' consumption of new cars and BEVs [1].

2 Data and method

In this study we use two interconnected registry databases from Statistics Sweden. The first database covers all individuals registered in Sweden 2016, 2020 and 2022, featuring diverse socio-economic variables. The second database details all privately owned vehicles in Sweden, with provisions for linking vehicles to their owners in the individual-level database. The data also includes cars that are leased or are company cars but used by the household. The definition of a leased vehicle is that it needs to be leased for at least one year and be registered to an individual user.

By matching[2] vehicle data (4.6 million vehicles) with data on Swedish households (4 million), we were able to link car ownership with several socio-economic factors. These observations were in turn linked to small geographical areas (DeSO)[3] for 2016, 2020 and 2022 to match additional information to each household. We discard households owning more than five cars (<0.03%) from the analysis. We also discard households having more than 12 household members (<0.01%).

In 2020, BEVs accounted for 9 percent of all newly registered passenger cars in Sweden. By 2022, this share had increased to 32 percent. Initially, BEVs were primarily adopted by companies, but from 2020 onwards, private individuals also began purchasing and leasing BEVs. In 2020, approximately 4,300 BEVs were

[2] Statistics Seden assigns each household with an identification number. In each household every person has a personal id-number. Each car in the national vehicle registry is connected to its owner by this personal id-number. Socio-economic data is added to each household.

[3] DeSO (Demographic Statistical Areas) is a nationwide division that follows county and municipal boundaries, dividing Sweden into 5,984 areas with between 700 and 2,700 inhabitants each. Category A: DeSO in this category is primarily located outside major population concentrations or urban areas. Category B: DeSO in this category is mainly located within a population concentration or urban area but not in the municipality's central city. Category C: DeSO in this category is primarily located in the municipality's central city. In summary, 72 percent of DeSO falls within category C, while 18 percent belong to category A, and 10 percent fall within category B.

purchased by private individuals, and just over 5,000 were acquired through private leasing. Together, these accounted for 33 percent of all newly registered BEVs that year. By 2022, the number of privately purchased BEVs had risen to nearly 14,000, and the number acquired through private leasing had reached almost 35,000—amounting to 51 percent of all newly registered EVs.

However, the transition of vehicles already in use has progressed towards electricity much more slowly. Sweden has nearly five million passenger cars in operation. Of these, only 1.1 percent were BEVs in 2020, a figure that had increased to 4 percent by 2022.

In the analysis we estimate five regression models for the year 2020 and 2022. The analysis was done in a sequence of steps. In the first step, Model 1 is estimated to sort out relevant factors explaining why households register a new vehicle, irrespective of the kind of fuel type. The following four models (Model 2-5) use the stock of households that have registered at least one vehicle in 2020 and 2022 (taken from Model 1) to analyze factors of importance to households choosing EVs and the choice to buy or lease these cars.

Pairwise correlations between the variables were examined, followed by a multicollinearity test using the Variance Inflation Factor (VIF) [12]. Some of the variables, especially different age groups, exhibited high values (VIF > 10). Principal component analysis were performed [13,14] and linear combinations of highly correlated variables were then added to the models. In the continued analysis, some of these variables were excluded due to multicollinearity.

Step two involved a detailed analysis of each variable's association with the dependent variable, both individually and in conjunction with other explanatory factors. This was done using scatter plots to investigate which variables had a positive or negative relationship with the dependent variable. Several model specifications were subsequently tested to select a subset of variables for inclusion in the model specification. In the third and final step, backward stepwise selection, stepwise selection, and Mallows' Cp selection [15,16] were performed.

3 Regression analysis

The results reveal a marked increase in the adoption of BEVs in Sweden between 2016 and 2022.[4] While ownership has expanded across the population, the transition remains unevenly distributed across socioeconomic and demographic groups. Income is the most significant predictor of BEV adoption. The probability of purchasing an EV increases substantially with income, and this effect has grown stronger over time. In 2022, individuals in the highest income deciles were far more likely to purchase a BEV than those in the lower deciles. Leasing is also positively correlated with income, but the effect is less pronounced than for purchases. This suggests that while leasing lowers the financial threshold for EV adoption, it does not eliminate structural inequalities.

Housing type plays a central role. Individuals living in detached houses are significantly more likely to both purchase and lease BEVs. The effect is stronger for purchases, indicating that homeownership and the ability to install private charging infrastructure remain key enablers. Residents in multi-dwelling units are underrepresented, particularly in the ownership segment. Household composition also matters. Couples—especially those with children—have lower odds of both purchasing and leasing BEVs compared to single-person households. The likelihood of leasing among single adults is particularly low, pointing to a gap in accessibility for smaller or less resource-rich households.

Age exhibits a curvilinear effect. Middle-aged individuals (36–55) are the most likely to purchase EVs, while both younger (<35) and older (>65) age groups have significantly lower adoption rates. Leasing appears somewhat more accessible to younger age groups, though their overall representation remains modest. In geographic terms, urban and suburban municipalities show higher levels of leasing, while EV purchases are more common in affluent suburban and semi-rural areas. Rural municipalities lag behind significantly in both categories. While EV ownership is spreading, these results confirm that structural differences in adoption

[4] Full estimate results can be found in: Transport Analysis (2024) *Elektrifierade fordon i Sverige – en analys av laddbara fordon över tid och geografi*. https://www.trafa.se/vagtrafik/elektrifierade-fordon-i-sverige--en-analys-av-laddbara-fordon-over-tid-och-geografi-15113/

remain strong. Leasing has allowed new user groups to access electric vehicles, but the broader pattern of socioeconomic stratification is largely intact.

3.1 Differences Between New Registrations and Vehicles in Use

While both new registrations and vehicles in use provide valuable insights into the electrification of the Swedish car fleet, the two perspectives reveal different patterns of ownership and transition dynamics.

First, socioeconomic disparities are more pronounced in new registrations than in the stock of vehicles in use. Income, for instance, has a stronger effect on the likelihood of owning a newly registered electric vehicle (EV) than on owning one that is already in traffic. This indicates that structural inequalities are more visible at the front line of the transition, where new technologies and market trends take hold. Over time, as these vehicles become part of the broader vehicle stock, the differences between groups become less distinct.

Second, age-related patterns are more prominent in new registrations. Younger (<35) and older (>65) individuals are significantly underrepresented among new EV owners. However, these effects are weaker in the vehicle fleet currently in use. This is likely due to the long lifespan of vehicles, which allows cars initially registered by one demographic group to later be owned by another, smoothing out the demographic distinctions.

4 Geographic and Ownership Transitions of Newly Registered BEVs

To complement the regression analysis of socio-demographic predictors of EV adoption, we also conducted a longitudinal flow analysis of BEVs registered in 2020. The aim was to examine how these vehicles have moved across geographic and ownership categories over a four-year period. The analysis includes both privately and corporately owned vehicles.

Using the six municipal categories defined by the Swedish Agency for Economic and Regional Growth, [17] we tracked the geographic location of each BEV at the time of registration in 2020 and in subsequent years until the end of 2023. Most vehicles were initially registered in metropolitan municipalities (Stockholm, Gothenburg, Malmö) and in dense mixed municipalities located in southern and central Sweden—13,953 and 9,161 vehicles, respectively.

The majority of these vehicles remained within the same municipal category over time. By the end of 2023, 9,257 vehicles were still registered in metropolitan municipalities and 8,341 in dense mixed municipalities. While there was a notable flow of vehicles between these two urban categories, very few BEVs had moved into more rural or sparsely populated areas.

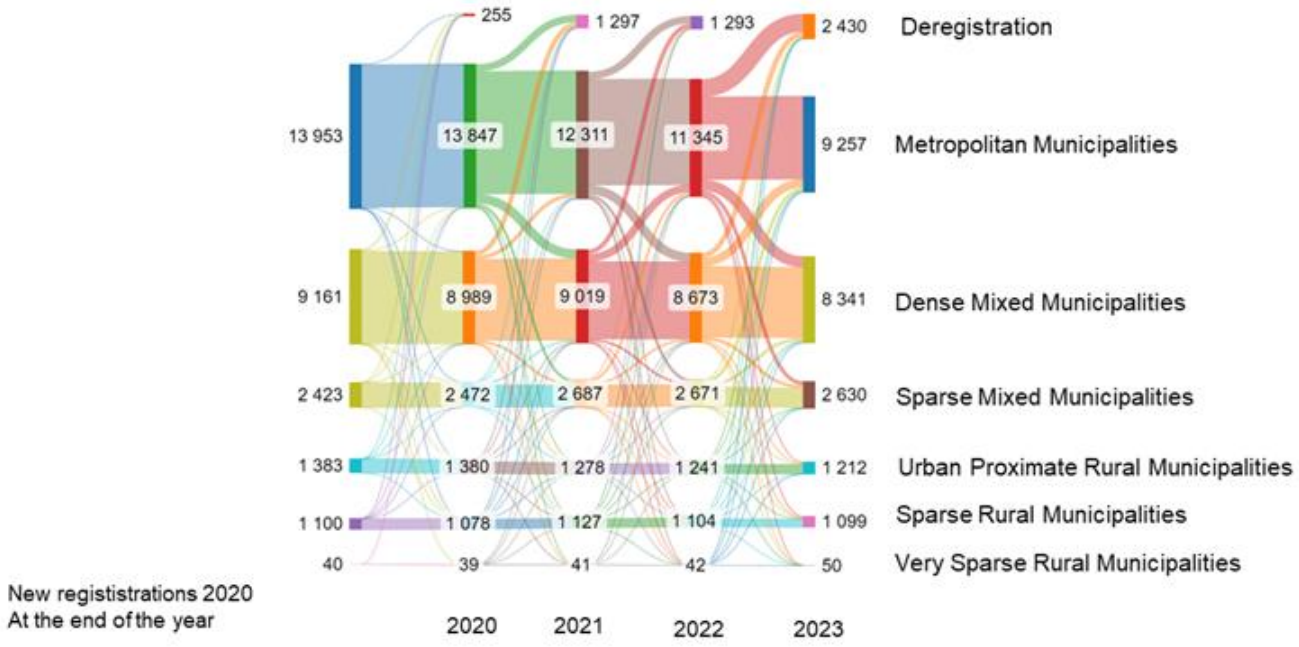


Figure 1. Newly registered BEVs in 2020 by the regional affiliation of the owner (according to the Swedish Agency for Economic and Regional Growth's municipal classification), at the time of registration and at the end of 2020, 2021, 2022, and 2023, respectively.

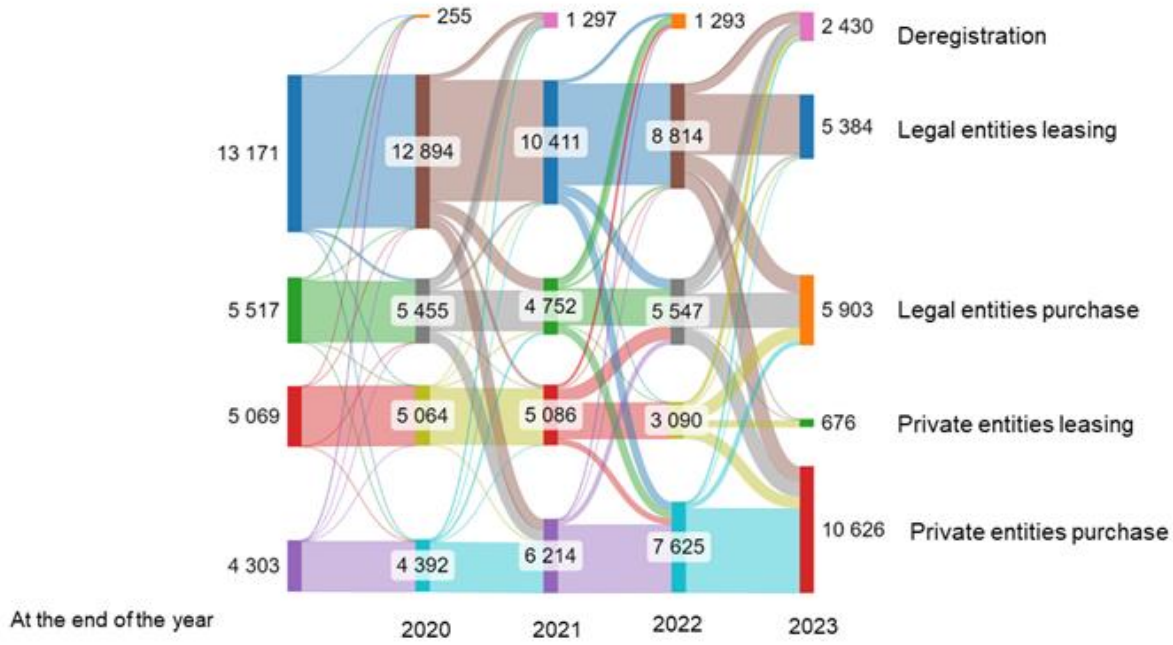
Instead of gradually diffusing into other municipal types, a significant portion of the BEVs were deregistered, particularly in 2023. Of all BEVs registered in 2020, 19 percent had been removed from the registry by 2023, primarily through export. The number of deregistered vehicles in 2023 alone was equivalent to the entire BEV stock in rural municipalities, underscoring the magnitude of this outflow.

The limited geographic spread of BEVs to rural areas can be partially attributed to differences in the age profile of the entire vehicle stock. The average age of passenger cars in sparsely populated municipalities was 14–17 years in 2023, making it unlikely that recently registered BEVs—typically four years old or younger—would appear in these areas. As BEVs age and change owners, broader spatial diffusion may occur in the future.

4.1 Shifting Ownership Patterns: Leasing and Purchase Dynamics

A second flow analysis focused on changes in ownership type over time, distinguishing between private individuals and corporations, and between leasing and purchase. Among BEVs registered in 2020, the number owned outright by private individuals more than doubled by 2023—from 4,303 to 10,626. This increase was made possible by the transition of vehicles from corporate leasing into the private second-hand market, particularly after the typical three-year leasing period had ended.

Meanwhile, the number of BEVs leased by private individuals declined sharply—from over 5,000 in 2020 to just 676 in 2023. Similarly, the number of vehicles leased by legal entities (corporations) was halved over the same period, dropping to 5,384. While the number of vehicles purchased by legal entities increased slightly in 2023 (from 5,517 to 5,903), the general trend indicates a substantial ownership shift from leasing to private purchase.



Figur 2, Newly registered electric passenger cars in 2020 by ownership type (private/legal entity, purchase/leasing/deregistration), at the time of registration and at the end of 2020, 2021, 2022, and 2023, respectively.

This pattern highlights the key role of the corporate sector in introducing BEVs to the market. Leasing through companies serves as an initial entry point, after which vehicles become available to private individuals through the second-hand market. The transition from corporate leasing to private ownership underscores the importance of company cars in facilitating broader diffusion among households.

The geographic flow analysis reveals a highly concentrated pattern of BEV retention in urban areas, with minimal diffusion into rural or peripheral municipalities. At the same time, the ownership analysis points to a dynamic reshaping of the BEV stock: as leases expire, vehicles shift from corporate to private hands. However, this change in ownership does not necessarily coincide with a change in geographic location.

These results suggest that while the ownership base of BEVs is broadening, the spatial distribution remains narrow. The corporate leasing market plays a vital role in initiating the adoption cycle, but current patterns indicate that the benefits of electrification remain largely urban. Over time, further diffusion may occur as vehicles age further, but policy intervention is likely needed in order to accelerate and support this transition.

5 Discussion

The transition to electric mobility in Sweden is progressing rapidly, yet the benefits are not equally shared across all household types. The results indicate that BEVs are primarily adopted by high-income households, individuals living in detached houses, and middle-aged couples. Leasing has somewhat widened access, but its reach remains socially and geographically constrained. From a policy perspective, this raises important challenges. If the goal is to accelerate the decarbonization of the vehicle fleet while promoting social inclusion, targeted interventions are needed. Several groups are currently underrepresented among EV adopters: low-income households, single adults, apartment dwellers, and rural residents. These groups face financial, infrastructural, and informational barriers that are not adequately addressed by current instruments.

Leasing plays an important intermediary role. It reduces the upfront costs of EV access and may appeal to individuals who are unwilling or unable to commit to a full purchase. However, leasing alone is not a panacea. Even leased EVs are disproportionately adopted by wealthier households with stable housing and relatively high income. Thus, policies that aim to expand leasing must be complemented by broader measures—such as

means-tested subsidies, investments in public and shared charging infrastructure, and tailored outreach to underrepresented groups.

Another policy implication is the importance of housing-based strategies. Since individuals living in detached houses dominate BEV adoption, expanding access among apartment dwellers is critical. This may involve regulatory requirements for charging infrastructure in new and existing buildings, or support for neighborhood-based charging hubs. In summary, leasing has made EVs more accessible, but socioeconomic and spatial inequalities persist. A more inclusive EV transition will require deliberate policy action to reach beyond the early adopter segments and ensure that all households—regardless of income, location, or housing type—can participate in and benefit from the electrification of transport.

Finally, from a policy standpoint, it is crucial to distinguish between adoption patterns in new registrations and the actual composition of vehicles on the road. Policies aimed solely at stimulating new EV purchases may not immediately impact the broader vehicle fleet or address long-term disparities. To ensure an equitable and comprehensive transition, strategies must consider both entry into the system (new registrations) and the legacy fleet (vehicles in use), acknowledging that system-wide change is gradual and affected by second-hand markets and vehicle turnover rates.

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Presenter Biography

Mikael Levin works as a Senior Adviser at the governmental agency Transport Analysis in Sweden. Levin works mainly on evaluating Swedish transport policy and the vehicle market in Sweden and has been working on forecasting the Swedish road vehicle fleet since 2016. Levin has a PhD in Social Science from Umeå University.

Krister Sandberg works as a Senior Adviser at Transport Analysis, focusing on questions relating to accessibility, people's travels, and freight transport. Over the years he has conducted research mainly in the fields of regional and transport economics, with a focus on spatial econometrics, economic growth, disparities, and hedonic prices. Sandberg has a PhD in Economics from Umeå University.

Anette Myhr works as a Statistician at Transport Analysis. She works with data on vehicles in official statistics, analyses, and forecasts. Studied mathematical statistics at Umeå University.