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Commercial Fleet Vehicle Additions and Replacements and the Potential Market Penetration for Electric Vehicles

Konstadinos G. Goulias*, Hui Shi

University of California Santa Barbara, CA 93117, USA

Abstract

Commercial fleets can play a major role in the rapid evolution of plugin hybrid electric vehicles (PHEV) and battery electric vehicles (BEV) market penetration. Using survey data in this analysis we identify groups of commercial fleets based on the attributes of the next vehicle planned to be added to a fleet and the propensity of replacing a current vehicle with an electric vehicle. We first develop principal components representing dimensions of the desired vehicle characteristics (price, efficiency, size and fuel type, timing of vehicle procurement, replacement of current vehicle or addition to the fleet, and intended purchase of new, used, or leased). Using 8 principal components capturing approximately 91.55% of the variance in the variables listed above and hierarchical clustering we derive six distinct market segments. One segment contains 43.5% of the total responses preferring a PHEV to replace a current vehicle in the fleet, it is a segment that is composed of 100% PHEV preferring respondents and almost all of them expect to purchase a small vehicle and 92% will do that within 5 years. The average price they expect to pay is approximately $27,000 and the expected efficiency to be about 55 miles per gallon equivalent (MPGe). Another segment contains 91.0% BEV preferring respondents who are only 11.6% of the sample. This segment also prefers small vehicles to replace vehicles in their fleet, possibly leasing and expecting to pay approximately $46,800 with an efficiency of about 100 MPGe. The other four segments are dominated by gasoline, diesel, and natural gas internal combustion engine vehicles.

Keywords: Commercial fleets; Market segments; Mixed factors; Clustering; Electric vehicles.

1. Introduction

The IEA (2021) in its electric vehicle outlook reports 10 million PEVs worldwide with a 41% increase in 2020 registrations with China, Europe and the United States as the three leaders in PEV market penetration. This is repeated

* Corresponding author. Tel.: +1-805-284-1597.
E-mail address: kgoulias@ucsb.edu

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in the IEA Global outlook for 2022 with China continuing adding EVs in its national fleet faster than other countries but also the US and Europe accelerating they transformation of national fleets away from internal combustion engine (ICE) cars. This is attributed to a combination of incentives backed by sustained policy support, pledges to phase out internal combustion engines and setting targets for EV market penetration, increasingly stricter emissions standards and energy efficiency, and increased variety of model production by automotive industry attracting wider market segments of buyers. As of December 2020, the United States had over 276 million registered vehicles nationwide of which approximately 30 million are in California (US DOT, 2022). Approximately 1 million of the nationwide fleet of vehicles are electric of which 425,300 are registered in California (US DOE, 2022).

Commercial fleets are vehicle fleets of large corporations, rental car companies, utilities, government agencies, and smaller operators providing services to businesses and dwellings. Depending on the definition of the commercial sector and the inclusion of small and large companies, current estimates show a nationwide commercial fleet of a little over 8 million vehicles that is approximately 3% of the total US vehicle fleet (US DOT, 2022). If a similar ratio applies to California, commercial fleets may be close to 1 million vehicles in California. Considering that fleet renewal and adoption of PEVs is part of a more complex planning cycle, it is worth digging deeper into ways to increase PEV market penetration and customize incentives to different fleets (Baykasoğlu et al., 2019). Fleets can function as agents of change in vehicle technology in the market and on top of that due to their operations have a higher potential in emissions reduction, easier to charge and/or refuel in headquarters, and targeting fleets with high turnover rates may be an administratively efficient way to achieve market penetration of new technologies because a small number of fleets control a large percentage of cars (Iogansen et al., 2023).

In this paper we first explore the intentions of fleet managers purchasing or leasing vehicles when they go through renewal of their fleet decisions. This includes the *decision to purchase or lease a car, adding or replacing a fleet car, vehicle size, vehicle fuel type, efficiency and price of the next car*. To do this analysis we extract from the data market segments with distinguishable characteristics based on the variables above. As we will show battery electric vehicle market segments are different from the plugin hybrid electric vehicles. They are also very different from their counterpart internal combustion engine market segments. We use as determinants of the decisions the current fleet composition, firm/agency characteristics such as size and type of industry, as well as preferences about specific vehicle attributes. The analysis includes data from the California Vehicle Survey conducted by the California Energy Commission (CEC) in 2017.

The next section describes the data used followed by a section of the method used to derive market segments. This is followed by a section on market segment composition. The paper ends with concluding remarks.

2. Commercial Fleet Data

This research uses data from the 2017 California Vehicle Survey (CVS), which is one of the set of surveys conducted by the California Energy Commission on residential and commercial light-duty vehicle ownership (NREL, 2023). The survey has taken place periodically over the past two decades to update light-duty vehicle ownership and preferences and forecast the shift in utilization behaviour. These surveys contain two separate vehicle owners that are the private vehicle owners that are households living in California and named the residents (and residential fleets) and commercial fleet owners that are single or multiple establishment firms in California and named commercial fleets. Data collection for both residential and commercial subjects follow a two-stage approach in which the first stage is a questionnaire that collects current fleet data, a variety of attitudinal data that change with the survey year, and intentions data about the next vehicle and/or what people do with any discarded vehicles. In the second stage hypothetical choice scenarios customized to each respondent collect data mimicking real life choices people make (CEC, 2018).

The 2017 survey (herein labelled CEC2017) has a set of questions specifically designed to collect information about the next vehicle procurement, therefore, it is used in this study. CEC2017 also contains questions to fleet managers about the size and composition of the current fleet, desired attributes of the next vehicle to be added to the current fleet (either as addition or replacement of a previously purchased or leased vehicle), and a series of choice experiments to contrast vehicle attributes. In this paper using the CEC2017 data we explore the purchase intentions and the relationships between the next vehicle and the current fleet using a technique that combines categorical with continuous vehicle attribute data as explained later. The questions from 1712 participants (commercial fleet owners) in CEC2017 survey that we analyse jointly to derive market segments are:

- When do you think you may purchase or lease one or more light-duty vehicles that will be company-owned/leased and/or used for business purposes in California at least 50% of the time? This was recoded as <= 5years and > 5years
- Will the next vehicle your company plans on acquiring most likely be new or used?
- Will the next vehicle your company plans on acquiring most likely be purchased or leased?
- Will the next vehicle your company plans on acquiring be an addition to your fleet or a replacement?
- What type of vehicle is your company most likely to purchase or lease next? This answer is one of 13 options from a subcompact car to a full-size large van.
- What type of engine/fuel type is the next vehicle your company acquires most likely to have? This answer is one of Gasoline, Hybrid (Gasoline), Plug-in Hybrid Electric vehicle (PHEV), Gasoline-ethanol Flex Fuel vehicle (E85 FFV), Diesel, Compressed Natural Gas (CNG) vehicle, Full Electric Vehicle, and Hydrogen vehicle.
- About how many miles per gallon (MPG or MPGe) do you expect your company's next vehicle to get, on average? (city/highway combined average)
- About how much money do you expect the company will spend to purchase/lease its next vehicle?

These are six categorical variables and two continuous variables that we will use to derive market segments of commercial fleets. Table 1 provides a summary of the statistics of this sample.

Table 1 Variables used in developing market segments

Characteristic	N = 1,712[1]
Purchase Or Lease	
Purchase New	784 / 1,712 (46%)
Purchase Used	564 / 1,712 (33%)
Lease	364 / 1,712 (21%)
Add Or Replace	
Add	286 / 1,712 (17%)
Replace	1,426 / 1,712 (83%)
Soon Or Later	
Buying in <= 5yrs	1,326 / 1,712 (77%)
Buying in > 5yrs	386 / 1,712 (23%)
Fuel Type	
Electric or Hydrogen	199 / 1,712 (12%)
PHEV	469 / 1,712 (27%)
ICE (gasoline or other)	1,044 / 1,712 (61%)
Vehicle Size	
Small	725 / 1,712 (42%)
Medium	457 / 1,712 (27%)
Large	530 / 1,712 (31%)
Price	31,663.4 [30,000.0] (22,236.8)
MPGe	38.6 [25.0] (34.5)

[1] n / N (%); Mean [Median] (SD)

3. Market Segment Derivation

The method used here belongs in the cluster analysis family of methods that aim to divide observations into groups according to the values of variables these groups have in common. The ultimate objective is to partition the data in such a way that commercial fleet respondents in the same group are similar (e.g., plan their next vehicle in the fleet to be a large car with internal combustion engine that costs about $30K and does on average 25 miles to the gallon) but at the same time dissimilar from other groups (e.g., one group that seeks to buy a small PHEV that costs about $25K and does on average 100 miles to the equivalent gallon). It is usual to differentiate between methods that are algorithmic, and they discern patterns in multidimensional data clouds (these are also labelled unsupervised methods) and methods that are model-based and require assumptions about the data generating distributions.

The algorithmic approaches are the earliest clustering techniques and include the well-known K-means, K-medoids, Hierarchical clustering among many others (Kaufman and Rousseeuw, 2009). The method we use here is a distance-based clustering of mixed data (Pagès, 2004). The word "mixed" refers to quantitative (in our case continuous data such as MPGe and vehicle price) and qualitative (in our case categorical that are either binary as the yes/no answer to purchasing a vehicle or multicategory as in the fuel used by a prospective vehicle). Cluster analysis in this approach is the second step after a data combination and reduction step called Factor Analysis with Mixed Data (FAMD). The data are viewed as a table of rows representing the individuals and columns representing the variables with the continuous variables standardized (subtract their mean and divide by their standard deviation) and the categorical variables transformed into dummy variables and divided by the squared root of the category proportion. This decreases the possibility that one variable "dominates" all the other variables due to its size or due to each frequency of choice. The resulting matrix of rows of individuals (fleets managers responding to the survey) and columns of the transformed variables is then used to derive principal components projecting the observed data on an orthogonal coordinate system (axes that yield uncorrelated components) that captures variation in the data in a hierarchical way with the first component having the highest variation, the next component having the second highest variation and so forth until 100% of the observed variation is represented in the new coordinate system. This allows to identify components that map the entire variation in the data from all the variables jointly. Then, retain for the subsequent cluster analysis the desired number of components based for example on the percent of variance that is considered the signal (the variation we want to explore further) versus noise in the data. FAMD in the way that is presented in (Husson et al., 2017) and implemented in FactoMineR (Lê et al., 2008), uses the matrix of the transformed variables described before. This is equivalent with the use of a pairwise distance (dissimilarity) between observations as the Euclidean distances used in Principal Component Analysis (PCA) for the continuous variables plus the sum of the chi-square distance contributions used in Multiple Correspondence Analysis (MCA) for the categorical variables. This technique produces principal components representing dimensions of the desired vehicle characteristics (price, efficiency, size and fuel type, timing of vehicle procurement, replacement of current vehicle or addition to the fleet, and intended purchase of new, used, or lease). These are the variables presented in Table 1 above.

In the FAMD application here (the first step) after the derivation of the new coordinate system (the principal components) we retain 8 principal components capturing approximately 91.55% of the variance in the variables listed above. Then, these 8 principal components are used in a hierarchical clustering routine to extract market segments (clusters) with systematic differences and similarities in their principal components and by reflection of the projection on the principal components of the original variables. Before presenting the findings, it is worth mentioning that deciding on the number of clusters to retain in analyses of our type cannot be done exclusively based on statistical indicators of "good" clusters. One popular indicator is the inertia that allows to obtain similarity within clusters and dissimilarity across clusters because total inertia (which is a constant for the data we have) is the sum of within-class inertia and between-class inertia as shown in Equation 1.

$$\sum_{k=1}^{K}\sum_{q=1}^{Q}\sum_{i=1}^{N}(x_{iqk}-\overline{x}_k)^2=\sum_{k=1}^{K}\sum_{q=1}^{Q}\sum_{i=1}^{N}(x_{iqk}-\overline{x}_{qk})^2+\sum_{k=1}^{K}\sum_{q=1}^{Q}(\overline{x}_{qk}-\overline{x}_k)^2 \tag{1}$$

i= 1,…,N observations
q = 1,…,Q classes
k= 1,…,K variables

x_{iqk}= value of variable k in class q for individual i
$\overline{x}_k$= value of overall average for variable k
$\overline{x}_{qk}$= value of average for variable k within class q

Hierarchical clustering when it is agglomerative starts will all the observations in one cluster (one class). This means the between inertia is equal to the total inertia. Then at a sequence of steps observations first and clusters afterward are combined to minimize the decrease in between-class inertia. In this way, observations are classed in the same cluster by minimizing the decrease in the between-class inertia. The difference between two cluster steps (one step with q and the next with q+1) is computed and if appearing to be a large difference the q+1 number of clusters solution is accepted. This is shown in Figure 1 left-hand side with an abrupt decrease from 1 to 2 clusters (the first bar in the graph) and then smaller changes in inertia as the number of clusters increases. This appears to be levelling off at 6 clusters (fifth dark bar on the figure). The right-hand side figure shows this 6 clusters solution in which the 1712 observations are classed in one of the six groups. Note that going from 6 clusters to 7 would not yield any major gain in maximizing between-cluster inertia. This is not sufficient criterion to decide on the number of clusters as our final solution. Two additional criteria for deciding on the number of clusters are the relative balance of cluster membership and the interpretability of the solution as demonstrated by van de Velden et al. (2016) using FAMD to illustrate its functionality.

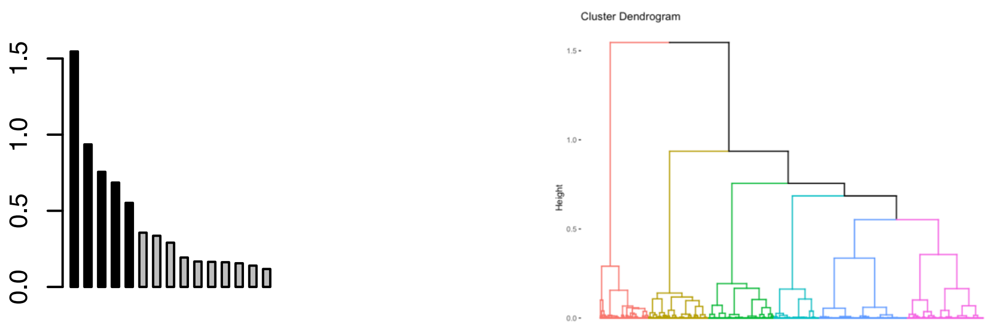

Fig. 1 Inertia gain by increasing number of clusters and dendrogram with six clusters highlighted

4. Market Segment Composition

The composition of these derived market segments can be presented in terms of the principal component scores and the original variables from Table 1 that are the vehicle characteristics each cluster fleet member wants to have for its next vehicle for the fleet. Tables 2 and 3 show all six market segments with membership that spans from 204 (~11.9% of the sample fleets) fleets to as many as 392 fleets (~22.9% of the sample fleets).

The first segment is composed by 100% of fleets that plan to replace a current vehicle and not to add to their fleet. They also show a strong preference for large vehicles (71%) and 96% prefer ICE (gasoline or other). The median desired price in this segment is the same as the overall median (see Table 3) but lower efficiency (MPGe). We name this market segment **SoonReplLargICE**. The second segment is also a group that just wants to replace a vehicle in their current fleet but after 5 years. This segment prefers medium and large vehicles powered by ICE but some of the respondents in this group also want to have PHEVs (23%). This segment aims at a median price lower than the overall median and efficiency higher than the overall median (this segment is named the **LaterReplMedLargICE+**). The third market segment is composed entirely of fleets that intend to add a vehicle with higher percentage preferring ICE but 28% prefer a PHEV. This segment's expected median price and efficiency are at the overall median levels. This segment is composed of fleets that at 86% plan to add this next vehicle within 5 years. We name this segment **SoonAddICE+.** All the fleets in the fourth segment intend their next vehicle to be a replacement of a current fleet vehicle and to procure this vehicle with 5 years. The majority of these fleets prefer medium size vehicles (80%) and divided between ICE (72%) and PHEV (28%). The preference of this segment for price and efficiency is similar to the previous one. We name this segment the **SoonReplMedICE+**. The last two segments represent the market segments that motivated our analysis here and they are as expected very different than the previous four.

Table 2 Next vehicle market segments and their characteristics from cluster analysis

Characteristic	SoonReplLargICE, N = 392[1]	LaterReplMedLargICE+, N = 291[1]	SoonAddICE+, N = 269[1]
Purchase Or Lease			
Purchase New	214 / 392 (55%)	142 / 291 (49%)	125 / 269 (46%)
Purchase Used	178 / 392 (45%)	122 / 291 (42%)	102 / 269 (38%)
Lease	0 / 392 (0%)	27 / 291 (9.3%)	42 / 269 (16%)
Add Or Replace			
Add	0 / 392 (0%)	0 / 291 (0%)	269 / 269 (100%)
Replace	392 / 392 (100%)	291 / 291 (100%)	0 / 269 (0%)
Soon or Later			
Buying in <= 5yrs	392 / 392 (100%)	0 / 291 (0%)	231 / 269 (86%)
Buying in > 5yrs	0 / 392 (0%)	291 / 291 (100%)	38 / 269 (14%)
Fuel Type			
Electric or Hydrogen	0 / 392 (0%)	0 / 291 (0%)	1 / 269 (0.4%)
PHEV	16 / 392 (4.1%)	67 / 291 (23%)	76 / 269 (28%)
ICE (gasoline or other)	376 / 392 (96%)	224 / 291 (77%)	192 / 269 (71%)
Vehicle Size			
Small	112 / 392 (29%)	70 / 291 (24%)	107 / 269 (40%)
Medium	0 / 392 (0%)	92 / 291 (32%)	67 / 269 (25%)
Large	280 / 392 (71%)	129 / 291 (44%)	95 / 269 (35%)
Price	29,287.0 [30,000.0] (15,134.7)	27,332.7 [25,000.0] (15,014.5)	29,291.6 [30,000.0] (17,065.4)
MPGe	22.3 [20.0] (6.2)	26.7 [25.0] (11.1)	28.3 [25.0] (16.6)

Characteristic	SoonReplMedICE+, N = 339[1]	SoonReplSmalPHEV, N = 204[1]	ReplSmallEV+, N = 217[1]
Purchase Or Lease			
Purchase New	122 / 339 (36%)	70 / 204 (34%)	111 / 217 (51%)
Purchase Used	83 / 339 (24%)	53 / 204 (26%)	26 / 217 (12%)
Lease	134 / 339 (40%)	81 / 204 (40%)	80 / 217 (37%)
Add Or Replace			
Add	0 / 339 (0%)	0 / 204 (0%)	17 / 217 (7.8%)
Replace	339 / 339 (100%)	204 / 204 (100%)	200 / 217 (92%)
Soon or Later			
Buying in <= 5yrs	339 / 339 (100%)	187 / 204 (92%)	177 / 217 (82%)
Buying in > 5yrs	0 / 339 (0%)	17 / 204 (8.3%)	40 / 217 (18%)
Fuel Type			
Electric or Hydrogen	0 / 339 (0%)	0 / 204 (0%)	198 / 217 (91%)
PHEV	96 / 339 (28%)	204 / 204 (100%)	10 / 217 (4.6%)
ICE (gasoline or other)	243 / 339 (72%)	0 / 204 (0%)	9 / 217 (4.1%)
Vehicle Size			
Small	52 / 339 (15%)	203 / 204 (100%)	181 / 217 (83%)
Medium	272 / 339 (80%)	0 / 204 (0%)	26 / 217 (12%)
Large	15 / 339 (4.4%)	1 / 204 (0.5%)	10 / 217 (4.6%)
Price	32,892.6 [30,000.0] (18,699.0)	27,356.5 [30,000.0] (14,320.3)	46,832.3 [35,000.0] (42,482.7)
MPGe	26.8 [25.0] (11.5)	55.4 [45.0] (33.7)	99.6 [100.0] (50.8)

[1] n / N (%); Mean [Median]; N=cluster size

The fifth segment is made exclusively of fleets that expect their next vehicle to be a PHEV and their strong majority to procure a small car to replace a current vehicle. Similarly, to all four previous segments they expectation is for a median price of $30,000 but a must higher efficiency (both the average and median are higher than the overall average and median MPGe). In addition, 92% of these fleets expect to procure their next vehicle within 5 years. We name this segment **SoonReplSamlPHEV**. The last market segment is heavily dominated by battery electric vehicles and/or hydrogen preferring fleets (91%) with the majority expecting to procure a small car (83%) and replace a current car (92%). This is the market segment that expects to pay the highest price (mean of ~$46,000) and is by far the highest efficiency expecting segment (in essence fourfold the overall sample efficiency with median 100 MPGe). However, the fleets in this segment also show high intra-segment variability in the price expectation (see the standard deviation in Table 5 that is ~$43,000). We name this segment the **ReplSmallEV+.**

All market segments, except for the first segment, show a similar spread in their preference for purchasing new, used, or leasing a vehicle. Leasing appears to be very strong among the last three market segments hovering at around

40%. Also, the high percentage of fleets expecting to purchase used PHEV or BEV vehicles shows that the potential for a secondary market is very high for this type of vehicles and fleets but with many unknowns at this time. However, some early evidence suggests a few possibilities to increase information provision and reduce risk perception in secondary markets (Tal et al., 2021).

To verify a few hypotheses emerging from the literature on the association between the demand for PEVs and current fleet characteristics we estimated a Multinomial Logit model that uses as dependent variable the membership to one of the six market segments and as independent variables fleet characteristics (not shown due to space limitations but available on request). Although one would expect the respondents' views about the next vehicle to add to the fleet are influenced by the fleet size the six market segments membership is not influenced by the size except for the group SoonReplSmalPHEV. When we consider the fleet composition and the number of vehicles by fuel type in the fleet, we see that fleets that already own and operate PHEVs and EVs are also more likely to seek as next vehicle a PHEV or EV. In contrast, fleets that own a higher number of ICE vehicle (Gasoline, Diesel, and CNG) are less likely to seek as next vehicle a PHEV or EV. As expected, fleets in companies that made investments in charging with Volt240 chargers are more likely to select a PHEV or EV as next vehicle and also companies that have solar panels are more likely to select an EV vehicle as the next car in the fleet. Construction companies are more likely to be in a segment seeking large ICE vehicles as the next vehicle to procure. Retail companies seem to only be unlikely to procure electric cars. Real estate, Professional, and Health companies are the ones with higher propensity for PHEVs and EVs. It should be noted that many professional companies are home-based consulting and service companies, and the preference of this group may coincide with residential preferences. Large urban areas (Los Angeles, San Francisco, and San Diego) that provide the infrastructure for charging and known to have shorter but more frequent trips are also more suitable for fleets that plan to procure PHEV and EVs. However, these three regions are also the regions with the highest numbers in this sample with Los Angeles having 747 fleets (43.6%), San Francisco 415 fleets (24.2%) and San Diego 175 fleets (10.2%).

In a parallel analysis not shown here due to space limitations (but available on request) we study correlation between the market segment membership with the top next vehicle characteristics. In that analysis we find vehicle price having a negative correlation with EV as the next vehicle and MPGe having a positive correlation with PHEV and EV and they are as expected considering these two markets have high expectations/desires for efficiency and for the EV the expectation of the price is higher. So, managers who are sensitive to vehicle prices avoid EVs. Also, when the top attributes are cargo capacity (e.g., payload) and towing, the fleets are less likely to be in the last two segments that are also characterized by small vehicles and in 2016-17 when the survey was done there were not that many large electric vehicles with large payloads. This is also as expected considering the concerns of commercial fleet managers (Romjue, 2021, Brown, 2022). However, industry trends predict a major change in these attributes [38].

Another potential inhibition of considering PHEV and/or EV as the next vehicle to procure is when a company makes extensive use of outsourcing such using rental cars, courier and delivery services, and taxi and TNC (Uber, Lyft and so forth) services. We did not find any correlation between courier and delivery services and membership in anyone of the six segments here. However, we do find negative and significant correlation between renting vehicles with all segments which means the more renting a company does the less likely it is to select a next vehicle of the type in each of the segments but not for the large vehicles segment. So, this may be a reflection of substitution between procuring a small and medium vehicle for any kind of fuel with rental services. In contrast, we find a positive correlation between frequency of taxi services and all the segments. This indicates complementarity between the next vehicle and taxi/TNC services and not substitution and maybe the next vehicle is viewed as one that satisfies added demand that is not served by the current service provision offered by taxis and TNCs. However, a more detailed data collection and analysis is required to identify the intensity and type of services both potential substitution and complementarity satisfy.

5. Conclusion

As mentioned earlier the PHEV and BEV market segments were derived using cluster analysis on principal components and then cluster membership is analysed based on desired/expected vehicle attributes by the respondents and compared to the overall sample responses. The two segments of interest here are the predominantly PHEV and BEV segments. The PHEV segment (204 from the 1712 respondents) contains 43.5% of the total responses preferring a PHEV to replace a current vehicle in the fleet, it is a segment that is composed of 100% PHEV preferring respondents and 99.51% of them expect to purchase a small vehicle within 5 years. The average price they expect to pay is approximately $27,000 and the expected efficiency to be about 55 MPG/MPGe. The BEV segment (217 from the 1712 respondents) contains 99.50% of the BEV preferring respondents who are only 11.6% of the 1712. This segment also prefers small vehicles to replace vehicles in their fleet, possibly leasing and expecting to pay approximately $46,800 with an efficiency of about 100 MPGe. The other four segments are dominated by gasoline, diesel, and natural gas internal combustion engine vehicles and all expect a lower vehicle price than the overall average which is approximately $31,600. We also find that construction firms are less likely to opt for PHEV or BEV and health firms show the opposite, but their membership is spread in multiple market segments. Firms with investment in EV facilities and high preference for fuel efficiency are more likely to be the PHEV and BEV segments.

In summary, cluster analysis to identify segments here shows a substantial demand size for PHEV and BEV in commercial fleets with PHEVs replacing smaller vehicles and expected to show higher efficiency and lower price than the overall average. BEVs are also replacing mostly smaller vehicles and expected to have almost double the efficiency of PHEVs and almost $20,000 higher price. Most fleet managers expect to replace current fleet vehicles with more efficient models of any fuel but at lower cost if they select internal combustion engine vehicles.

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