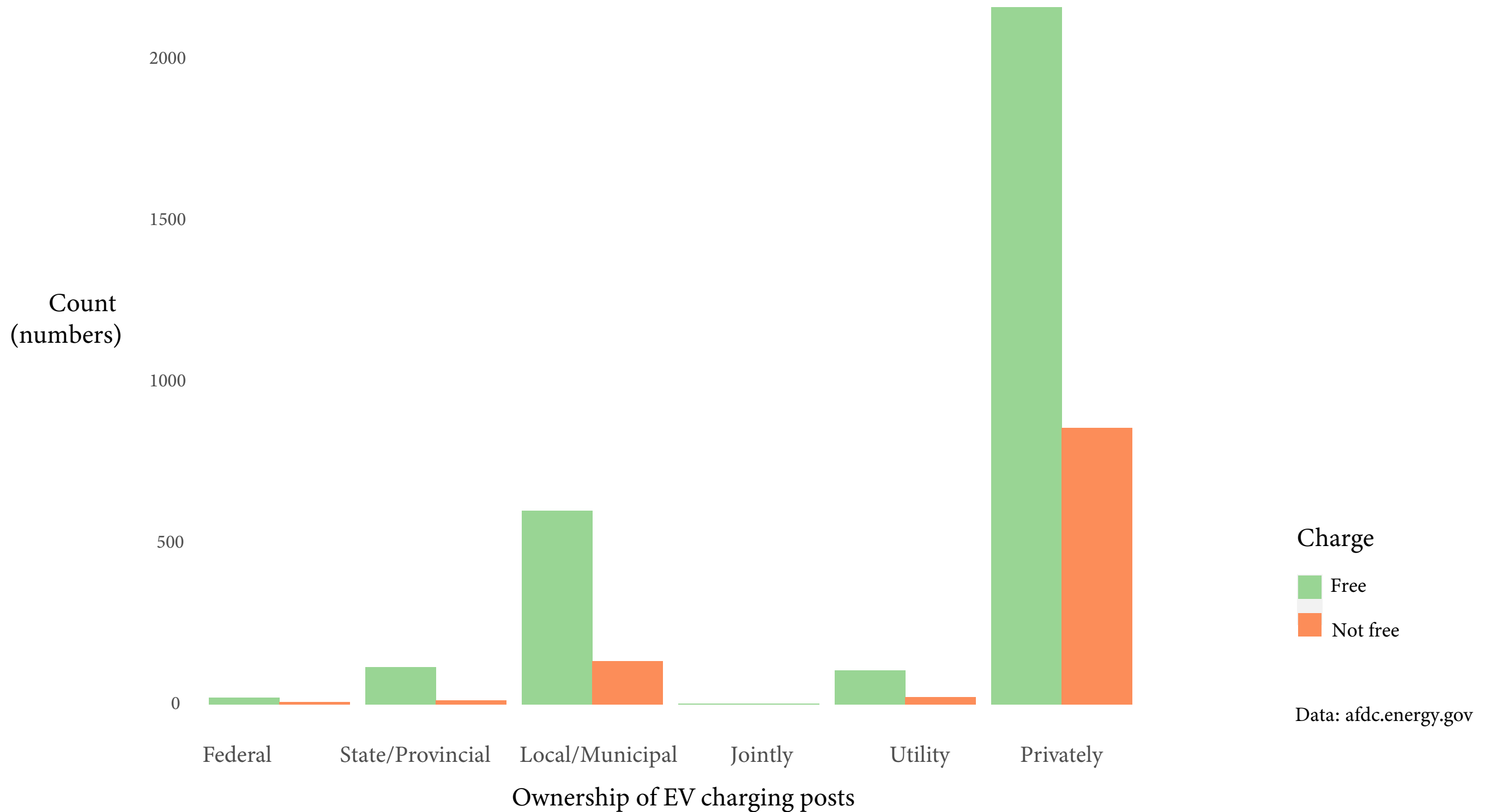


This bar chart still serves the theme of my thesis. The reason I created this bar chart is that I wanted to see how many of the charging posts built by different owners that are open to the public are free and how many of them are paid. I used a light green color for free and a light orange color to show a mild contrast with it for charging.

Ultimately, what this graph tells us is that, first, free charging is the majority of charging posts owned by various entities. Secondly, private charging posts are the type with the most ownership of charging posts.

Ownership and charging of electric vehicle charging posts

Charges for electric vehicle charging stations of different owners in US



03_1

ShaeChang

2023-03-16

```
# Load packages -----  
  
library(tidyverse)  
library(sf)  
  
# Load the data -----  
  
electricity_station_initial <-  
  
  # read in the dataset  
  
  st_read('data_own/alt_fuel_stations.geojson') %>%  
  
  # convert an sf object into a pure tibble  
  
  as_tibble()
```

```
## Reading layer `alt_fuel_stations' from data source  
##   `/Users/maxzhang/GU/Data_viz/data_own/alt_fuel_stations.geojson'  
##   using driver `GeoJSON'  
## Simple feature collection with 58698 features and 66 fields  
## Geometry type: POINT  
## Dimension:      XY  
## Bounding box:   xmin: -164.8489 ymin: 0 xmax: 77.64996 ymax: 64.85247  
## Geodetic CRS:   WGS 84
```

```

electricity_station <-
  electricity_station_initial %>%

  # filter for the wanted types

  filter(

    # only include public electricity stations but not private ones

    access_code == 'public',

    # only include those are currently available but not planned nor
    # temporarily unavailable

    status_code == 'E',

    # only include those in the US

    country == 'US',

    # only include the charging stations open to the public

    restricted_access == FALSE) %>%

  # select the wanted traits of those electricity charging stations

  select(
    c(access_days_time, id, open_date, owner_type_code, state,
      ev_pricing, ev_renewable_source, facility_type))

# Data preperation -----

# create the wanted variable

elec_new <-
  electricity_station %>%

  # create a variable measuring this station charge individuals or not

  mutate(Charge =
    if_else(
      str_detect(ev_pricing, 'Free'),
      'Free',
      'Not free')) %>%

  # filter the missing values for the two variables we care

  filter(
    !is.na(Charge),
    !is.na(owner_type_code)) %>%

  # generate new categorical names

```

```

mutate(owner_type_new =
  case_when(
    owner_type_code == 'FG' ~ 'Federal',
    owner_type_code == 'J' ~ 'Jointly',
    owner_type_code == 'LG' ~ 'Local/Municipal',
    owner_type_code == 'P' ~ 'Privately',
    owner_type_code == 'SG' ~ 'State/Provincial',
    owner_type_code == 'T' ~ 'Utility'))

# convert the owner type into a factor with specific levels

elec_new$owner_type_new <-
  factor(elec_new$owner_type_new,
    levels = c('Federal',
               'State/Provincial',
               'Local/Municipal',
               'Jointly',
               'Utility',
               'Privately'))

# Data visualization -----

p1 <-
  elec_new %>%
  ggplot(mapping =
    aes(x = owner_type_new)) +
  geom_bar(aes(fill = Charge),
    position = 'dodge') +
  scale_x_discrete(drop = FALSE) +

  # to use green to represent free while use a diverging color of orange to
  # represent not free

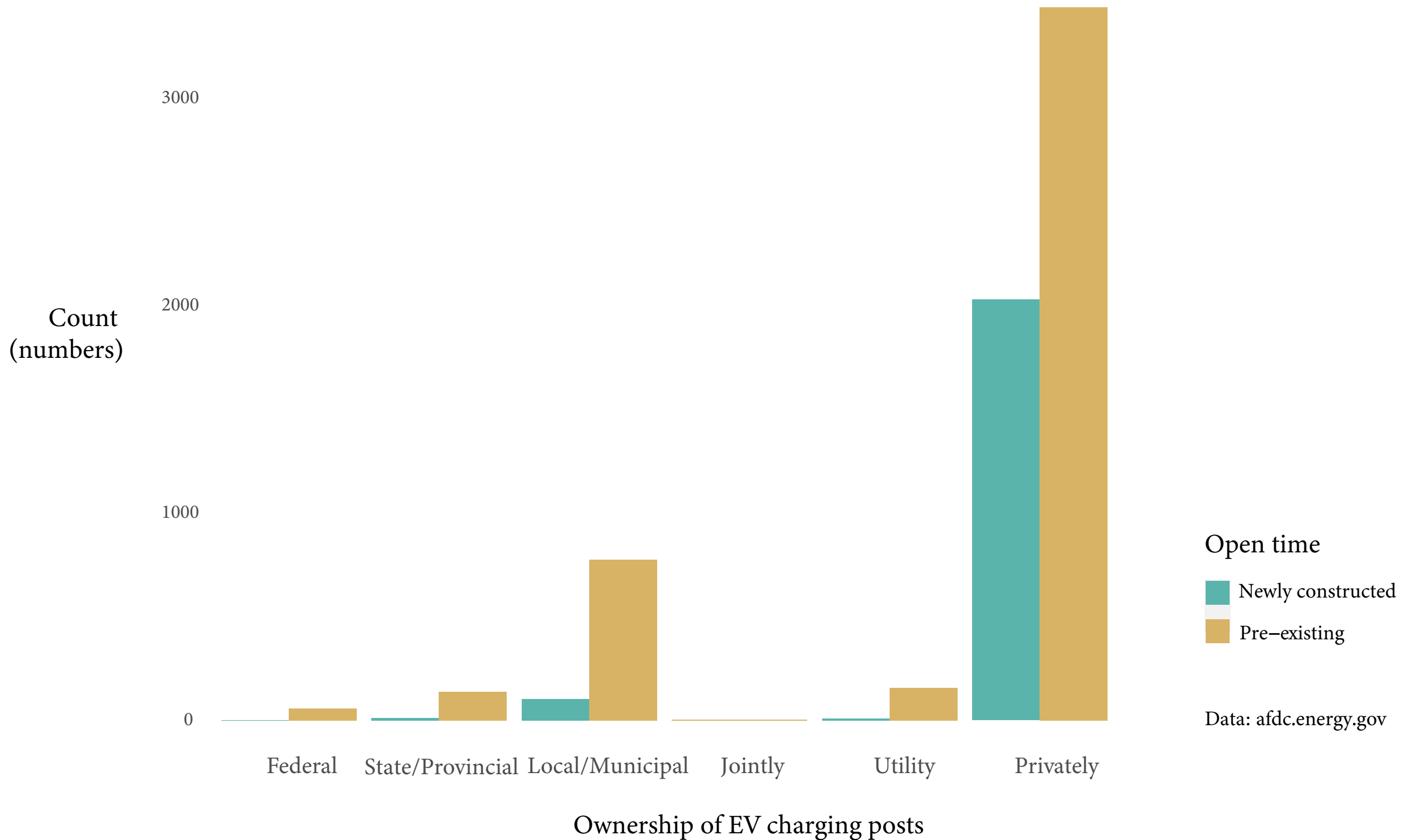
  scale_fill_manual(values = c('#99d594',
                                '#fc8d59')) +
  labs(title = 'Ownership and charging of electric vehicle charging posts',
    subtitle = paste('Charges for electric vehicle charging stations of',
                     'different owners in US'),
    caption = 'Data: afdc.energy.gov',
    x = 'Ownership of EV charging posts',
    y = 'Count (numbers)') +
  theme(
    axis.ticks = element_blank(),
    panel.background = element_blank())

```

This data visualization, like the previous one, serves the topic of the thesis. Its purpose is to show which entity will have the greatest incentive to build electric vehicle charging posts as a result of the Bipartisan Infrastructure Law Incentives issued by the Biden administration in November 2021. Based on the graphs made, it appears that this bill has incentives for Local/Municipal and Private for the construction of charging posts and that the incentives are mainly focused on private entities. This makes sense because under the new bill, private entities can receive tax credits for building EV charging stations. But on the other hand, the Bipartisan Infrastructure Act also allocates significant funds to all levels of government to facilitate the construction of EV charging infrastructure, and the flow and role of these funds should be further examined.

Bipartisan Infrastructure Law Incentives for building EV charging posts

Comparison of the number of charging piles built by different entities before and after November 16, 2021



03-2

ShaeChang

2023-03-16

```
# Load packages -----  
  
library(tidyverse)  
library(sf)  
  
# Load the data -----  
  
electricity_station_initial <-  
  
  # read in the dataset  
  
  st_read('data_own/alt_fuel_stations.geojson') %>%  
  
  # convert an sf object into a pure tibble  
  
  as_tibble()
```

```
## Reading layer `alt_fuel_stations' from data source  
##   `/Users/maxzhang/GU/Data_viz/data_own/alt_fuel_stations.geojson'  
##   using driver `GeoJSON'  
## Simple feature collection with 58698 features and 66 fields  
## Geometry type: POINT  
## Dimension:      XY  
## Bounding box:   xmin: -164.8489 ymin: 0 xmax: 77.64996 ymax: 64.85247  
## Geodetic CRS:   WGS 84
```



```

electricity_station <-
  electricity_station_initial %>%

  # filter for the wanted types

  filter(

    # only include public electricity stations but not private ones

    access_code == 'public',

    # only include those are currently available but not planned nor
    # temporarily unavailable

    status_code == 'E',

    # only include those in the US

    country == 'US',

    # only include the charging stations open to the public

    restricted_access == FALSE) %>%

  # select the wanted traits of those electricity charging stations

  select(
    c(access_days_time, id, open_date, owner_type_code, state,
      ev_pricing, ev_renewable_source, facility_type))

# Data preparation -----

p2 <-
  elec_date <-
    electricity_station %>%
    filter(!is.na(open_date),
      !is.na(owner_type_code)) %>%
    mutate(open_time =
      if_else(open_date >= lubridate::ymd('2021-11-16'),
        'Newly constructed',
        'Pre-existing')) %>%
    mutate(owner_type_new =
      case_when(
        owner_type_code == 'FG' ~ 'Federal',
        owner_type_code == 'J' ~ 'Jointly',
        owner_type_code == 'LG' ~ 'Local/Municipal',
        owner_type_code == 'P' ~ 'Privately',
        owner_type_code == 'SG' ~ 'State/Provincial',
        owner_type_code == 'T' ~ 'Utility'))

elec_date$owner_type_new <-
  factor(elec_date$owner_type_new,

```

```

      levels = c('Federal',
                  'State/Provincial',
                  'Local/Municipal',
                  'Jointly',
                  'Utility',
                  'Privately'))

# Data visualization-----

p2 <-
  elec_date %>%
  ggplot(mapping =
    aes(x = owner_type_new)) +
  geom_bar(aes(fill = open_time),
    position = 'dodge') +
  scale_x_discrete(drop = FALSE) +

  # to use green to represent free while use a diverging color of orange to
  # represent not free

  scale_fill_manual(values = c('#5ab4ac',
                                '#d8b365')) +
  labs(title = paste('Bipartisan Infrastructure Law Incentives for building EV',
                    'charging posts'),
        subtitle = paste('Comparison of the number of charging piles built by',
                          'different entities before and after November 16, 2021'),
        caption = 'Data: afdc.energy.gov',
        x = 'Ownership of EV charging posts',
        y = 'Count (numbers)') +
  theme(
    axis.ticks = element_blank(),
    panel.background = element_blank())

```