```python
import pandas as pd

# Load the data into a DataFrame
df = pd.read_csv('householdtask3.csv')
print(df.head())
```

```
      year    tot_hhs      own  own_wm  own_prop  own_wm_prop  prop_hhs   age  \
   0  2008   1560859  1087580  574406      69.7         36.8     100.0  35.9
   1  2008    185965    71256   39405      38.3         21.2      11.9  29.9
   2  2008    312376   191470   48424      61.3         15.5      20.0  40.0
   3  2008    312333   196203   84171      62.8         26.9      20.0  34.7
   4  2008    312240   217657  141318      69.7         45.3      20.0  31.5

      size  income  expenditure  eqv_income  eqv_exp
   0   2.7   46704        42394       26869    25132
   1   2.6   23404        25270       14258    15824
   2   2.3   16747        21145       13402    14408
   3   2.8   31308        29855       18917    18266
   4   3.0   49106        46561       26870    24672
```

```python
print(df.columns)
```

```
Index(['year', 'tot_hhs', 'own', 'own_wm', 'own_prop', 'own_wm_prop',
       'prop_hhs', 'age', 'size', 'income', 'expenditure', 'eqv_income',
       'eqv_exp'],
      dtype='object')
```

```python
print(df)
```

```
      year    tot_hhs      own  own_wm  own_prop  own_wm_prop  prop_hhs   age  \
   0  2008   1560859  1087580  574406      69.7         36.8     100.0  35.9
   1  2008    185965    71256   39405      38.3         21.2      11.9  29.9
   2  2008    312376   191470   48424      61.3         15.5      20.0  40.0
   3  2008    312333   196203   84171      62.8         26.9      20.0  34.7
   4  2008    312240   217657  141318      69.7         45.3      20.0  31.5
  ..   ...       ...      ...     ...       ...          ...       ...   ...
  65  2020    352564   213893  119637      60.7         33.9      20.1  36.9
  66  2020    350182   235256  141104      67.2         40.3      19.9  35.0
  67  2020    351328   288779  187838      82.2         53.5      20.0  39.6
  68  2020    329588   156459  107753      47.5         32.7      18.8  31.1
  69  2020    388013   314154   38270      81.0          9.9      22.1  69.8

      size  income  expenditure  eqv_income  eqv_exp
   0   2.7   46704        42394       26869    25132
   1   2.6   23404        25270       14258    15824
   2   2.3   16747        21145       13402    14408
   3   2.8   31308        29855       18917    18266
   4   3.0   49106        46561       26870    24672
  ..   ...     ...          ...         ...      ...
  65   2.8   69779        57351       38889    33468
  66   3.0   88944        83038       48929    45978
  67   2.6  104277       123424       62718    71985
  68   3.2   69581        54141       35075    29684
  69   1.7   34712        34643       25077    27037

[70 rows x 13 columns]
```

```python
print(df.sample(69))
```

```
      year    tot_hhs      own  own_wm  own_prop  own_wm_prop  prop_hhs   age  \
   4  2008    312240   217657  141318      69.7         45.3      20.0  31.5
  14  2011   1607228  1048164  523698      65.2         32.6     100.0  36.3
  15  2011    197237    56665   27129      28.7         13.8      12.3  28.0
  43  2017    132215    30080   14220      22.8         10.8       7.8  29.1
  37  2014    328959   218610  113005      66.5         34.4      20.1  36.4
  ..   ...       ...      ...     ...       ...          ...       ...   ...
  30  2014    328349   171141   52691      52.1         16.0      20.0  37.4
  64  2020    350530   198616   80783      56.7         23.0      20.0  37.4
  59  2020    349670   193484   73432      55.3         21.0      19.9  38.4
  39  2014    327576   271549  180208      82.9         55.0      20.0  37.9
  51  2017    338553   217590  117386      64.3         34.7      20.0  35.7

      size  income  expenditure  eqv_income  eqv_exp
   4   3.0   49106        46561       26870    24672
  14   2.6   53103        46098       30833    27335
  15   2.7   25902        27605       16097    16685
  43   2.8   29947        30054       16822    17655
  37   2.8   60890        49330       33139    29706
  ..   ...     ...          ...         ...      ...
```

```
30   2.4   22822        25809        17168   17555
64   2.8   51756        40102        28481   24061
59   2.7   41199        41509        25750   24552
39   2.5   97676        97823        60056   56910
51   2.9   65099        54936        35959   31409

[69 rows x 13 columns]
```
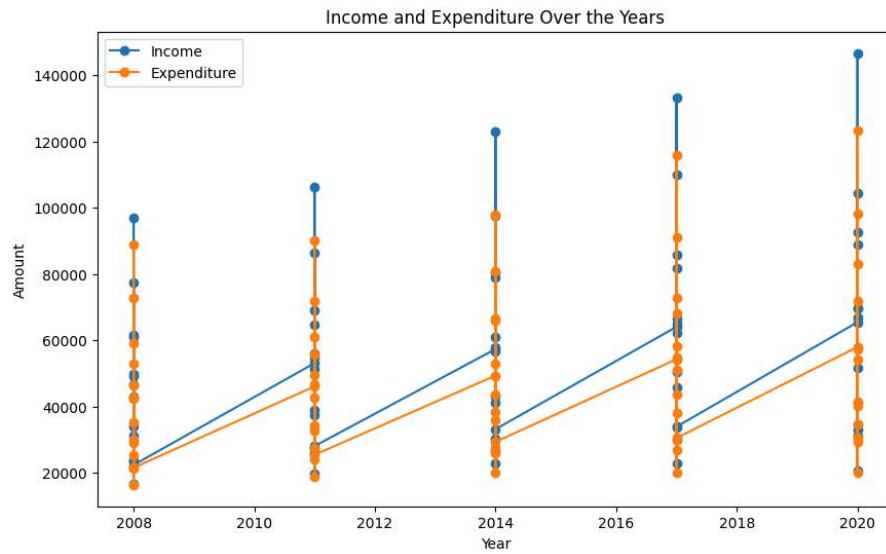
```python
import matplotlib.pyplot as plt
```

```python
# Bar Chart: Visualize total households and owned households
plt.figure(figsize=(10, 6))
plt.bar(df['year'], df['tot_hhs'], label='Total Households')
plt.bar(df['year'], df['own'], label='Owned Households', alpha=0.7)
plt.xlabel('Year')
plt.ylabel('Number of Households')
plt.title('Total and Owned Households Over the Years')
plt.legend()
plt.show()
```
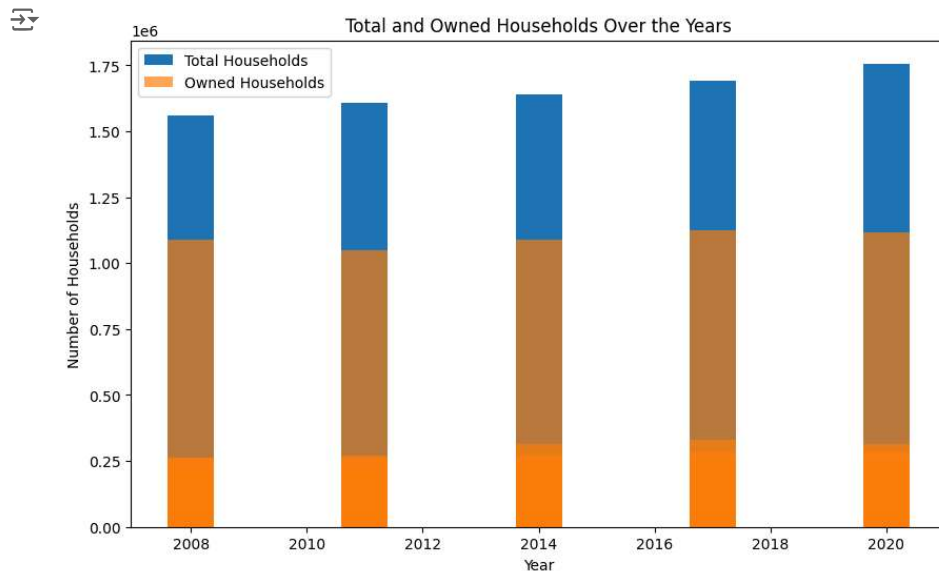


```python
# Line Chart: Visualize income and expenditure
plt.figure(figsize=(10, 6))
plt.plot(df['year'], df['income'], marker='o', label='Income')
plt.plot(df['year'], df['expenditure'], marker='o', label='Expenditure')
plt.xlabel('Year')
plt.ylabel('Amount')
plt.title('Income and Expenditure Over the Years')
plt.legend()
plt.show()
```

Income and Expenditure Over the Years


```
# Bar Chart: Visualize total households and owned households with customization
plt.figure(figsize=(10, 6))
plt.bar(df['year'], df['tot_hhs'], color='skyblue', label='Total Households')
plt.bar(df['year'], df['own'], color='orange', alpha=0.7, label='Owned Households')
plt.xlabel('Year', fontsize=12)
plt.ylabel('Number of Households', fontsize=12)
plt.title('Total and Owned Households Over the Years', fontsize=15)
plt.legend()
plt.grid(True)
plt.show()
```
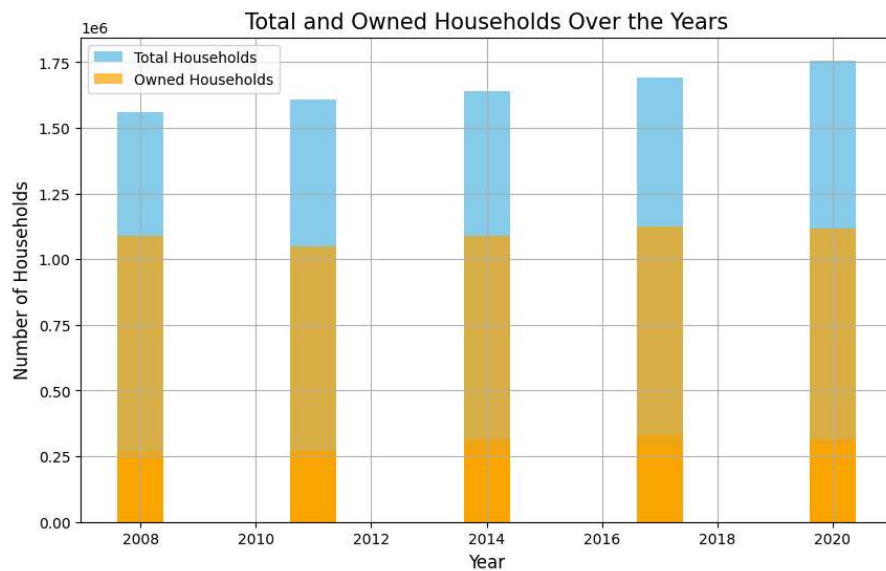
```python
# Line Chart: Visualize income and expenditure with customization
plt.figure(figsize=(10, 6))
plt.plot(df['year'], df['income'], marker='o', linestyle='-', color='blue', label='Income')
plt.plot(df['year'], df['expenditure'], marker='o', linestyle='--', color='red', label='Expenditure')
plt.xlabel('Year', fontsize=12)
plt.ylabel('Amount', fontsize=12)
plt.title('Income and Expenditure Over the Years', fontsize=15)
plt.legend()
plt.grid(True)
plt.show()
```
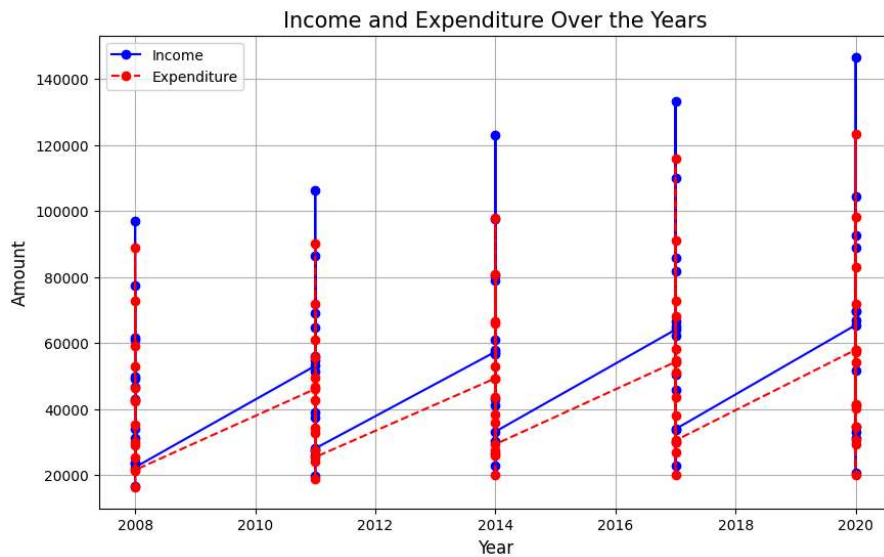


```python
# Bar Chart
plt.figure(figsize=(12, 6))
plt.bar(df['year'], df['tot_hhs'], color='skyblue')
plt.xlabel('Year')
plt.ylabel('Total Households')
plt.title('Total Households by Year')
plt.xticks(rotation=45)
plt.tight_layout()
plt.show()
```
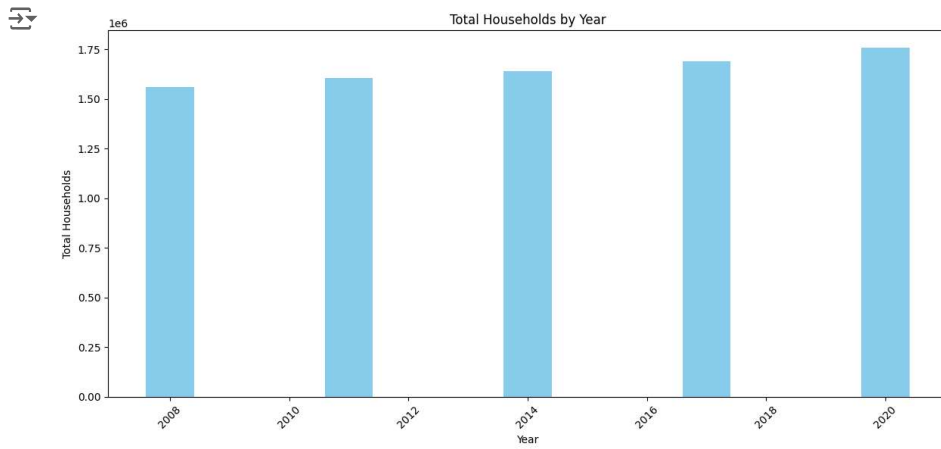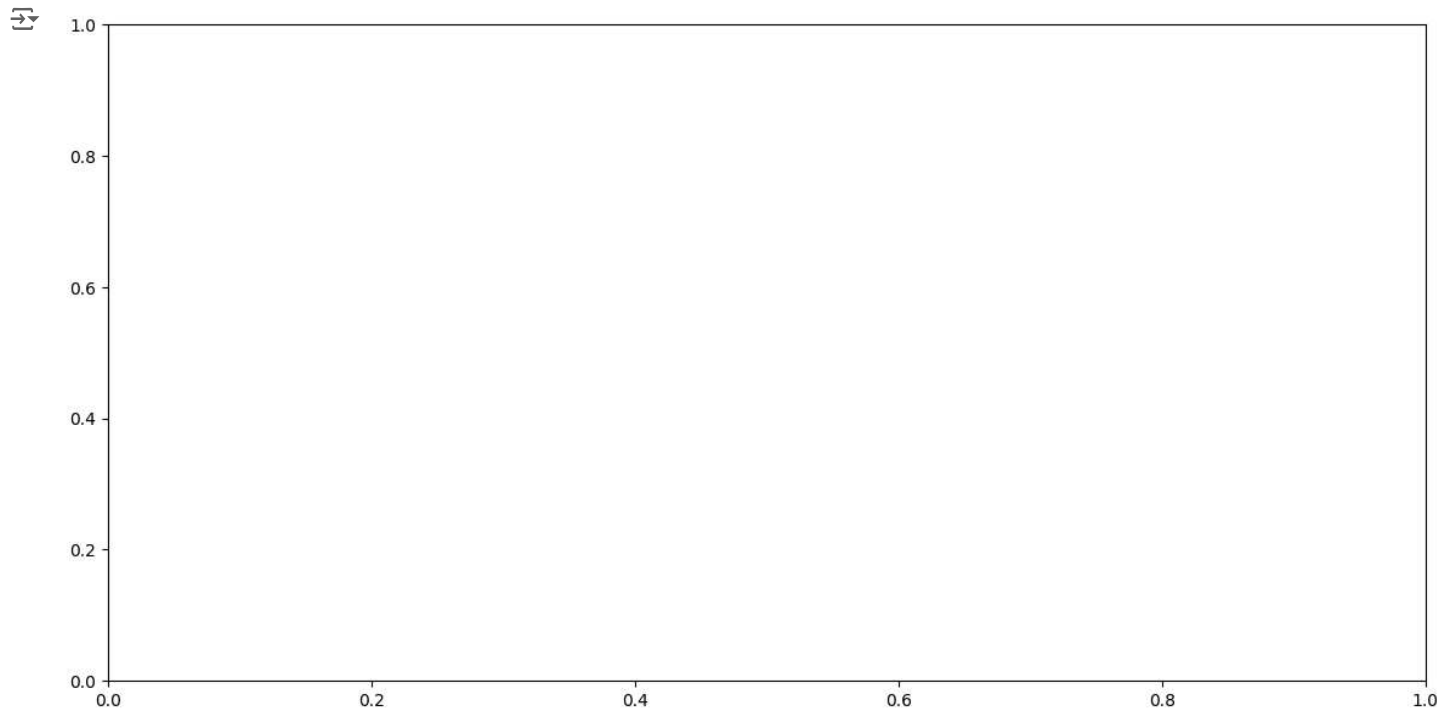
```
# Line Chart
plt.figure(figsize=(12, 6))
plt.plot(df['year'], df['income'], marker='o', color='orange')
plt.xlabel('Year')
plt.ylabel('Income')
plt.title('Income by Year')
plt.xticks(rotation=45)
plt.tight_layout()
plt.show()
```
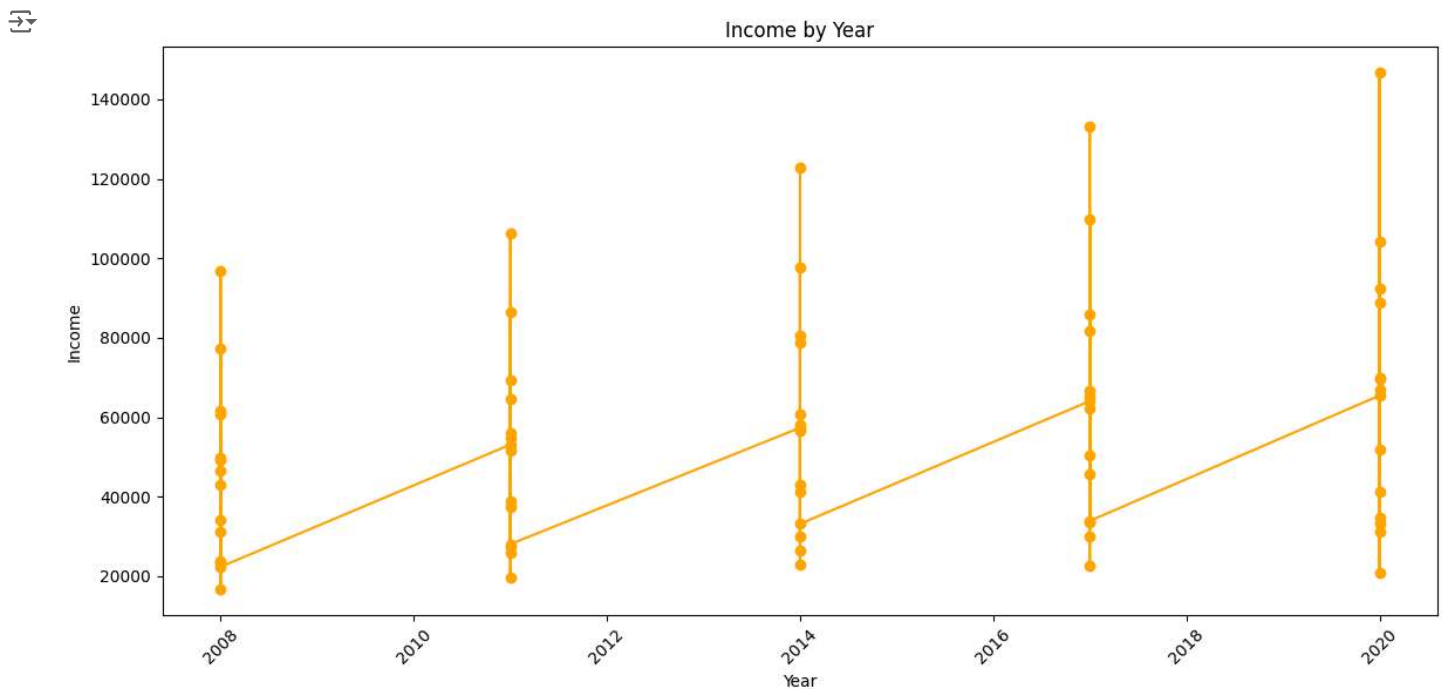


```
# Set up the plotting environment
```

```
# Set up the plotting environment
fig, ax1 = plt.subplots(figsize=(14, 7))
```



```
# Plot the bar chart
color = 'tab:blue'
ax1.set_xlabel('Year')
ax1.set_ylabel('Total Households (tot_hhs)', color=color)
ax1.bar(df['year'].astype(str), df['tot_hhs'], color=color, alpha=0.6)
ax1.tick_params(axis='y', labelcolor=color)


# Create a second y-axis for the line chart
ax2 = ax1.twinx()
color = 'tab:red'
ax2.set_ylabel('Own (%)', color=color)
ax2.plot(df['year'].astype(str), df['own_prop'], color=color, marker='o')
ax2.tick_params(axis='y', labelcolor=color)


# Title and show plot
plt.title('Total Households and Ownership Percentage Over Years')
plt.tight_layout()
plt.show()
```

Total Households and Ownership Percentage Over Years
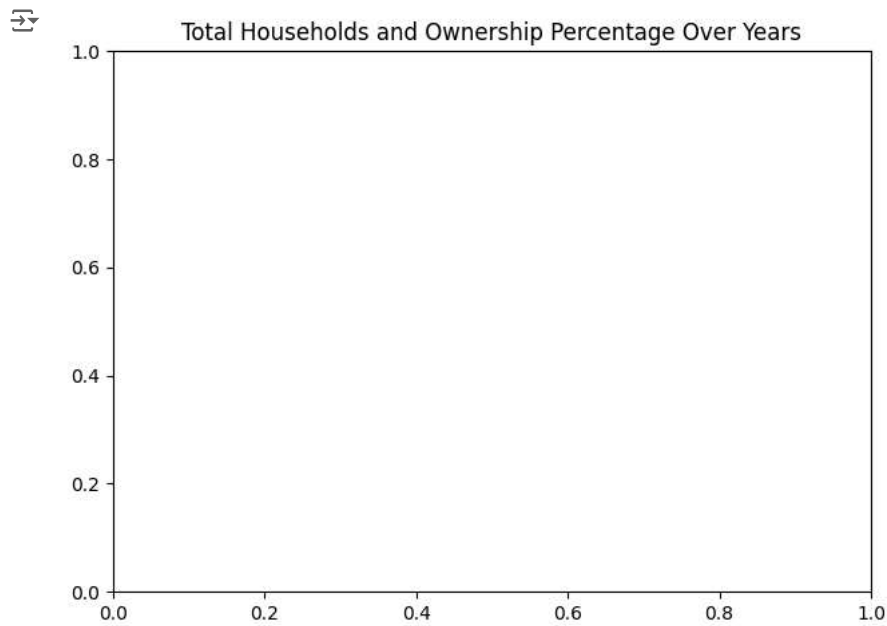

```python
# Create a figure and a set of subplots
num_cols = len(df.columns)
fig, axs = plt.subplots(nrows=(num_cols + 2) // 3, ncols=3, figsize=(15, num_cols * 3))

# Flatten the array of axes for easy iteration
axs = axs.flatten()

# Plot each column in a separate subplot
for i, col in enumerate(df.columns):
    axs[i].plot(df[col])
    axs[i].set_title(col)
    axs[i].set_xlabel('Index')
    axs[i].set_ylabel('Value')

# Hide any unused subplots
for j in range(i + 1, len(axs)):
    axs[j].axis('off')

plt.tight_layout()
plt.show()
```