Laptop

June 26, 2025

[1]:

```
import math
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sb
import sklearn as sl
import warnings
warnings.filterwarnings('ignore')
from collections import Counter
```

[2]:

```
data = pd.read_csv(r'C:\Users\banga\OneDrive\Desktop\Internship\DATA␣
↪SETS\Laptop Data.csv')
```

[3]:

```
data.head()
```

[3]:

```
  Company      Product   TypeName  Inches  Ram     OS  Weight  Price_euros  \
0    Apple  MacBook Pro  Ultrabook    13.3    8  macOS    1.37      1339.69
1    Apple  Macbook Air  Ultrabook    13.3    8  macOS    1.34       898.94
2       HP       250 G6   Notebook    15.6    8  No OS    1.86       575.00
3    Apple  MacBook Pro  Ultrabook    15.4   16  macOS    1.83      2537.45
4    Apple  MacBook Pro  Ultrabook    13.3    8  macOS    1.37      1803.60

     Screen  ScreenW  …  RetinaDisplay CPU_company CPU_freq      CPU_model  \
0  Standard     2560  …            Yes       Intel      2.3        Core i5
1  Standard     1440  …             No       Intel      1.8        Core i5
2   Full HD     1920  …             No       Intel      2.5  Core i5 7200U
3  Standard     2880  …            Yes       Intel      2.7        Core i7
4  Standard     2560  …            Yes       Intel      3.1        Core i5

  PrimaryStorage  SecondaryStorage PrimaryStorageType  SecondaryStorageType  \
0            128                 0                SSD                    No
1            128                 0      Flash Storage                    No
2            256                 0                SSD                    No
3            512                 0                SSD                    No
4            256                 0                SSD                    No

   GPU_company              GPU_model
0        Intel  Iris Plus Graphics 640
```

```
1        Intel        HD Graphics 6000
2        Intel         HD Graphics 620
3          AMD          Radeon Pro 455
4        Intel  Iris Plus Graphics 650

[5 rows x 23 columns]
```

[4]:
```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1275 entries, 0 to 1274
Data columns (total 23 columns):
 #   Column                Non-Null Count  Dtype
---  ------                --------------  -----
 0   Company               1275 non-null   object
 1   Product               1275 non-null   object
 2   TypeName              1275 non-null   object
 3   Inches                1275 non-null   float64
 4   Ram                   1275 non-null   int64
 5   OS                    1275 non-null   object
 6   Weight                1275 non-null   float64
 7   Price_euros           1275 non-null   float64
 8   Screen                1275 non-null   object
 9   ScreenW               1275 non-null   int64
 10  ScreenH               1275 non-null   int64
 11  Touchscreen           1275 non-null   object
 12  IPSpanel              1275 non-null   object
 13  RetinaDisplay         1275 non-null   object
 14  CPU_company           1275 non-null   object
 15  CPU_freq              1275 non-null   float64
 16  CPU_model             1275 non-null   object
 17  PrimaryStorage        1275 non-null   int64
 18  SecondaryStorage      1275 non-null   int64
 19  PrimaryStorageType    1275 non-null   object
 20  SecondaryStorageType  1275 non-null   object
 21  GPU_company           1275 non-null   object
 22  GPU_model             1275 non-null   object
dtypes: float64(4), int64(5), object(14)
memory usage: 229.2+ KB
```

[5]:
```
data.describe()
```

[5]:
```
            Inches          Ram       Weight  Price_euros      ScreenW  \
count  1275.000000  1275.000000  1275.000000  1275.000000  1275.000000
mean     15.022902     8.440784     2.040525  1134.969059  1900.043922
std       1.429470     5.097809     0.669196   700.752504   493.346186
min      10.100000     2.000000     0.690000   174.000000  1366.000000
25%      14.000000     4.000000     1.500000   609.000000  1920.000000
```

```
50%      15.600000    8.000000     2.040000   989.000000  1920.000000
75%      15.600000    8.000000     2.310000  1496.500000  1920.000000
max      18.400000   64.000000     4.700000  6099.000000  3840.000000

           ScreenH     CPU_freq  PrimaryStorage  SecondaryStorage
count  1275.000000  1275.000000     1275.000000       1275.000000
mean   1073.904314     2.302980      444.517647        176.069020
std     283.883940     0.503846      365.537726        415.960655
min     768.000000     0.900000        8.000000          0.000000
25%    1080.000000     2.000000      256.000000          0.000000
50%    1080.000000     2.500000      256.000000          0.000000
75%    1080.000000     2.700000      512.000000          0.000000
max    2160.000000     3.600000     2048.000000       2048.000000
```

[6]:

```
data.isnull().sum()
```

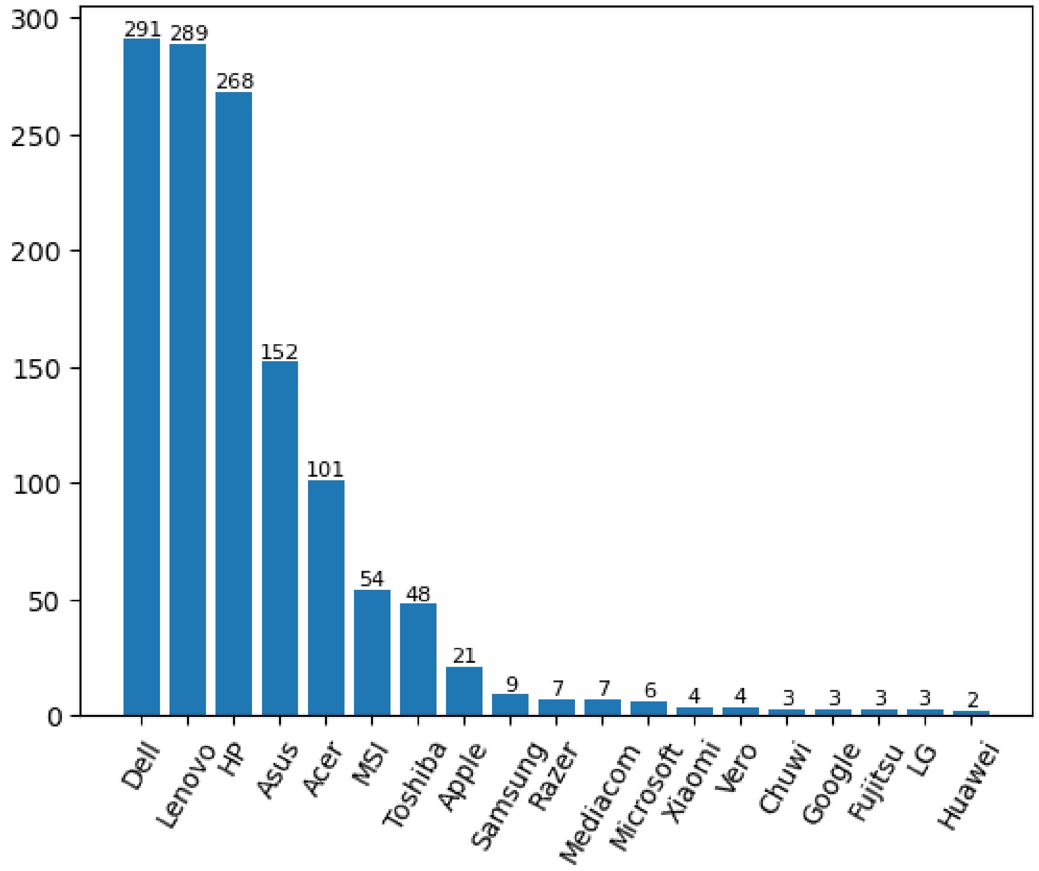
[6]:

```
Company                 0
Product                 0
TypeName                0
Inches                  0
Ram                     0
OS                      0
Weight                  0
Price_euros             0
Screen                  0
ScreenW                 0
ScreenH                 0
Touchscreen             0
IPSpanel                0
RetinaDisplay           0
CPU_company             0
CPU_freq                0
CPU_model               0
PrimaryStorage          0
SecondaryStorage        0
PrimaryStorageType      0
SecondaryStorageType    0
GPU_company             0
GPU_model               0
dtype: int64
```

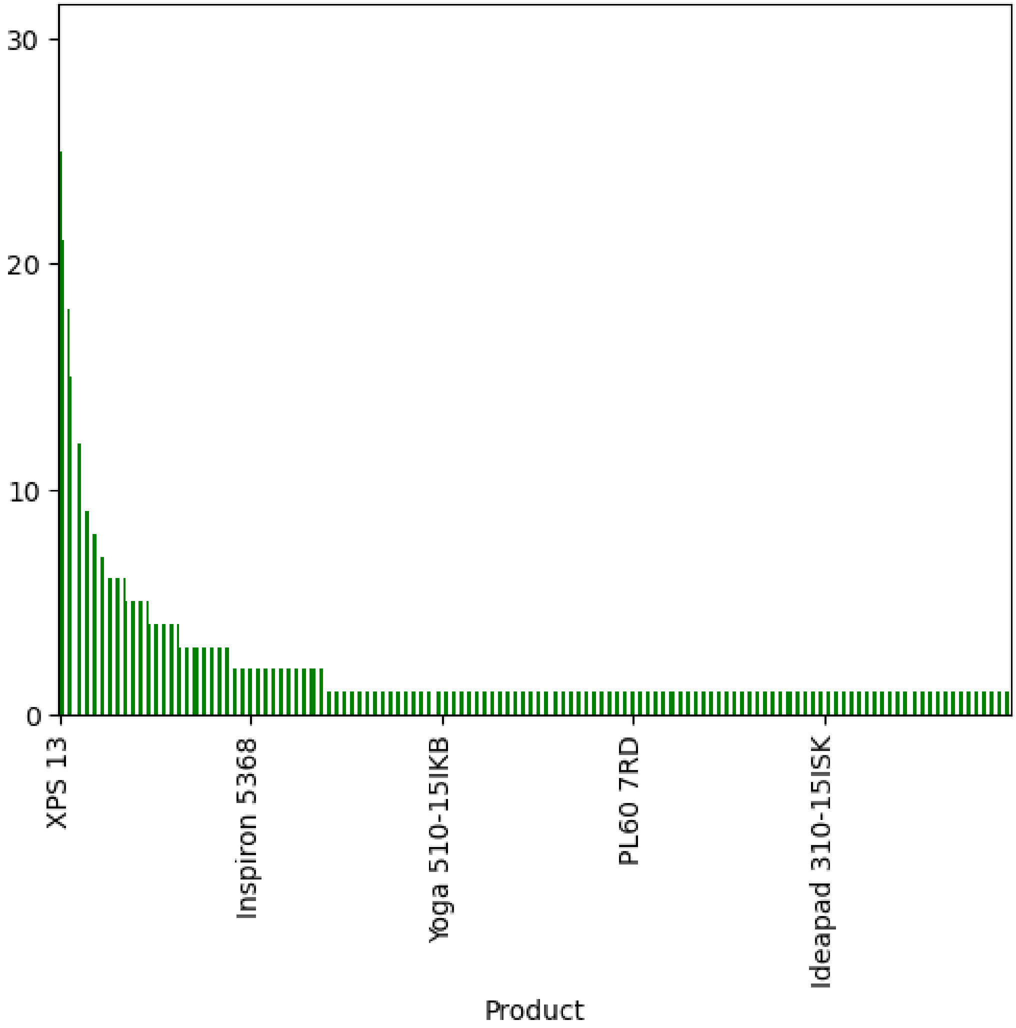
[7]:

```
company_counts = data['Company'].value_counts()
fig,cx=plt.subplots()
bars=cx.bar(company_counts.index,company_counts.values)
cx.bar_label(bars,fontsize=8)
plt.xticks(rotation=60)
```

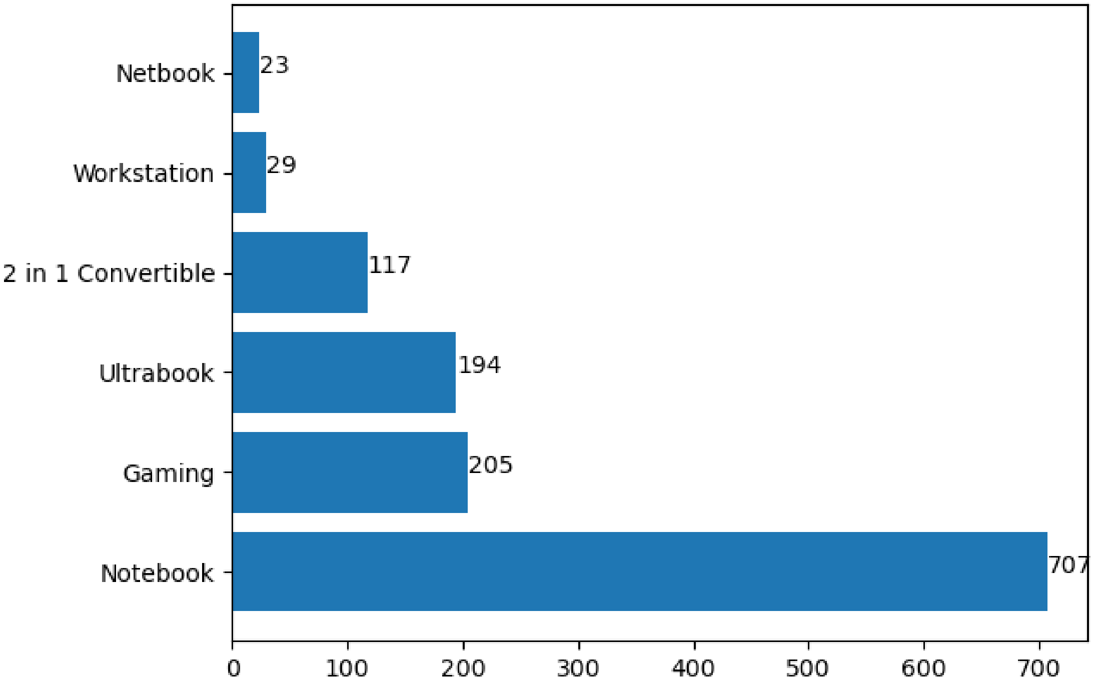
```
[7]: ([0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18],
      [Text(0, 0, 'Dell'),
       Text(1, 0, 'Lenovo'),
       Text(2, 0, 'HP'),
       Text(3, 0, 'Asus'),
       Text(4, 0, 'Acer'),
       Text(5, 0, 'MSI'),
       Text(6, 0, 'Toshiba'),
       Text(7, 0, 'Apple'),
       Text(8, 0, 'Samsung'),
       Text(9, 0, 'Razer'),
       Text(10, 0, 'Mediacom'),
       Text(11, 0, 'Microsoft'),
       Text(12, 0, 'Xiaomi'),
       Text(13, 0, 'Vero'),
       Text(14, 0, 'Chuwi'),
       Text(15, 0, 'Google'),
       Text(16, 0, 'Fujitsu'),
       Text(17, 0, 'LG'),
       Text(18, 0, 'Huawei')])
```



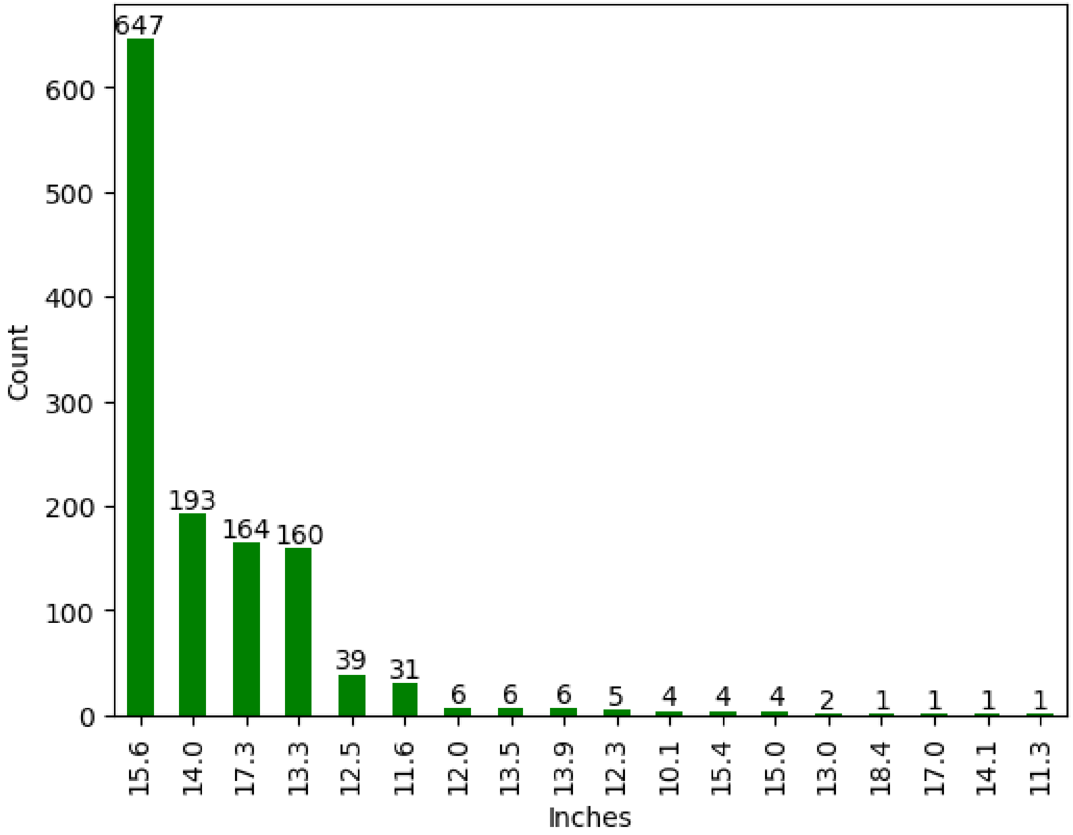
```
[8]: data['Product'].value_counts().plot(kind='bar',color='green')
     plt.locator_params(nbins=5)
```



```
[9]: Typename = data['TypeName'].value_counts()
     plt.barh(Typename.index,Typename.values)
     for i,v in enumerate(Typename):
                     plt.text(v,i,str(v))
     plt.show()
```

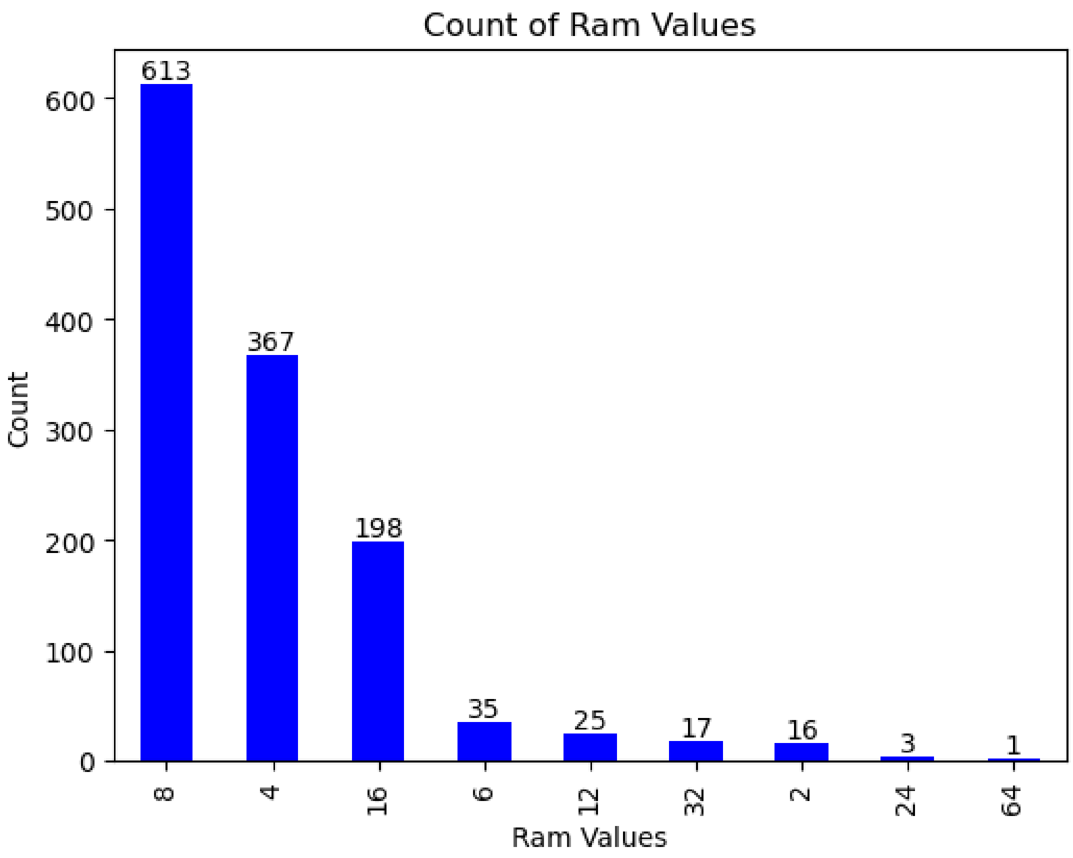


[65]:
```
inches=data['Inches'].value_counts()
ix = inches.plot(kind='bar',color='green')
for p in ix.patches:
    ix.annotate(str(p.get_height()), (p.get_x() + p.get_width() / 2, p.
 ↪get_height()), ha='center', va='bottom')

plt.xlabel('Inches')
plt.ylabel('Count')
plt.show()
```



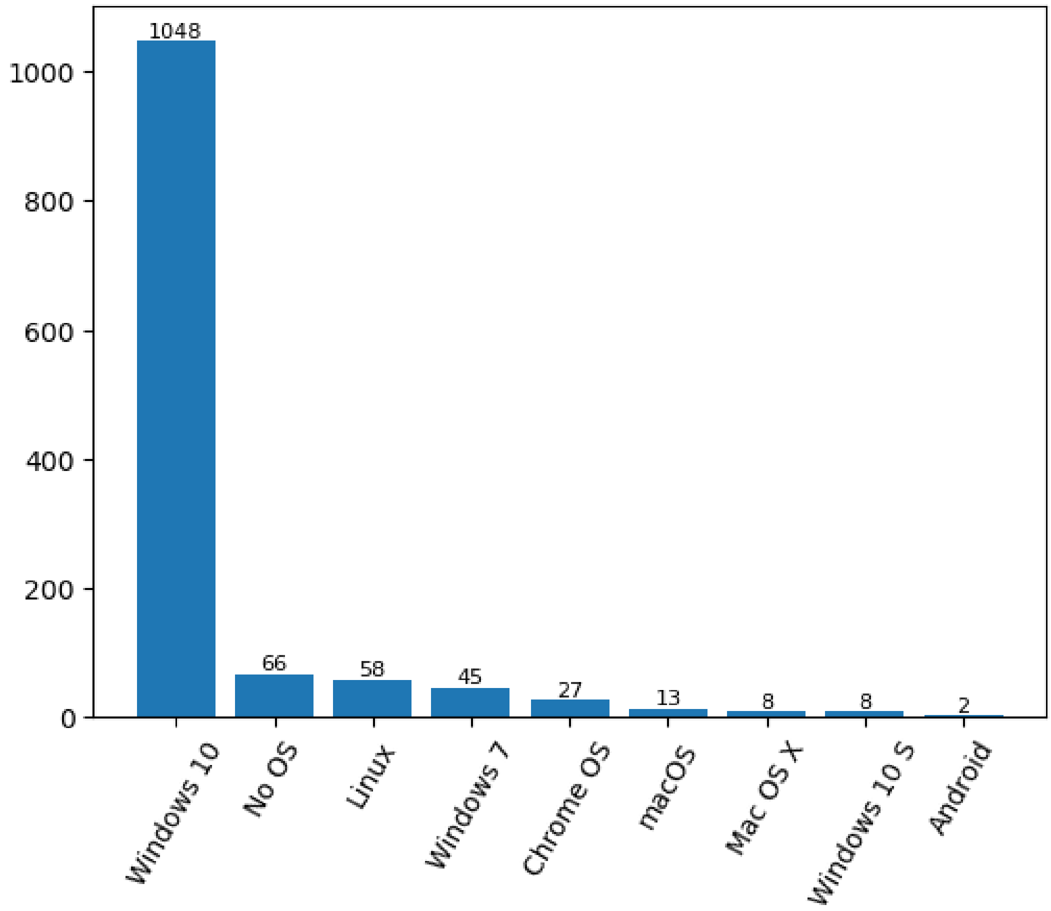
[11]:

```
Ram_counts = data['Ram'].value_counts()
ax = Ram_counts.plot(kind='bar', color='blue')
for p in ax.patches:
    ax.annotate(str(p.get_height()), (p.get_x() + p.get_width() / 2, p.
 ↪get_height()), ha='center', va='bottom')

plt.xlabel('Ram Values')
plt.ylabel('Count')
plt.title('Count of Ram Values')
plt.show()
```



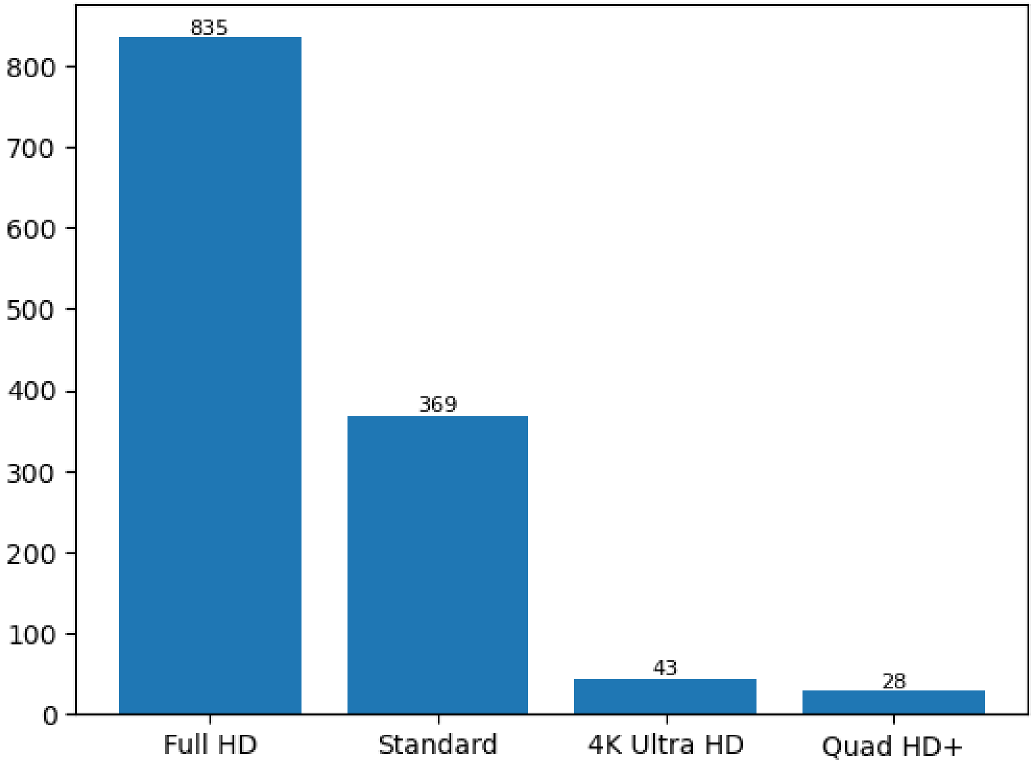
```
[12]: OS_counts = data['OS'].value_counts()
      fig,Ox=plt.subplots()
      bars = Ox.bar(OS_counts.index,OS_counts.values)
      Ox.bar_label(bars,fontsize=8)
      plt.xticks(rotation=60)
```

```
[12]: ([0, 1, 2, 3, 4, 5, 6, 7, 8],
       [Text(0, 0, 'Windows 10'),
        Text(1, 0, 'No OS'),
        Text(2, 0, 'Linux'),
        Text(3, 0, 'Windows 7'),
        Text(4, 0, 'Chrome OS'),
        Text(5, 0, 'macOS'),
        Text(6, 0, 'Mac OS X'),
        Text(7, 0, 'Windows 10 S'),
        Text(8, 0, 'Android')])
```



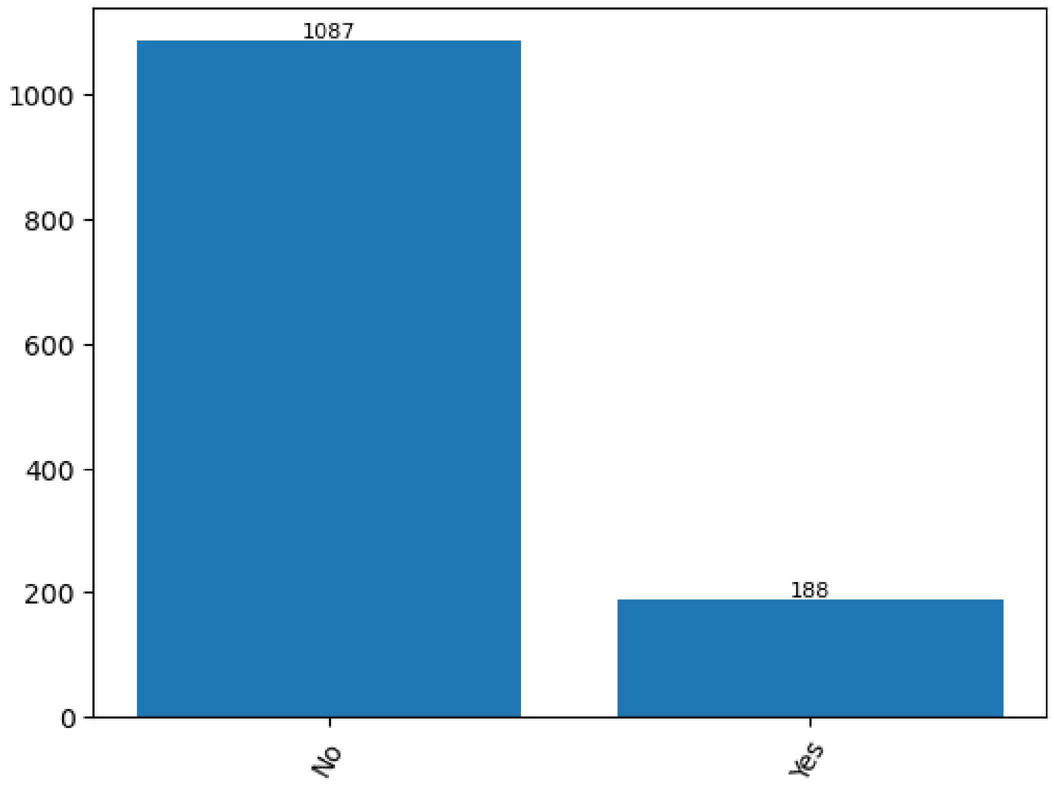
```
[13]: Screen_counts = data['Screen'].value_counts()
      fig,SC=plt.subplots()
      bars = SC.bar(Screen_counts.index,Screen_counts.values)
      SC.bar_label(bars,fontsize=8)
      #plt.xticks(rotation=60)
```

```
[13]: [Text(0, 0, '835'), Text(0, 0, '369'), Text(0, 0, '43'), Text(0, 0, '28')]
```



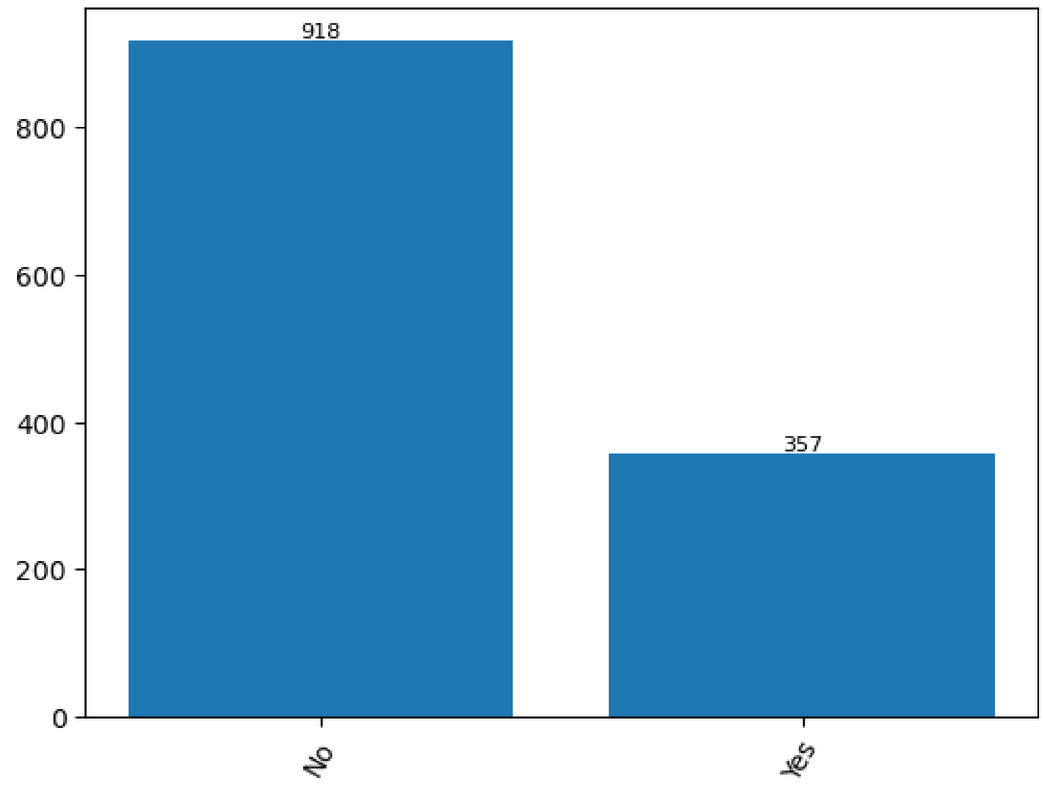
```
[14]: Touch_counts = data['Touchscreen'].value_counts()
      fig,Tx=plt.subplots()
      bars = Tx.bar(Touch_counts.index,Touch_counts.values)
      Tx.bar_label(bars,fontsize=8)
      plt.xticks(rotation=60)
```

```
[14]: ([0, 1], [Text(0, 0, 'No'), Text(1, 0, 'Yes')])
```



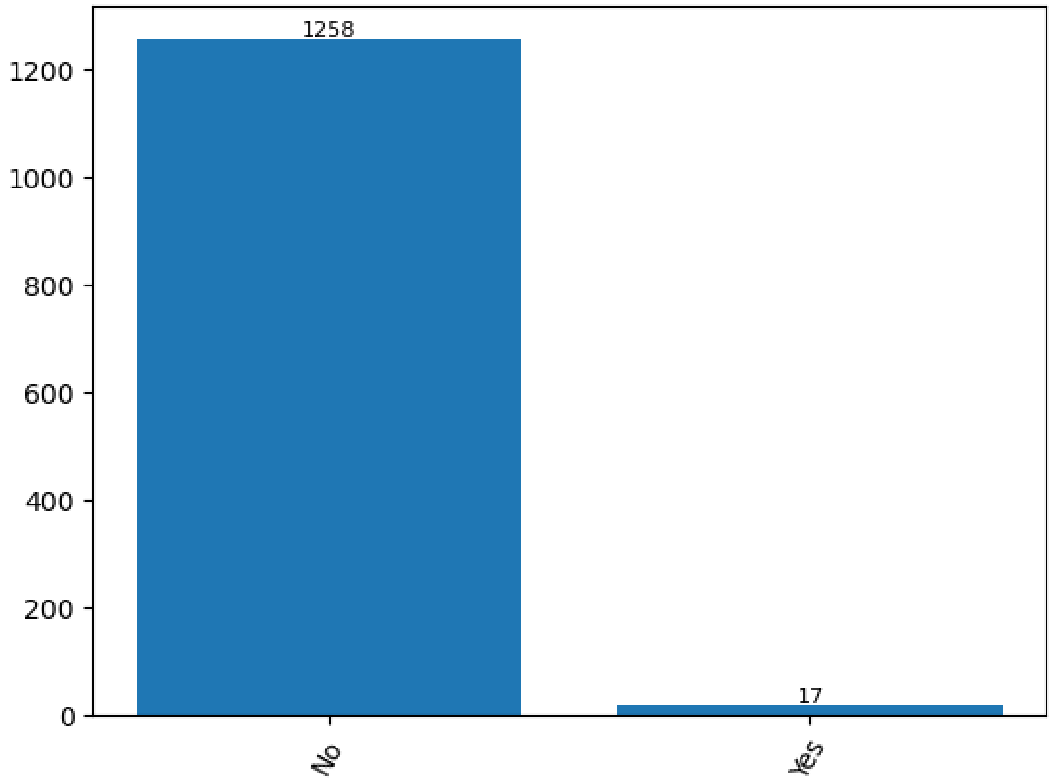
```
[15]: IPSpanel_counts = data['IPSpanel'].value_counts()
      fig,Ix=plt.subplots()
      bars = Ix.bar(IPSpanel_counts.index,IPSpanel_counts.values)
      Ix.bar_label(bars,fontsize=8)
      plt.xticks(rotation=60)
```

```
[15]: ([0, 1], [Text(0, 0, 'No'), Text(1, 0, 'Yes')])
```



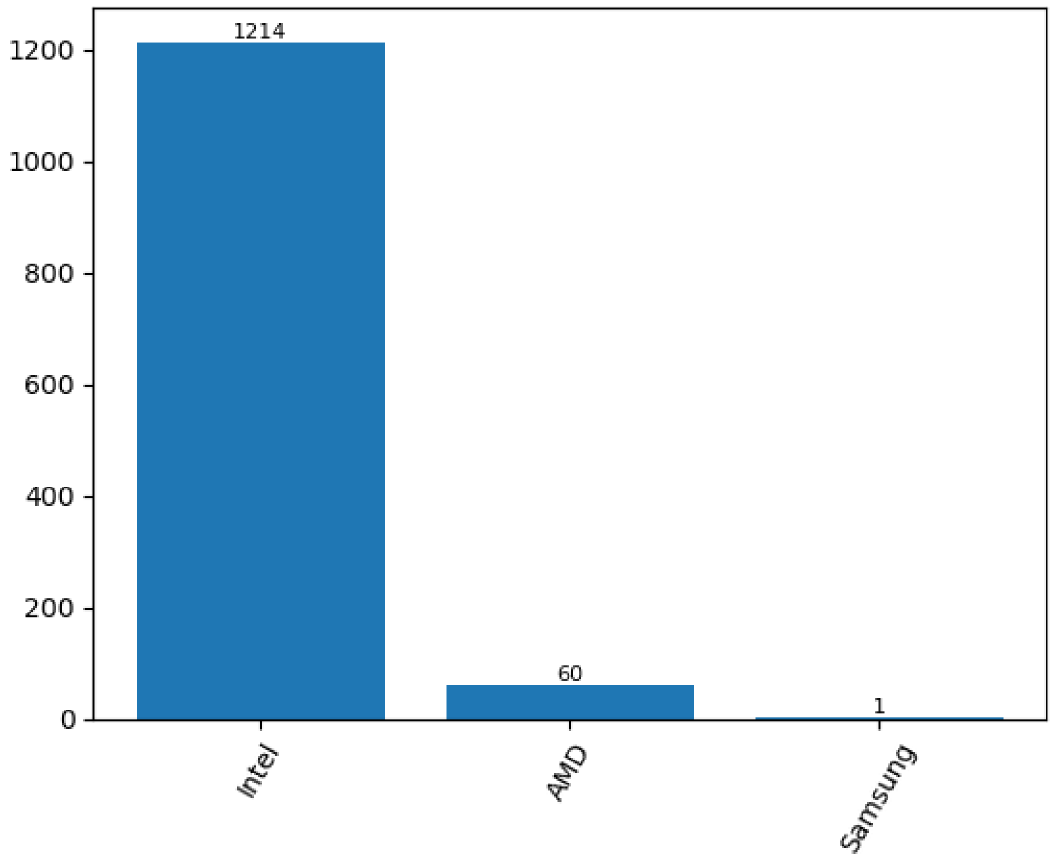
[16]:
```
Retina_counts = data['RetinaDisplay'].value_counts()
fig,RDx=plt.subplots()
bars = RDx.bar(Retina_counts.index,Retina_counts.values)
RDx.bar_label(bars,fontsize=8)
plt.xticks(rotation=60)
```

[16]:
```
([0, 1], [Text(0, 0, 'No'), Text(1, 0, 'Yes')])
```

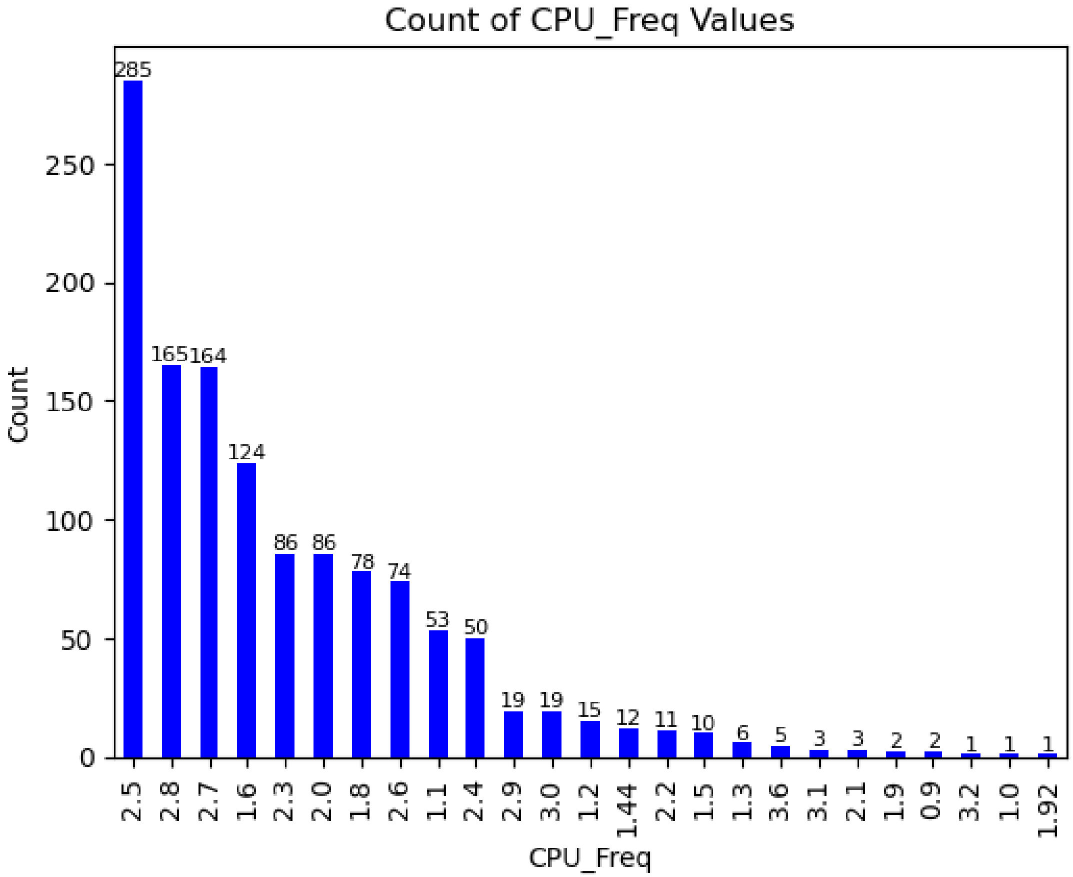


[17]:
```
CPU_company = data['CPU_company'].value_counts()
fig,CCx=plt.subplots()
bars = CCx.bar(CPU_company.index,CPU_company.values)
CCx.bar_label(bars,fontsize=8)
plt.xticks(rotation=60)
```

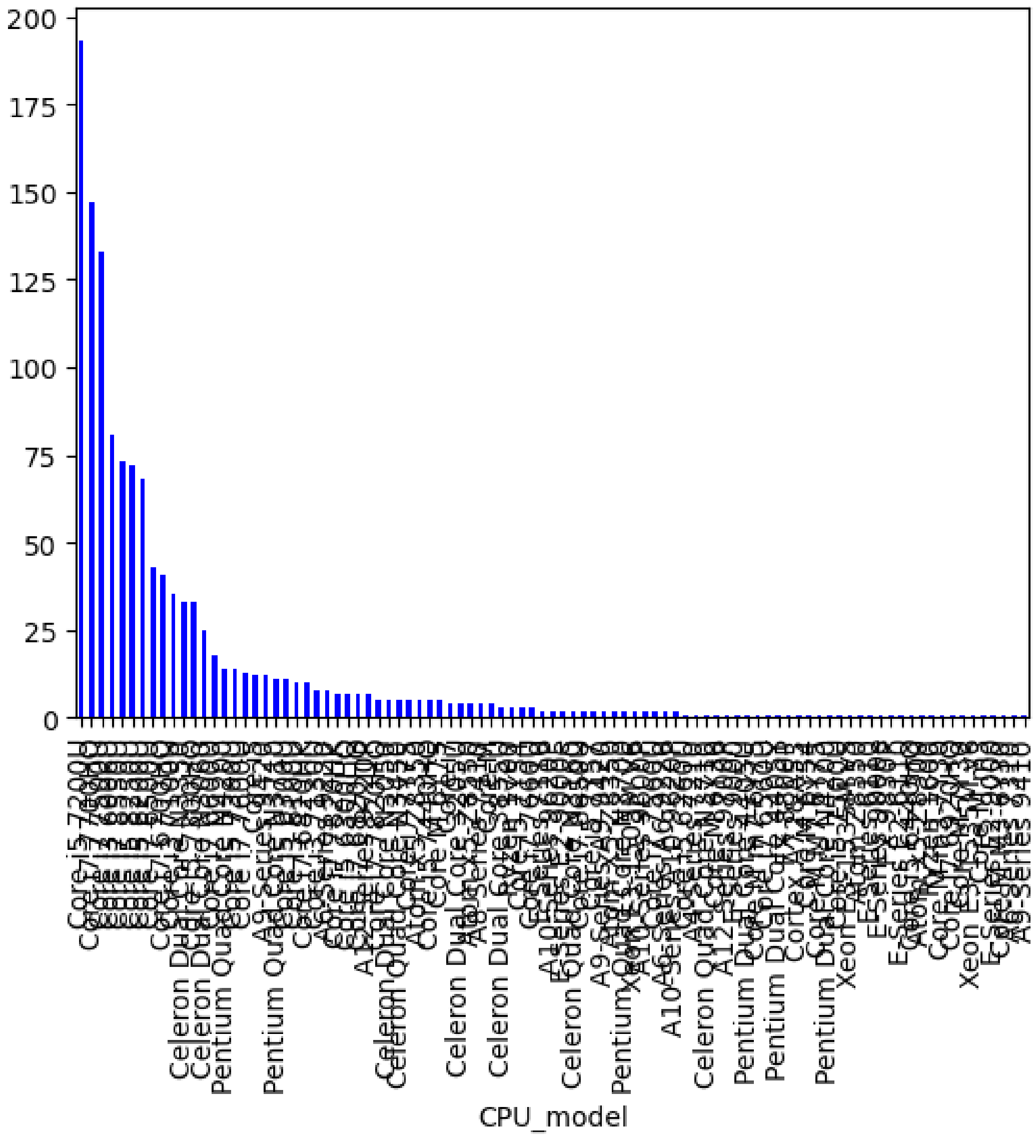
[17]:
```
([0, 1, 2], [Text(0, 0, 'Intel'), Text(1, 0, 'AMD'), Text(2, 0, 'Samsung')])
```



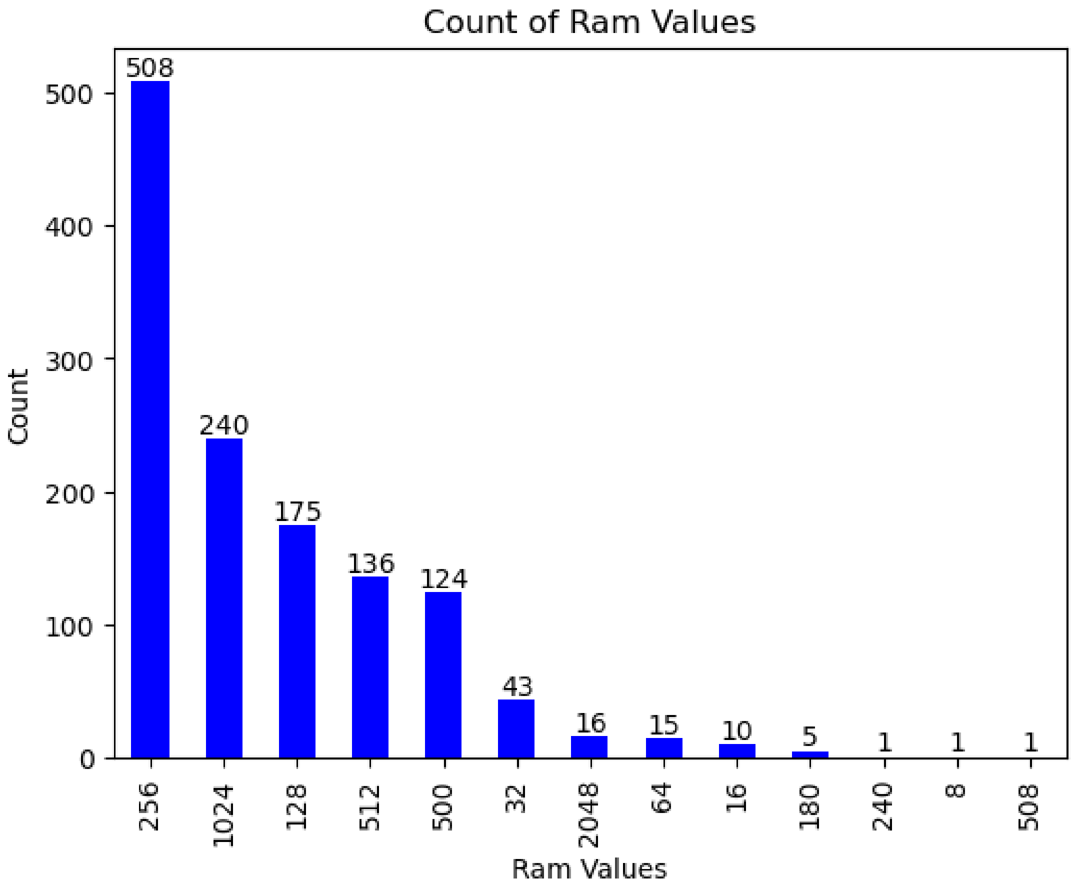
[18]:
```
CPU_Freq = data['CPU_freq'].value_counts()
CF = CPU_Freq.plot(kind='bar', color='blue')
for p in CF.patches:
    CF.annotate(str(p.get_height()), (p.get_x() + p.get_width() / 2, p.
 ↪get_height()), ha='center', va='bottom',fontsize=8)
plt.xlabel('CPU_Freq')
plt.ylabel('Count')
plt.title('Count of CPU_Freq Values')
plt.show()
```



```
[19]: CPU_Model = data['CPU_model'].value_counts().plot(kind='bar', color='blue')
```

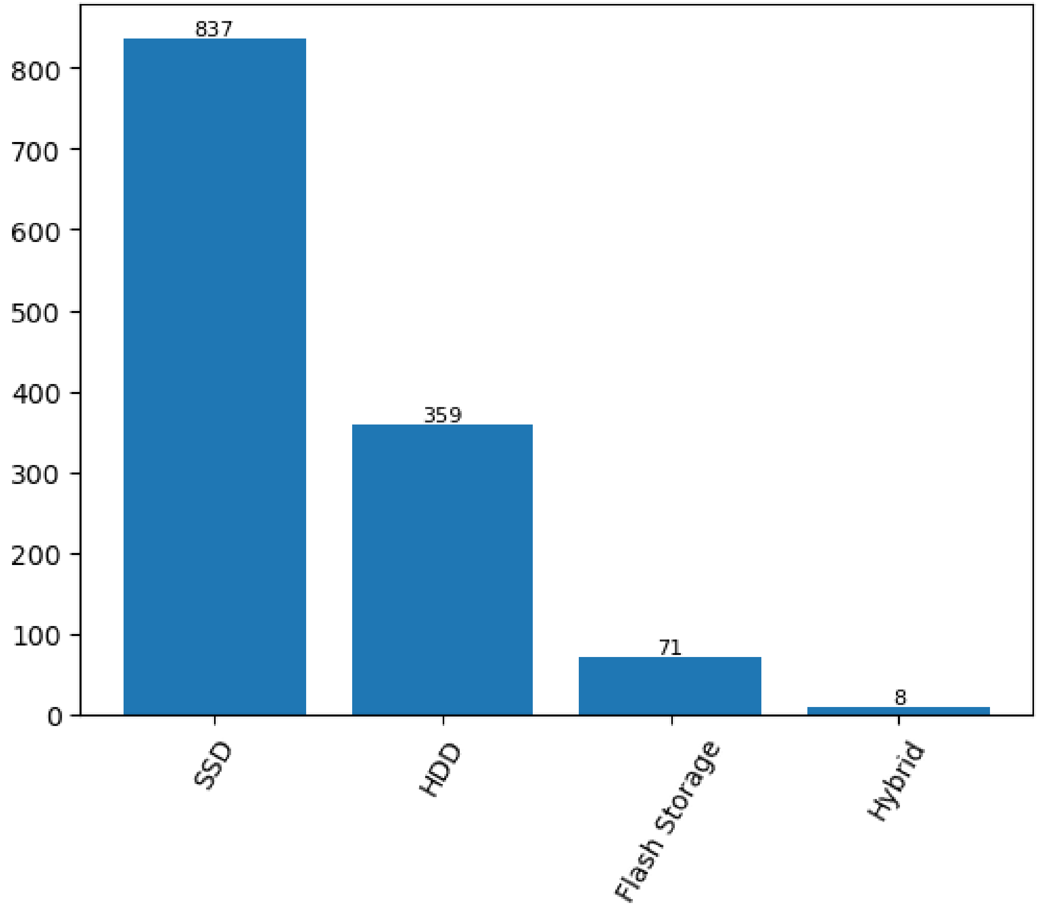


```
[20]: Primary_storage = data['PrimaryStorage'].value_counts()
      ax = Primary_storage.plot(kind='bar', color='blue')
      for p in ax.patches:
          ax.annotate(str(p.get_height()), (p.get_x() + p.get_width() / 2, p.
        ↪get_height()), ha='center', va='bottom')

      plt.xlabel('Ram Values')
      plt.ylabel('Count')
      plt.title('Count of Ram Values')
      plt.show()
```

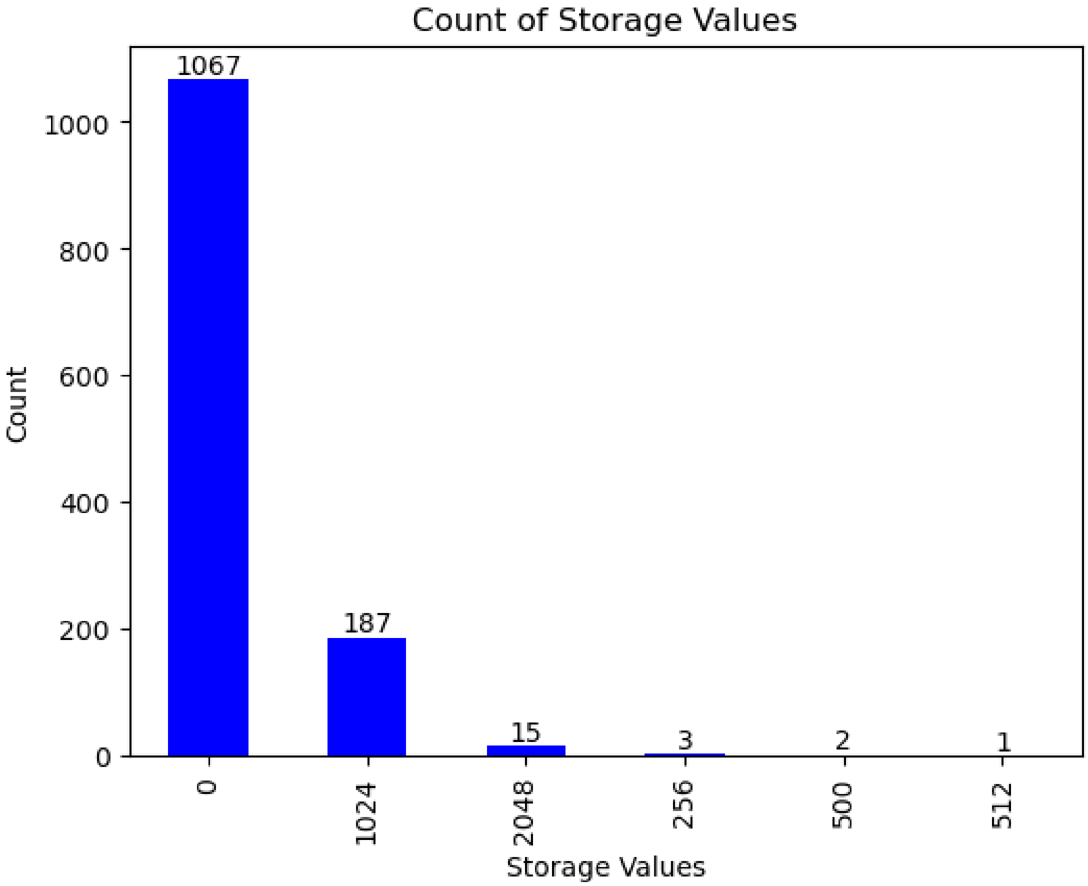


```
[21]: Primary_storage_Type = data['PrimaryStorageType'].value_counts()
      fig,PST=plt.subplots()
      bars = PST.bar(Primary_storage_Type.index,Primary_storage_Type.values)
      PST.bar_label(bars,fontsize=8)
      plt.xticks(rotation=60)
```

```
[21]: ([0, 1, 2, 3],
       [Text(0, 0, 'SSD'),
        Text(1, 0, 'HDD'),
        Text(2, 0, 'Flash Storage'),
        Text(3, 0, 'Hybrid')])
```

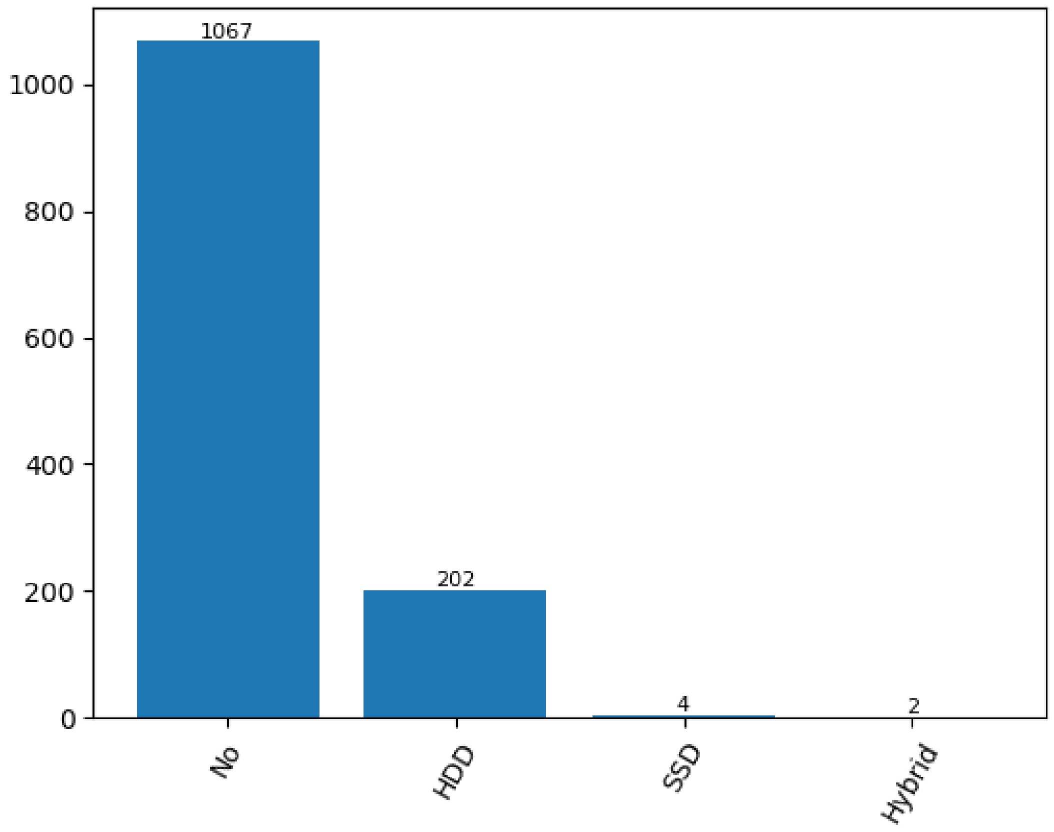


[22]:
```
Secondary_Storage = data['SecondaryStorage'].value_counts()
ax = Secondary_Storage.plot(kind='bar', color='blue')
for p in ax.patches:
    ax.annotate(str(p.get_height()), (p.get_x() + p.get_width() / 2, p.
 ↪get_height()), ha='center', va='bottom')

plt.xlabel('Storage Values')
plt.ylabel('Count')
plt.title('Count of Storage Values')
plt.show()
```



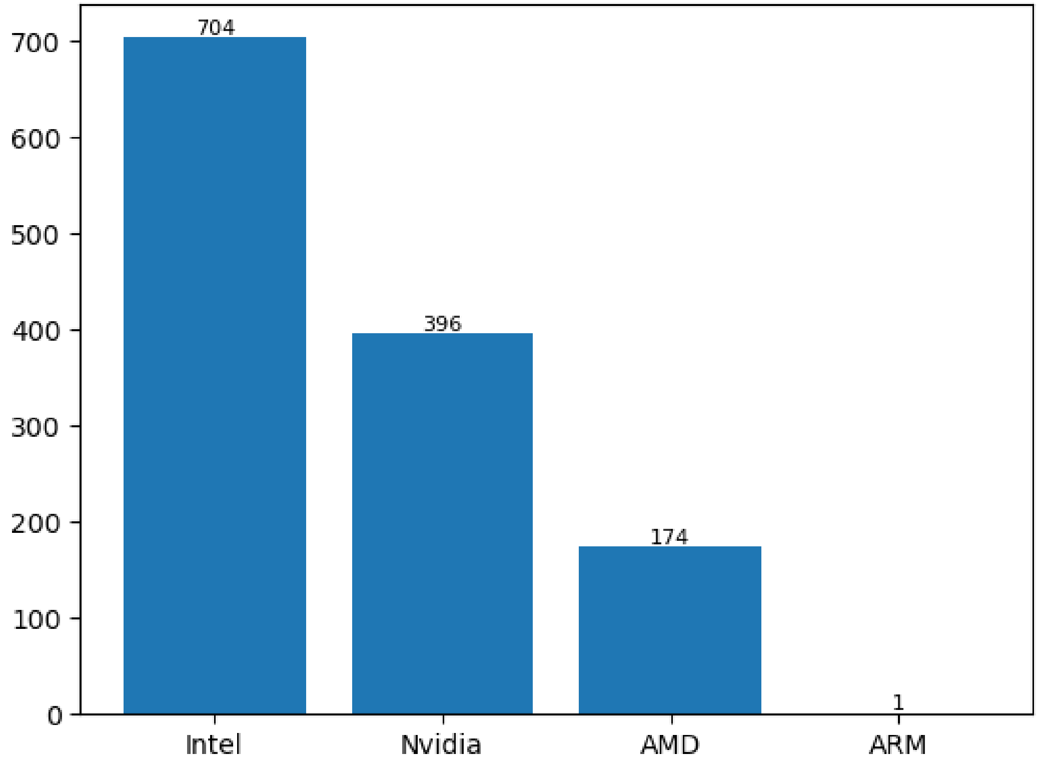
```
[23]: Secondary_Storage_Type = data['SecondaryStorageType'].value_counts()
      fig,SST=plt.subplots()
      bars = SST.bar(Secondary_Storage_Type.index,Secondary_Storage_Type.values)
      SST.bar_label(bars,fontsize=8)
      plt.xticks(rotation=60)
```

```
[23]: ([0, 1, 2, 3],
       [Text(0, 0, 'No'),
        Text(1, 0, 'HDD'),
        Text(2, 0, 'SSD'),
        Text(3, 0, 'Hybrid')])
```



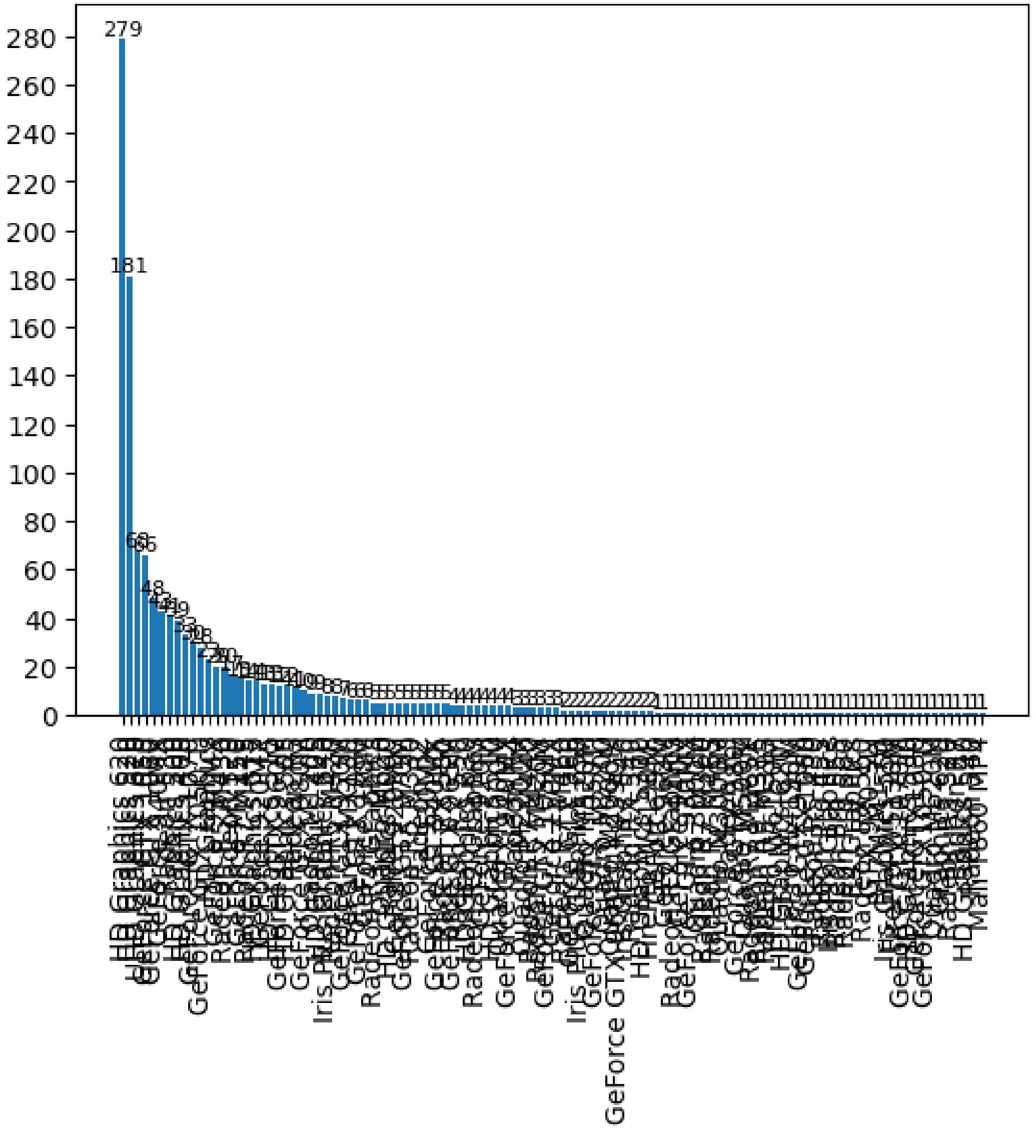
```
[24]: GPU_company = data['GPU_company'].value_counts()
      fig,CC=plt.subplots()
      bars = CC.bar(GPU_company.index,GPU_company.values)
      CC.bar_label(bars,fontsize=8)
```

```
[24]: [Text(0, 0, '704'), Text(0, 0, '396'), Text(0, 0, '174'), Text(0, 0, '1')]
```



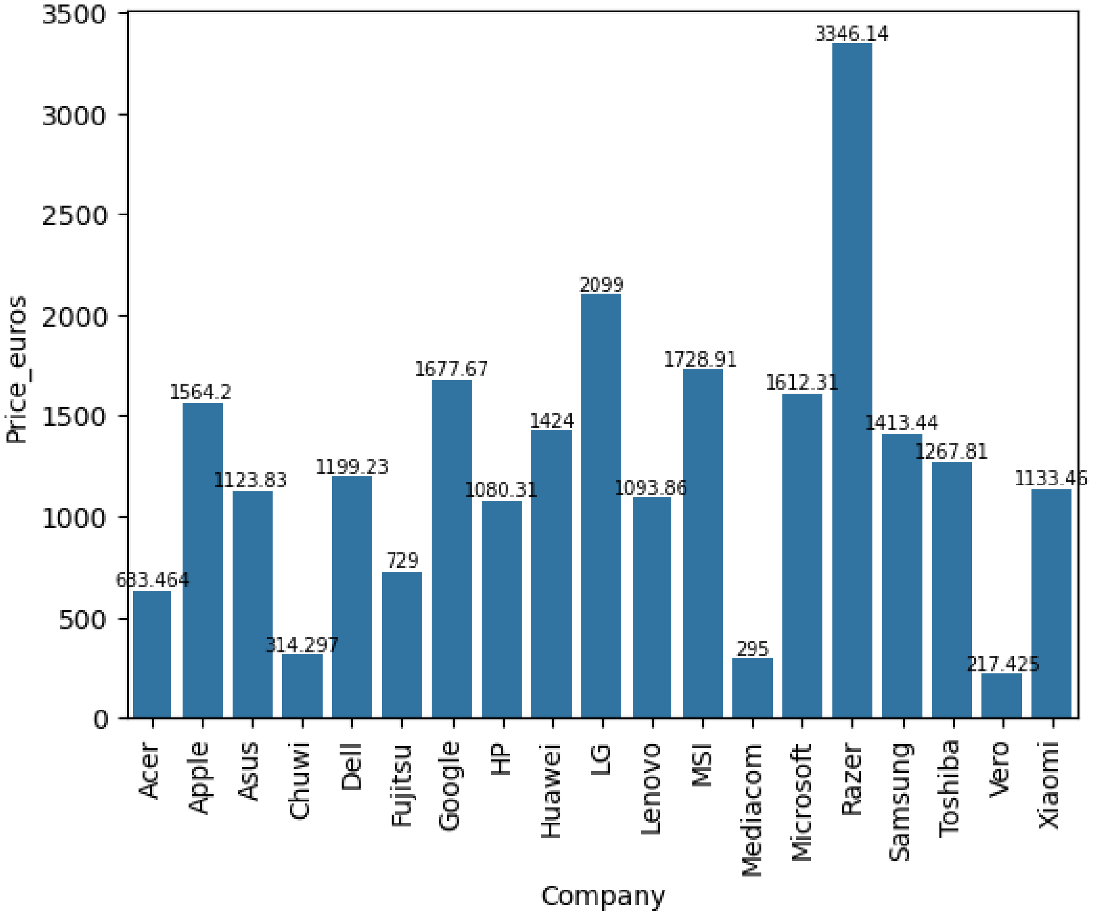
[25]:

```
Gpu_Model = data['GPU_model'].value_counts()
fig,GM=plt.subplots()
bars = GM.bar(Gpu_Model.index,Gpu_Model.values)
GM.bar_label(bars,fontsize=8)
plt.xticks(rotation=90)
plt.locator_params(nbins=20)
```



```
[26]: company = data.groupby(by='Company')['Price_euros'].mean().reset_index()
      ax=sb.barplot(x='Company',y='Price_euros',data=company,errwidth=0)
      ax.bar_label(ax.containers[0],fontsize=7)
      plt.xticks(rotation=90)
```

```
[26]: ([0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18],
       [Text(0, 0, 'Acer'),
        Text(1, 0, 'Apple'),
        Text(2, 0, 'Asus'),
        Text(3, 0, 'Chuwi'),
        Text(4, 0, 'Dell'),
        Text(5, 0, 'Fujitsu'),
        Text(6, 0, 'Google'),
        Text(7, 0, 'HP'),
        Text(8, 0, 'Huawei'),
        Text(9, 0, 'LG'),
        Text(10, 0, 'Lenovo'),
        Text(11, 0, 'MSI'),
        Text(12, 0, 'Mediacom'),
        Text(13, 0, 'Microsoft'),
        Text(14, 0, 'Razer'),
        Text(15, 0, 'Samsung'),
        Text(16, 0, 'Toshiba'),
        Text(17, 0, 'Vero'),
        Text(18, 0, 'Xiaomi')])
```

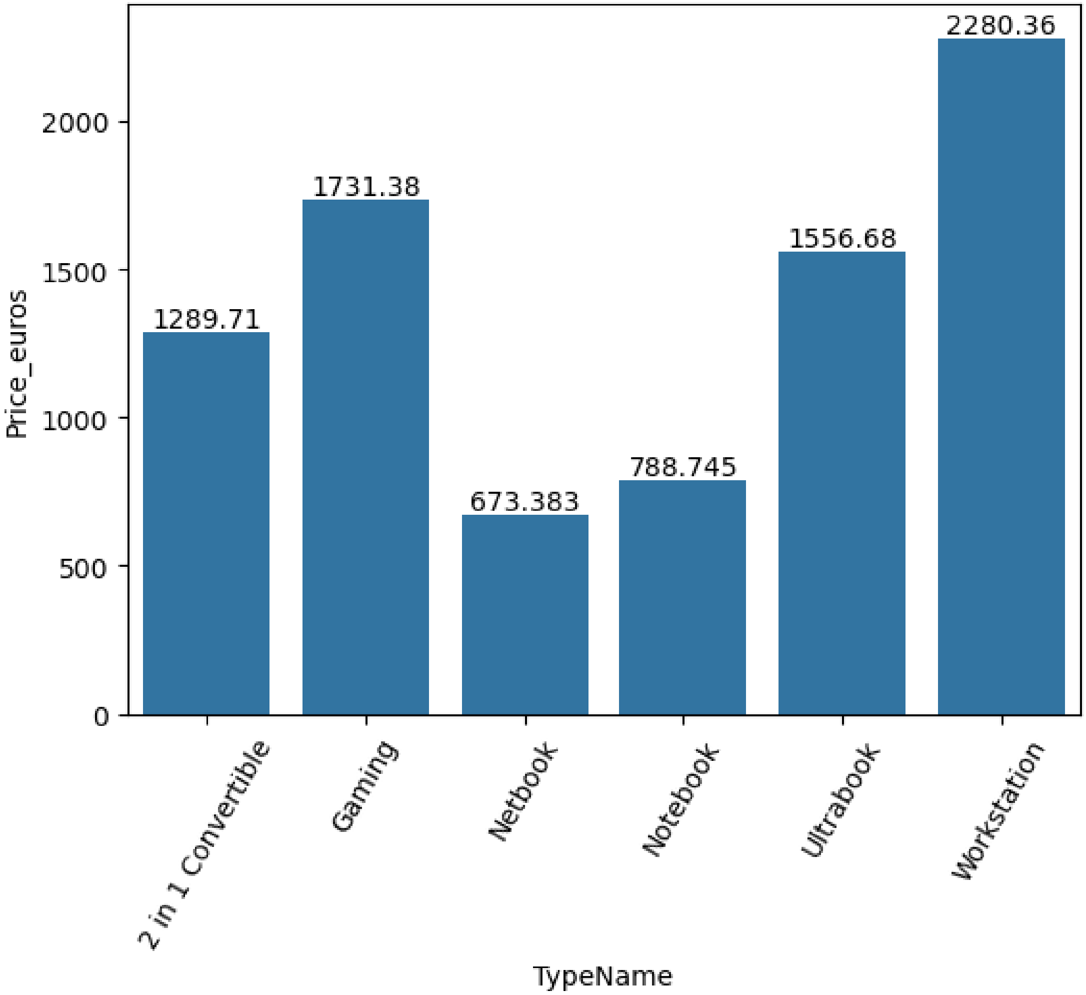


[66]:
```
typename = data.groupby(by='TypeName')['Price_euros'].mean().reset_index()
ax=sb.barplot(x='TypeName',y='Price_euros',data=typename,errwidth=0)
ax.bar_label(ax.containers[0])
```

```
plt.xticks(rotation=60)
```

[66]:

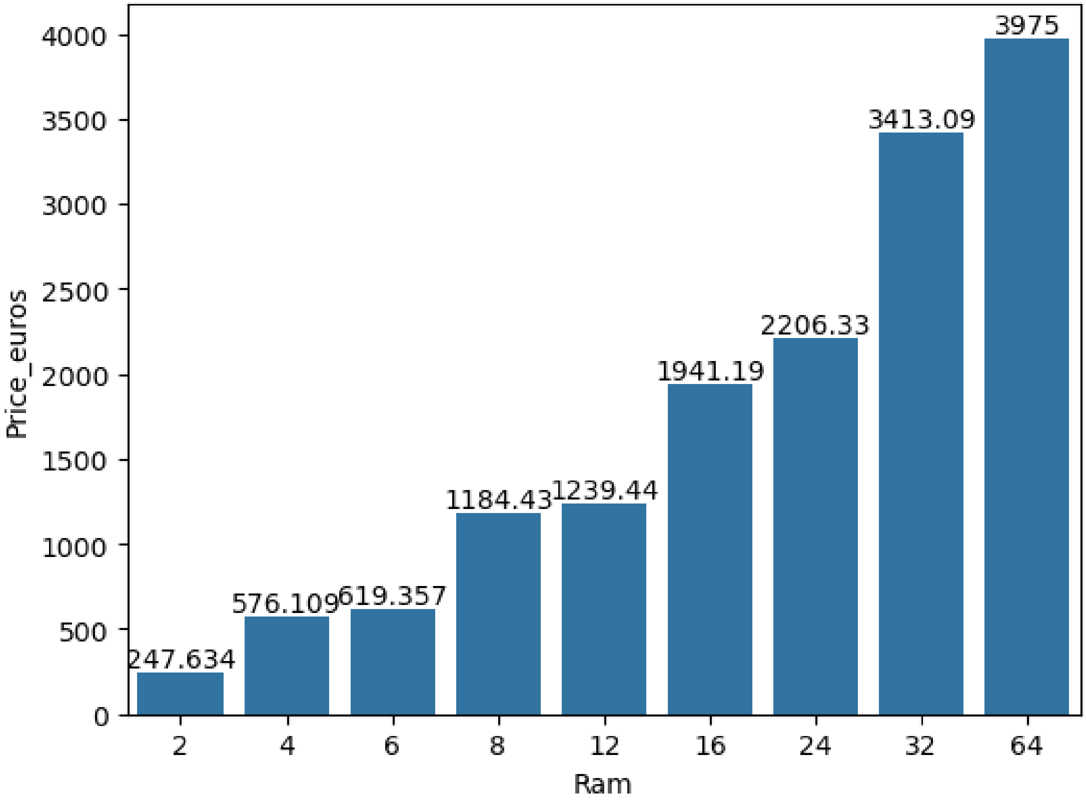
```
([0, 1, 2, 3, 4, 5],
 [Text(0, 0, '2 in 1 Convertible'),
  Text(1, 0, 'Gaming'),
  Text(2, 0, 'Netbook'),
  Text(3, 0, 'Notebook'),
  Text(4, 0, 'Ultrabook'),
  Text(5, 0, 'Workstation')])
```



[28]:

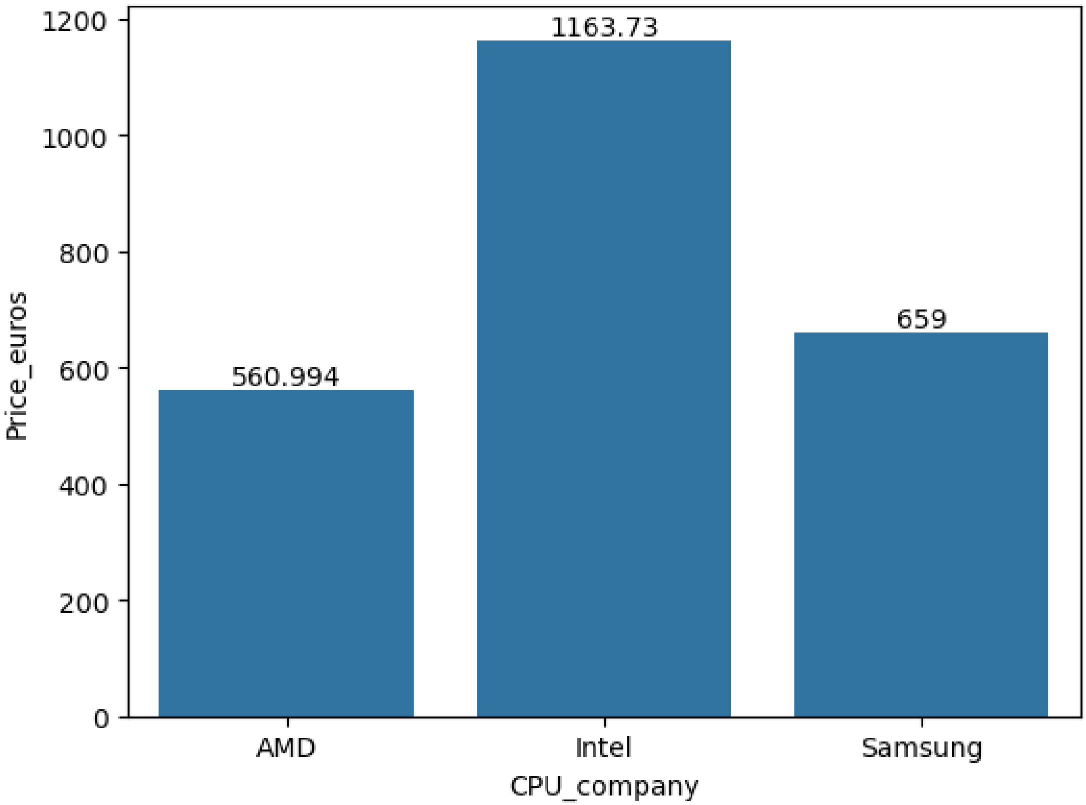
```
ram = data.groupby(by='Ram')['Price_euros'].mean().reset_index()
ax=sb.barplot(x='Ram',y='Price_euros',data=ram,errwidth=0)
ax.bar_label(ax.containers[0])
```

[28]:
```
[Text(0, 0, '247.634'),
 Text(0, 0, '576.109'),
 Text(0, 0, '619.357'),
 Text(0, 0, '1184.43'),
 Text(0, 0, '1239.44'),
 Text(0, 0, '1941.19'),
 Text(0, 0, '2206.33'),
 Text(0, 0, '3413.09'),
 Text(0, 0, '3975')]
```



[29]:
```
Cpu_Company = data.groupby(by='CPU_company')['Price_euros'].mean().reset_index()
ax=sb.barplot(x='CPU_company',y='Price_euros',data=Cpu_Company,errwidth=0)
ax.bar_label(ax.containers[0])
```

[29]:
```
[Text(0, 0, '560.994'), Text(0, 0, '1163.73'), Text(0, 0, '659')]
```



[30]:
```
Cpu_Freq = data.groupby(by='CPU_freq')['Price_euros'].mean().reset_index()
ax=sb.barplot(x='CPU_freq',y='Price_euros',data=Cpu_Freq,errwidth=0)
ax.bar_label(ax.containers[0],fontsize=6)
plt.xticks(rotation=60)
```

[30]:
```
([0,
  1,
  2,
  3,
  4,
  5,
  6,
  7,
  8,
  9,
  10,
  11,
  12,
  13,
  14,
  15,
  16,
  17,
  18,
  19,
  20,
  21,
  22,
  23,
  24],
 [Text(0, 0, '0.9'),
  Text(1, 0, '1.0'),
  Text(2, 0, '1.1'),
  Text(3, 0, '1.2'),
  Text(4, 0, '1.3'),
  Text(5, 0, '1.44'),
  Text(6, 0, '1.5'),
  Text(7, 0, '1.6'),
  Text(8, 0, '1.8'),
  Text(9, 0, '1.9'),
  Text(10, 0, '1.92'),
  Text(11, 0, '2.0'),
  Text(12, 0, '2.1'),
  Text(13, 0, '2.2'),
  Text(14, 0, '2.3'),
  Text(15, 0, '2.4'),
  Text(16, 0, '2.5'),
  Text(17, 0, '2.6'),
  Text(18, 0, '2.7'),
  Text(19, 0, '2.8'),
  Text(20, 0, '2.9'),
  Text(21, 0, '3.0'),
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  Text(23, 0, '3.2'),
  Text(24, 0, '3.6')])
```

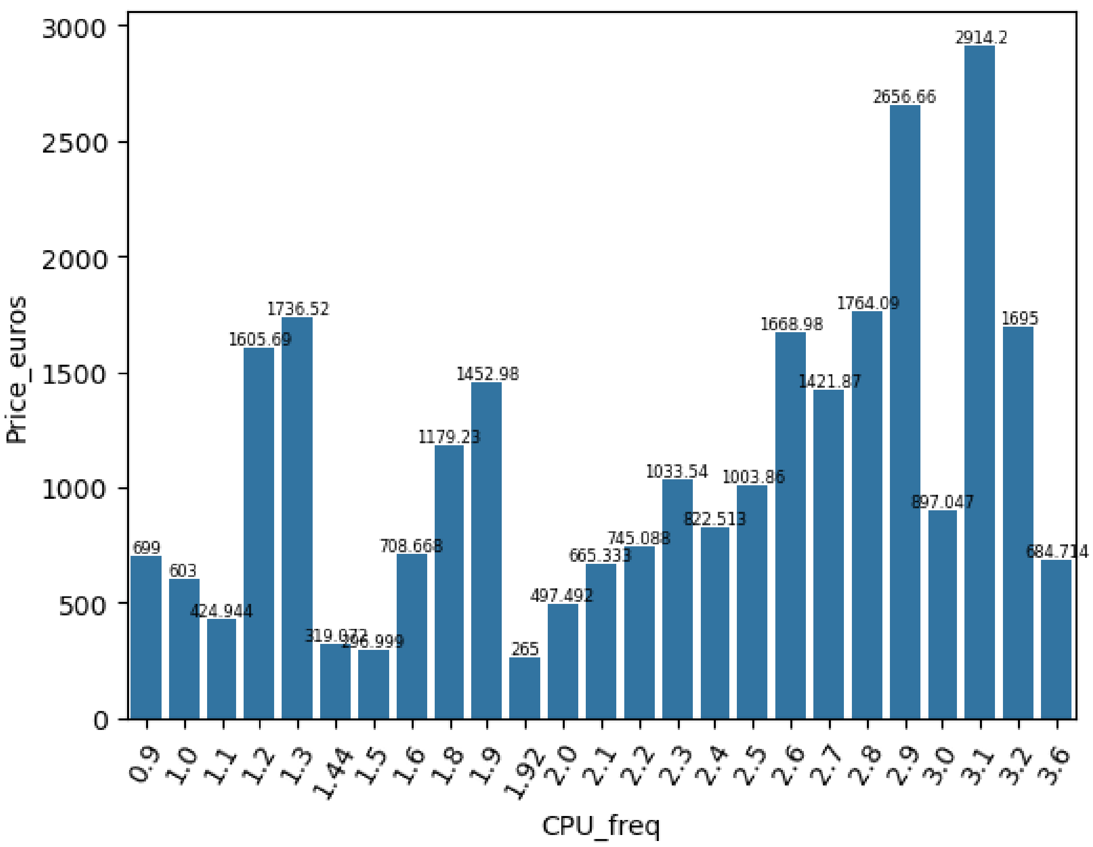

[31]:
```python
Cpu_Model = data.groupby(by='CPU_model')['Price_euros'].mean().reset_index()
ax=sb.barplot(x='CPU_model',y='Price_euros',data=Cpu_Model,errwidth=0)
ax.bar_label(ax.containers[0],fontsize=5)
plt.locator_params(nbins=5)
plt.xticks(rotation=90)
```

[31]:
```
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Text(50, 0, 'Core i5 7500U'),
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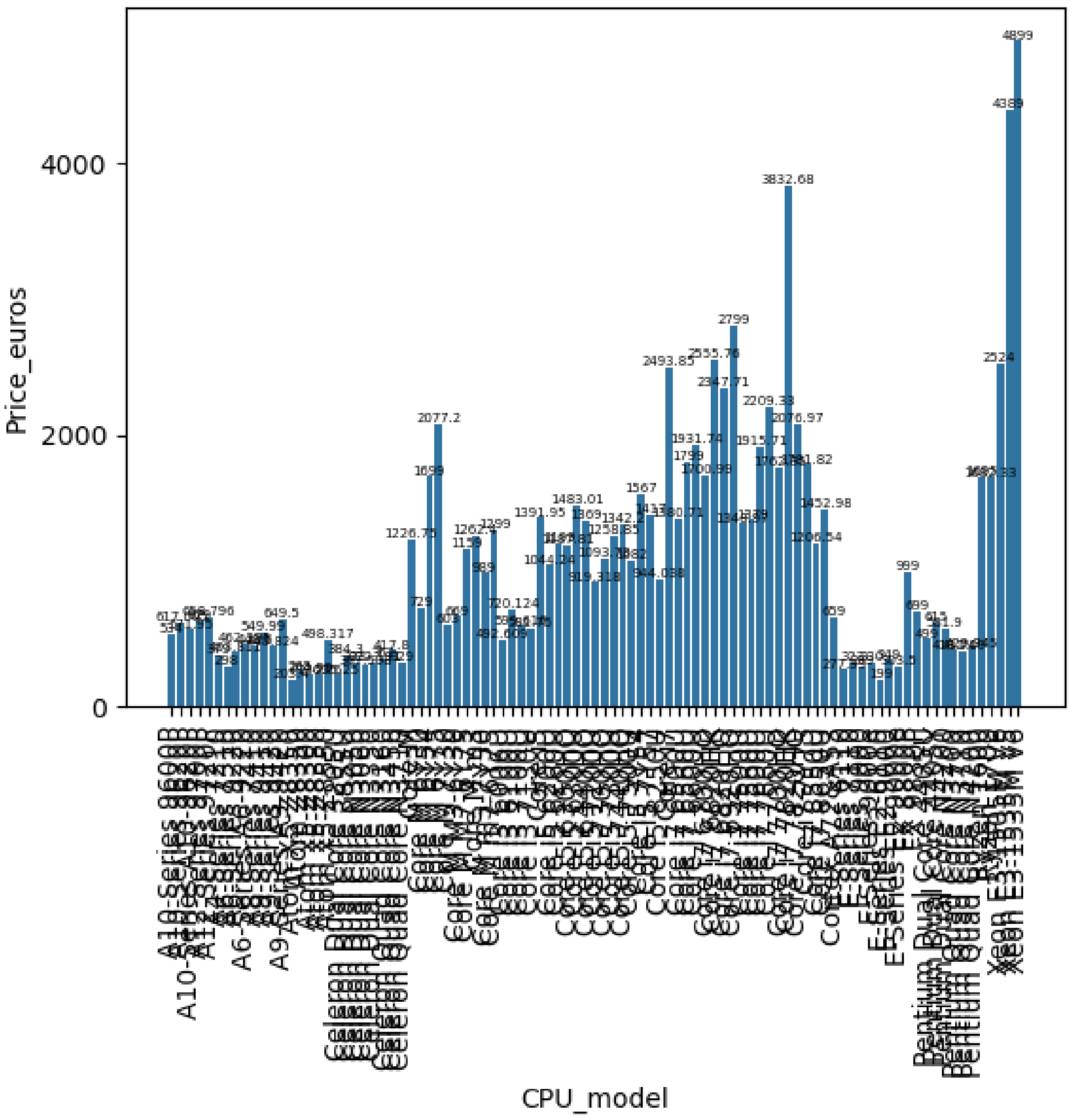
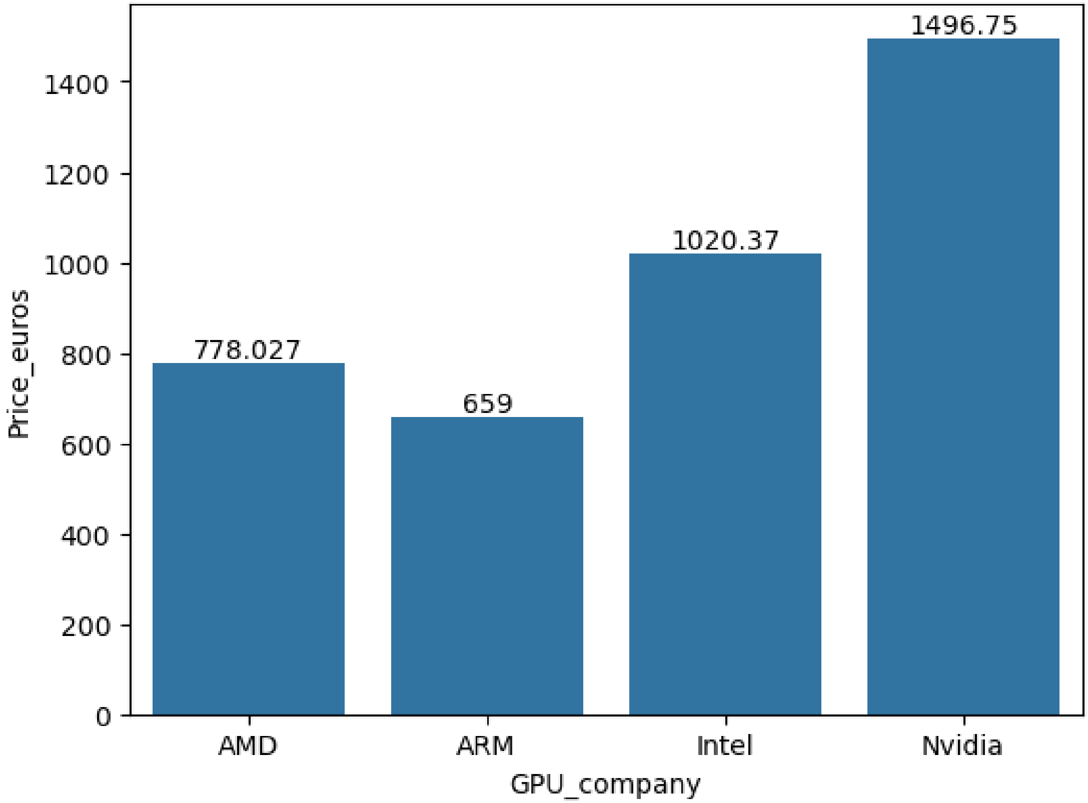
Text(90, 0, 'Xeon E3-1505M V6'),
Text(91, 0, 'Xeon E3-1535M v5'),
Text(92, 0, 'Xeon E3-1535M v6')])
```



```
[32]: Gpu_Company = data.groupby(by='GPU_company')['Price_euros'].mean().reset_index()
      ax=sb.barplot(x='GPU_company',y='Price_euros',data=Gpu_Company,errwidth=0)
      ax.bar_label(ax.containers[0])
```

```
[32]: [Text(0, 0, '778.027'),
       Text(0, 0, '659'),
       Text(0, 0, '1020.37'),
       Text(0, 0, '1496.75')]
```



[33]:
```
Gpu_Model = data.groupby(by='GPU_model')['Price_euros'].mean().reset_index()
ax=sb.barplot(x='GPU_model',y='Price_euros',data=Gpu_Model,errwidth=0)
ax.bar_label(ax.containers[0])
plt.xticks(rotation=90)
```

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 Text(5, 0, 'GeForce 150MX'),
 Text(6, 0, 'GeForce 920'),
 Text(7, 0, 'GeForce 920M'),
 Text(8, 0, 'GeForce 920MX'),
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 Text(23, 0, 'GeForce GTX 1070M'),
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Text(62, 0, 'Iris Pro Graphics'),
Text(63, 0, 'Mali T860 MP4'),
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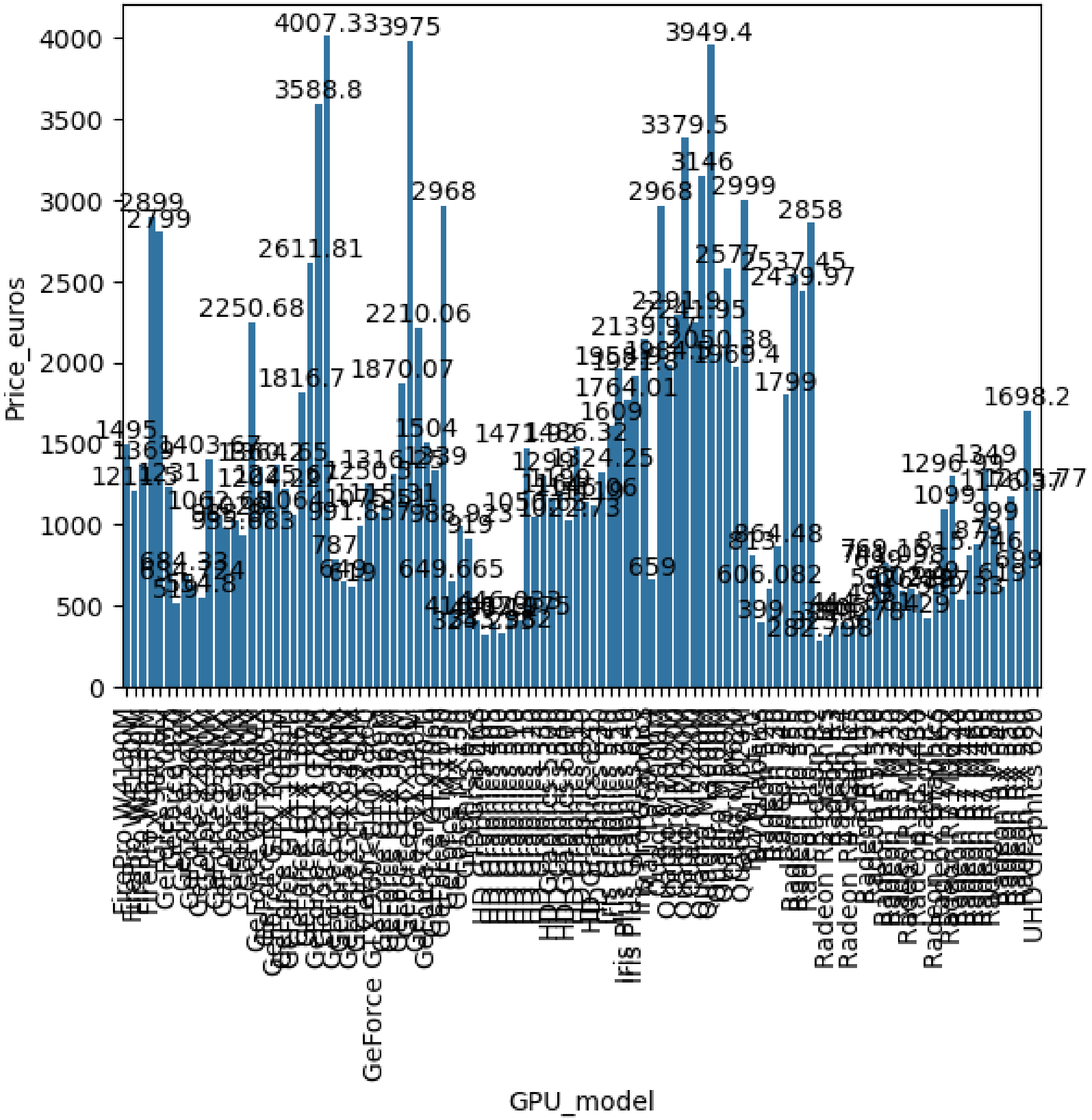
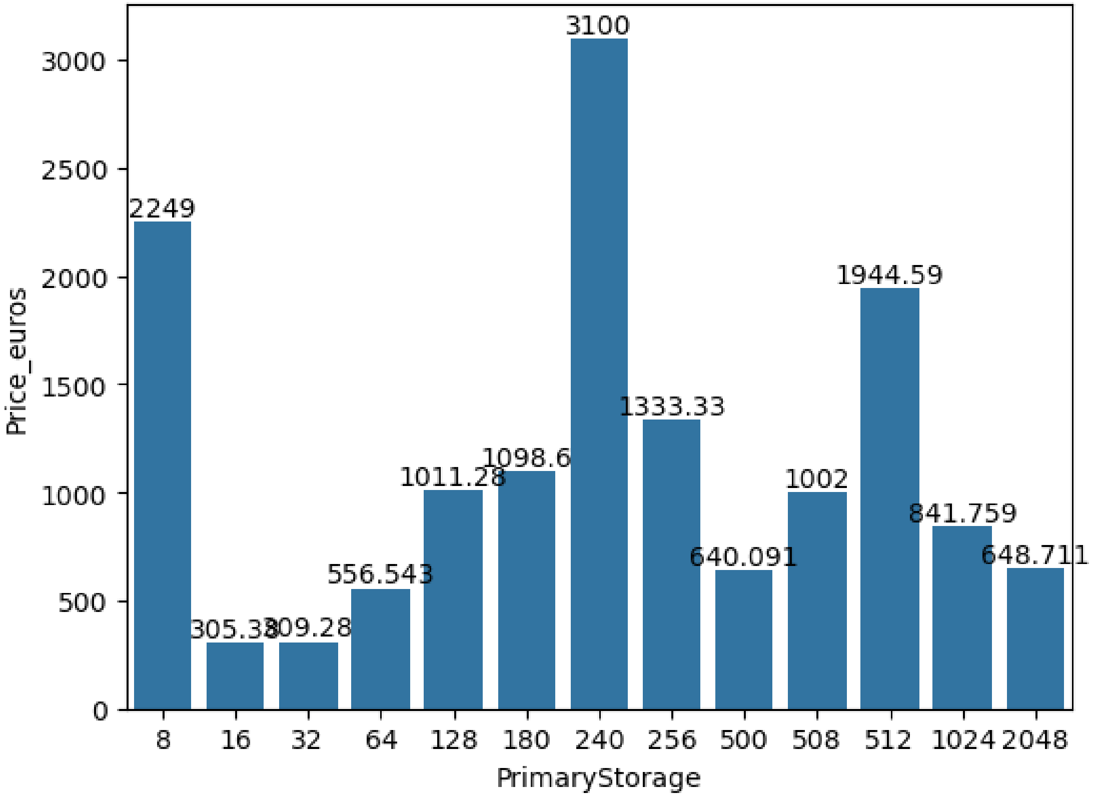
Text(109, 0, 'UHD Graphics 620')])
```



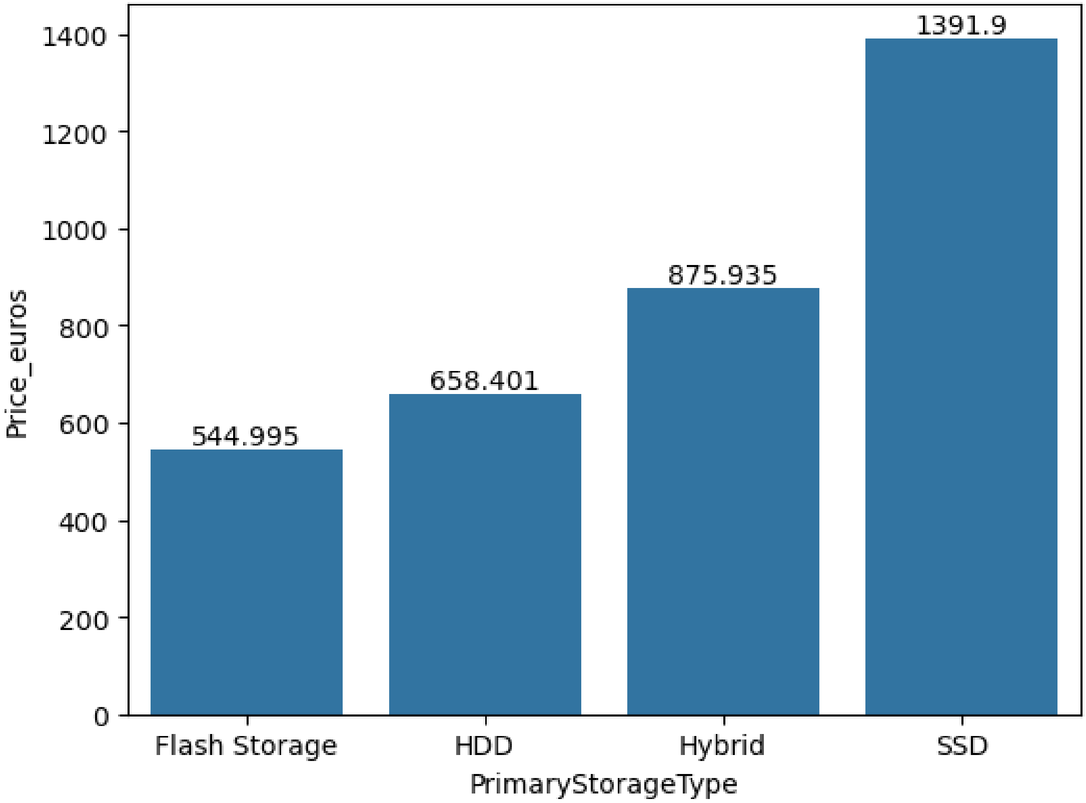
```
[34]: Primary_storage = data.groupby(by='PrimaryStorage')['Price_euros'].mean().
      ↪reset_index()
      ax=sb.
      ↪barplot(x='PrimaryStorage',y='Price_euros',data=Primary_storage,errwidth=0)
      ax.bar_label(ax.containers[0])
```

```
[34]: [Text(0, 0, '2249'),
       Text(0, 0, '305.38'),
       Text(0, 0, '309.28'),
       Text(0, 0, '556.543'),
       Text(0, 0, '1011.28'),
       Text(0, 0, '1098.6'),
       Text(0, 0, '3100'),
       Text(0, 0, '1333.33'),
       Text(0, 0, '640.091'),
       Text(0, 0, '1002'),
       Text(0, 0, '1944.59'),
       Text(0, 0, '841.759'),
       Text(0, 0, '648.711')]
```



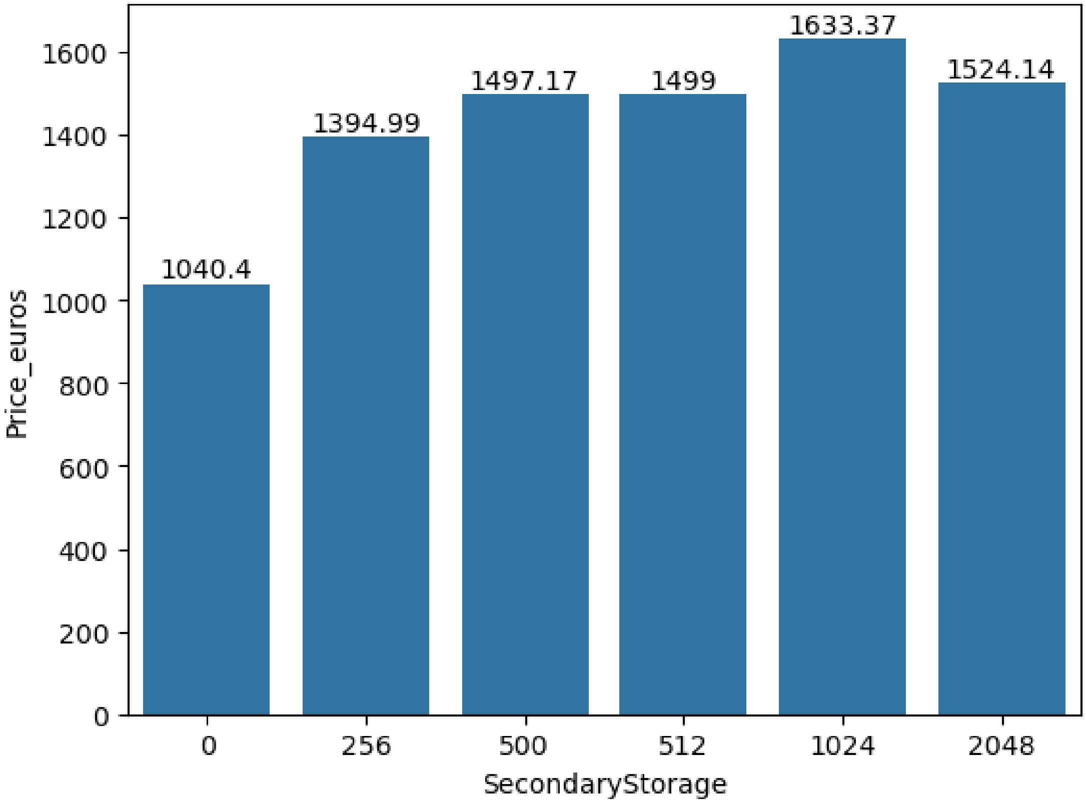
[35]:
```
Primary_Storage_Type = data.groupby(by='PrimaryStorageType')['Price_euros'].
  ↪mean().reset_index()
ax=sb.
  ↪barplot(x='PrimaryStorageType',y='Price_euros',data=Primary_Storage_Type,errwidth=0)
ax.bar_label(ax.containers[0])
```

[35]:
```
[Text(0, 0, '544.995'),
 Text(0, 0, '658.401'),
 Text(0, 0, '875.935'),
 Text(0, 0, '1391.9')]
```



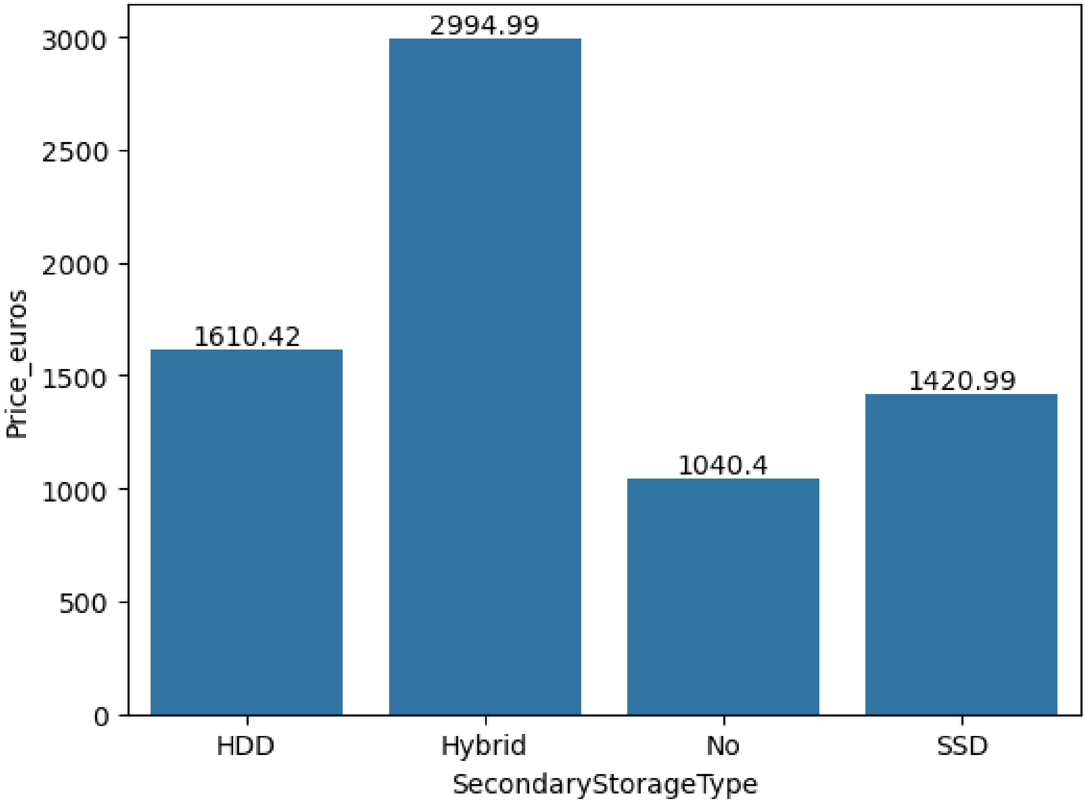
```
[36]: Secondary_Storage = data.groupby(by='SecondaryStorage')['Price_euros'].mean().
        ↪reset_index()
      ax=sb.
        ↪barplot(x='SecondaryStorage',y='Price_euros',data=Secondary_Storage,errwidth=0)
      ax.bar_label(ax.containers[0])
```

```
[36]: [Text(0, 0, '1040.4'),
       Text(0, 0, '1394.99'),
       Text(0, 0, '1497.17'),
       Text(0, 0, '1499'),
       Text(0, 0, '1633.37'),
       Text(0, 0, '1524.14')]
```



```
[37]: Secondary_Storage_Type = data.groupby(by='SecondaryStorageType')['Price_euros'].
        ↪mean().reset_index()
      ax=sb.
        ↪barplot(x='SecondaryStorageType',y='Price_euros',data=Secondary_Storage_Type,errwidth=0)
      ax.bar_label(ax.containers[0])
```

```
[37]: [Text(0, 0, '1610.42'),
       Text(0, 0, '2994.99'),
       Text(0, 0, '1040.4'),
       Text(0, 0, '1420.99')]
```

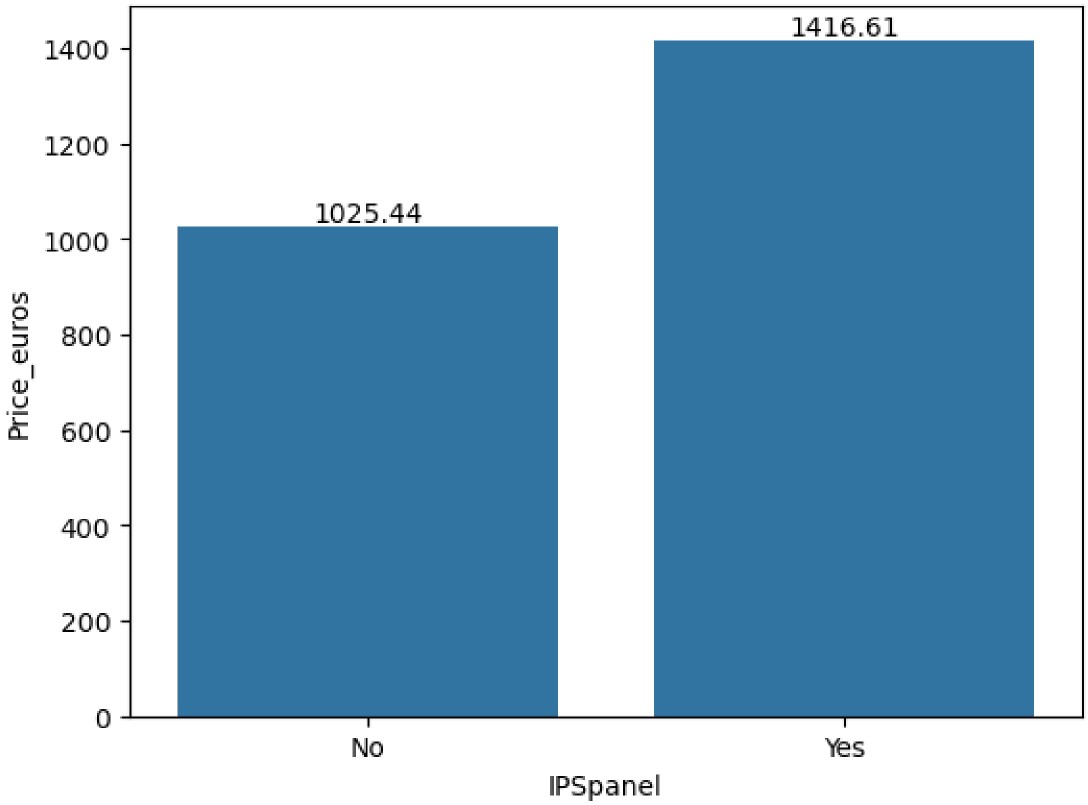


[38]:

```
IPS_panel = data.groupby(by='IPSpanel')['Price_euros'].mean().reset_index()
ax=sb.barplot(x='IPSpanel',y='Price_euros',data=IPS_panel,errwidth=0)
ax.bar_label(ax.containers[0])
```

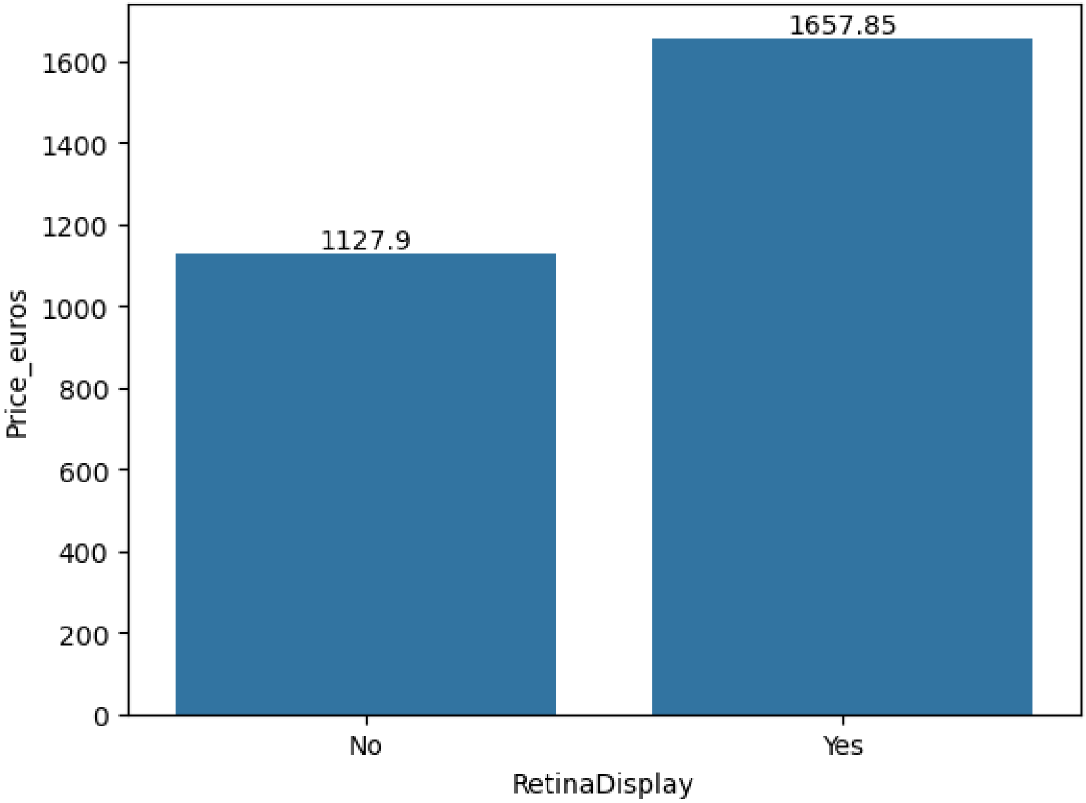
[38]:

```
[Text(0, 0, '1025.44'), Text(0, 0, '1416.61')]
```

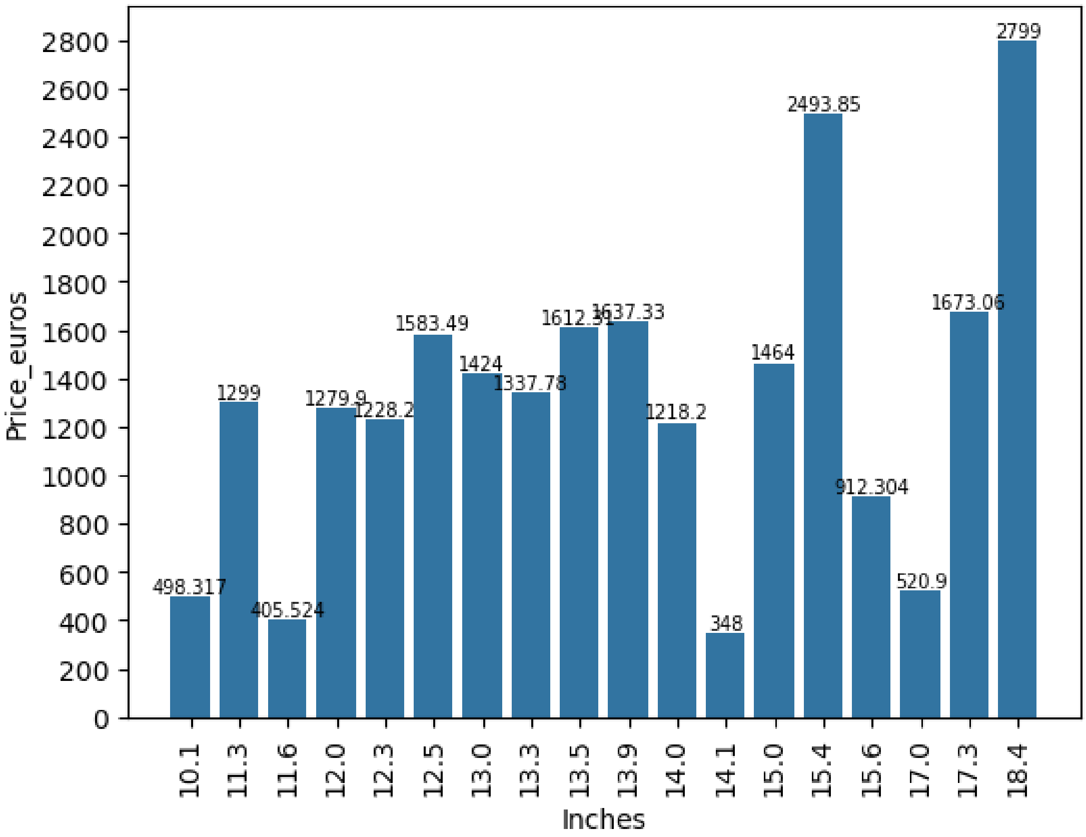


[39]:
```
Retina_Display = data.groupby(by='RetinaDisplay')['Price_euros'].mean().
  ↪reset_index()
ax=sb.barplot(x='RetinaDisplay',y='Price_euros',data=Retina_Display,errwidth=0)
ax.bar_label(ax.containers[0])
```

[39]:
```
[Text(0, 0, '1127.9'), Text(0, 0, '1657.85')]
```

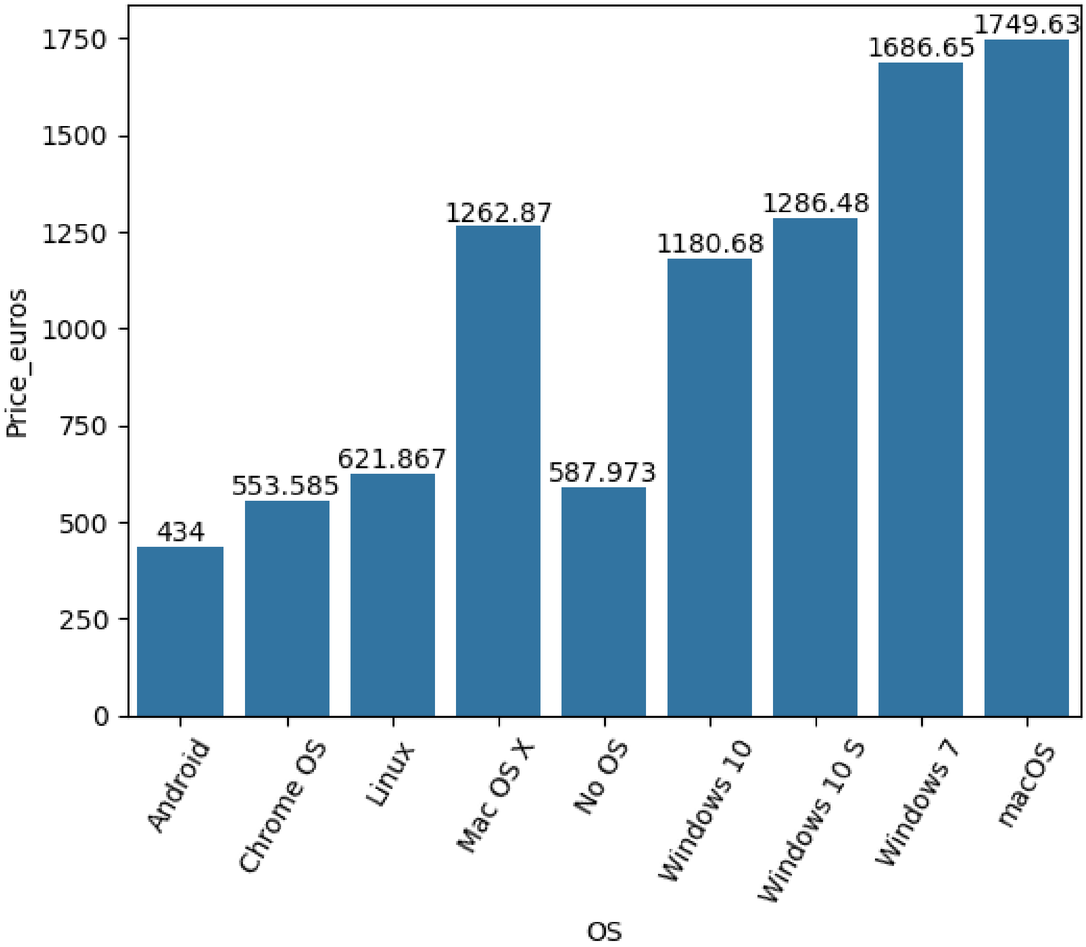


[40]:
```
price_by_inches = data.groupby(by='Inches')['Price_euros'].mean().reset_index()
ax=sb.barplot(x='Inches',y='Price_euros',data=price_by_inches,errwidth=0)
ax.bar_label(ax.containers[0],fontsize=7)
plt.xticks(rotation=90)
plt.locator_params(nbins=20)
```



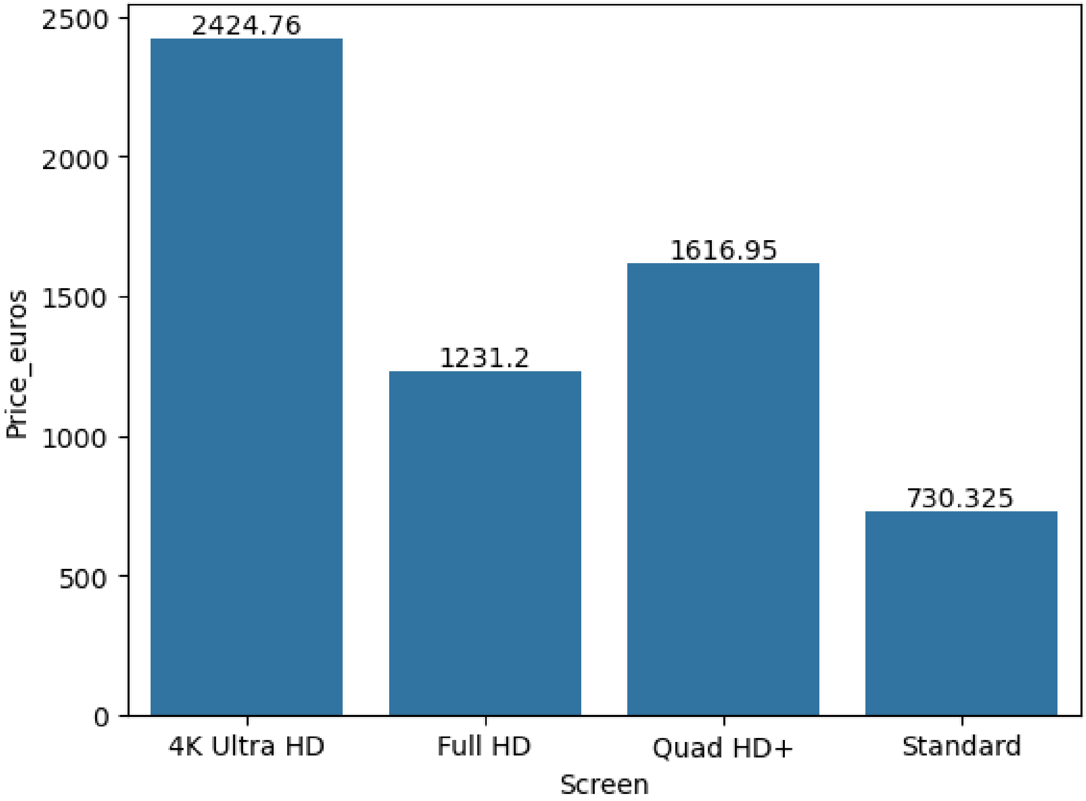
[41]:
```
os = data.groupby(by='OS')['Price_euros'].mean().reset_index()
ax=sb.barplot(x='OS',y='Price_euros',data=os,errwidth=0)
ax.bar_label(ax.containers[0])
plt.xticks(rotation=60)
```

[41]:
```
([0, 1, 2, 3, 4, 5, 6, 7, 8],
 [Text(0, 0, 'Android'),
  Text(1, 0, 'Chrome OS'),
  Text(2, 0, 'Linux'),
  Text(3, 0, 'Mac OS X'),
  Text(4, 0, 'No OS'),
  Text(5, 0, 'Windows 10'),
  Text(6, 0, 'Windows 10 S'),
  Text(7, 0, 'Windows 7'),
  Text(8, 0, 'macOS')])
```

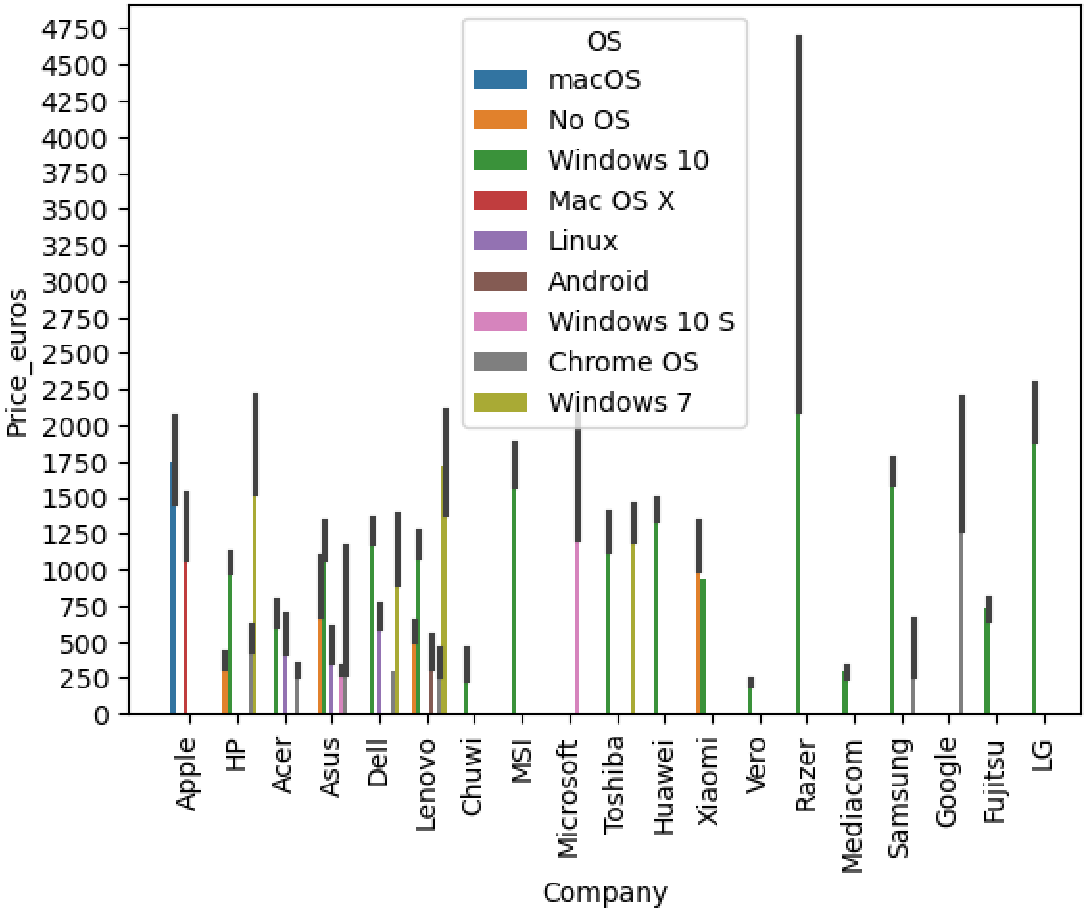


```
[42]: screen = data.groupby(by='Screen')['Price_euros'].mean().reset_index()
      ax=sb.barplot(x='Screen',y='Price_euros',data=screen,errwidth=0)
      ax.bar_label(ax.containers[0])
```

```
[42]: [Text(0, 0, '2424.76'),
       Text(0, 0, '1231.2'),
       Text(0, 0, '1616.95'),
       Text(0, 0, '730.325')]
```

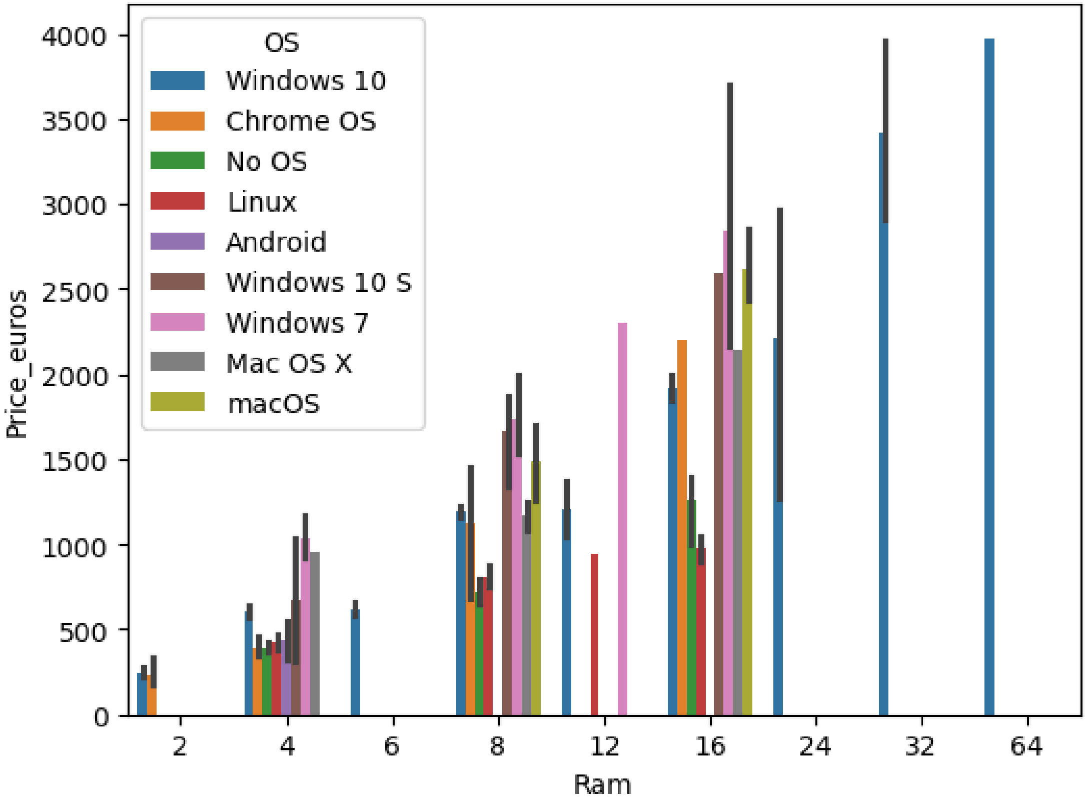


[43]:
```
sb.barplot(x='Company',y='Price_euros',data=data,hue=data['OS'])
plt.xticks(rotation=90)
plt.locator_params(nbins=20)
```



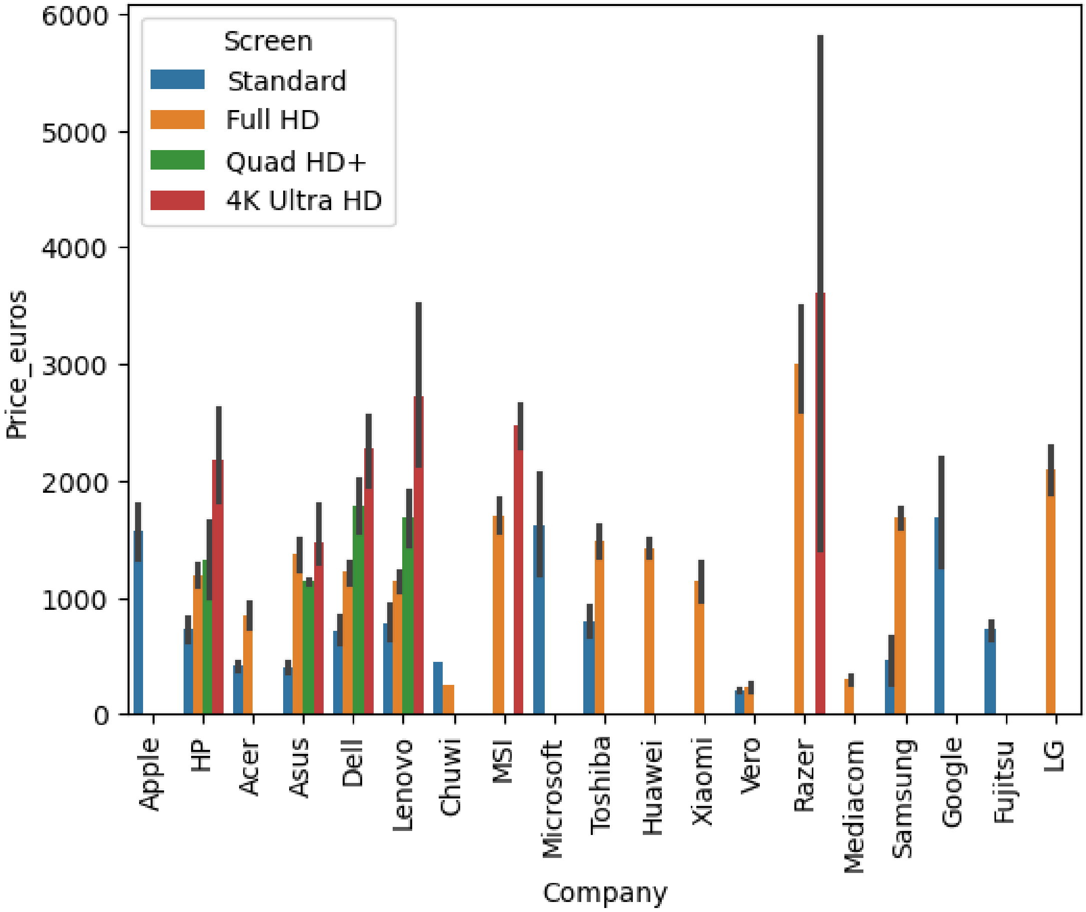
```
[44]: sb.barplot(x='Ram',y='Price_euros',data=data,hue='OS')
```

```
[44]: <Axes: xlabel='Ram', ylabel='Price_euros'>
```



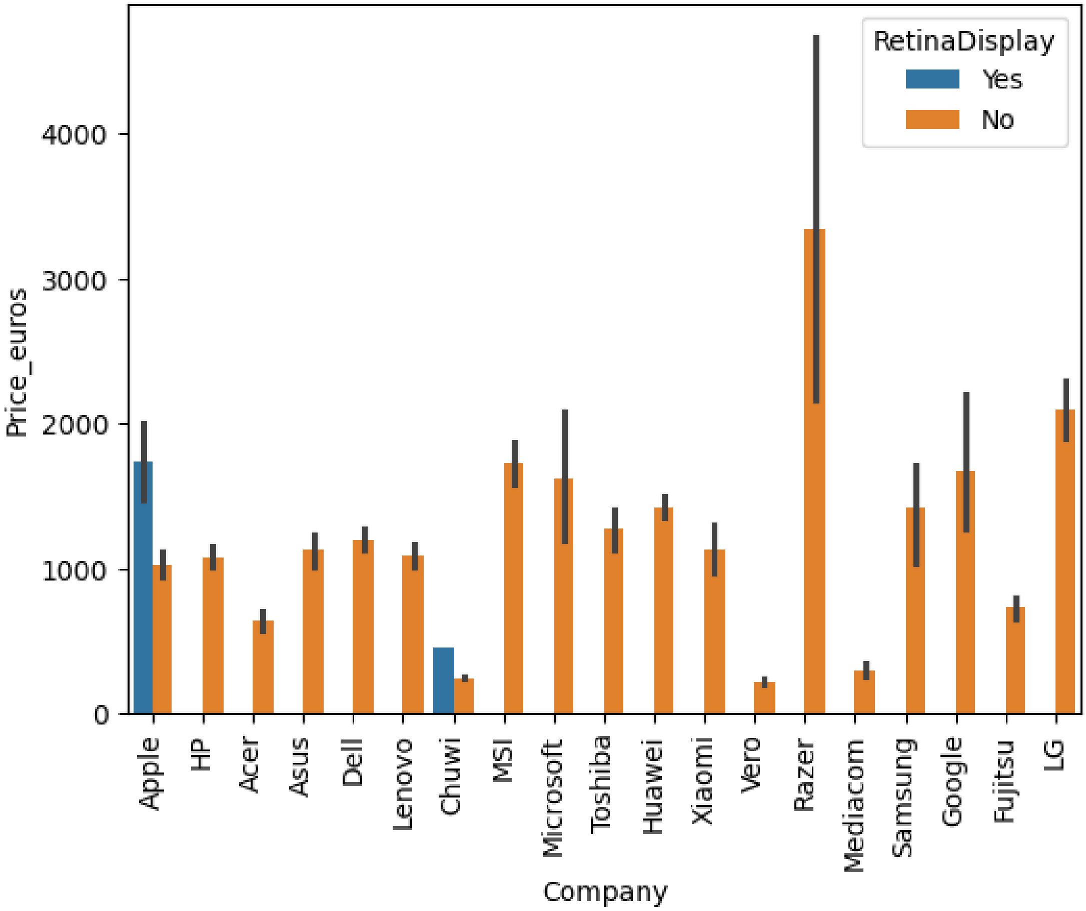
```
[45]: sb.barplot(x='Company',y='Price_euros',data=data,hue='Screen')
      plt.xticks(rotation=90)
```

```
[45]: ([0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18],
       [Text(0, 0, 'Apple'),
        Text(1, 0, 'HP'),
        Text(2, 0, 'Acer'),
        Text(3, 0, 'Asus'),
        Text(4, 0, 'Dell'),
        Text(5, 0, 'Lenovo'),
        Text(6, 0, 'Chuwi'),
        Text(7, 0, 'MSI'),
        Text(8, 0, 'Microsoft'),
        Text(9, 0, 'Toshiba'),
        Text(10, 0, 'Huawei'),
        Text(11, 0, 'Xiaomi'),
        Text(12, 0, 'Vero'),
        Text(13, 0, 'Razer'),
        Text(14, 0, 'Mediacom'),
        Text(15, 0, 'Samsung'),
        Text(16, 0, 'Google'),
        Text(17, 0, 'Fujitsu'),
        Text(18, 0, 'LG')])
```



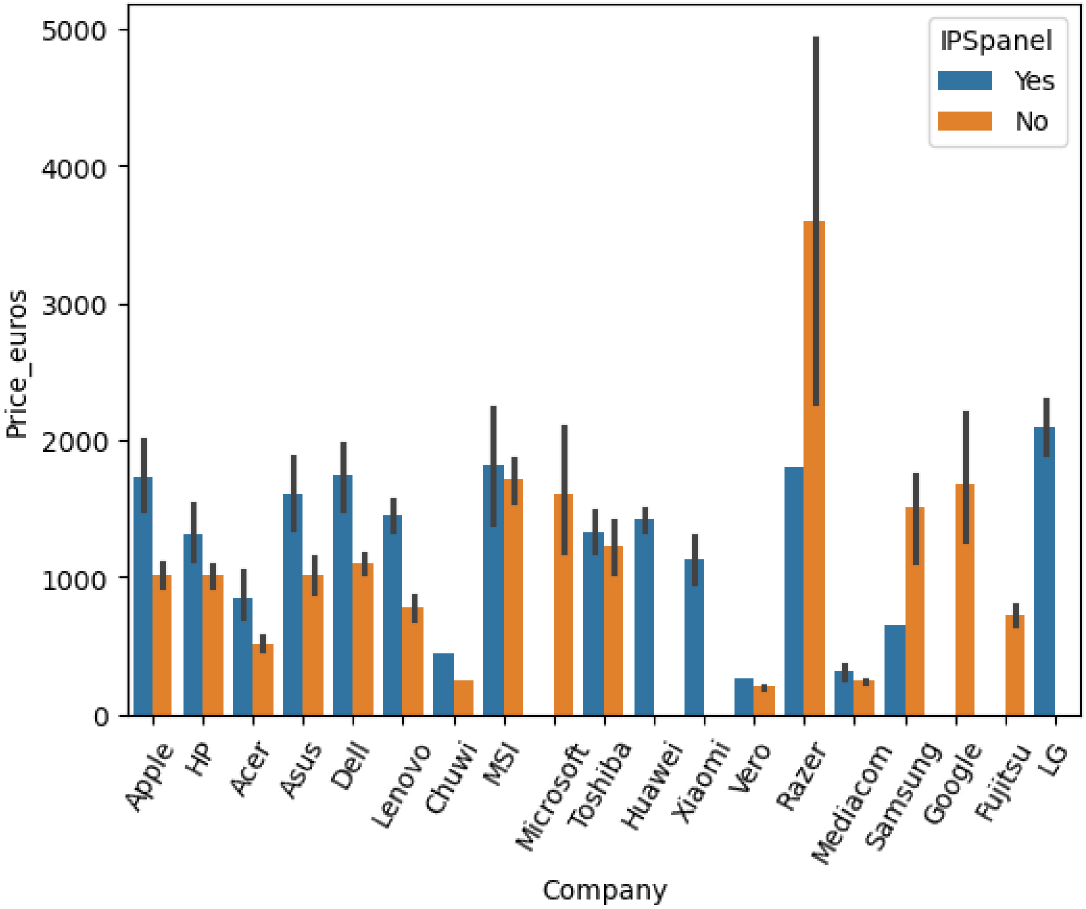
[46]:
```
sb.barplot(x='Company',y='Price_euros',data=data,hue='RetinaDisplay')
plt.xticks(rotation=90)
```

[46]:
```
([0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18],
 [Text(0, 0, 'Apple'),
  Text(1, 0, 'HP'),
  Text(2, 0, 'Acer'),
  Text(3, 0, 'Asus'),
  Text(4, 0, 'Dell'),
  Text(5, 0, 'Lenovo'),
  Text(6, 0, 'Chuwi'),
  Text(7, 0, 'MSI'),
  Text(8, 0, 'Microsoft'),
  Text(9, 0, 'Toshiba'),
  Text(10, 0, 'Huawei'),
  Text(11, 0, 'Xiaomi'),
  Text(12, 0, 'Vero'),
  Text(13, 0, 'Razer'),
  Text(14, 0, 'Mediacom'),
  Text(15, 0, 'Samsung'),
  Text(16, 0, 'Google'),
  Text(17, 0, 'Fujitsu'),
  Text(18, 0, 'LG')])
```



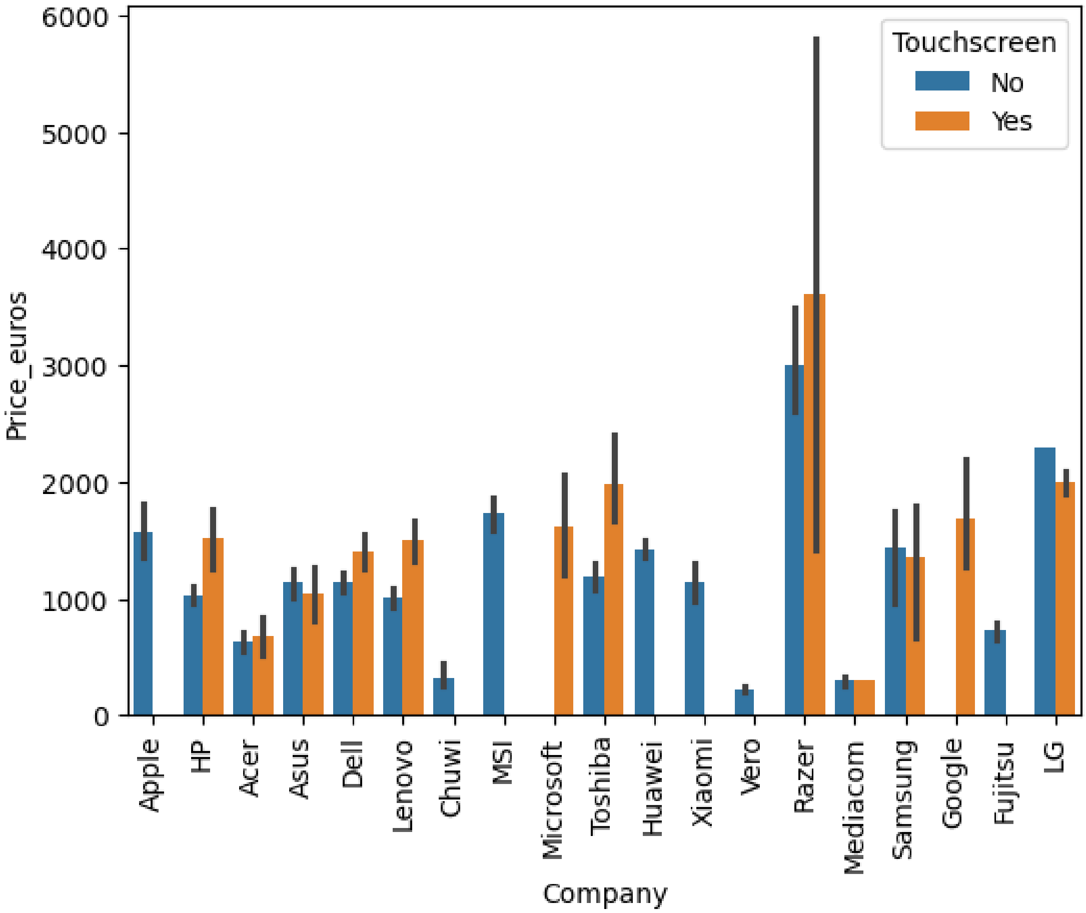
[47]:
```
sb.barplot(x='Company',y='Price_euros',data=data,hue='IPSpanel')
plt.xticks(rotation=60)
```

[47]:
```
([0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18],
 [Text(0, 0, 'Apple'),
  Text(1, 0, 'HP'),
  Text(2, 0, 'Acer'),
  Text(3, 0, 'Asus'),
  Text(4, 0, 'Dell'),
  Text(5, 0, 'Lenovo'),
  Text(6, 0, 'Chuwi'),
  Text(7, 0, 'MSI'),
  Text(8, 0, 'Microsoft'),
  Text(9, 0, 'Toshiba'),
  Text(10, 0, 'Huawei'),
  Text(11, 0, 'Xiaomi'),
  Text(12, 0, 'Vero'),
  Text(13, 0, 'Razer'),
  Text(14, 0, 'Mediacom'),
  Text(15, 0, 'Samsung'),
  Text(16, 0, 'Google'),
  Text(17, 0, 'Fujitsu'),
  Text(18, 0, 'LG')])
```



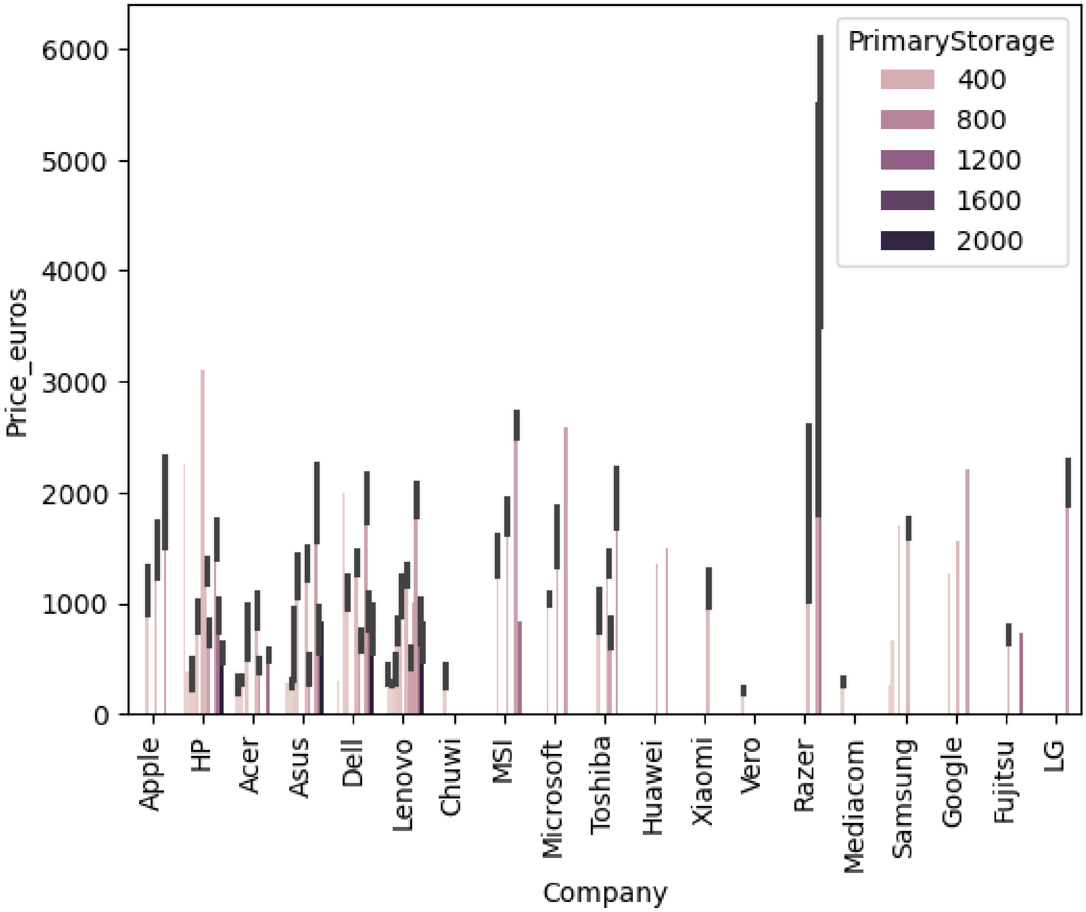
[48]:
```
sb.barplot(x='Company',y='Price_euros',data=data,hue='Touchscreen')
plt.xticks(rotation=90)
```

```
[48]: ([0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18],
       [Text(0, 0, 'Apple'),
        Text(1, 0, 'HP'),
        Text(2, 0, 'Acer'),
        Text(3, 0, 'Asus'),
        Text(4, 0, 'Dell'),
        Text(5, 0, 'Lenovo'),
        Text(6, 0, 'Chuwi'),
        Text(7, 0, 'MSI'),
        Text(8, 0, 'Microsoft'),
        Text(9, 0, 'Toshiba'),
        Text(10, 0, 'Huawei'),
        Text(11, 0, 'Xiaomi'),
        Text(12, 0, 'Vero'),
        Text(13, 0, 'Razer'),
        Text(14, 0, 'Mediacom'),
        Text(15, 0, 'Samsung'),
        Text(16, 0, 'Google'),
        Text(17, 0, 'Fujitsu'),
        Text(18, 0, 'LG')])
```



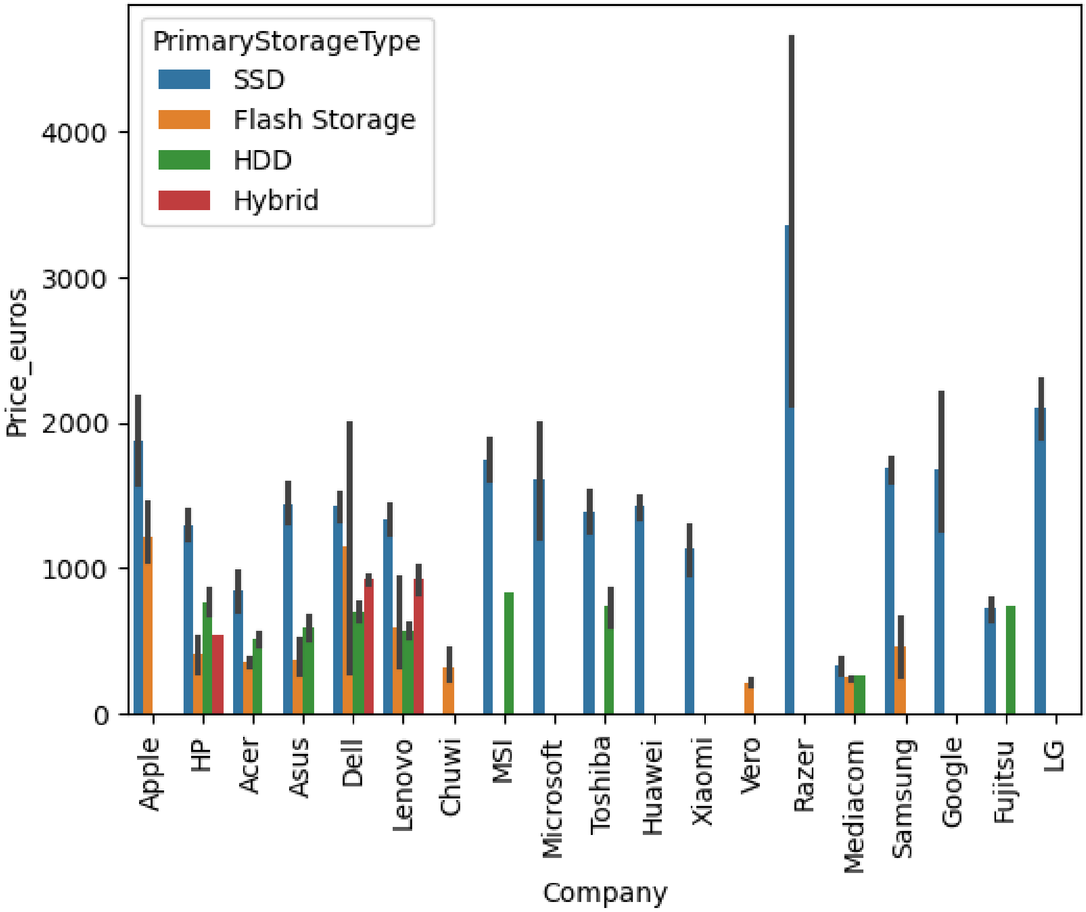
```
[49]: sb.barplot(x='Company',y='Price_euros',data=data,hue='PrimaryStorage')
      plt.xticks(rotation=90)
```

```
[49]: ([0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18],
       [Text(0, 0, 'Apple'),
        Text(1, 0, 'HP'),
        Text(2, 0, 'Acer'),
        Text(3, 0, 'Asus'),
        Text(4, 0, 'Dell'),
        Text(5, 0, 'Lenovo'),
        Text(6, 0, 'Chuwi'),
        Text(7, 0, 'MSI'),
        Text(8, 0, 'Microsoft'),
        Text(9, 0, 'Toshiba'),
        Text(10, 0, 'Huawei'),
        Text(11, 0, 'Xiaomi'),
        Text(12, 0, 'Vero'),
        Text(13, 0, 'Razer'),
        Text(14, 0, 'Mediacom'),
        Text(15, 0, 'Samsung'),
        Text(16, 0, 'Google'),
        Text(17, 0, 'Fujitsu'),
        Text(18, 0, 'LG')])
```



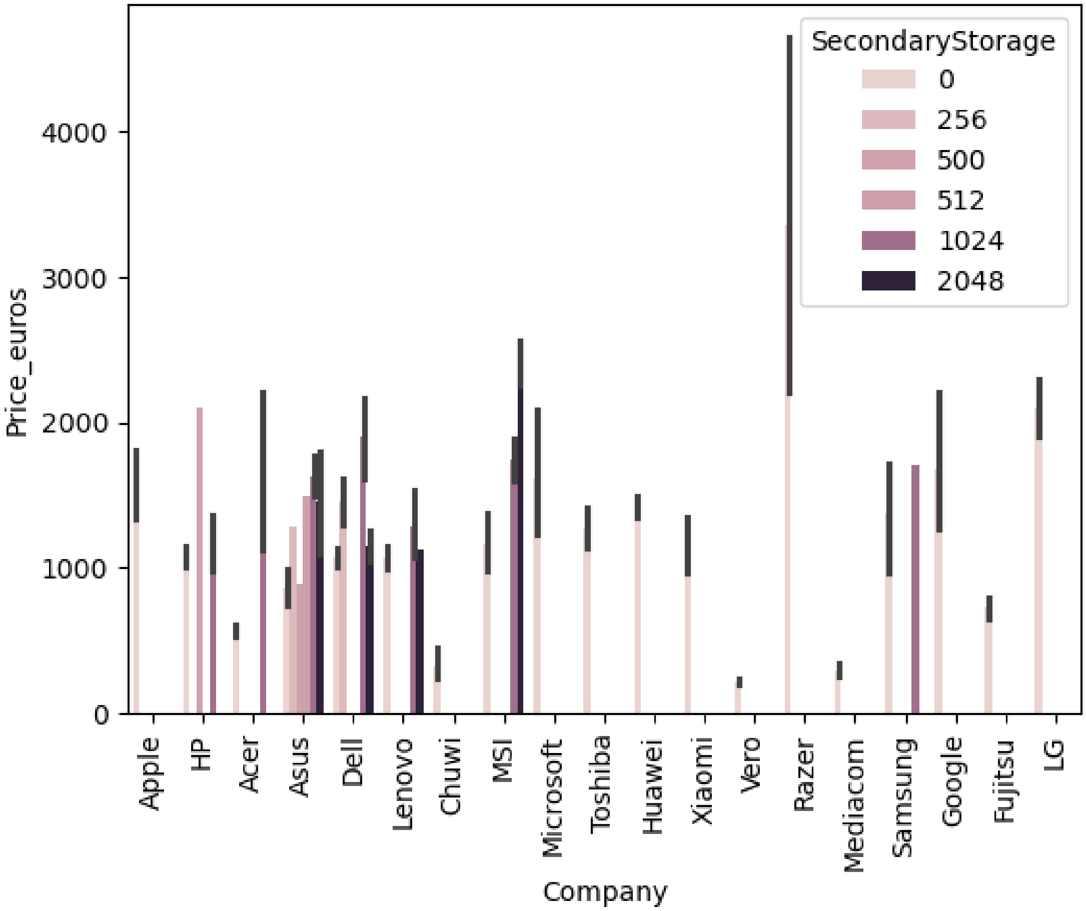
[50]:
```
sb.barplot(x='Company',y='Price_euros',data=data,hue='PrimaryStorageType')
plt.xticks(rotation=90)
```

[50]:
```
([0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18],
 [Text(0, 0, 'Apple'),
  Text(1, 0, 'HP'),
  Text(2, 0, 'Acer'),
  Text(3, 0, 'Asus'),
  Text(4, 0, 'Dell'),
  Text(5, 0, 'Lenovo'),
  Text(6, 0, 'Chuwi'),
  Text(7, 0, 'MSI'),
  Text(8, 0, 'Microsoft'),
  Text(9, 0, 'Toshiba'),
  Text(10, 0, 'Huawei'),
  Text(11, 0, 'Xiaomi'),
  Text(12, 0, 'Vero'),
  Text(13, 0, 'Razer'),
  Text(14, 0, 'Mediacom'),
  Text(15, 0, 'Samsung'),
  Text(16, 0, 'Google'),
  Text(17, 0, 'Fujitsu'),
  Text(18, 0, 'LG')])
```



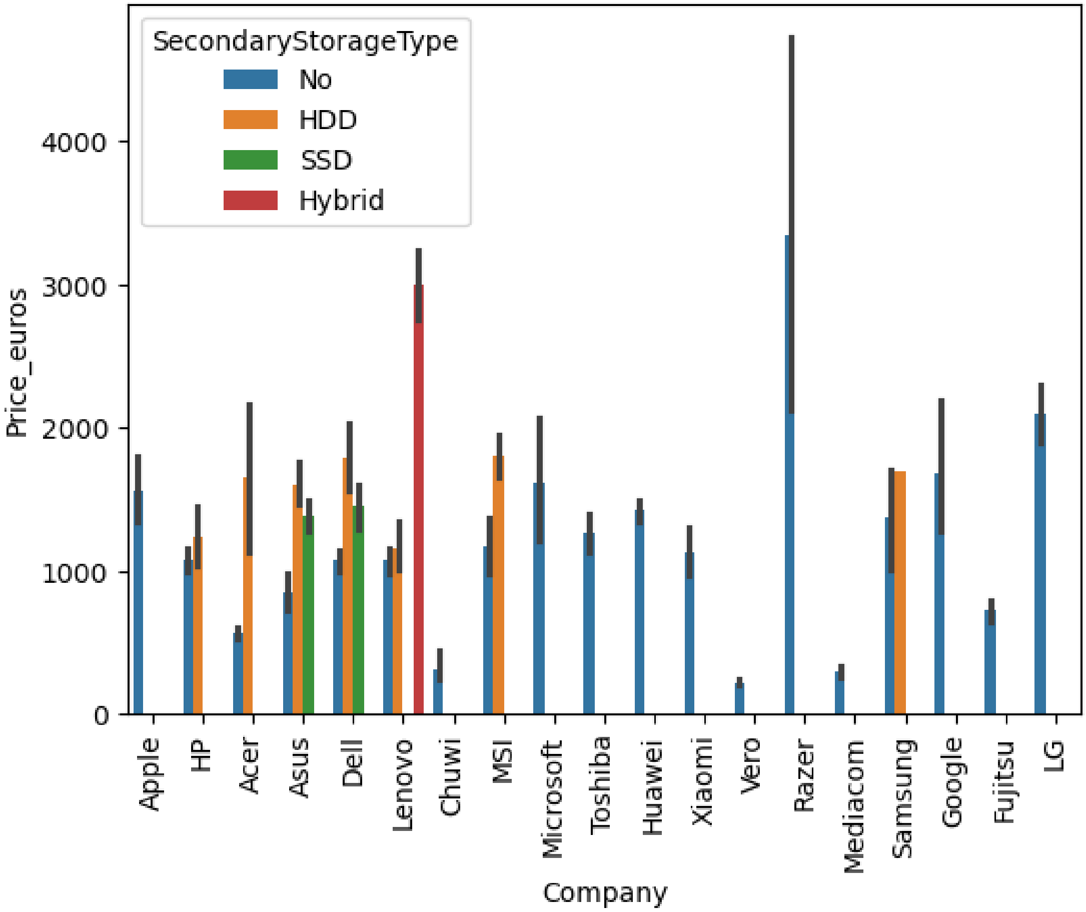
```
[51]: sb.barplot(x='Company',y='Price_euros',data=data,hue='SecondaryStorage')
      plt.xticks(rotation=90)
```

```
[51]: ([0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18],
       [Text(0, 0, 'Apple'),
        Text(1, 0, 'HP'),
        Text(2, 0, 'Acer'),
        Text(3, 0, 'Asus'),
        Text(4, 0, 'Dell'),
        Text(5, 0, 'Lenovo'),
        Text(6, 0, 'Chuwi'),
        Text(7, 0, 'MSI'),
        Text(8, 0, 'Microsoft'),
        Text(9, 0, 'Toshiba'),
        Text(10, 0, 'Huawei'),
        Text(11, 0, 'Xiaomi'),
        Text(12, 0, 'Vero'),
        Text(13, 0, 'Razer'),
        Text(14, 0, 'Mediacom'),
        Text(15, 0, 'Samsung'),
        Text(16, 0, 'Google'),
        Text(17, 0, 'Fujitsu'),
        Text(18, 0, 'LG')])
```



```
[52]: sb.barplot(x='Company',y='Price_euros',data=data,hue='SecondaryStorageType')
      plt.xticks(rotation=90)
```

```
[52]: ([0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18],
       [Text(0, 0, 'Apple'),
        Text(1, 0, 'HP'),
        Text(2, 0, 'Acer'),
        Text(3, 0, 'Asus'),
        Text(4, 0, 'Dell'),
        Text(5, 0, 'Lenovo'),
        Text(6, 0, 'Chuwi'),
        Text(7, 0, 'MSI'),
        Text(8, 0, 'Microsoft'),
        Text(9, 0, 'Toshiba'),
        Text(10, 0, 'Huawei'),
        Text(11, 0, 'Xiaomi'),
        Text(12, 0, 'Vero'),
        Text(13, 0, 'Razer'),
        Text(14, 0, 'Mediacom'),
        Text(15, 0, 'Samsung'),
        Text(16, 0, 'Google'),
        Text(17, 0, 'Fujitsu'),
        Text(18, 0, 'LG')])
```

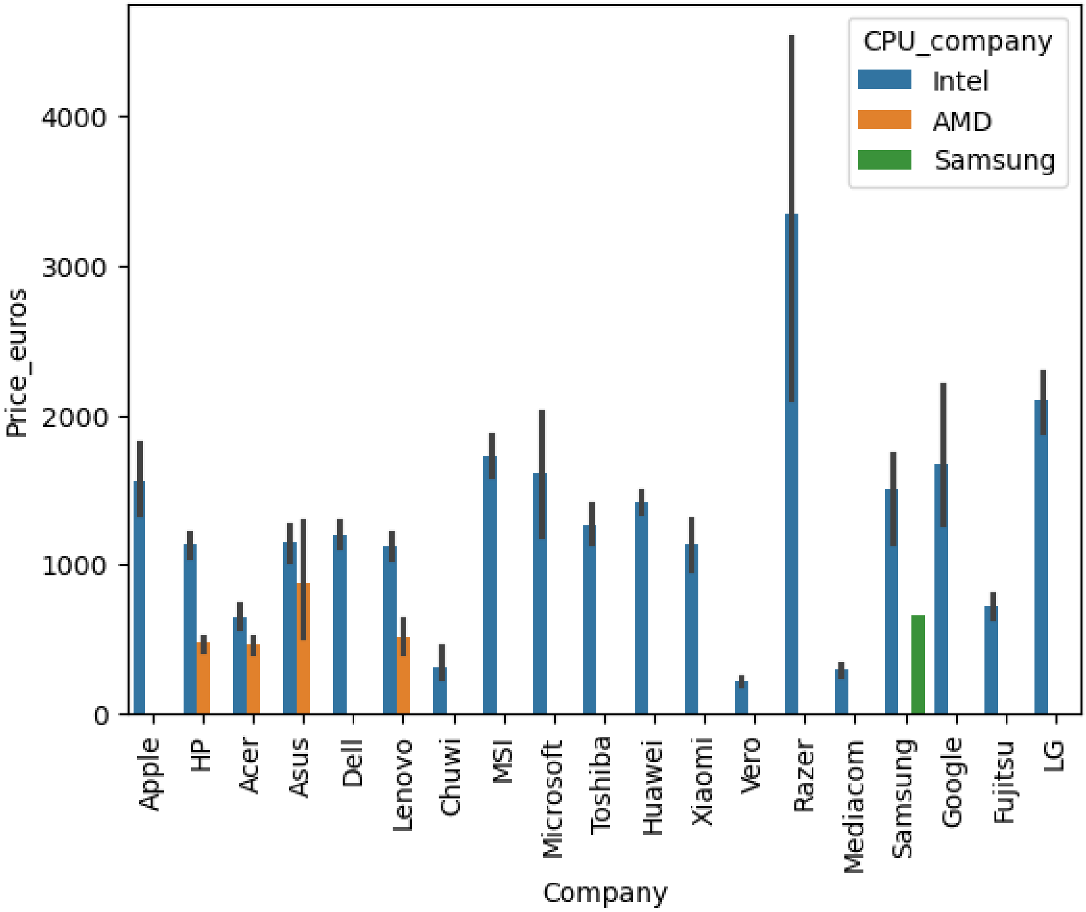


[53]:

```
sb.barplot(x='Company',y='Price_euros',data=data,hue='CPU_company')
plt.xticks(rotation=90)
```

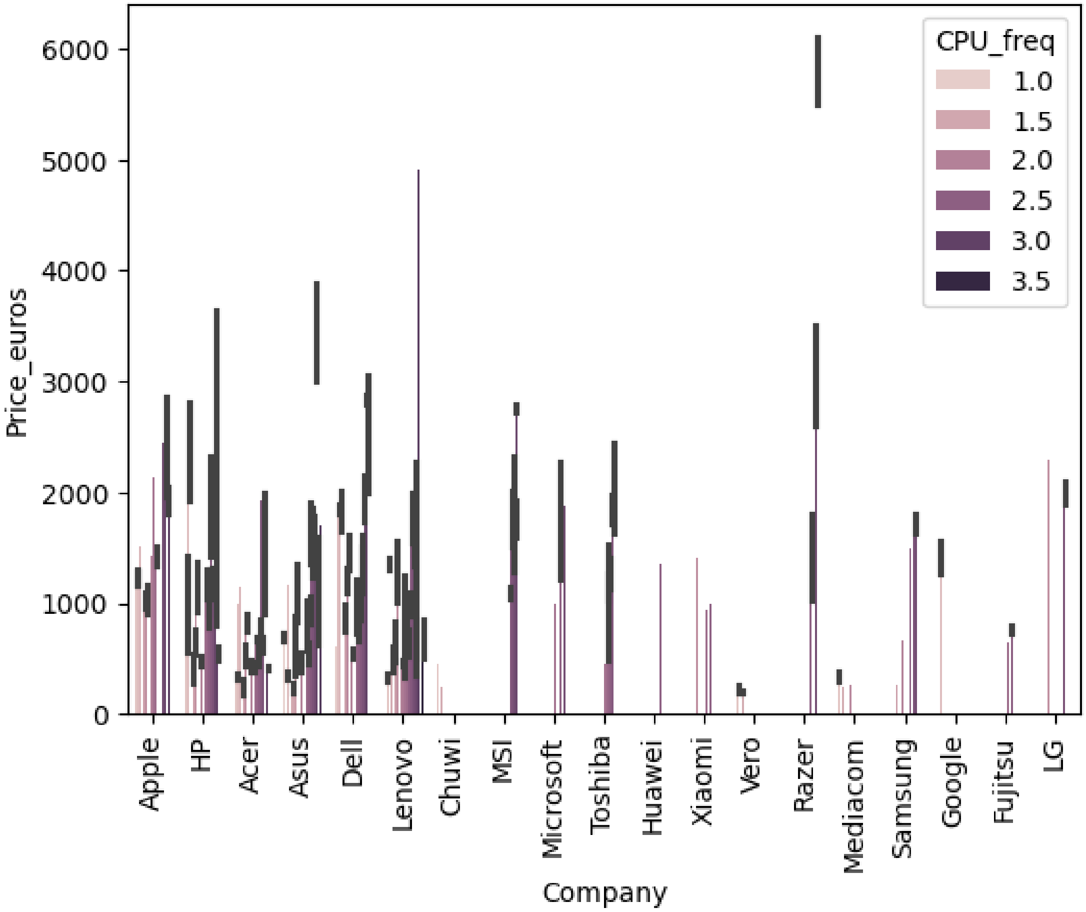
[53]:

```
([0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18],
 [Text(0, 0, 'Apple'),
  Text(1, 0, 'HP'),
  Text(2, 0, 'Acer'),
  Text(3, 0, 'Asus'),
  Text(4, 0, 'Dell'),
  Text(5, 0, 'Lenovo'),
  Text(6, 0, 'Chuwi'),
  Text(7, 0, 'MSI'),
  Text(8, 0, 'Microsoft'),
  Text(9, 0, 'Toshiba'),
  Text(10, 0, 'Huawei'),
  Text(11, 0, 'Xiaomi'),
  Text(12, 0, 'Vero'),
  Text(13, 0, 'Razer'),
  Text(14, 0, 'Mediacom'),
  Text(15, 0, 'Samsung'),
  Text(16, 0, 'Google'),
  Text(17, 0, 'Fujitsu'),
  Text(18, 0, 'LG')])
```



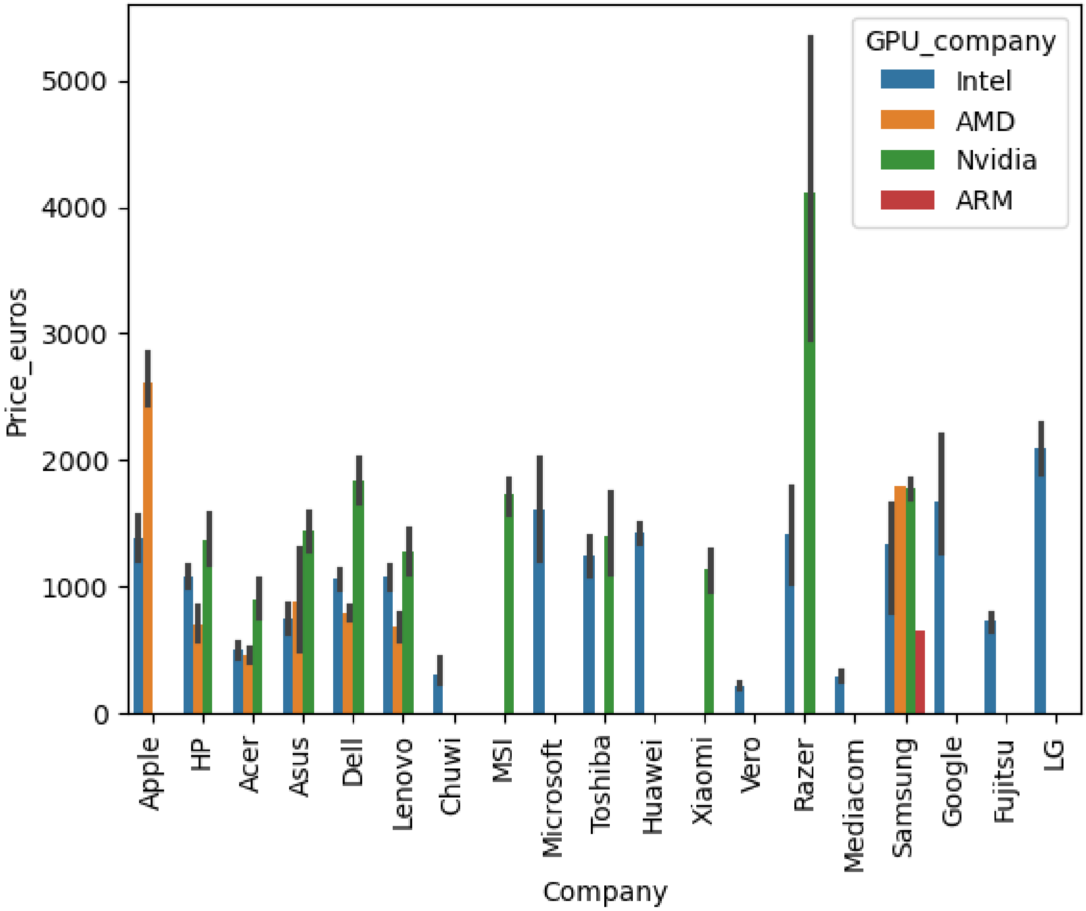
```
[54]: sb.barplot(x='Company',y='Price_euros',data=data,hue='CPU_freq')
      plt.xticks(rotation=90)
```

```
[54]: ([0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18],
       [Text(0, 0, 'Apple'),
        Text(1, 0, 'HP'),
        Text(2, 0, 'Acer'),
        Text(3, 0, 'Asus'),
        Text(4, 0, 'Dell'),
        Text(5, 0, 'Lenovo'),
        Text(6, 0, 'Chuwi'),
        Text(7, 0, 'MSI'),
        Text(8, 0, 'Microsoft'),
        Text(9, 0, 'Toshiba'),
        Text(10, 0, 'Huawei'),
        Text(11, 0, 'Xiaomi'),
        Text(12, 0, 'Vero'),
        Text(13, 0, 'Razer'),
        Text(14, 0, 'Mediacom'),
        Text(15, 0, 'Samsung'),
        Text(16, 0, 'Google'),
        Text(17, 0, 'Fujitsu'),
        Text(18, 0, 'LG')])
```



[55]:
```
sb.barplot(x='Company',y='Price_euros',data=data,hue='GPU_company')
plt.xticks(rotation=90)
```

[55]:
```
([0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18],
 [Text(0, 0, 'Apple'),
  Text(1, 0, 'HP'),
  Text(2, 0, 'Acer'),
  Text(3, 0, 'Asus'),
  Text(4, 0, 'Dell'),
  Text(5, 0, 'Lenovo'),
  Text(6, 0, 'Chuwi'),
  Text(7, 0, 'MSI'),
  Text(8, 0, 'Microsoft'),
  Text(9, 0, 'Toshiba'),
  Text(10, 0, 'Huawei'),
  Text(11, 0, 'Xiaomi'),
  Text(12, 0, 'Vero'),
  Text(13, 0, 'Razer'),
  Text(14, 0, 'Mediacom'),
  Text(15, 0, 'Samsung'),
  Text(16, 0, 'Google'),
  Text(17, 0, 'Fujitsu'),
  Text(18, 0, 'LG')])
```



```
[56]: def recommend_products(budget):
          # Filter products within the budget
          affordable_products = data[data['Price_euros'] <= budget]

          # Sort the affordable products by the company in descending order
          top_products = affordable_products.sort_values(by='Company').head(10)
```

```python
    return top_products[['Company', 'TypeName', 'Product']]
```

[57]:

```python
budget = int(input("Please enter your budget: "))
```

```
Please enter your budget:  250
```

[58]:

```python
recommendations = recommend_products(budget)
print("Top 10 recommended products within your budget:")
print(recommendations)
```

```
Top 10 recommended products within your budget:
     Company  TypeName                               Product
1215    Acer   Netbook      C740-C9QX (3205U/2GB/32GB/Chrome
290     Acer  Notebook                   Chromebook C910-C2ST
1102    Acer  Notebook                          Chromebook 15
20      Asus   Netbook                        Vivobook E200HA
31      Asus  Notebook  E402WA-GA010T (E2-6110/2GB/32GB/W10)
515     Asus   Netbook                           VivoBook E12
555     Asus  Notebook  A541NA-GO342 (N3350/4GB/500GB/Linux)
30     Chuwi  Notebook                          LapBook 15.6"
483    Chuwi  Notebook                           Lapbook 15,6
67        HP  Notebook                      Stream 14-AX040wm
```

[59]:

```python
def recommend_products(budget):
    # Filter products within the budget
    affordable_products1 = data[data['RetinaDisplay'] == 'Yes']

    # Sort the affordable products by the company
    top_products = affordable_products1.sort_values(by='Company').head(10)

    return top_products[['Company', 'TypeName','Product']]
```

[60]:

```python
budget = int(input("Please enter your budget: "))
```

```
Please enter your budget:  350
```

[61]:

```python
recommendations1 = recommend_products(budget)
print("Top 10 recommended products within your budget:")
print(recommendations1)
```

```
Top 10 recommended products within your budget:
     Company   TypeName      Product
0      Apple  Ultrabook  MacBook Pro
1069   Apple  Ultrabook  MacBook 12"
794    Apple  Ultrabook  MacBook 12"
270    Apple  Ultrabook  MacBook Pro
249    Apple  Ultrabook  MacBook Pro
81     Apple  Ultrabook  MacBook 12"
```

```
1193   Apple  Ultrabook  MacBook 12"
45     Apple  Ultrabook  MacBook Pro
15     Apple  Ultrabook  MacBook Pro
14     Apple  Ultrabook  MacBook 12"
```