In [1]:
```
import pandas as pd
import matplotlib.pyplot as plt
```

In [2]:
```
# 1. Load the data
data_file = 'LEGO Analytics Case Data.xlsx'
df = pd.read_excel(data_file)
```

In [19]:
```
# 2. Inspect and clean column names
print("Original columns:", df.columns.tolist())

#Rename columns for consistency
df = df.rename(columns={
    'Set #': 'SetID',
    'Piece Count': 'PieceCount',
    '# of Minifigures': 'Minifigures',
    'US Retail Price ($)': 'Price'
})
```

```
Original columns: ['SetID', 'Name', 'Theme', 'Subtheme', 'Release Mo
nth (US)', 'PieceCount', 'Minifigures', 'Length (in.)', 'Width (i
n.)', 'Height (in.)', 'Weight (lb.)', 'Price', 'price_per_piece']
```

In [28]:
```
# 3. Compute price-per-piece
df['price_per_piece'] = df['Price'] / df['PieceCount']
```

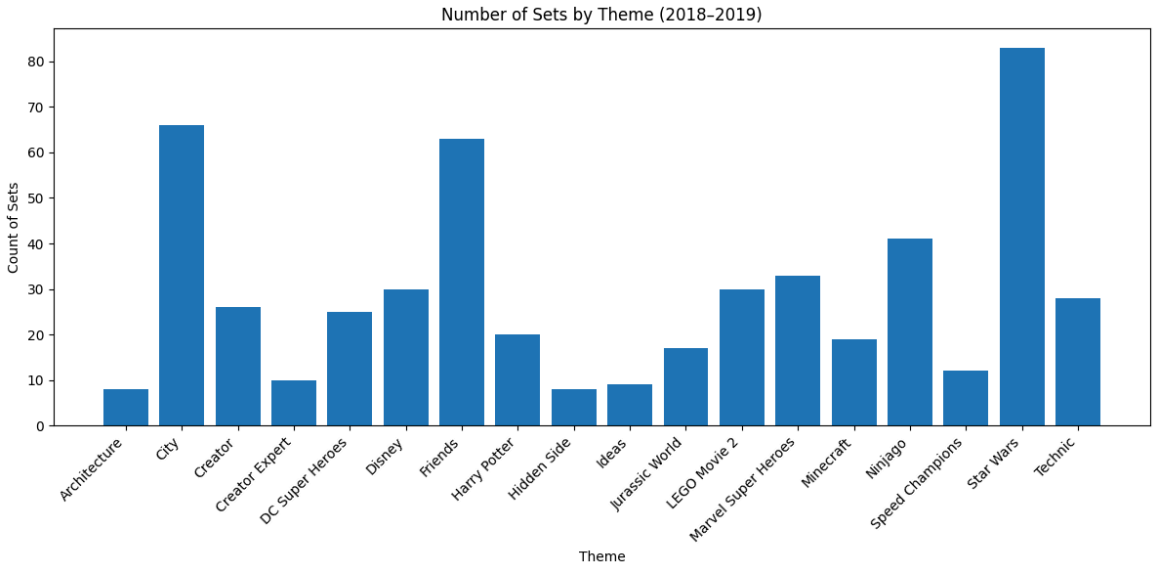
In [29]:
```
# 4. Define themes and subthemes
themes = [
  'Architecture','City','Creator','Creator Expert','DC Super Heroes',
  'Friends','Harry Potter','Hidden Side','Ideas','Jurassic World','LEG
  'Marvel Super Heroes','Minecraft','Ninjago','Speed Champions','Star
]
subthemes = ['Brickheadz', 'Juniors']
```

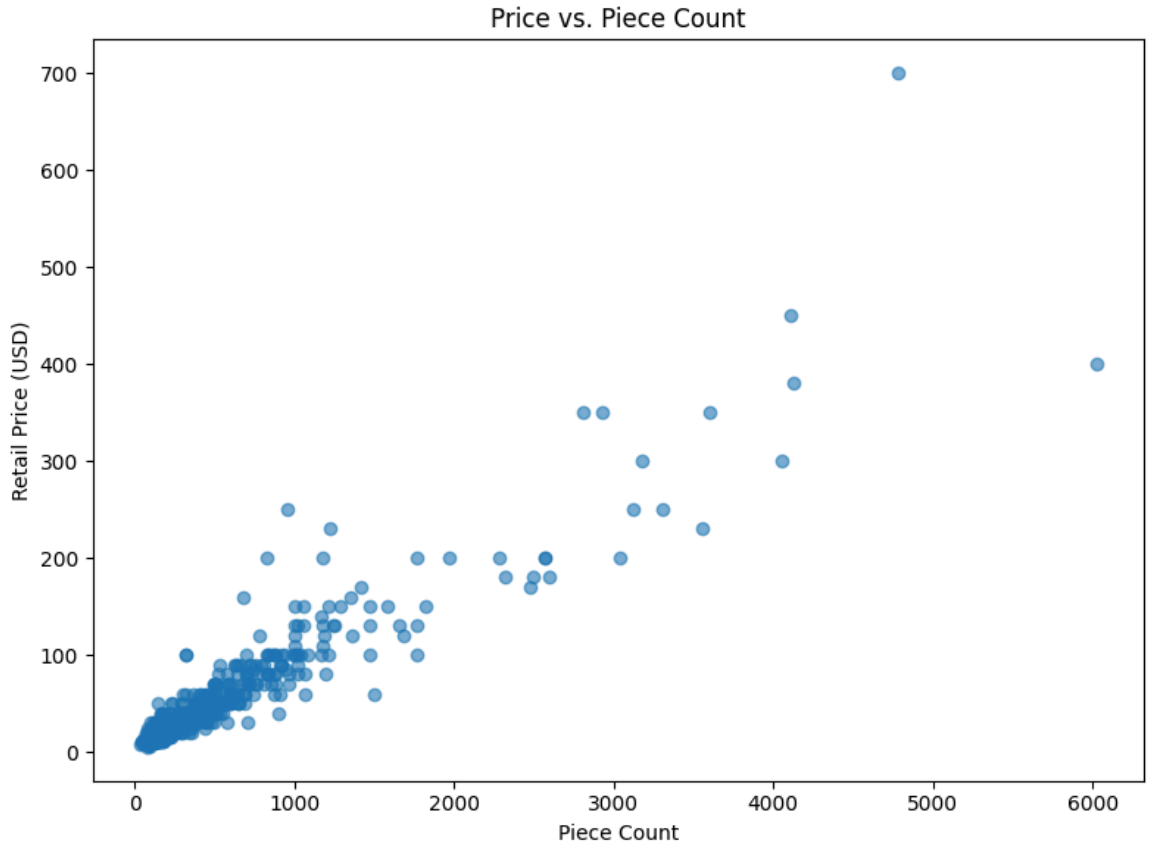
In [30]:
```
# 5. Filter data
df_theme = df[df['Theme'].isin(themes)].copy()
df_sub = df[df['Subtheme'].isin(subthemes)].copy()
```

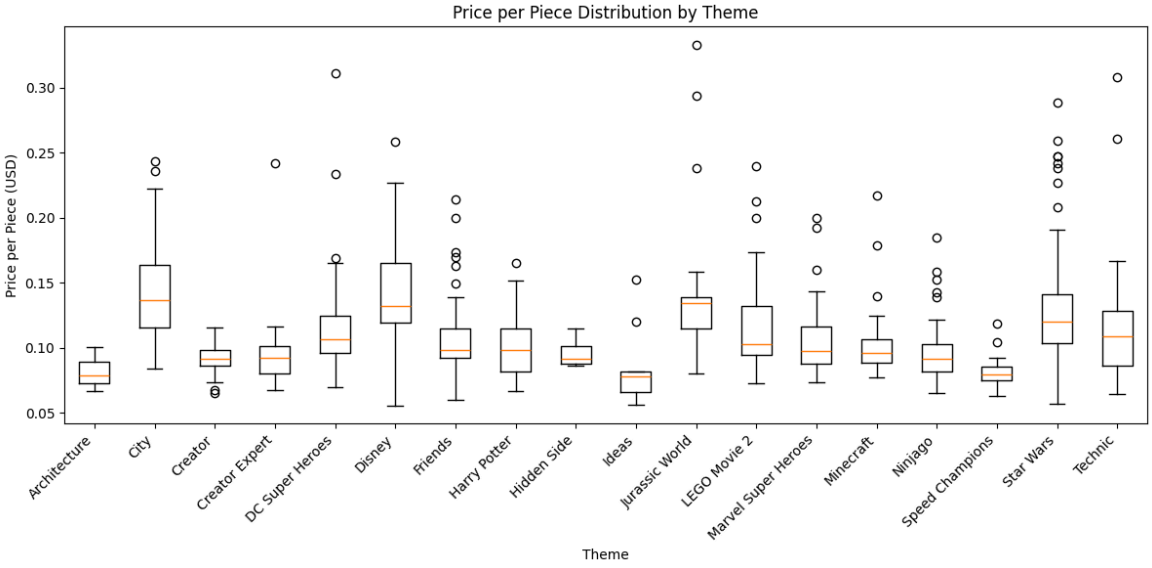
In [32]:
```
# 6. Descriptive summaries
theme_summary = df_theme.groupby('Theme').agg(
    set_count=('SetID', 'count'),
    avg_pieces=('PieceCount', 'mean'),
    avg_price=('Price', 'mean'),
    avg_price_per_piece=('price_per_piece', 'mean')
).reset_index()
sub_summary = df_sub.groupby('Subtheme').agg(
    set_count=('SetID', 'count'),
    avg_pieces=('PieceCount', 'mean'),
    avg_price=('Price', 'mean'),
    avg_price_per_piece=('price_per_piece', 'mean')
).reset_index()
print(theme_summary)
print(sub_summary)
```

```
                  Theme  set_count   avg_pieces   avg_price  \
0          Architecture          8   939.000000   72.490000
1                  City         66   339.969697   47.702121
2               Creator         26   353.884615   32.413077
3        Creator Expert         10  1751.300000  164.990000
4       DC Super Heroes         25   365.120000   37.790000
5                Disney         30   305.600000   38.990000
6               Friends         63   305.333333   31.021746
7          Harry Potter         20   693.000000   59.490000
8           Hidden Side          8   585.875000   54.990000
9                 Ideas          9  1209.666667   91.656667
10       Jurassic World         17   531.588235   61.460588
11         LEGO Movie 2         30   502.500000   51.156667
12  Marvel Super Heroes         33   351.939394   35.899091
13            Minecraft         19   309.631579   31.305789
14              Ninjago         41   531.073171   45.477805
15     Speed Champions          12   309.500000   27.490000
16            Star Wars         83   496.686747   59.809277
17              Technic         28  1134.500000  114.990000

    avg_price_per_piece
0              0.081017
1              0.144326
2              0.091032
3              0.104207
4              0.120602
5              0.142399
6              0.107266
7              0.102435
8              0.096347
9              0.085756
10             0.151350
11             0.121284
12             0.107500
13             0.108282
14             0.098294
15             0.083072
16             0.127478
17             0.119666
     Subtheme  set_count  avg_pieces  avg_price  avg_price_per_piece
0  Brickheadz         54  174.648148  13.508519             0.081197
1     Juniors         39  127.025641  24.605385             0.196361
```

In [35]:
```
# 7. Visualizations

# a) Number of sets by theme
plt.figure(figsize=(12,6))
plt.bar(theme_summary['Theme'], theme_summary['set_count'])
plt.title('Number of Sets by Theme (2018–2019)')
plt.xlabel('Theme')
plt.ylabel('Count of Sets')
plt.xticks(rotation=45, ha='right')
plt.tight_layout()
plt.savefig('sets_by_theme.png')
plt.show()
plt.close()

# b) Price vs. Piece Count scatter
plt.figure(figsize=(8,6))
plt.scatter(df['PieceCount'], df['Price'], alpha=0.6)
plt.title('Price vs. Piece Count')
plt.xlabel('Piece Count')
plt.ylabel('Retail Price (USD)')
plt.tight_layout()
plt.savefig('price_vs_pieces.png')
plt.show()
plt.close()

# c) Price-per-Piece boxplot by theme
plt.figure(figsize=(12,6))
box_data = [df_theme[df_theme['Theme']==t]['price_per_piece'] for t in
plt.boxplot(box_data)
plt.xticks(ticks=range(1,len(themes)+1), labels=themes, rotation=45, h
plt.title('Price per Piece Distribution by Theme')
plt.xlabel('Theme')
plt.ylabel('Price per Piece (USD)')
plt.tight_layout()
plt.savefig('price_per_piece_by_theme.png')
plt.show()
plt.close()
```







In [36]:
```
# 8. Export summaries to CSV
theme_summary.to_csv('theme_summary.csv', index=False)
sub_summary.to_csv('subtheme_summary.csv', index=False)
```

In [ ]:
```

```