

Exploring the FDI Dynamices - Trend and Insights in OECD Countries

In this notebook we will explore the FDI (Foreign Direct Investment) inflow and outflow for OECD countries, focusing on data from United States , United Kingdom , Japan , Germany , France , Canada .

Data Visualization

- We will compare the inflow and outflow data for OECD countries and analyze the trends in FDI over the last 14 years.
- We will examine the net FDI by OECD countries during last 14 years and visualize the trend.
- We will also investigate FDI by industry in OECD countries for year 2023 .

Justification For Selecting Python Libraries Used For Analysis and Visualization

Lib	Utility	Installatin comand
glob	Unix path pattern	!pip install glob
pandas	Data analysis and manupulation	!pip install pandas
matplotlib	Visualization toolkit	!pip install matplotlib
seaborn	Visualization - abstraction layer on matplotlib	!pip install seaborn

glob

g lob is used to search for a specific file patten using wildcard charactors. Instead of hard coding the FDI files library is used to find all the file in dir which matches the file patten. It returns the list of files which can ge used for further processing.

pandas

pandas - pands is fast and very powerful library for data analysis and manipulation tool. It is tool for reading and writing data between in-memory and data structure using different format e.g. csv , excel and parquet

Matplotlib

Matplotlib is one of the oldest and matured plotting library for Python . It is extension of numerical mathematics extension [Numpy](https://numpy.org/doc/stable/index.html) . Matplotlib was originally writthe by John D. Hunter . It has very active development community and is disrtibuted under a BSD license. We will be using a seaborn lib for plotting which provides a abstraction layer on top of Matplotlib . It will be used to modify the seaborn plot properties.

seaborn

Seaborn is a Python data visualization library based on Matplotlib . It provides a high-level abstraction for drawing attractive and informative statistical graphics. Functions in the seaborn library expose declarative, data-oriented API that makes is easy to translate questions about data into graphics that can answer them. It provide extension options for customization and also exposing underlying matplotlib object.

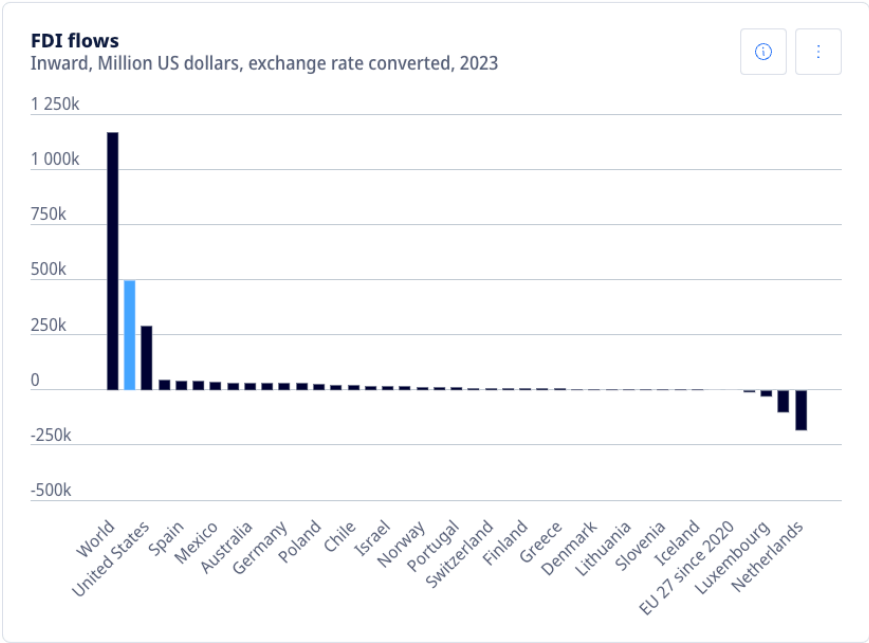
- We will be plotting line plot which helps find the trands and relationship between two variable.
- We will plotting the bar chart to compare the data among OECD FDI data and find out the net FDI for individual countries

Collectiong And Cleaning Data

Downloading the data

OECD FDI data is available [here](https://www.oecd.org/en/data/indicators/fdi-flows.html) .To download the data follow these instruction.

- In searchbox on the rightside select both Inward and Outward.
- Select the contries from the dropdown
- Click Yearly option form (yearly/Quarterly)
- on the left side chart click 3 virthical dot and download data as csv file.
- Select year from the scrollbar



Inward

Australia, Austria, Belgium, Canada, Chile, C...

Yearly

Quarterly

2023

Data cleaning and processing

- Read all the csv files and merge the data.
- Include only following countries data for analysis - United States, United Kingdom, Japan, Germany, France, Canada
- Calculate the Net FDI
- Update the Year column to dataset

```
In [1]: #Import libraries used for data enrichment and visualization
import glob
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
import numpy as np

In [2]: #file_pat - String - File path reject
#columns - List - Column names to read from underlying files
#countries - List - for countries to include in data analysis
#return - Pandas DataFrame
def FDI(file_pat , columns , countries):
    data = None
    files = sorted(glob.glob(file_pat))

    for f in files:
        df = pd.read_csv(f,names = columns , skiprows=2, header=0)
        df = df[df['COUNTRY'].isin(countries)]
        df[columns[1:]] = df[columns[1:]].apply(lambda x: x/1000) # Filter out the contries # FDI value convert to Billion
        df['NET'] = df['INWARD'] - df['OUTWARD'] # calculate Net FDI
        year = f.split('_')[1][4:]
        df['YEAR'] = year
        data = pd.concat([data,df])

    data = data.reset_index(drop=True)
    return data

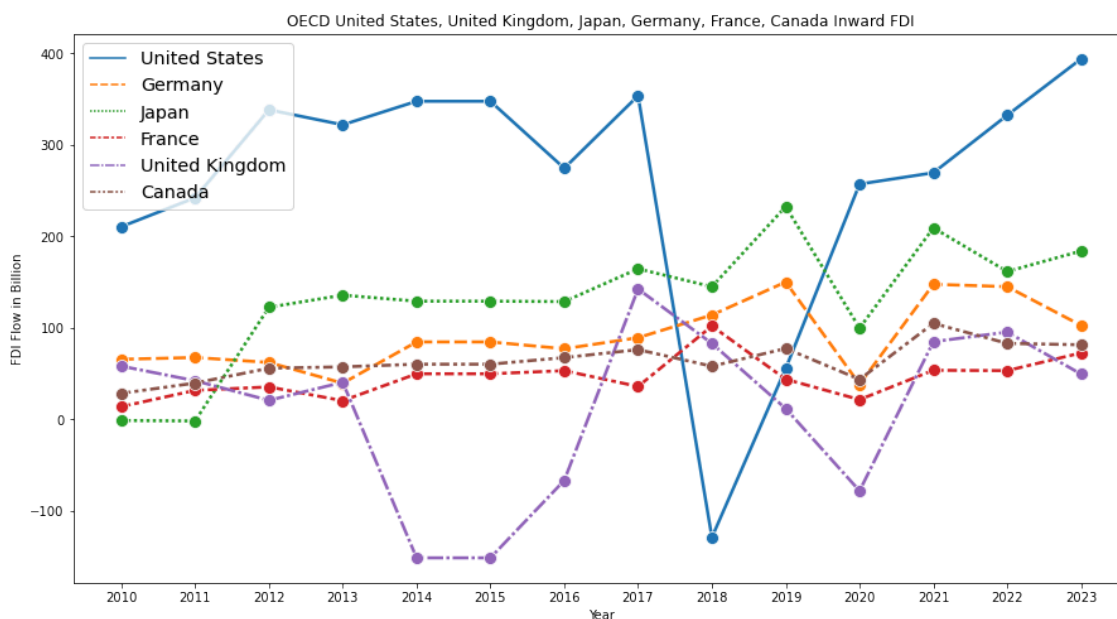
In [3]: columns = ['COUNTRY', 'OUTWARD','INWARD']
countries = ['United States', 'United Kingdom', 'Japan', 'Germany', 'France', 'Canada']
con_str = ', '.join(countries) # jo

# get all the file list with prefix FDI in dir OECD
data = FDI('OECD/FDI*.csv', columns, countries)
```

Analyse the FDI Flow Data Since 2010 – 2023 for OECD countries

Inward FDI Flow

```
In [4]: fig = plt.subplots(figsize = (15,8))
sns.lineplot(x = 'YEAR', y = 'INWARD', data = data, hue = 'COUNTRY',
             style = 'COUNTRY', linewidth = 2.5, marker = 'o', markersize = 10).set(
    title = 'OECD ' + con_str + ' Inward FDI', xlabel = 'Year', ylabel = 'FDI Flow in Billion')
plt.legend(fontsize='x-large', loc='upper left')
plt.show()
```

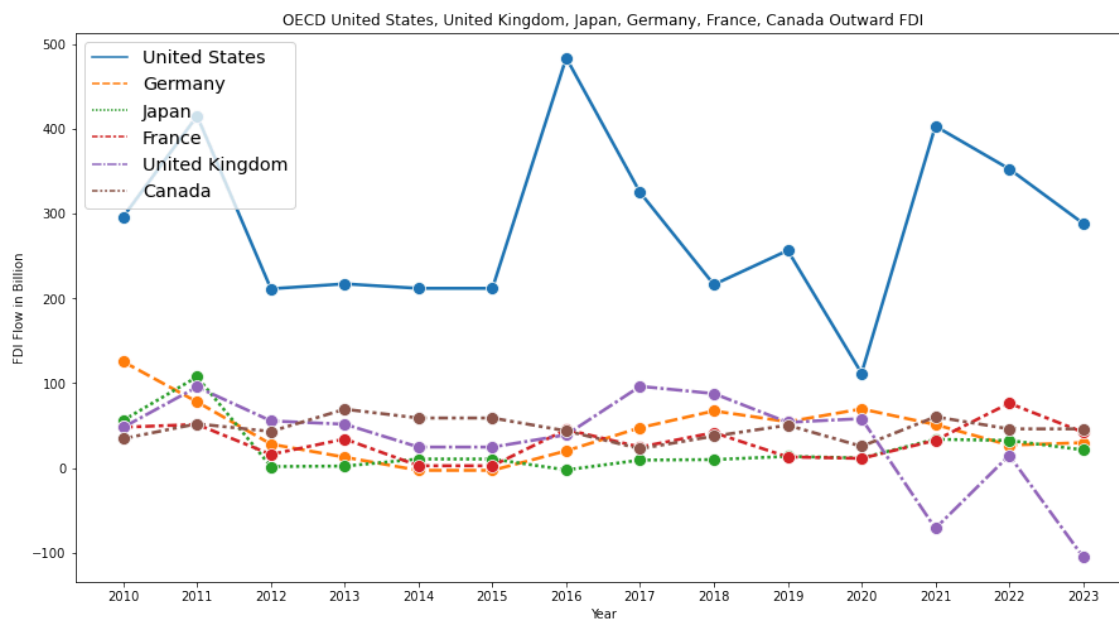


Lineplot Visualization Result

- Data indicates that FDI inflow to United states expernced a sharp decline in 2018 . For further details please follow the [link \(https://cepr.org/voxeu/columns/recent-fall-fdi-flows-us\)](https://cepr.org/voxeu/columns/recent-fall-fdi-flows-us).
- In the United Kingdom FDI inflow was negative in 2014, 2015 , 2016 and 2020 . Further readings are available [here \(https://www.ons.gov.uk/economy/nationalaccounts/balanceofpayments/bulletins/foreigndirectinvestmentinvolvingukcompanies/2014#:~:text=Summary,%C2%A356.7%20bi\)](https://www.ons.gov.uk/economy/nationalaccounts/balanceofpayments/bulletins/foreigndirectinvestmentinvolvingukcompanies/2014#:~:text=Summary,%C2%A356.7%20bi)
- Japan maintained a steady inward FDI flow even during covid pandemic in 2020 .

Outward FDI Flow

```
In [5]: fig, ax = plt.subplots(figsize = (15,8))
sns.lineplot(x = 'YEAR', y = 'OUTWARD', data = data, hue = 'COUNTRY',
             style = 'COUNTRY', linewidth = 2.5, marker = 'o', markersize = 10).set(
             title = 'OECD ' + con_str + ' Outward FDI', xlabel = 'Year', ylabel = 'FDI Flow in Billion')
plt.legend(fontsize='x-large', loc='upper left')
plt.show()
```

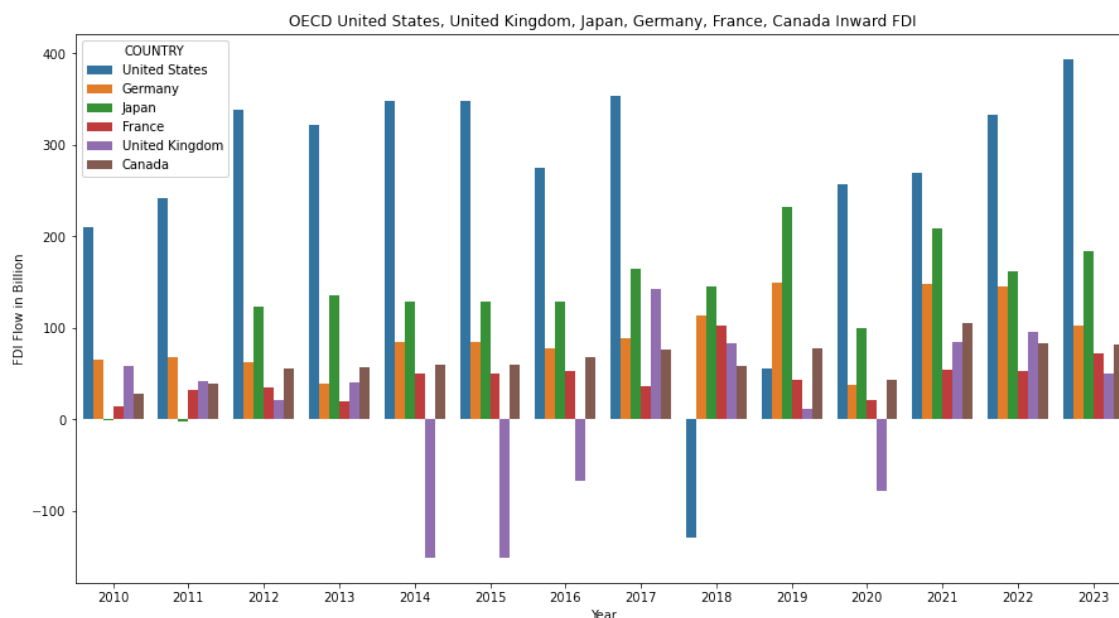


Lineplot Visualization Trend

- Data indicate that Outward flow from United Kingdom to other countries is declining since 2020.
- Japan outflow is consistent since 2012.

Compare Inward FDI for OECD Countries Since 2010 – 2023

```
In [6]: fig = plt.subplots(figsize = (15,8))
sns.barplot(data=data, x="YEAR", y="INWARD", hue="COUNTRY").set(
         title = 'OECD ' + con_str + ' Inward FDI', xlabel = 'Year', ylabel = 'FDI Flow in Billion')
plt.show()
```

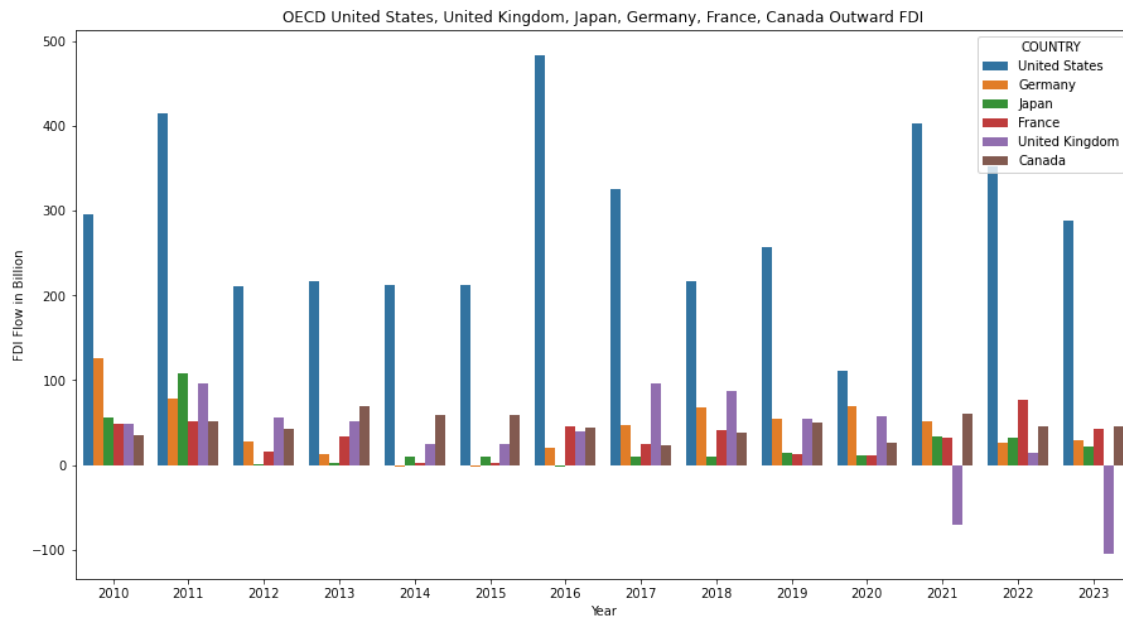


Illustrate Findings

- Plot indicate that United States has consistent and highest FDI inflow, only exception is year 2018 when United States has negative FDI inflow compared to 2017.
- Japan has received second highest FDI inflow starting 2012 to 2023.

Compare Outward FDI for OEDC Countries since 2010 – 2023

```
In [12]: fig = plt.subplots(figsize = (15,8))
sns.barplot(data=data, x="YEAR", y="OUTWARD", hue="COUNTRY" ).set(
    title = 'OECD ' + con_str + ' Outward FDI' , xlabel = 'Year', ylabel = 'FDI Flow in Billion')
plt.show()
```



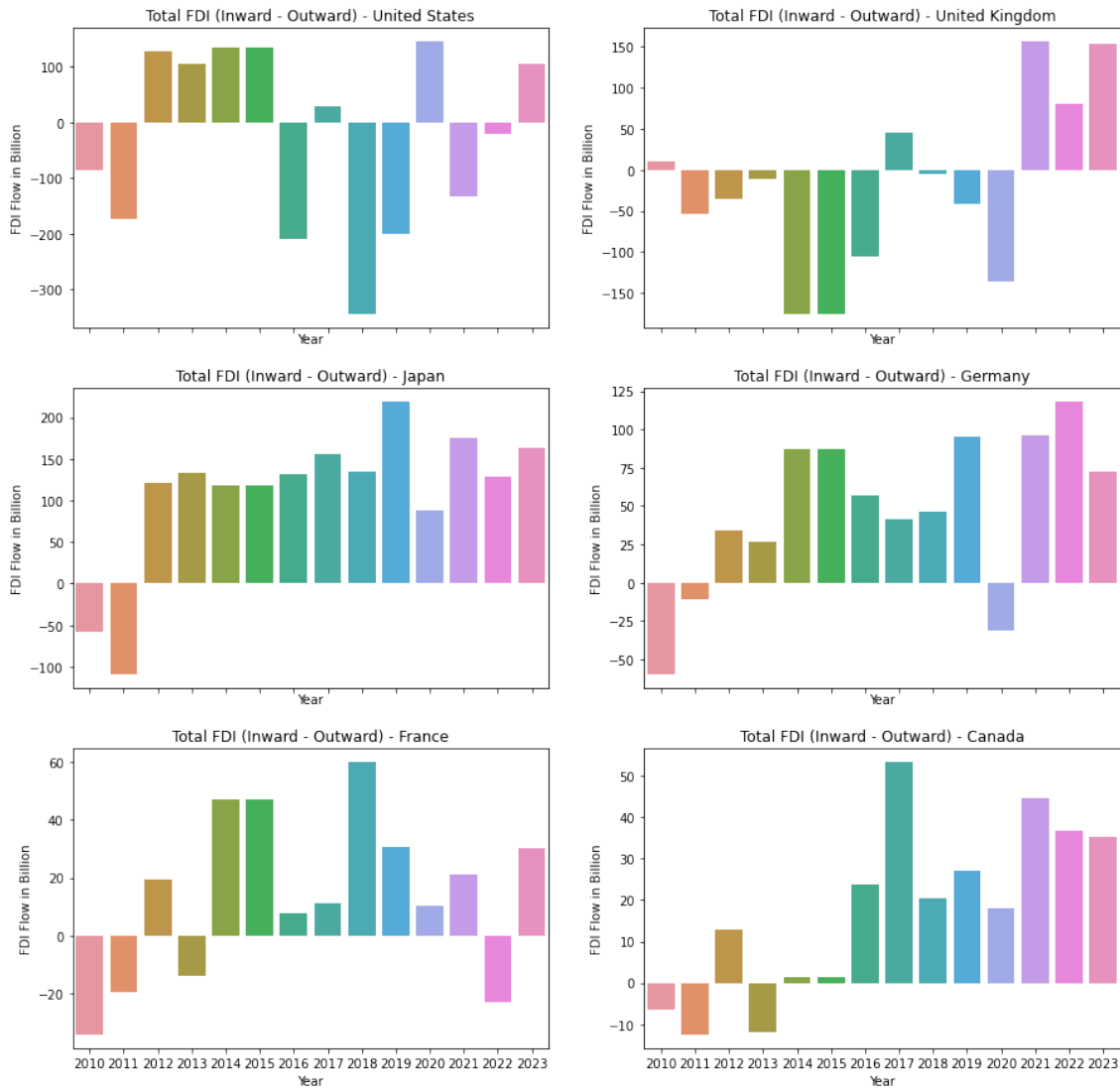
Graph Result

- Highest FDI outflow is also from United States .
- FDI outflow from United Kingdom has fallen since 2021 compare to other countries.

Net FDI Flow In OECD Countries Since 2010 – 2023

```
In [13]: i, j, row, col = 0, 0, 3, 2
fig, ax = plt.subplots(3, 2, figsize=(15, 15), sharex=True)

for c in countries:
    g = sns.barplot(data=data[data['COUNTRY'] == c], x="YEAR", y="NET", ax=ax[i, j]).set(
        title = 'Total FDI (Inward - Outward) - ' + c, xlabel = 'Year', ylabel = 'FDI Flow in Billion')
    if j+1 >= col:
        j = 0
        i += 1
    else:
        j += 1
```



Visualize Results

- Japan gets significant FDI investment then outflow after 2012.
- United Kingdom has FDI deficit most of year before 2020. In 2020 FDI outward reduced significantly hence net flow becomes positive.

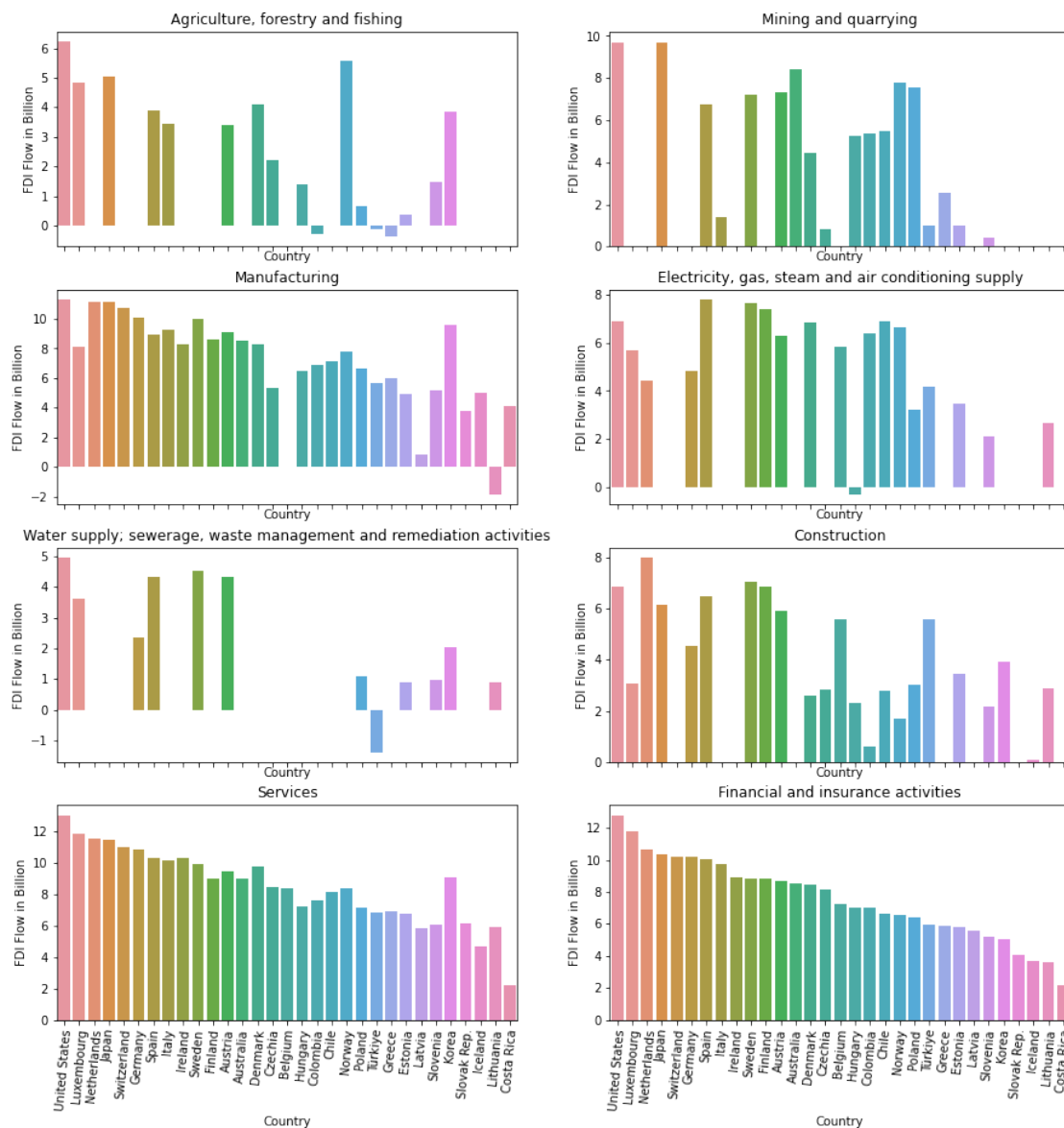
Visualizing the OECD FDI Data By Industry

```
In [14]: # load the OECD FDI by industry data for 2023
country_missing_values = ['Canada', 'Portugal', 'France']
df_ind = pd.read_csv('OECD/FDI_IND23.csv', skiprows=2)
df_ind = df_ind.rename(columns = {'Category': 'COUNTRY'})
df_ind = df_ind[~df_ind['COUNTRY'].isin(country_missing_values)]
```

```
In [16]: columns = df_ind.columns.values[1:]
i, j, row, col = 0, 0, int(len(columns)/2), 2

fig, ax = plt.subplots(row, col, figsize=(15, 15), sharex=True)

for c in columns:
    df_ind[c] = df_ind[c].apply(np.log)
    sns.barplot(data = df_ind, x = "COUNTRY", y = c, ax = ax[i,j]).set(
        title = c, xlabel = 'Country', ylabel = 'FDI Flow in Billion')
    ax[i, j].tick_params(axis='x', rotation=85)
    if j+1 >= col:
        j = 0
        i += 1
    else:
        j += 1
```



Illustrate Findings

- Finance and Technology/Services are the industries attracting FDI across OEDC countries.
- Water Supply and Waste Management Industry gets least investmet across OEDC countries.

```
In [ ]: print
```