india-trade-3

April 16, 2024

0.1 Introduction

- Historical Growth in Exports: From 1950-51 to 2003-04, India's merchandise exports grew from USD 1.3 billion to USD 63.8 billion, with an annual growth rate of 7.6%.
- Post-Liberalization Progress: After economic reforms began in 1991, Indian exports grew faster than global demand, indicating improved competitiveness of Indian products.
- Trade Policy Changes Since 1991:

Simplified procedures. Removal of quantitative restrictions. Significant reductions in tariff rates. Growth in Export of Services: The 1990s saw remarkable growth in the export of services such as IT and telecommunications, thanks to liberalization.

- Impact of Economic Reforms:

Introduced transparency, openness, and integration with global markets. Focused on liberalization and globalization.

- Factors Influencing Trade Growth:

Dependent on global trade dynamics, especially with key trading partners. Affected by international price changes and developments in competitor countries. Influenced by exchange rate movements, especially between the Indian rupee and the US dollar.

0.2 Objective

The main objective of this notebook is to examine the trends in India s exports and import in terms of value and to examine the structural changes in composition of India s exports amd import.

0.3 Importing Packages and Collecting Data

[146]:
```
'''Ignore deprecation and future, and user warnings.'''
import warnings as wrn
wrn.filterwarnings('ignore', category = DeprecationWarning)
wrn.filterwarnings('ignore', category = FutureWarning)
wrn.filterwarnings('ignore', category = UserWarning)

'''Import basic modules.'''
import pandas as pd
import numpy as np
from scipy import stats
```

```
'''Customize visualization
Seaborn and matplotlib visualization.'''
from plotnine import *
import matplotlib.pyplot as plt
import seaborn as sns
sns.set_style("whitegrid")

'''Plotly visualization .'''
import plotly.offline as py
from plotly.offline import iplot, init_notebook_mode
import plotly.graph_objs as go
init_notebook_mode(connected = True) # Required to use plotly offline in␣
 ↪jupyter notebook

'''Display markdown formatted output like bold, italic bold etc.'''
from IPython.display import Markdown
def bold(string):
    display(Markdown(string))
```

[147]:
```
'''Read in export and import data from CSV file'''
df_export = pd.read_csv('/kaggle/input/india-trade-data/2010_2021_HS2_export.
 ↪csv')
df_import = pd.read_csv('/kaggle/input/india-trade-data/2010_2021_HS2_import.
 ↪csv')
```

[149]:
```
print(df_export.shape)
print(df_import.shape)
```

```
(184755, 5)
(101051, 5)
```

[150]:
```
'''Export and Import data at a glance.'''
bold('**Preview of Export Data:**')
display(df_export.sample(n=5))
bold('**Preview of Import Data:**')
display(df_import.sample(n=5))
```

Preview of Export Data:

	HSCode	Commodity	value	country	year
56740	13	LAC; GUMS, RESINS AND OTHER VEGETABLE SAPS AND…	7.64		
146937	59	IMPREGNATED, COATED, COVERED OR LAMINATED TEXT…	0.00		
148967	64	FOOTWEAR, GAITERS AND THE LIKE; PARTS OF SUCH …	20.57		
171093	22	BEVERAGES, SPIRITS AND VINEGAR.	1.20		
65007	34	SOAP, ORGANIC SURFACE-ACTIVE AGENTS, WASHING P…	NaN		

```
56740   SOUTH AFRICA  2013
146937       NAMIBIA  2019
148967        RUSSIA  2019
171093  BURKINA FASO  2021
65007     GUADELOUPE  2014
```

Preview of Import Data:

```
       HSCode                                              Commodity  value  \
42042      47  PULP OF WOOD OR OF OTHER FIBROUS CELLULOSIC MA…   1.62
13961       1                                  LIVE ANIMALS.    NaN
95434      19  PREPARATIONS OF CEREALS, FLOUR, STARCH OR MILK…   0.00
9553       19  PREPARATIONS OF CEREALS, FLOUR, STARCH OR MILK…   1.80
39514      95  TOYS, GAMES AND SPORTS REQUISITES; PARTS AND A…    NaN

           country  year
42042      AUSTRIA  2015
13961  PHILIPPINES  2011
95434    HONG KONG  2021
9553    CHINA P RP  2011
39514   SAUDI ARAB  2014
```

In both the files we have 5 columns each are HSCode, Commodity, value, country, year.

0.3.1 What is an HS Code?

HSCode:- HS stands for Harmonized System. It was developed by the WCO (World Customs Organization) as a multipurpose international product nomenclature that describes the type of good that is shipped.

0.3.2 HS Code Structure

The HS code can be described as follows: * It is a six-digit identification code. * It has 5000 commodity groups. * Those groups have 99 chapters. * Those chapters have 21 sections. * It's arranged in a legal and logical structure. * Well-defined rules support it to realize uniform classification worldwide * HSCode List

0.3.3 What is Commodity?

In economics, a commodity is defined as a tangible good that can be bought and sold or exchanged for products of similar value. Natural resources such as oil as well as basic foods like corn are two common types of commodities. Like other classes of assets such as stocks, commodities have value and can be traded on open markets. And like other assets, commodities can fluctuate in price according to supply and demand.

- **Value**: values for export and import of commodities in million US $.
- **Export**: Exports are the goods and services produced in one country and purchased by residents of another country.

- **Import**: Imports are foreign goods and services bought by residents of a country. Residents include citizens, businesses, and the government.
- **Country**: Country Imported From/ Exported To
- **Year**: Year in which comodities where Imported/Exported which is in between 2010 to 2018.

[151]:
```
'''Variable Description'''
def description(df):
    summary = pd.DataFrame(df.dtypes,columns=['dtypes'])
    summary = summary.reset_index()
    summary['Name'] = summary['index']
    summary = summary[['Name','dtypes']]
    summary['Missing'] = df.isnull().sum().values
    summary['Uniques'] = df.nunique().values
    summary['First Value'] = df.loc[0].values
    summary['Second Value'] = df.loc[1].values
    summary['Third Value'] = df.loc[2].values
    return summary
```

[152]:
```
bold('**Variable Description of export dataset:**')
display(description(df_export))

bold('**Variable Description of import dataset:**')
display(description(df_import))
```

Variable Description of export dataset:

	Name	dtypes	Missing	Uniques	First Value	Second Value	Third Value
0	HSCode	int64	0	98	2	3	4
1	Commodity	object	0	98	MEAT AND EDIBLE MEAT OFFAL.	FISH AND CRUSTACEANS, MOLLUSCS AND OTHER AQUAT…	DAIRY PRODUCE; BIRDS' EGGS; NATURAL HONEY; EDI…
2	value	float64	19258	12944	1.4	0.08	3.89
3	country	object	0	249	AFGHANISTAN	AFGHANISTAN	AFGHANISTAN
4	year	int64	0	12	2010	2010	2010

Variable Description of import dataset:

```
        Name   dtypes  Missing  Uniques  \
0     HSCode    int64        0       98
1  Commodity   object        0       98
2      value  float64    15745    11062
3    country   object        0      243
4       year    int64        0       12

                                    First Value  \
0                                             7
1  EDIBLE VEGETABLES AND CERTAIN ROOTS AND TUBERS.
2                                          9.14
3                                     AFGHANISTAN
4                                            2010

                                     Second Value  \
0                                               8
1  EDIBLE FRUIT AND NUTS; PEEL OR CITRUS FRUIT OR…
2                                           93.82
3                                       AFGHANISTAN
4                                              2010

                    Third Value
0                             9
1  COFFEE, TEA, MATE AND SPICES.
2                          2.54
3                    AFGHANISTAN
4                           2010
```

0.4 Data preprocessing

[153]:
```
"""Let's see if export and import data contain the zero and NAN values """
bold('**Export Data with zeros:**')
display(df_export[df_export.value == 0].head(3))
bold('**Import Data with zeros:**')
display(df_import[df_import.value == 0].head(3))
bold('**Export Data with NAN:**')
display(df_export.isnull().sum())
bold('**Import Data with NAN:**')
display(df_import.isnull().sum())
```

Export Data with zeros:

```
    HSCode                                          Commodity  value  \
14      16  PREPARATIONS OF MEAT, OF FISH OR OF CRUSTACEAN…    0.0
21      23  RESIDUES AND WASTE FROM THE FOOD INDUSTRIES; P…    0.0
31      35  ALBUMINOIDAL SUBSTANCES; MODIFIED STARCHES; GL…    0.0

        country  year
```

```
14  AFGHANISTAN  2010
21  AFGHANISTAN  2010
31  AFGHANISTAN  2010
```

Import Data with zeros:

```
   HSCode                                             Commodity  value  \
5      16  PREPARATIONS OF MEAT, OF FISH OR OF CRUSTACEAN…    0.0
6      18                       COCOA AND COCOA PREPARATIONS.    0.0
9      27  MINERAL FUELS, MINERAL OILS AND PRODUCTS OF TH…    0.0

       country  year
5  AFGHANISTAN  2010
6  AFGHANISTAN  2010
9  AFGHANISTAN  2010
```

Export Data with NAN:

```
HSCode           0
Commodity        0
value        19258
country          0
year             0
dtype: int64
```

Import Data with NAN:

```
HSCode           0
Commodity        0
value        15745
country          0
year             0
dtype: int64
```

[154]:
```
df_import = df_import.dropna()
df_import['country'] = df_import['country'].replace({'U S A': 'USA'})
df_import['country'] = df_import['country'].replace({'SAUDI ARAB': 'SAUDI␣
 ↪ARABIA'})
df_import['country'] = df_import['country'].replace({'U K': 'UK'})
df_import = df_import.reset_index(drop=True)

df_export = df_export.dropna()
df_export['country'] = df_export['country'].replace({'U S A': 'USA'})
df_export['country'] = df_export['country'].replace({'SAUDI ARAB': 'SAUDI␣
 ↪ARABIA'})
df_export['country'] = df_export['country'].replace({'U K': 'UK'})
df_export = df_export.reset_index(drop=True)
```

0.5 1. Year Wise Analysis

[155]:
```
'''Coverting dataset in year wise'''
exp_year = df_export.groupby('year').agg({'value': 'sum'})
exp_year = exp_year.rename(columns={'value': 'Export'})
imp_year = df_import.groupby('year').agg({'value': 'sum'})
imp_year = imp_year.rename(columns={'value': 'Import'})

'''Calculating the growth of export and import'''
exp_year['Growth Rate(E)'] = exp_year.pct_change()
imp_year['Growth Rate(I)'] = imp_year.pct_change()

'''Calculating trade deficit'''
total_year = pd.concat([exp_year, imp_year], axis = 1)
total_year['Trade Deficit'] = exp_year.Export - imp_year.Import

bold('**Export/Import and Trade Balance of India**')
display(total_year)
bold('**Descriptive statistics**')
display(total_year.describe())
```

Export/Import and Trade Balance of India

year	Export	Growth Rate(E)	Import	Growth Rate(I)	Trade Deficit
2010	249801.18	NaN	369762.25	NaN	-119961.07
2011	305948.28	0.224767	489311.81	0.323315	-183363.53
2012	300384.32	-0.018186	490730.07	0.002898	-190345.75
2013	314388.61	0.046621	450192.99	-0.082606	-135804.38
2014	310321.02	-0.012938	448026.63	-0.004812	-137705.61
2015	262274.30	-0.154829	381000.97	-0.149602	-118726.67
2016	275835.27	0.051705	384350.29	0.008791	-108515.02
2017	303507.85	0.100323	465574.02	0.211327	-162066.17
2018	330058.64	0.087480	514071.33	0.104167	-184012.69
2019	313341.14	-0.050650	474701.75	-0.076584	-161360.61
2020	291789.46	-0.068780	394428.98	-0.169101	-102639.52
2021	421984.37	0.446195	613045.41	0.554261	-191061.04

Descriptive statistics

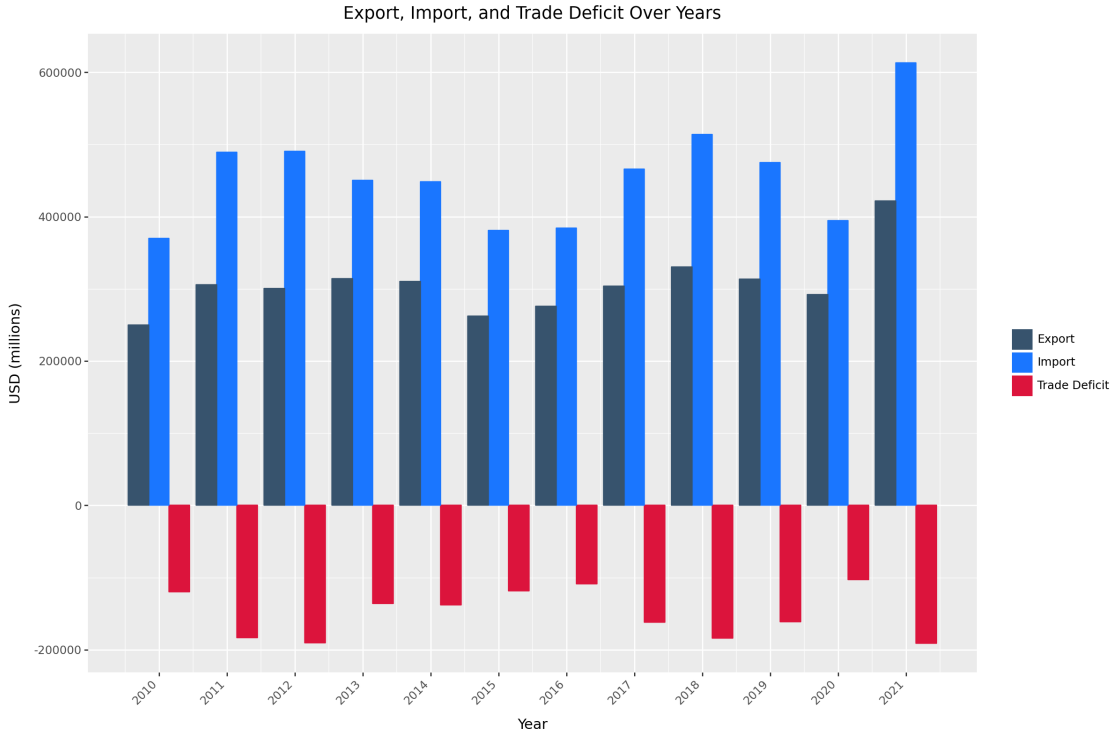
	Export	Growth Rate(E)	Import	Growth Rate(I)	\
count	12.000000	11.000000	12.000000	11.000000	
mean	306636.203333	0.059246	456266.375000	0.065641	
std	43052.939353	0.162889	69331.700692	0.219915	
min	249801.180000	-0.154829	369762.250000	-0.169101	
25%	287800.912500	-0.034418	391909.307500	-0.079595	
50%	304728.065000	0.046621	457883.505000	0.002898	
75%	313603.007500	0.093901	489666.375000	0.157747	
max	421984.370000	0.446195	613045.410000	0.554261	

```
       Trade Deficit
count      12.000000
mean  -149630.171667
std     33102.919639
min   -191061.040000
25%   -183525.820000
50%   -149533.110000
75%   -119652.470000
max   -102639.520000
```

0.5.1 Growth Rate:

Growth rates refer to the percentage change of a specific variable from its previous value. we calucate the annual growth rate. ### Trade Deficit: A trade deficit is an amount by which the cost of a country's imports exceeds the cost of its exports. It's one way of measuring international trade, and it's also called a negative balance of trade. You can calculate a trade deficit by subtracting the total value of a country's exports from the total value of its imports.

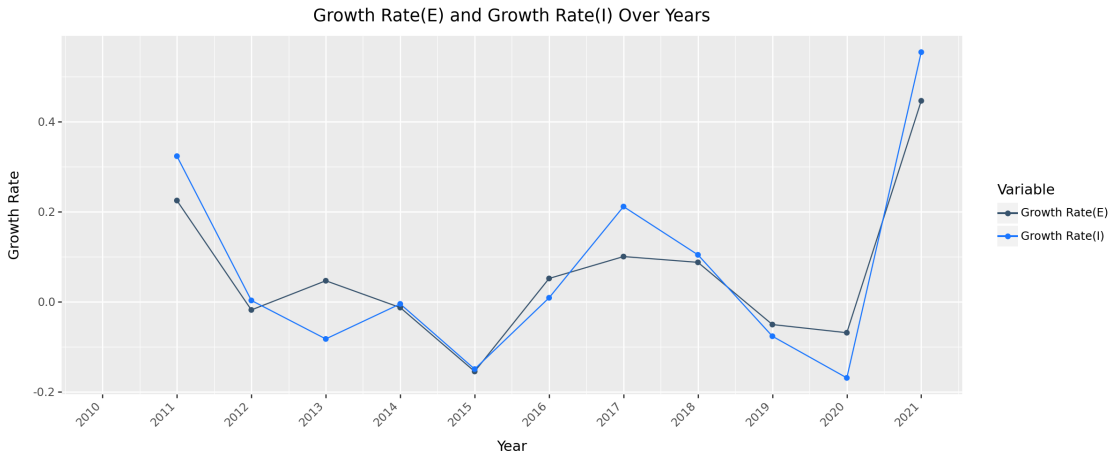
[156]:
```
total_year_filtered = total_year[['Export', 'Import', 'Trade Deficit']]

# Reshape the DataFrame for plotting
total_year_melted = total_year_filtered.reset_index().melt(id_vars=['year'],␣
 ↪var_name='Variable', value_name='Value')

custom_colors = {'Export': '#37536d', 'Import': '#1a76ff', 'Trade Deficit':␣
 ↪'crimson'}
# Create the bar plot
plot = (
    ggplot(total_year_melted, aes(x='year', y='Value', fill='Variable',␣
 ↪color='Variable')) +
    geom_bar(stat='identity', position='dodge') +
    ggtitle("Export, Import, and Trade Deficit Over Years") +
    xlab("Year") +
    ylab("USD (millions)") +
    scale_x_continuous(breaks=total_year.index.tolist()) +
    scale_color_manual(values=custom_colors) +
    scale_fill_manual(values=custom_colors) +
    theme(axis_text_x = element_text(angle=45, hjust=1),figure_size=(12,␣
 ↪8),legend_title=element_text(text=''))
)

# Print the plot
print(plot)
ggsave(plot, "plot1.png")
```



- Exports and Imports have seen a major bump in year 2021.
- The country has been experiencing trade deficits consistently for a decade indicating that the country's domestic demand for goods and services exceeds its domestic production.
- This might be due to several reasons such as domestic industries being less competitive, lack of natural resources, or consumer preference for foreign goods.

[157]:
```
growth_rates = total_year[['Growth Rate(E)', 'Growth Rate(I)']]

# Reshape the DataFrame for plotting
growth_rates_melted = growth_rates.reset_index().melt(id_vars=['year'],␣
 ↪var_name='Variable', value_name='Value')

custom_colors = {'Growth Rate(E)': '#37536d', 'Growth Rate(I)': '#1a76ff'}
# Create the scatter plot
plot = (
    ggplot(growth_rates_melted, aes(x='year', y='Value', color='Variable')) +
    geom_line() +
    geom_point() +
    ggtitle("Growth Rate(E) and Growth Rate(I) Over Years") +
    xlab("Year") +
    ylab("Growth Rate") +
    scale_x_continuous(breaks=total_year.index.tolist()) +
```

```
    scale_color_manual(values=custom_colors) +
    theme(axis_text_x=element_text(angle=45, hjust=1),figure_size=(12, 5))
)

# Print the scatter plot
print(plot)
ggsave(plot, "plot2.png")
```



- Growth rates of both imports and exports have increased for the year 2021 which were consisirently decreasing from year 2017 till 2020
- This increased export growth indicates that domestic goods and services are getting competitive on the international market.
- An increase in import growth generally indicates rising domestic demand and consumer confidence.

0.6 Commodity Wise Analysis

[158]:
```
'''Commodity export/Import count'''
print('Total number of Export commodity:', df_export['Commodity'].nunique())
print('Total number of Import commodity:', df_import['Commodity'].nunique())
```

```
Total number of Export commodity: 98
Total number of Import commodity: 98
```

[159]:
```
"""Let's count the most importing and exporting commodities"""
bold('**Most Exporting Commodities(In Numbers) from 2010 to 2021**')
display(pd.DataFrame(df_export['Commodity'].value_counts().head(20)))
bold('**Most Importing Commodities(In Numbers) from 2010 to 2021**')
display(pd.DataFrame(df_import['Commodity'].value_counts().head(20)))
```

Most Exporting Commodities(In Numbers) from 2010 to 2021

Commodity	count
NUCLEAR REACTORS, BOILERS, MACHINERY AND MECHAN…	2537
ELECTRICAL MACHINERY AND EQUIPMENT AND PARTS TH…	2514
PHARMACEUTICAL PRODUCTS	2513
OPTICAL, PHOTOGRAPHIC CINEMATOGRAPHIC MEASURING…	2488
PLASTIC AND ARTICLES THEREOF.	2435
ARTICLES OF APPAREL AND CLOTHING ACCESSORIES, N…	2421
ARTICLES OF IRON OR STEEL	2401
VEHICLES OTHER THAN RAILWAY OR TRAMWAY ROLLING …	2400
OTHER MADE UP TEXTILE ARTICLES; SETS; WORN CLOT…	2395
PAPER AND PAPERBOARD; ARTICLES OF PAPER PULP, O…	2328
ARTICLES OF APPAREL AND CLOTHING ACCESSORIES, K…	2328
ARTICLES OF LEATHER,SADDLERY AND HARNESS;TRAVEL…	2317
RUBBER AND ARTICLES THEREOF.	2314
FURNITURE; BEDDING, MATTRESSES, MATTRESS SUPPOR…	2311
ESSENTIAL OILS AND RESINOIDS; PERFUMERY, COSMET…	2270
PRINTED BOOKDS, NEWSPAPERS, PICTURES AND OTHER …	2263
ORGANIC CHEMICALS	2238
MISCELLANEOUS MANUFACTURED ARTICLES.	2215
MISCELLANEOUS CHEMICAL PRODUCTS.	2208
ARTICLES OF STONE, PLASTER, CEMENT, ASBESTOS, M…	2206

Most Importing Commodities(In Numbers) from 2010 to 2021

Commodity	count
ELECTRICAL MACHINERY AND EQUIPMENT AND PARTS TH…	2081
NUCLEAR REACTORS, BOILERS, MACHINERY AND MECHAN…	1970
IRON AND STEEL	1828
ALUMINIUM AND ARTICLES THEREOF.	1716
PLASTIC AND ARTICLES THEREOF.	1712
OPTICAL, PHOTOGRAPHIC CINEMATOGRAPHIC MEASURING…	1626
COPPER AND ARTICLES THEREOF.	1498
ARTICLES OF IRON OR STEEL	1460
WOOD AND ARTICLES OF WOOD; WOOD CHARCOAL.	1396
RUBBER AND ARTICLES THEREOF.	1346
RAW HIDES AND SKINS (OTHER THAN FURSKINS) AND L…	1345
MINERAL FUELS, MINERAL OILS AND PRODUCTS OF THE…	1329
NATURAL OR CULTURED PEARLS,PRECIOUS OR SEMIPREC…	1321
ORGANIC CHEMICALS	1290
PAPER AND PAPERBOARD; ARTICLES OF PAPER PULP, O…	1274
MISCELLANEOUS CHEMICAL PRODUCTS.	1261
MISCELLANEOUS GOODS.	1208
INORGANIC CHEMICALS; ORGANIC OR INORGANIC COMPO…	1192
SALT; SULPHUR; EARTHS AND STONE; PLASTERING MAT…	1187
PULP OF WOOD OR OF OTHER FIBROUS CELLULOSIC MAT…	1165

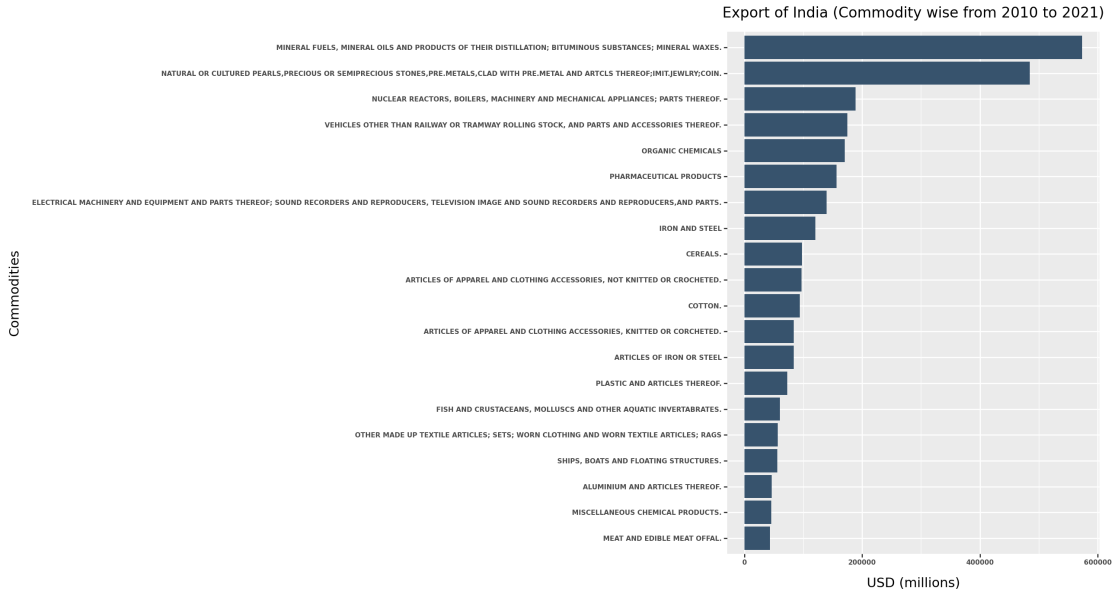
[160]:
```
'''Coverting dataset in commodity wise'''
exp_comm = df_export.groupby('Commodity').agg({'value':'sum'})
exp_comm = exp_comm.sort_values(by = 'value', ascending = False)
exp_comm = exp_comm[:20]

imp_comm = df_import.groupby('Commodity').agg({'value':'sum'})
imp_comm = imp_comm.sort_values(by = 'value', ascending = False)
imp_comm = imp_comm[:20]
```

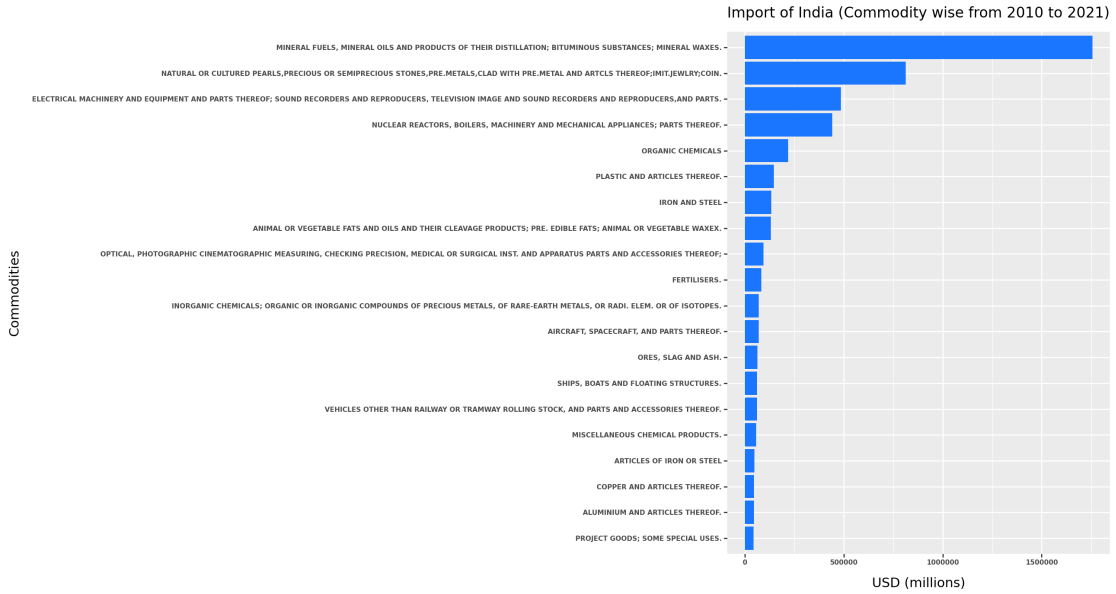
[161]:
```
print(exp_comm)
print(imp_comm)
```

```
                                                    value
Commodity
MINERAL FUELS, MINERAL OILS AND PRODUCTS OF THE…  573781.24
NATURAL OR CULTURED PEARLS,PRECIOUS OR SEMIPREC…  484859.90
NUCLEAR REACTORS, BOILERS, MACHINERY AND MECHAN…  189003.07
VEHICLES OTHER THAN RAILWAY OR TRAMWAY ROLLING …  174616.34
ORGANIC CHEMICALS                                   170491.42
PHARMACEUTICAL PRODUCTS                             156859.86
ELECTRICAL MACHINERY AND EQUIPMENT AND PARTS TH…  139396.39
IRON AND STEEL                                      120904.29
CEREALS.                                             97642.07
ARTICLES OF APPAREL AND CLOTHING ACCESSORIES, N…   96902.61
COTTON.                                              94126.62
ARTICLES OF APPAREL AND CLOTHING ACCESSORIES, K…   84336.04
ARTICLES OF IRON OR STEEL                            84097.54
PLASTIC AND ARTICLES THEREOF.                        72896.40
FISH AND CRUSTACEANS, MOLLUSCS AND OTHER AQUATI…   60394.39
OTHER MADE UP TEXTILE ARTICLES; SETS; WORN CLOT…   56746.00
SHIPS, BOATS AND FLOATING STRUCTURES.                55810.69
ALUMINIUM AND ARTICLES THEREOF.                      46875.96
MISCELLANEOUS CHEMICAL PRODUCTS.                     45783.89
MEAT AND EDIBLE MEAT OFFAL.                          43611.13
                                                        value
Commodity
MINERAL FUELS, MINERAL OILS AND PRODUCTS OF THE…  1756299.54
NATURAL OR CULTURED PEARLS,PRECIOUS OR SEMIPREC…   813961.33
ELECTRICAL MACHINERY AND EQUIPMENT AND PARTS TH…   485408.24
NUCLEAR REACTORS, BOILERS, MACHINERY AND MECHAN…   441796.29
ORGANIC CHEMICALS                                    218286.99
PLASTIC AND ARTICLES THEREOF.                        147087.63
IRON AND STEEL                                       133851.71
ANIMAL OR VEGETABLE FATS AND OILS AND THEIR CLE…   131471.56
OPTICAL, PHOTOGRAPHIC CINEMATOGRAPHIC MEASURING…    94703.59
FERTILISERS.                                          83587.98
INORGANIC CHEMICALS; ORGANIC OR INORGANIC COMPO…    71737.20
```

```
AIRCRAFT, SPACECRAFT, AND PARTS THEREOF.                70627.54
ORES, SLAG AND ASH.                                     64661.51
SHIPS, BOATS AND FLOATING STRUCTURES.                   61634.02
VEHICLES OTHER THAN RAILWAY OR TRAMWAY ROLLING …    61530.25
MISCELLANEOUS CHEMICAL PRODUCTS.                        58318.35
ARTICLES OF IRON OR STEEL                               49473.88
COPPER AND ARTICLES THEREOF.                            46842.21
ALUMINIUM AND ARTICLES THEREOF.                         46617.57
PROJECT GOODS; SOME SPECIAL USES.                       44231.41
```

[162]:
```
plot = (ggplot(exp_comm, aes(x='reorder(exp_comm.index, +value)', y='value')) +
        geom_bar(stat='identity', fill='#37536d') +
        theme(axis_text_x=element_text(size=5.6, weight='bold'),
              axis_text_y=element_text(size=5.6, weight='bold'),
              plot_title=element_text(size=12),
             figure_size=(13,7)) +
        labs(x='Commodities', y='USD (millions)', title='Export of India␣
 ↪(Commodity wise from 2010 to 2021)') +
        coord_flip())

print(plot)
ggsave(plot, "plot3.png")

plot = (ggplot(imp_comm, aes(x='reorder(imp_comm.index, +value)', y='value')) +
        geom_bar(stat='identity', fill='#1a76ff') +
        scale_fill_brewer(type='qual', palette='Set1') +
        theme(axis_text_x=element_text(size=5.6, weight='bold'),
              axis_text_y=element_text(size=5.6, weight='bold'),
              plot_title=element_text(size=12),
             figure_size=(13,7)) +
        labs(x='Commodities', y='USD (millions)', title='Import of India␣
 ↪(Commodity wise from 2010 to 2021)') +
        coord_flip())

print(plot)
ggsave(plot, "plot4.png")
```





[163]:
```
'''Create pivot table of export/import (commodity wise)'''
exp_comm_table = pd.pivot_table(df_export, values = 'value', index =␣
 ↪'Commodity', columns = 'year')
```

```
imp_comm_table = pd.pivot_table(df_import, values = 'value', index =␣
 ↪'Commodity', columns = 'year')
bold('**Commodity Composition of Exports**')
display(exp_comm_table.sample(n=5))
bold('**Commodity Composition of Imports**')
display(imp_comm_table.sample(n=5))
```

Commodity Composition of Exports

year	2010	2011	\
Commodity			
FURSKINS AND ARTIFICIAL FUR, MANUFACTURES THEREOF.	0.009412	0.029636	
RUBBER AND ARTICLES THEREOF.	10.378407	13.987725	
MISCELLANEOUS MANUFACTURED ARTICLES.	1.880734	2.223427	
EDIBLE FRUIT AND NUTS; PEEL OR CITRUS FRUIT OR …	8.957087	11.938110	
NATURAL OR CULTURED PEARLS,PRECIOUS OR SEMIPREC…	237.417880	261.203094	

year	2012	2013	\
Commodity			
FURSKINS AND ARTIFICIAL FUR, MANUFACTURES THEREOF.	0.007059	0.025143	
RUBBER AND ARTICLES THEREOF.	15.072609	13.597716	
MISCELLANEOUS MANUFACTURED ARTICLES.	2.537514	2.688444	
EDIBLE FRUIT AND NUTS; PEEL OR CITRUS FRUIT OR …	9.739862	11.431056	
NATURAL OR CULTURED PEARLS,PRECIOUS OR SEMIPREC…	244.515587	229.077473	

year	2014	2015	\
Commodity			
FURSKINS AND ARTIFICIAL FUR, MANUFACTURES THEREOF.	0.066286	0.103750	
RUBBER AND ARTICLES THEREOF.	14.655269	12.468579	
MISCELLANEOUS MANUFACTURED ARTICLES.	2.894645	2.937647	
EDIBLE FRUIT AND NUTS; PEEL OR CITRUS FRUIT OR …	11.185000	10.634765	
NATURAL OR CULTURED PEARLS,PRECIOUS OR SEMIPREC…	224.592378	214.966413	

year	2016	2017	\
Commodity			
FURSKINS AND ARTIFICIAL FUR, MANUFACTURES THEREOF.	0.168143	0.150759	
RUBBER AND ARTICLES THEREOF.	12.916218	14.956616	
MISCELLANEOUS MANUFACTURED ARTICLES.	2.997676	2.954973	
EDIBLE FRUIT AND NUTS; PEEL OR CITRUS FRUIT OR …	11.775986	12.379667	
NATURAL OR CULTURED PEARLS,PRECIOUS OR SEMIPREC…	239.686978	223.226364	

year	2018	2019	\
Commodity			
FURSKINS AND ARTIFICIAL FUR, MANUFACTURES THEREOF.	0.172400	0.188806	
RUBBER AND ARTICLES THEREOF.	16.358571	15.884824	
MISCELLANEOUS MANUFACTURED ARTICLES.	3.322634	3.294815	
EDIBLE FRUIT AND NUTS; PEEL OR CITRUS FRUIT OR …	11.001905	9.742876	
NATURAL OR CULTURED PEARLS,PRECIOUS OR SEMIPREC…	214.016138	198.273791	

year	2020	2021
Commodity		
FURSKINS AND ARTIFICIAL FUR, MANUFACTURES THEREOF.	0.252321	0.398333
RUBBER AND ARTICLES THEREOF.	16.349397	23.061741
MISCELLANEOUS MANUFACTURED ARTICLES.	2.768836	3.467157
EDIBLE FRUIT AND NUTS; PEEL OR CITRUS FRUIT OR …	9.202245	10.597172
NATURAL OR CULTURED PEARLS,PRECIOUS OR SEMIPREC…	151.235549	224.391200

Commodity Composition of Imports

year	2010	2011	\
Commodity			
OTHER BASE METALS; CERMETS; ARTICLES THEREOF.	3.580508	4.757049	
PHOTOGRAPHIC OR CINEMATOGRAPHIC GOODS.	5.487959	6.111042	
EDIBLE VEGETABLES AND CERTAIN ROOTS AND TUBERS.	25.159091	30.778125	
SUGARS AND SUGAR CONFECTIONERY.	11.985357	2.600893	
CERAMIC PRODUCTS.	7.717867	9.530814	

year	2012	2013	\
Commodity			
OTHER BASE METALS; CERMETS; ARTICLES THEREOF.	5.224902	5.252037	
PHOTOGRAPHIC OR CINEMATOGRAPHIC GOODS.	7.277442	6.380513	
EDIBLE VEGETABLES AND CERTAIN ROOTS AND TUBERS.	44.757818	35.693000	
SUGARS AND SUGAR CONFECTIONERY.	11.078103	10.099149	
CERAMIC PRODUCTS.	9.685890	9.081324	

year	2014	2015	\
Commodity			
OTHER BASE METALS; CERMETS; ARTICLES THEREOF.	5.488947	4.77537	
PHOTOGRAPHIC OR CINEMATOGRAPHIC GOODS.	6.561081	5.88050	
EDIBLE VEGETABLES AND CERTAIN ROOTS AND TUBERS.	51.534545	67.03850	
SUGARS AND SUGAR CONFECTIONERY.	14.605532	13.85160	
CERAMIC PRODUCTS.	11.735077	9.49680	

year	2016	2017	\
Commodity			
OTHER BASE METALS; CERMETS; ARTICLES THEREOF.	5.181296	6.742881	
PHOTOGRAPHIC OR CINEMATOGRAPHIC GOODS.	5.827879	5.692703	
EDIBLE VEGETABLES AND CERTAIN ROOTS AND TUBERS.	61.248143	44.310448	
SUGARS AND SUGAR CONFECTIONERY.	20.822075	16.939677	
CERAMIC PRODUCTS.	6.299459	8.586571	

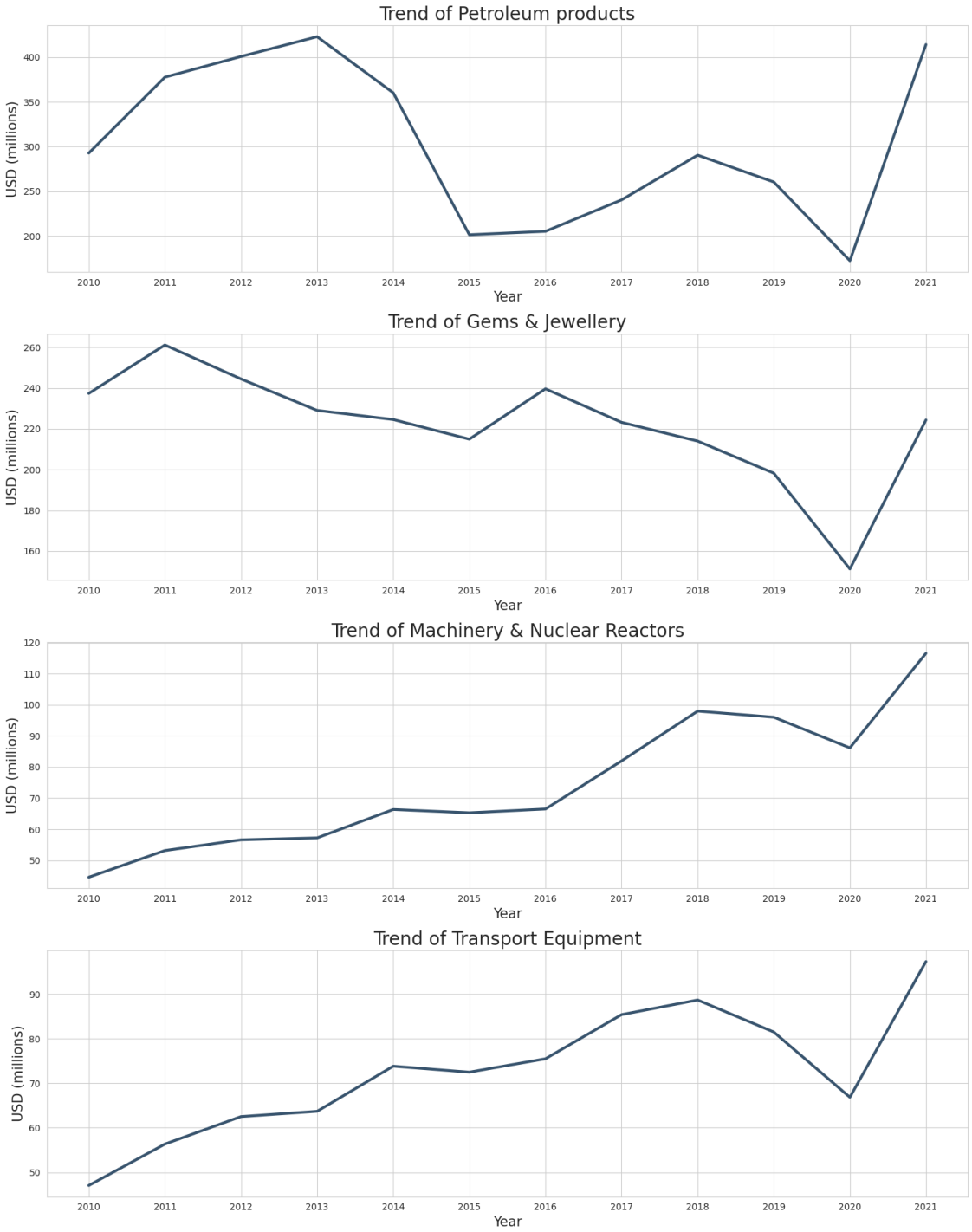
year	2018	2019	\
Commodity			
OTHER BASE METALS; CERMETS; ARTICLES THEREOF.	7.659844	6.797619	
PHOTOGRAPHIC OR CINEMATOGRAPHIC GOODS.	5.969143	5.880588	
EDIBLE VEGETABLES AND CERTAIN ROOTS AND TUBERS.	16.067973	21.591918	
SUGARS AND SUGAR CONFECTIONERY.	10.459231	7.444590	

```
CERAMIC PRODUCTS.                                    8.788235   7.982895

year                                                     2020       2021
Commodity
OTHER BASE METALS; CERMETS; ARTICLES THEREOF.        5.543279  10.210000
PHOTOGRAPHIC OR CINEMATOGRAPHIC GOODS.               5.613600   6.564194
EDIBLE VEGETABLES AND CERTAIN ROOTS AND TUBERS.     25.511667  35.151818
SUGARS AND SUGAR CONFECTIONERY.                     15.322653   5.568889
CERAMIC PRODUCTS.                                    7.715714  10.228235
```

[164]:
```
bold('**Trend of the Most Exporting Goods(In Values) From 2010 to 2021**')
plt.figure(figsize=(15,19))
categorical_years = [2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018,␣
 ↪2019, 2020, 2021]

plt.subplot(411)
g = exp_comm_table.loc["MINERAL FUELS, MINERAL OILS AND PRODUCTS OF THEIR␣
 ↪DISTILLATION; BITUMINOUS SUBSTANCES; MINERAL WAXES."].plot(color='#37536d',␣
 ↪linewidth=3)
g.set_ylabel('USD (millions)', fontsize = 15)
g.set_xlabel('Year', fontsize = 15)
g.set_xticks(categorical_years)
g.set_title('Trend of Petroleum products', size = 20)

plt.subplot(412)
g1 = exp_comm_table.loc["NATURAL OR CULTURED PEARLS,PRECIOUS OR SEMIPRECIOUS␣
 ↪STONES,PRE.METALS,CLAD WITH PRE.METAL AND ARTCLS THEREOF;IMIT.JEWLRY;COIN."].
 ↪plot(color='#37536d', linewidth=3)
g1.set_ylabel('USD (millions)', fontsize = 15)
g1.set_xlabel('Year', fontsize = 15)
g1.set_xticks(categorical_years)
g1.set_title('Trend of Gems & Jewellery', size = 20)

plt.subplot(414)
g2 = exp_comm_table.loc["VEHICLES OTHER THAN RAILWAY OR TRAMWAY ROLLING STOCK,␣
 ↪AND PARTS AND ACCESSORIES THEREOF."].plot(color='#37536d', linewidth=3)
g2.set_ylabel('USD (millions)', fontsize = 15)
g2.set_xlabel('Year', fontsize = 15)
g2.set_xticks(categorical_years)
g2.set_title('Trend of Transport Equipment', size = 20)


plt.subplot(413)
g3 = exp_comm_table.loc["NUCLEAR REACTORS, BOILERS, MACHINERY AND MECHANICAL␣
 ↪APPLIANCES; PARTS THEREOF."].plot(color='#37536d', linewidth=3)
g3.set_ylabel('USD (millions)', fontsize = 15)
g3.set_xlabel('Year', fontsize = 15)
```

```
g3.set_xticks(categorical_years)
g3.set_title('Trend of Machinery & Nuclear Reactors', size = 20)

plt.subplots_adjust(hspace = 0.4)
plt.tight_layout()
plt.savefig('plot5.png')
plt.show()
```

Trend of the Most Exporting Goods(In Values) From 2010 to 2021



- The Petroleum products have shown a dip from 2013 till 2015 then an increase till 2018 before dipping again till 2020 and then followed by a sharp rise in the year 2021.
- The exports of Gems & Jewellery have shown a consistent major decline till 2020 before increasing in 2021.
- The exports of Transport Equipment and Machinery & Nuclear Reactors tend to show increase

in trade.

- All of the four major export commodities have seen a major increase in the year 2021 as compared to the time before it.

[165]:
```
bold('**Trend of the Most Importing Goods(In Values) From 2010 to 2021**')
plt.figure(figsize=(15,19))

plt.subplot(411)
g = imp_comm_table.loc["MINERAL FUELS, MINERAL OILS AND PRODUCTS OF THEIR␣
 ↪DISTILLATION; BITUMINOUS SUBSTANCES; MINERAL WAXES."].plot(color='#1a76ff',␣
 ↪linewidth=3)
g.set_ylabel('USD (millions)', fontsize = 15)
g.set_xlabel('Year', fontsize = 15)
g.set_xticks(categorical_years)
g.set_title('Trend of Petroleum products', size = 20)

plt.subplot(412)
g1 = imp_comm_table.loc["NATURAL OR CULTURED PEARLS,PRECIOUS OR SEMIPRECIOUS␣
 ↪STONES,PRE.METALS,CLAD WITH PRE.METAL AND ARTCLS THEREOF;IMIT.JEWLRY;COIN."].
 ↪plot(color='#1a76ff', linewidth=3)
g1.set_ylabel('USD (millions)', fontsize = 15)
g1.set_xlabel('Year', fontsize = 15)
g1.set_xticks(categorical_years)
g1.set_title('Trend of Gems & Jewellery', size = 20)

plt.subplot(413)
g2 = imp_comm_table.loc["ELECTRICAL MACHINERY AND EQUIPMENT AND PARTS THEREOF;␣
 ↪SOUND RECORDERS AND REPRODUCERS, TELEVISION IMAGE AND SOUND RECORDERS AND␣
 ↪REPRODUCERS,AND PARTS."].plot(color='#1a76ff', linewidth=3)
g2.set_ylabel('USD (millions)', fontsize = 15)
g2.set_xlabel('Year', fontsize = 15)
g2.set_xticks(categorical_years)
g2.set_title('Trend of Electrical Equipment', size = 20)


plt.subplot(414)
g3 = imp_comm_table.loc["NUCLEAR REACTORS, BOILERS, MACHINERY AND MECHANICAL␣
 ↪APPLIANCES; PARTS THEREOF."].plot(color='#1a76ff', linewidth=3)
g3.set_ylabel('USD (millions)', fontsize = 15)
g3.set_xlabel('Year', fontsize = 15)
g3.set_xticks(categorical_years)
g3.set_title('Trend of Machinery & Nuclear Reactors', size = 20)

plt.subplots_adjust(hspace = 0.4)
plt.tight_layout()
plt.savefig('plot6.png')
plt.show()
```

Trend of the Most Importing Goods(In Values) From 2010 to 2021

- The imports of petroleums products have shown significant decline from 2013 to 2015 just like the exports indicating volatality of oil prices during that period.
- The imports of Gems and Jewellaries have shown a decreasing trend till 2020.

- From 2010 to 2015, imports of Electrical Equipment and Machinery & Nuclear Reactors were low but after 2015 it started to increase.
- All four commodities have shown sharp increase of imports in 2021.
- Petroleum products, Gewelry, Machinery, Electrical Equipments have shown higher exports and imports indicating that they might be relying on complex global supply chains. Different components or stages of production may occur in different countries, leading to both imports and exports of the final product or its components.
- It might also be the case that the competitiveness of those products is very high.
- Both the insights highlights the interdependence of economies in the globalized world.

0.7 Country Wise Analysis

[168]:
```
'''Country export/Import count'''
print('Total number of country Export to:', df_export['country'].nunique())
print('Total number of country Import from:', df_import['country'].nunique())
```

```
Total number of country Export to: 249
Total number of country Import from: 242
```

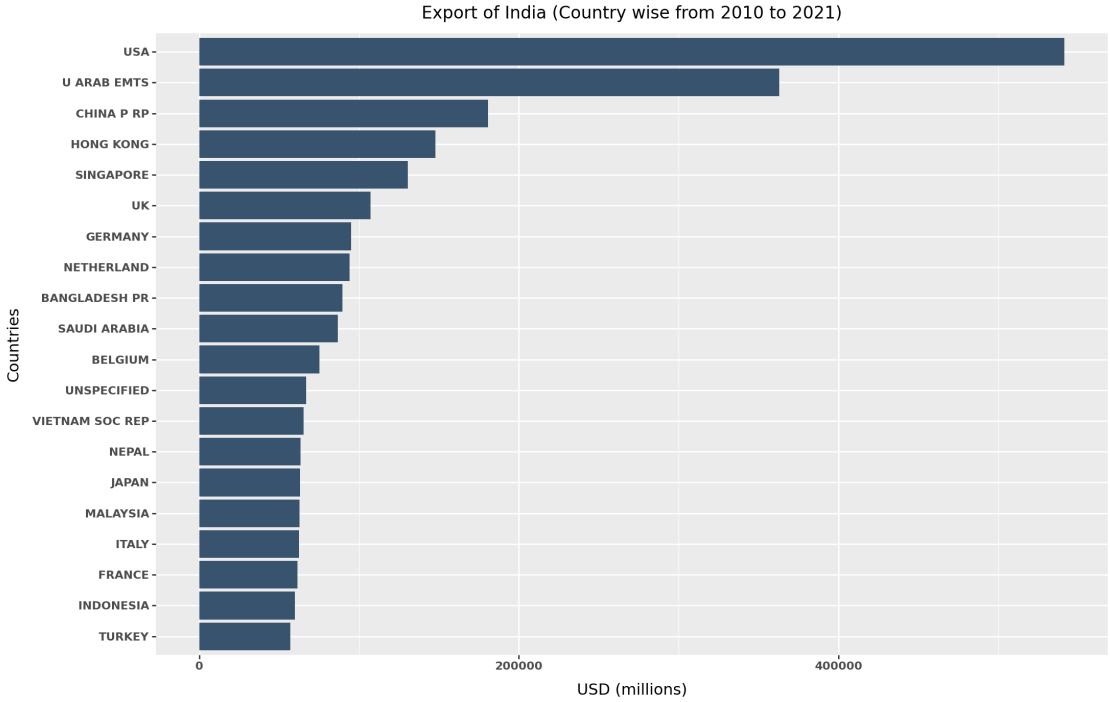
[169]:
```
'''Coverting dataset in Country wise'''
exp_country = df_export.groupby('country').agg({'value':'sum'})
exp_country = exp_country.rename(columns={'value': 'Export'})
exp_country = exp_country.sort_values(by = 'Export', ascending = False)
exp_country = exp_country[:20]

imp_country = df_import.groupby('country').agg({'value':'sum'})
imp_country = imp_country.rename(columns={'value': 'Import'})
imp_country = imp_country.sort_values(by = 'Import', ascending = False)
imp_country = imp_country[:20]
```

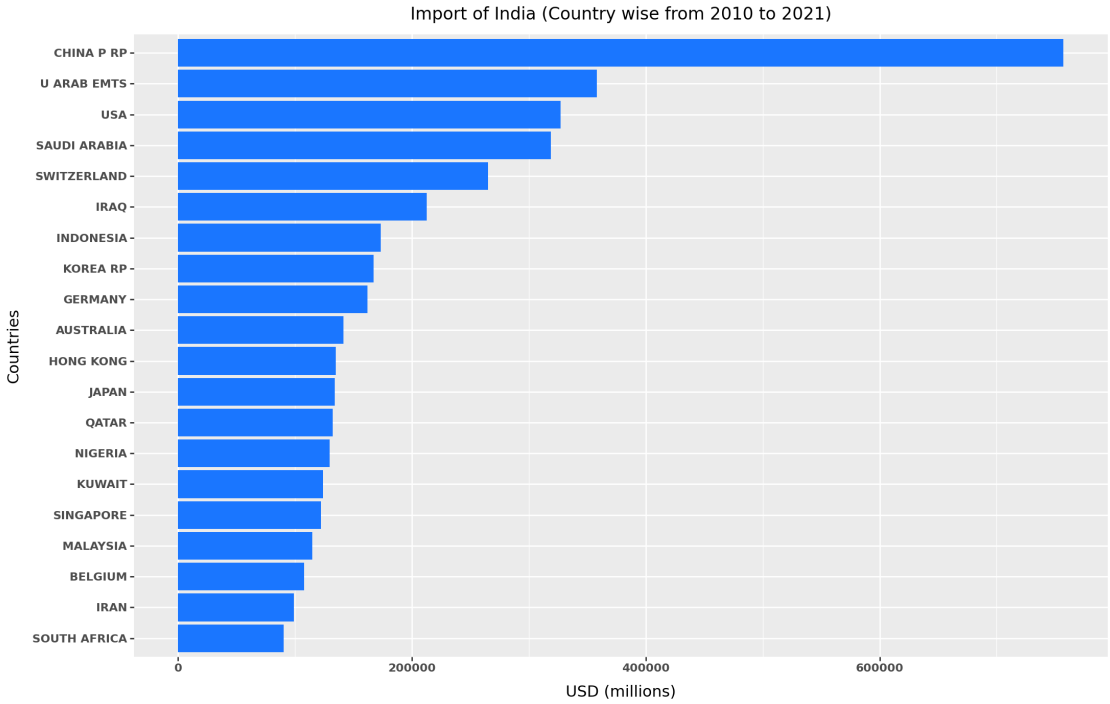
[170]:
```
print(exp_country)
```

```
                  Export
country
USA             541487.45
U ARAB EMTS     362951.83
CHINA P RP      180865.06
HONG KONG       147807.24
SINGAPORE       130427.76
UK              107298.44
GERMANY          95153.81
NETHERLAND       93963.12
BANGLADESH PR    89520.36
SAUDI ARABIA     86847.66
BELGIUM          75098.44
UNSPECIFIED      66839.80
VIETNAM SOC REP  65171.06
```

```
NEPAL              63505.18
JAPAN              62953.11
MALAYSIA           62794.30
ITALY              62480.10
FRANCE             61353.39
INDONESIA          59775.33
TURKEY             56998.92
```

[171]:
```
plot = (ggplot(exp_country, aes(x='reorder(exp_country.index, +Export)',␣
 ↪y='Export')) +
       geom_bar(stat='identity', fill='#37536d') +
       theme(axis_text_x=element_text(size=8, weight='bold'),
             axis_text_y=element_text(size=8, weight='bold'),
             plot_title=element_text(size=12),
            figure_size=(11,7)) +
       labs(x='Countries', y='USD (millions)', title='Export of India (Country␣
 ↪wise from 2010 to 2021)') +
       coord_flip())

print(plot)
ggsave(plot,"plot7.png")
plot = (ggplot(imp_country, aes(x='reorder(imp_country.index, +Import)',␣
 ↪y='Import')) +
       geom_bar(stat='identity', fill='#1a76ff') +
       scale_fill_brewer(type='qual', palette='Set1') +
       theme(axis_text_x=element_text(size=8, weight='bold'),
             axis_text_y=element_text(size=8, weight='bold'),
             plot_title=element_text(size=12),
            figure_size=(11,7)) +
       labs(x='Countries', y='USD (millions)', title='Import of India (Country␣
 ↪wise from 2010 to 2021)') +
       coord_flip())

print(plot)
ggsave(plot,"plot8.png")
```


Export of India (Country wise from 2010 to 2021)
USA
U ARAB EMTS
CHINA P RP
HONG KONG
SINGAPORE
UK
GERMANY
NETHERLAND
BANGLADESH PR
SAUDI ARABIA
BELGIUM
UNSPECIFIED
VIETNAM SOC REP
NEPAL
JAPAN
MALAYSIA
ITALY
FRANCE
INDONESIA
TURKEY
Countries
0
200000
400000
USD (millions)


Import of India (Country wise from 2010 to 2021)
CHINA P RP
U ARAB EMTS
USA
SAUDI ARABIA
SWITZERLAND
IRAQ
INDONESIA
KOREA RP
GERMANY
AUSTRALIA
HONG KONG
JAPAN
QATAR
NIGERIA
KUWAIT
SINGAPORE
MALAYSIA
BELGIUM
IRAN
SOUTH AFRICA
Countries
0
200000
400000
600000
USD (millions)

- China has the biggest market in India followed by UAE, USA and Saudi Arabia
- For India, USA is the biggest importer followed by UAE and China.

[172]:
```
'''Create pivot table of export/import (country wise)'''
exp_country_table = pd.pivot_table(df_export, values = 'value', index =␣
 ↪'country', columns = 'year')
imp_country_table = pd.pivot_table(df_import, values = 'value', index =␣
 ↪'country', columns = 'year')
bold('**Direction of Foreign Trade Export in India**')
display(exp_country_table.sample(n=5))
bold('**Direction of Foreign Trade Import in India**')
display(imp_country_table.sample(n=5))
```

Direction of Foreign Trade Export in India

year	2010	2011	2012	2013	2014	2015
country						
TAJIKISTAN	0.435238	0.545385	0.879250	1.356250	1.118542	0.541951
ERITREA	0.544222	0.750476	0.451190	0.365333	0.333571	0.207097
UGANDA	3.252444	5.240241	5.222921	6.027841	6.364943	6.474545
GUATEMALA	1.877333	2.854030	3.563651	3.216970	3.367059	3.819104
UK	75.099588	87.649388	87.879796	100.812165	96.077113	92.929053

year	2016	2017	2018	2019	2020	2021
country						
TAJIKISTAN	0.497561	0.498333	0.569744	0.602821	1.243023	0.820698
ERITREA	0.128000	0.211714	0.347308	0.245417	0.248158	0.457632
UGANDA	5.554157	5.847582	6.443222	7.061023	7.446111	7.751111
GUATEMALA	3.599552	4.229565	4.424058	3.989589	4.358553	7.774930
UK	87.038367	100.946042	96.968646	91.016563	84.971563	108.968438

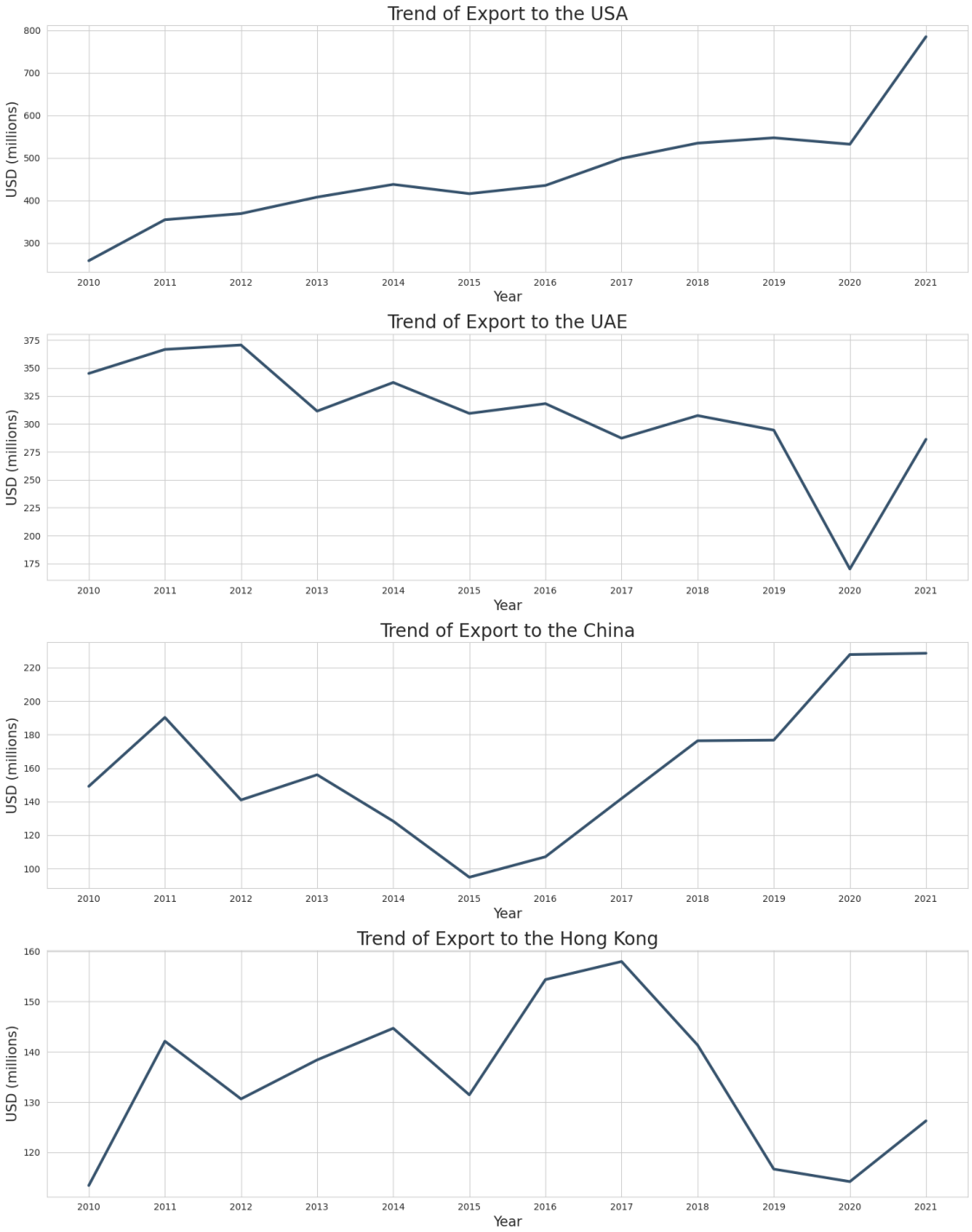
Direction of Foreign Trade Import in India

year	2010	2011	2012	2013	2014	2015
country						
BOLIVIA	0.515385	0.506250	1.058571	0.403333	0.296667	15.015625
LESOTHO	0.380000	0.608000	1.453333	0.833333	0.230000	1.235000
BHUTAN	10.077500	11.252778	8.631579	8.950000	8.325556	11.249600
GIBRALTAR	11.570000	0.060000	0.045000	0.065000	0.000000	NaN
COLOMBIA	20.885122	12.723409	47.055000	108.056957	50.831667	17.560870

year	2016	2017	2018	2019	2020	2021
country						
BOLIVIA	9.132105	39.250588	50.130588	60.420000	89.163077	121.912941
LESOTHO	12.455000	29.856667	0.000000	0.040000	0.085000	NaN
BHUTAN	13.991818	14.536538	12.365333	13.524000	17.319200	18.794828
GIBRALTAR	NaN	0.010000	0.030000	1.010000	0.153333	0.125000
COLOMBIA	13.198889	13.172889	22.446170	18.430227	29.863617	61.755625

[173]:
```
bold('**Trend of the Direction of Foreign Trade Export in India From 2010 to␣
↪2021**')
plt.figure(figsize=(15,19))

plt.subplot(411)
g = exp_country_table.loc["USA"].plot(color='#37536d', linewidth=3)
g.set_ylabel('USD (millions)', fontsize = 15)
g.set_xlabel('Year', fontsize = 15)
g.set_xticks(categorical_years)
g.set_title('Trend of Export to the USA', size = 20)

plt.subplot(412)
g1 = exp_country_table.loc["U ARAB EMTS"].plot(color='#37536d', linewidth=3)
g1.set_ylabel('USD (millions)', fontsize = 15)
g1.set_xlabel('Year', fontsize = 15)
g1.set_xticks(categorical_years)
g1.set_title('Trend of Export to the UAE', size = 20)

plt.subplot(413)
g2 = exp_country_table.loc["CHINA P RP"].plot(color='#37536d', linewidth=3)
g2.set_ylabel('USD (millions)', fontsize = 15)
g2.set_xlabel('Year', fontsize = 15)
g2.set_xticks(categorical_years)
g2.set_title('Trend of Export to the China', size = 20)


plt.subplot(414)
g3 = exp_country_table.loc["HONG KONG"].plot(color='#37536d', linewidth=3)
g3.set_ylabel('USD (millions)', fontsize = 15)
g3.set_xlabel('Year', fontsize = 15)
g3.set_xticks(categorical_years)
g3.set_title('Trend of Export to the Hong Kong', size = 20)

plt.subplots_adjust(hspace = 0.4)
plt.tight_layout()
plt.savefig('plot9.png')
plt.show()
```

Trend of the Direction of Foreign Trade Export in India From 2010 to 2021

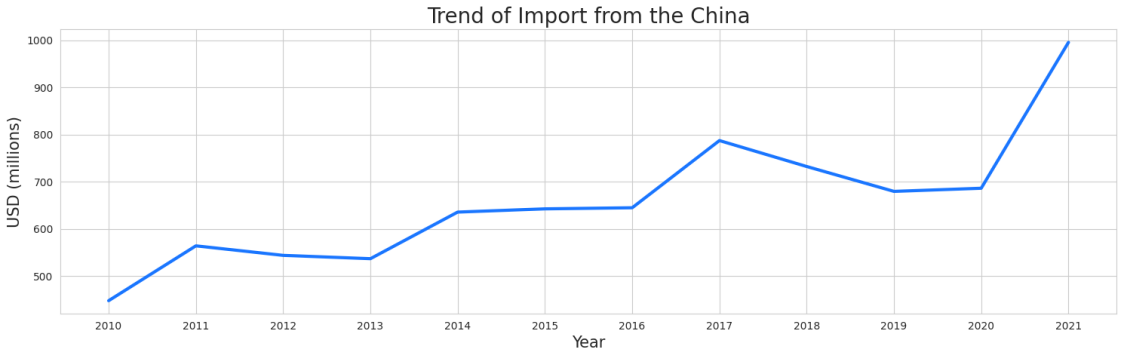


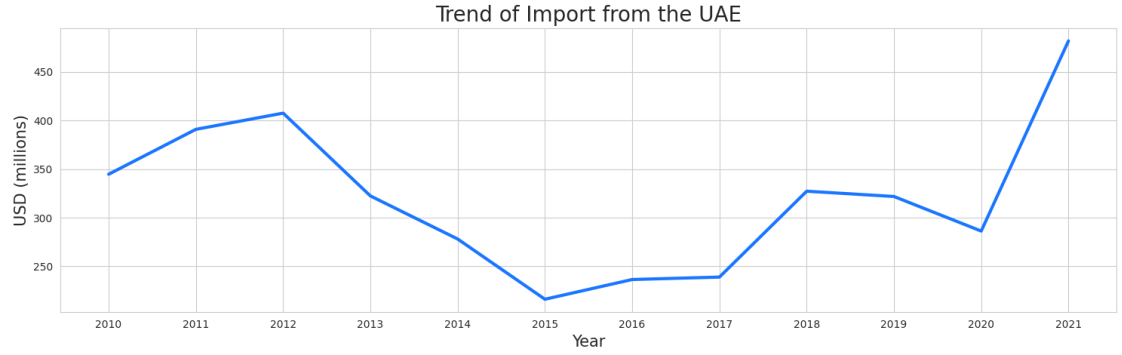
- Every year India has increased its export to USA and therefore USA is growing as one of the major trading partners of India.
- Exports to UAE show decreasing trend from 2012 to 2020, with rise in 2021
- Exports to China have also shown a decreasing trend from 2011 to 2015, afterwards it started to increase.

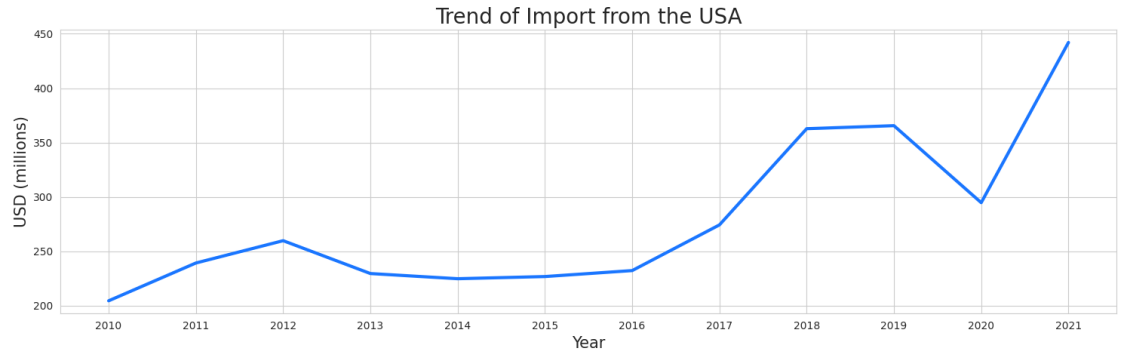
- Exports to Hong Kong have shown a decrease fronm the year 2017 till 2020.

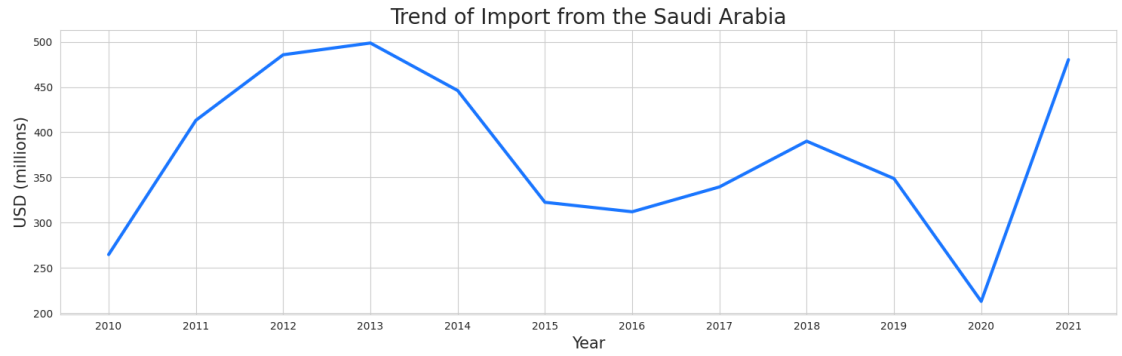
[174]:
```
bold('**Trend of the Direction of Foreign Trade Export in India From 2010 to␣
 ↪2021**')
plt.figure(figsize=(15,19))

plt.subplot(411)
g = imp_country_table.loc["CHINA P RP"].plot(color='#1a76ff', linewidth=3)
g.set_ylabel('USD (millions)', fontsize = 15)
g.set_xlabel('Year', fontsize = 15)
g.set_xticks(categorical_years)
g.set_title('Trend of Import from the China', size = 20)

plt.subplot(412)
g1 = imp_country_table.loc["U ARAB EMTS"].plot(color='#1a76ff', linewidth=3)
g1.set_ylabel('USD (millions)', fontsize = 15)
g1.set_xlabel('Year', fontsize = 15)
g1.set_xticks(categorical_years)
g1.set_title('Trend of Import from the UAE', size = 20)

plt.subplot(413)
g2 = imp_country_table.loc["USA"].plot(color='#1a76ff', linewidth=3)
g2.set_ylabel('USD (millions)', fontsize = 15)
g2.set_xlabel('Year', fontsize = 15)
g2.set_xticks(categorical_years)
g2.set_title('Trend of Import from the USA', size = 20)


plt.subplot(414)
g3 = imp_country_table.loc["SAUDI ARABIA"].plot(color='#1a76ff', linewidth=3)
g3.set_ylabel('USD (millions)', fontsize = 15)
g3.set_xlabel('Year', fontsize = 15)
g3.set_xticks(categorical_years)
g3.set_title('Trend of Import from the Saudi Arabia', size = 20)

plt.subplots_adjust(hspace = 0.4)
plt.tight_layout()
plt.savefig('plot10.png')
plt.show()
```

Trend of the Direction of Foreign Trade Export in India From 2010 to 2021





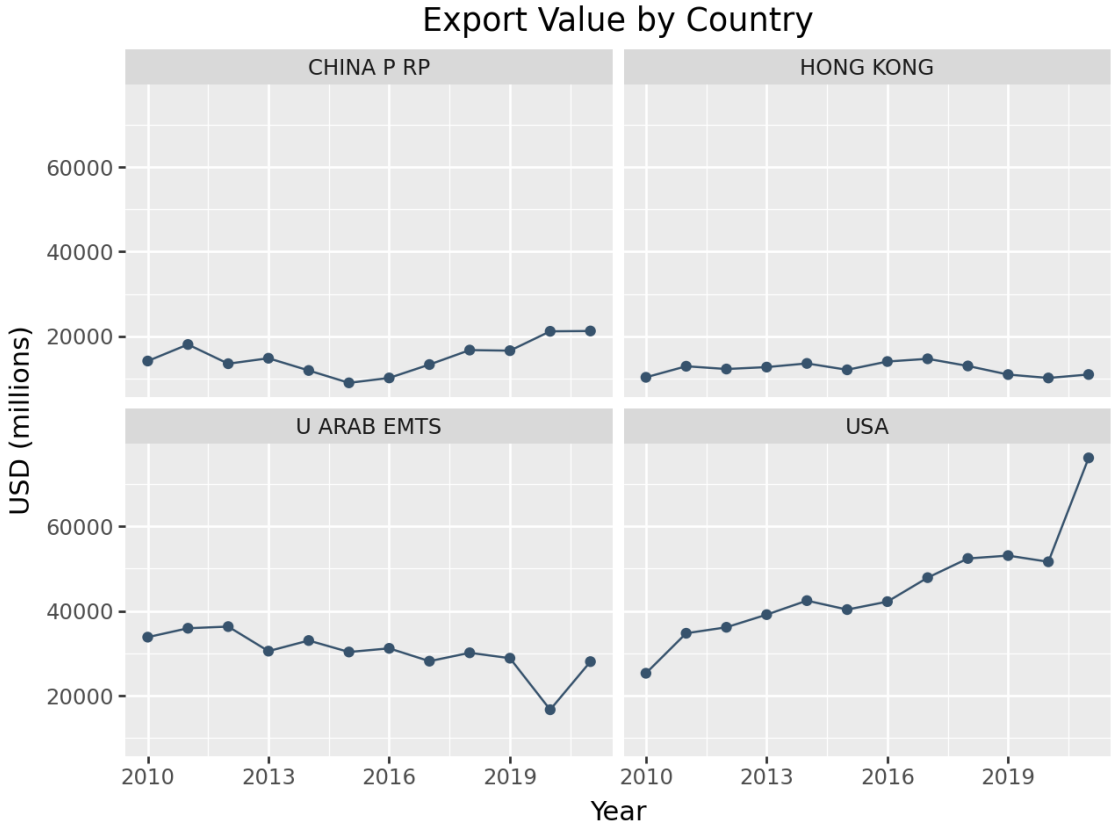




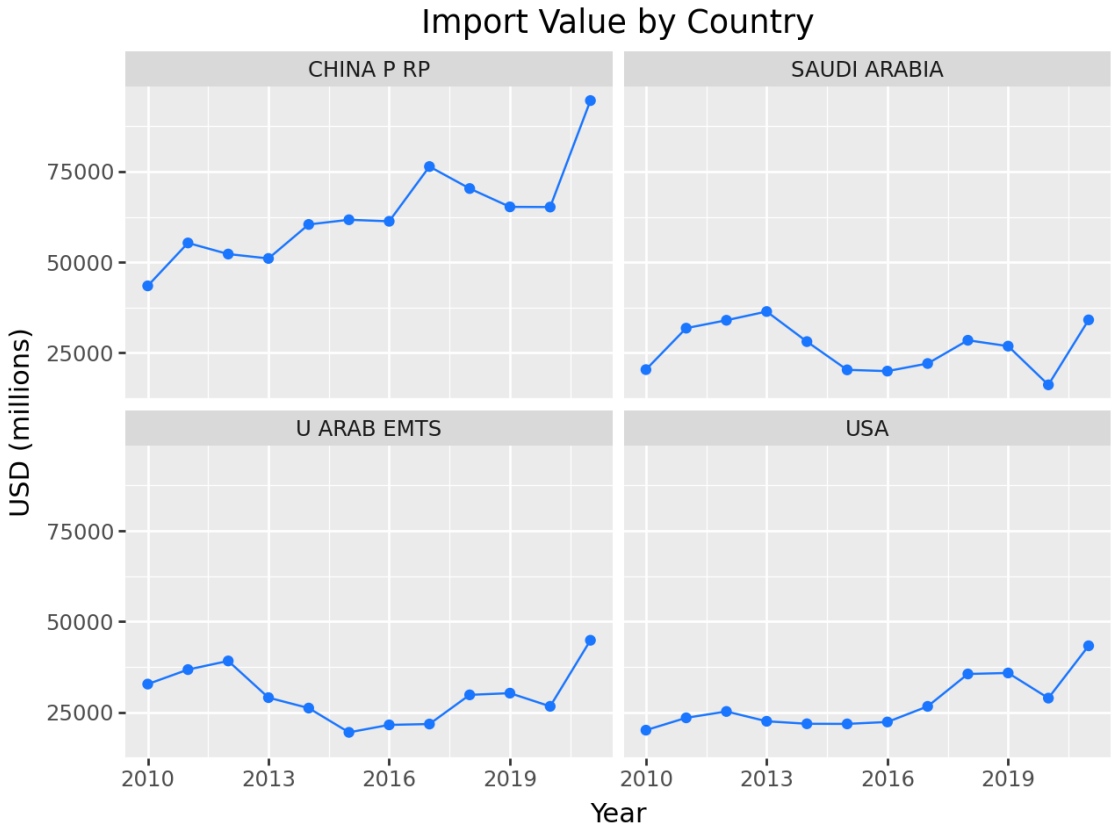
- From 2010 to 2016, imports from USA were low, after 2016 it started to increase .
- Imports from UAE and Suadi Arab show a similar trend. Imports fall during 2012 to 2015, after 2015 it started to increase.
- Imports from China has been continuously rising.

[175]:
```
req=['USA', 'U ARAB EMTS', 'CHINA P RP', 'HONG KONG']
df_exp_tmp=df_export.loc[df_export['country'].isin(req) , ['value', 'year',␣
 ↪'country'] ]
req=['CHINA P RP', 'U ARAB EMTS', 'USA', 'SAUDI ARABIA']
df_imp_tmp=df_import.loc[df_import['country'].isin(req) , ['value', 'year',␣
 ↪'country'] ]
```

[176]:
```
export_agg = df_exp_tmp.groupby(['year', 'country'])['value'].sum().
 ↪reset_index()
plot = (ggplot(export_agg, aes(x='year', y='value')) +
    geom_line(color='#37536d') +
    geom_point(color='#37536d') +
    facet_wrap('~country', nrow=2) +
    xlab("Year") +
    ylab("USD (millions)") +
    ggtitle("Export Value by Country"))

print(plot)
ggsave(plot,"plot13.png")
```



[177]:
```
import_agg = df_imp_tmp.groupby(['year', 'country'])['value'].sum().
  ↪reset_index()
plot = (ggplot(import_agg, aes(x='year', y='value')) +
    geom_line(color='#1a76ff') +
    geom_point(color='#1a76ff') +
    facet_wrap('~country', nrow=2) +
    xlab("Year") +
    ylab("USD (millions)") +
    ggtitle("Import Value by Country"))

print(plot)
ggsave(plot,"plot14.png")
```



0.8 HS Code Wise Analysis

For HScode Wise Analysis, we are creating dataframe according to Hs Codes list and Section

List Of Indian HS Classification is based on HS Code used in actual Shipment Data: http://www.cybex.in/HS-Codes/Default.aspx

[178]:
```
''' creating a new dataframe on Sections of HSCode'''
HSCode = pd.DataFrame()
HSCode['Start']=[1,6,15,16,25,28,39,41,44,47,50,64,68,71,72,84,86,90,93,94,97]
HSCode['End']=[5,14,15,24,27,38,40,43,46,49,63,67,70,71,83,85,89,92,93,96,99]
HSCode['Sections Name']=['Animals & Animal Products',
'Vegetable Products',
'Animal Or Vegetable Fats',
'Prepared Foodstuffs',
'Mineral Products',
'Chemical Products',
'Plastics & Rubber',
'Hides & Skins',
'Wood & Wood Products',
'Wood Pulp Products',
'Textiles & Textile Articles',
'Footwear, Headgear',
'Articles Of Stone, Plaster, Cement, Asbestos',
'Pearls, Precious Or Semi-Precious Stones, Metals',
'Base Metals & Articles Thereof',
'Machinery & Mechanical Appliances',
'Transportation Equipment',
'Instruments - Measuring, Musical',
'Arms & Ammunition',
'Miscellaneous',
'Works Of Art',]
HSCode.index += 1
HSCode.index.name = 'Section'
```

[179]:
```
bold('**List Of indian HS Classification is based on the HS Code:**')
display(HSCode)
```

List Of indian HS Classification is based on the HS Code:

Section	Start	End	Sections Name
1	1	5	Animals & Animal Products
2	6	14	Vegetable Products
3	15	15	Animal Or Vegetable Fats
4	16	24	Prepared Foodstuffs
5	25	27	Mineral Products
6	28	38	Chemical Products
7	39	40	Plastics & Rubber
8	41	43	Hides & Skins
9	44	46	Wood & Wood Products
10	47	49	Wood Pulp Products
11	50	63	Textiles & Textile Articles
12	64	67	Footwear, Headgear
13	68	70	Articles Of Stone, Plaster, Cement, Asbestos

```
14          71   71  Pearls, Precious Or Semi-Precious Stones, Metals
15          72   83                    Base Metals & Articles Thereof
16          84   85                Machinery & Mechanical Appliances
17          86   89                         Transportation Equipment
18          90   92                 Instruments - Measuring, Musical
19          93   93                                 Arms & Ammunition
20          94   96                                     Miscellaneous
21          97   99                                      Works Of Art
```

[180]:
```
df_export['Sections Name'] = df_export['HSCode']
df_import['Sections Name'] = df_import['HSCode']
for i in range(1,22):
    df_export.loc[(df_export['Sections Name'] >= HSCode['Start'][i]) &␣
 ↪(df_export['Sections Name'] <= HSCode['End'][i]),'Sections Name']=i
    df_import.loc[(df_import['Sections Name'] >= HSCode['Start'][i]) &␣
 ↪(df_import['Sections Name'] <= HSCode['End'][i]),'Sections Name']=i
```

[181]:
```
print(df_export)
```

```
        HSCode                                          Commodity  value  \
0            2                          MEAT AND EDIBLE MEAT OFFAL.   1.40
1            3  FISH AND CRUSTACEANS, MOLLUSCS AND OTHER AQUAT…   0.08
2            4  DAIRY PRODUCE; BIRDS' EGGS; NATURAL HONEY; EDI…   3.89
3            7    EDIBLE VEGETABLES AND CERTAIN ROOTS AND TUBERS.   0.17
4            8  EDIBLE FRUIT AND NUTS; PEEL OR CITRUS FRUIT OR…   0.12
…          …                                                …    …
165492      94  FURNITURE; BEDDING, MATTRESSES, MATTRESS SUPPO…   0.19
165493      95  TOYS, GAMES AND SPORTS REQUISITES; PARTS AND A…   0.03
165494      96               MISCELLANEOUS MANUFACTURED ARTICLES.   0.31
165495      98                  PROJECT GOODS; SOME SPECIAL USES.   0.01
165496      99                               MISCELLANEOUS GOODS.   0.00

            country  year  Sections Name
0       AFGHANISTAN  2010              1
1       AFGHANISTAN  2010              1
2       AFGHANISTAN  2010              1
3       AFGHANISTAN  2010              2
4       AFGHANISTAN  2010              2
…               …    …              …
165492     ZIMBABWE  2021             20
165493     ZIMBABWE  2021             20
165494     ZIMBABWE  2021             20
165495     ZIMBABWE  2021             21
165496     ZIMBABWE  2021             21

[165497 rows x 6 columns]
```

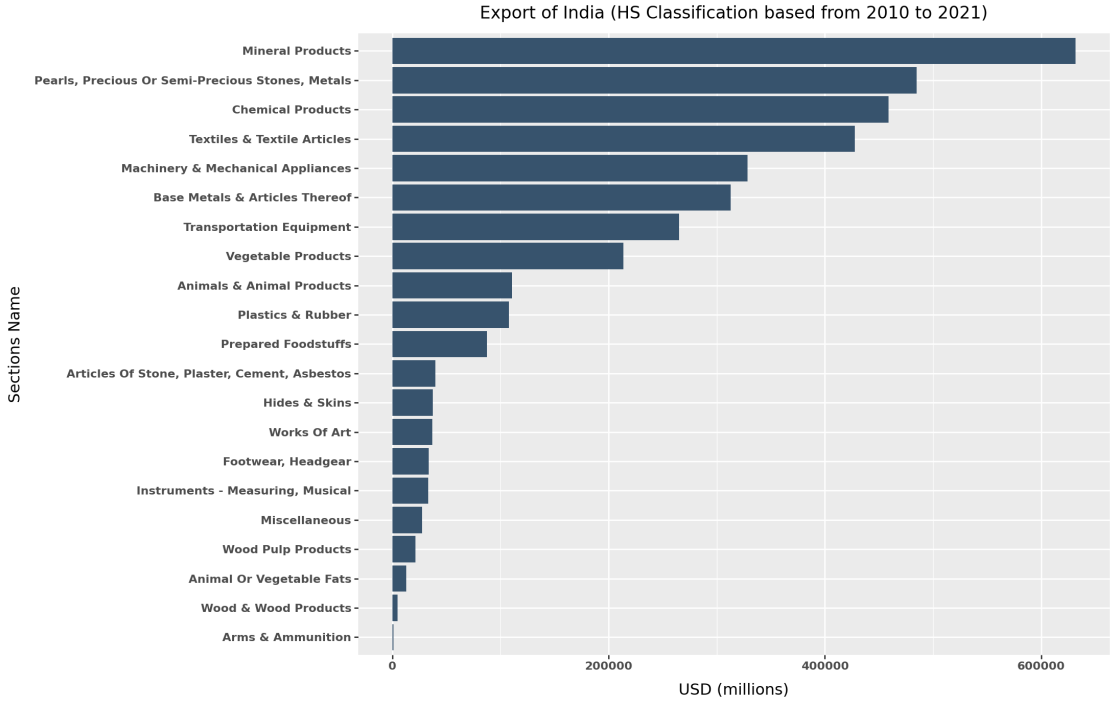
[182]:
```
exp_hscode = df_export.groupby(['Sections Name']).agg({'value':'sum'})
exp_hscode['Sections_Name'] = HSCode['Sections Name']
imp_hscode = df_import.groupby(['Sections Name']).agg({'value':'sum'})
imp_hscode['Sections_Name'] = HSCode['Sections Name']
```

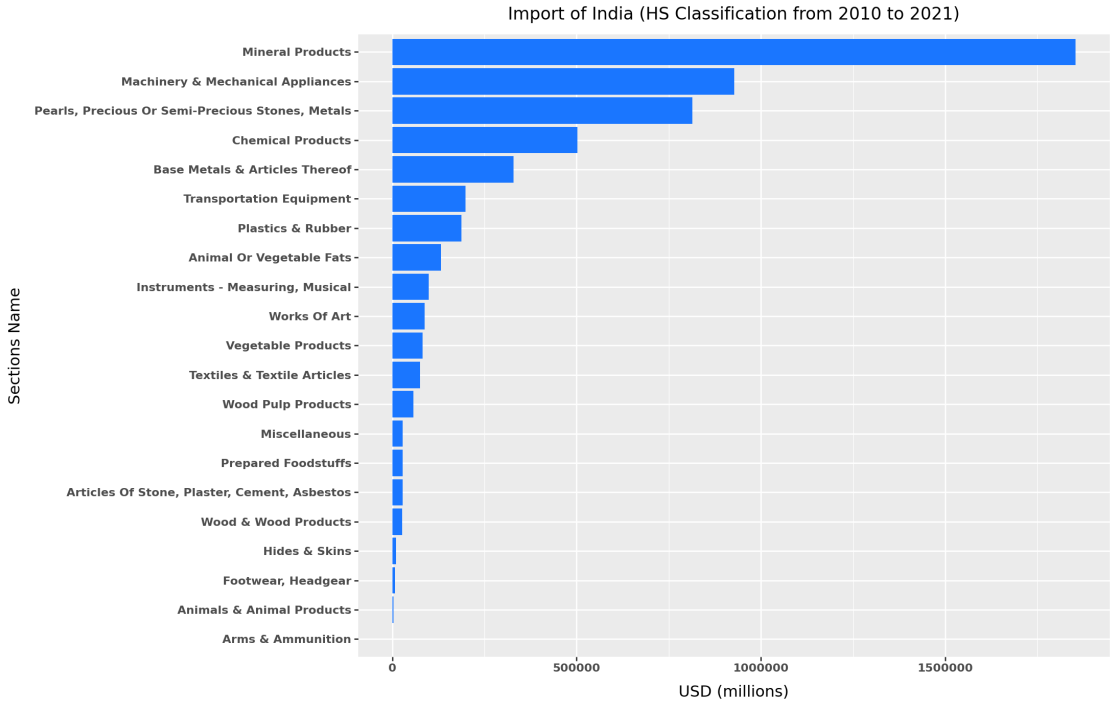
[183]:
```
print(exp_hscode)
print(imp_hscode)
```

```
                   value                                Sections_Name
Sections Name
1              110692.18                  Animals & Animal Products
2              213836.65                        Vegetable Products
3               13119.69                 Animal Or Vegetable Fats
4               87690.55                      Prepared Foodstuffs
5              631776.46                         Mineral Products
6              458731.77                        Chemical Products
7              107686.51                        Plastics & Rubber
8               37685.75                            Hides & Skins
9                5054.63                     Wood & Wood Products
10              21476.48                       Wood Pulp Products
11             427602.33                 Textiles & Textile Articles
12              33843.44                       Footwear, Headgear
13              39841.17     Articles Of Stone, Plaster, Cement, Asbestos
14             484859.90  Pearls, Precious Or Semi-Precious Stones, Metals
15             313046.96               Base Metals & Articles Thereof
16             328399.46           Machinery & Mechanical Appliances
17             265088.75                   Transportation Equipment
18              33149.95            Instruments - Measuring, Musical
19               1244.95                        Arms & Ammunition
20              27595.36                            Miscellaneous
21              37211.50                             Works Of Art
                   value                                Sections_Name
Sections Name
1                2586.15                  Animals & Animal Products
2               82782.85                        Vegetable Products
3              131471.56                 Animal Or Vegetable Fats
4               27772.22                      Prepared Foodstuffs
5             1853431.17                         Mineral Products
6              502470.29                        Chemical Products
7              187356.37                        Plastics & Rubber
8               10467.71                            Hides & Skins
9               26973.87                     Wood & Wood Products
10              57442.39                       Wood Pulp Products
11              74608.71                 Textiles & Textile Articles
12               6850.53                       Footwear, Headgear
13              27755.00     Articles Of Stone, Plaster, Cement, Asbestos
14             813961.33  Pearls, Precious Or Semi-Precious Stones, Metals
```

15	328663.17	Base Metals & Articles Thereof
16	927204.53	Machinery & Mechanical Appliances
17	198944.78	Transportation Equipment
18	98858.13	Instruments - Measuring, Musical
19	571.54	Arms & Ammunition
20	27830.19	Miscellaneous
21	87194.01	Works Of Art

[184]:
```
plot = (ggplot(exp_hscode, aes(x='reorder(Sections_Name, +value)', y='value')) +
        geom_bar(stat='identity', fill='#37536d') +
        theme(axis_text_x=element_text(size=8, weight='bold'),
              axis_text_y=element_text(size=8, weight='bold'),
              plot_title=element_text(size=12),
             figure_size=(11,7)) +
        labs(x='Sections Name', y='USD (millions)', title='Export of India (HS␣
 ↪Classification based from 2010 to 2021)') +
        coord_flip())

print(plot)
ggsave(plot,"plot11.png")
plot = (ggplot(imp_hscode, aes(x='reorder(Sections_Name, +value)', y='value')) +
        geom_bar(stat='identity', fill='#1a76ff') +
        scale_fill_brewer(type='qual', palette='Set1') +
        theme(axis_text_x=element_text(size=8, weight='bold'),
              axis_text_y=element_text(size=8, weight='bold'),
              plot_title=element_text(size=12),
             figure_size=(11,7)) +
        labs(x='Sections Name', y='USD (millions)', title='Import of India (HS␣
 ↪Classification from 2010 to 2021)') +
        coord_flip())

print(plot)
ggsave(plot,"plot12.png")
```


Export of India (HS Classification based from 2010 to 2021)
Sections Name
Mineral Products
Pearls, Precious Or Semi-Precious Stones, Metals
Chemical Products
Textiles & Textile Articles
Machinery & Mechanical Appliances
Base Metals & Articles Thereof
Transportation Equipment
Vegetable Products
Animals & Animal Products
Plastics & Rubber
Prepared Foodstuffs
Articles Of Stone, Plaster, Cement, Asbestos
Hides & Skins
Works Of Art
Footwear, Headgear
Instruments - Measuring, Musical
Miscellaneous
Wood Pulp Products
Animal Or Vegetable Fats
Wood & Wood Products
Arms & Ammunition
0
200000
400000
600000
USD (millions)

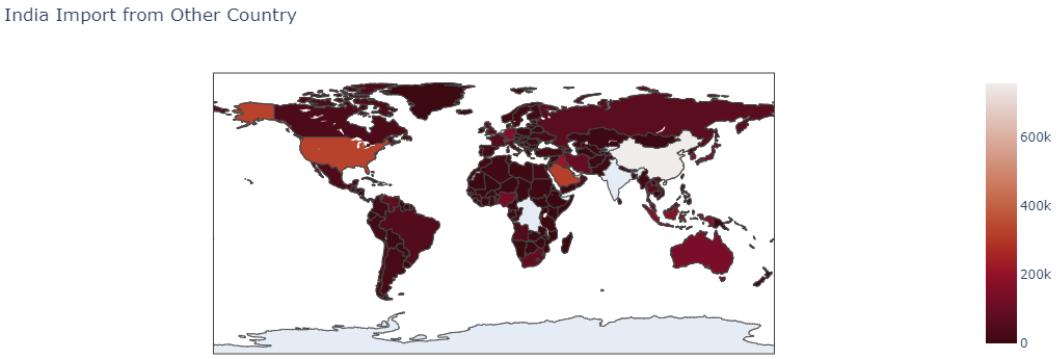

Import of India (HS Classification from 2010 to 2021)
Sections Name
Mineral Products
Machinery & Mechanical Appliances
Pearls, Precious Or Semi-Precious Stones, Metals
Chemical Products
Base Metals & Articles Thereof
Transportation Equipment
Plastics & Rubber
Animal Or Vegetable Fats
Instruments - Measuring, Musical
Works Of Art
Vegetable Products
Textiles & Textile Articles
Wood Pulp Products
Miscellaneous
Prepared Foodstuffs
Articles Of Stone, Plaster, Cement, Asbestos
Wood & Wood Products
Hides & Skins
Footwear, Headgear
Animals & Animal Products
Arms & Ammunition
0
500000
1000000
1500000
USD (millions)

- Above two plots give more clear picture about the export/import of goods.
- Its seems that most exporting goods are Mineral Products followed by Pearls, Precious Or Semi-Precious Stones, Metals and Chemical products etc.
- The most importing goods are Mineral Products followed by Machinery & Mechanical Appliances and Pearls, Precious Or Semi-Precious Stones, Metals, etc.

[185]:
```
export_map = pd.DataFrame(df_export.groupby(['country'])['value'].sum().
 ↪reset_index())
count = pd.DataFrame(export_map.groupby('country')['value'].sum().reset_index())

trace = [go.Choropleth(
            colorscale = 'algae',
            locationmode = 'country names',
            locations = count['country'],
            text = count['country'],
            z = count['value'],
            reversescale=True)]

layout = go.Layout(title = 'India Export to Other Country')

fig = go.Figure(data = trace, layout = layout)
py.iplot(fig)
```

[186]:
```
import_map = pd.DataFrame(df_import.groupby(['country'])['value'].sum().
 ↪reset_index())
count = pd.DataFrame(import_map.groupby('country')['value'].sum().reset_index())

trace = [go.Choropleth(
            colorscale = 'amp',
            locationmode = 'country names',
```

```
            locations = count['country'],
            text = count['country'],
            z = count['value'],
            reversescale=True)]

layout = go.Layout(title = 'India Import from Other Country')

fig = go.Figure(data = trace, layout = layout)
py.iplot(fig)
```



[ ]: