Assignment: GDP Analysis

In [472]:

```
# importing packages
import pandas as pd
import numpy as np
from scipy.interpolate import spline
from numpy import array
import matplotlib as mpl
%matplotlib inline
# for plots
import matplotlib.pyplot as plt
from matplotlib import cm
from matplotlib.dates import date2num


# for date and time processing
import datetime

# for statistical graphs
import seaborn as sns
```

Part-I: GDP Analysis of Indian States

In [473]:

```
#Reading part 1a Data set
State =  pd.read_csv (r"/Users/Divesh/Downloads/GDP_Anal
```

In [474]:

```
#Data profiling
State.head()
State.describe()
State.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 11 entries, 0 to 10
Data columns (total 36 columns):
Items  Description           11 non-null o
bject
Duration                     11 non-null o
bject
Andhra Pradesh               11 non-null f
loat64
Arunachal Pradesh            9 non-null fl
oat64
Assam                        9 non-null fl
oat64
Bihar                        9 non-null fl
oat64
Chhattisgarh                 11 non-null f
loat64
Goa                          9 non-null fl
oat64
Gujarat                      9 non-null fl
oat64
Haryana                      11 non-null f
loat64
Himachal Pradesh             7 non-null fl
oat64
Jammu & Kashmir              9 non-null fl
oat64
Jharkhand                    9 non-null fl
oat64
Karnataka                    9 non-null fl
oat64
Kerala                       9 non-null fl
oat64
Madhya Pradesh               11 non-null f
loat64
```

```
Maharashtra                    7 non-null fl
oat64
Manipur                        7 non-null fl
oat64
Meghalaya                      11 non-null f
loat64
Mizoram                        7 non-null fl
oat64
Nagaland                       7 non-null fl
oat64
Odisha                         11 non-null f
loat64
Punjab                         7 non-null fl
oat64
Rajasthan                      7 non-null fl
oat64
Sikkim                         9 non-null fl
oat64
Tamil Nadu                     11 non-null f
loat64
Telangana                      11 non-null f
loat64
Tripura                        7 non-null fl
oat64
Uttar Pradesh                  9 non-null fl
oat64
Uttarakhand                    9 non-null fl
oat64
West Bengal1                   0 non-null fl
oat64
Andaman & Nicobar Islands      7 non-null fl
oat64
Chandigarh                     9 non-null fl
oat64
Delhi                          11 non-null f
loat64
Puducherry                     11 non-null f
loat64
All_India GDP                  11 non-null f
loat64
dtypes: float64(34), object(2)
memory usage: 3.2+ KB
```

In [475]:

```
#Data Cleasning

#Drop WB as it has no data
State.drop('West Bengal1',axis=1,inplace=True)


#Removing Union territoris
State.drop('Chandigarh',axis=1,inplace=True)
State.drop('Delhi',axis=1,inplace=True)
State.drop('Andaman & Nicobar Islands',axis=1,inplace=Tr
State.drop('Puducherry',axis=1,inplace=True)
#State.drop('All_India GDP',axis=1,inplace=True)

#Raw Data
State

#State.set_index('Duration')

#Remove the rows: '(% Growth over the previous year)' ar
df_State = State.drop(State.index[[5,10]])
```

In [476]:

```
#Indexing to select required Df for Analysis
df_T = df_State.iloc[6: , 1:35]
df_GDPS = df_T.set_index('Duration')
df_GDPS = df_GDPS.transpose()

#fillNan with Mean value of its column mean value

df_GDPS["2015-16"].fillna(df_GDPS["2015-16"].mean(), inp
df_GDPS["2014-15"].fillna(df_GDPS["2014-15"].mean(), inp
df_GDPS["2013-14"].fillna(df_GDPS["2013-14"].mean(), inp

#calculating the mean value for

df_GDPS['Mean']= df_GDPS.mean(axis=1)
df_GDPS.sort_values("Mean", ascending=False, inplace=Tru
```

In [477]:

```
#Dropping All_India_GDP
df_GDPS_state = df_GDPS.drop(['All_India GDP'])
df_GDPS_state
```

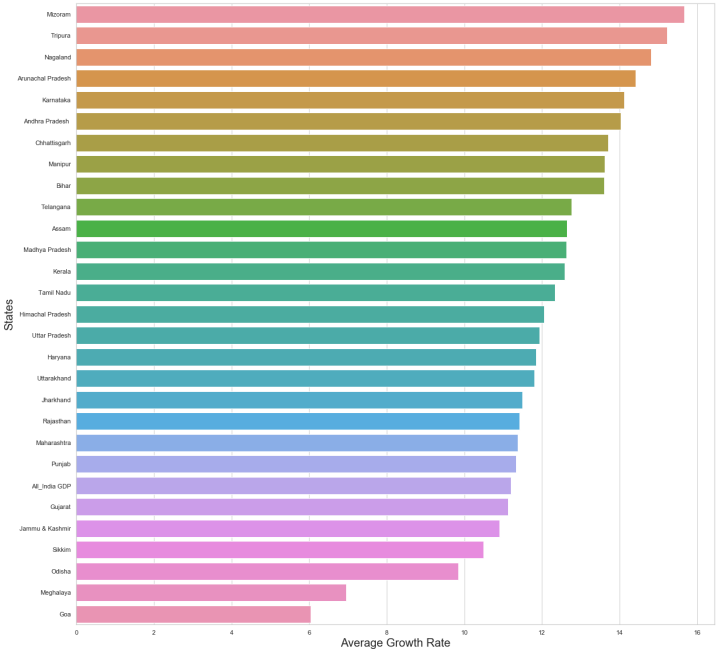
Out[477]:

Duration	2013-14	2014-15	2015-16	Mean
Mizoram	23.10	12.30	11.61381	15.671270
Tripura	18.14	15.92	11.61381	15.224603
Nagaland	21.98	10.85	11.61381	14.814603
Arunachal Pradesh	16.38	14.79	12.07000	14.413333
Karnataka	18.24	12.70	11.42000	14.120000
Andhra Pradesh	12.85	13.40	15.85000	14.033333
Chhattisgarh	16.44	13.69	10.98000	13.703333
Manipur	17.83	11.39	11.61381	13.611270
Bihar	12.30	17.92	10.59000	13.603333
Telangana	12.63	13.05	12.61000	12.763333
Assam	13.31	11.45	13.19000	12.650000
Madhya Pradesh	14.91	10.11	12.86000	12.626667
Kerala	12.79	13.11	11.85000	12.583333
Tamil Nadu	13.51	12.51	10.99000	12.336667
Himachal Pradesh	14.42	10.14	11.61381	12.057937
Uttar Pradesh	14.73	10.51	10.58000	11.940000
Haryana	15.45	9.18	10.91000	11.846667
Uttarakhand	13.64	8.12	13.65000	11.803333

Duration	2013-14	2014-15	2015-16	Mean
Jharkhand	7.92	15.14	11.44000	11.500000
Rajasthan	11.27	11.37	11.61381	11.417937
Maharashtra	13.74	8.78	11.61381	11.377937
Punjab	12.42	9.95	11.61381	11.327937
Gujarat	11.47	10.82	11.09000	11.126667
Jammu & Kashmir	10.09	4.70	17.91000	10.900000
Sikkim	12.35	9.72	9.39000	10.486667
Odisha	12.95	10.37	6.19000	9.836667
Meghalaya	4.87	6.41	9.58000	6.953333
Goa	-5.77	13.12	10.75000	6.033333

In [478]:

```
#Plotting the Avg growth of states over the duration 20

plt.figure(figsize=(20,20))
sns.set(style="whitegrid")
sns.barplot(x='Mean',y=df_GDPS.index,data=df_GDPS)
plt.ylabel("States",fontsize = 20)
plt.xlabel("Average Growth Rate",fontsize = 20)
plt.show()


#Which states have been growing consistently fast, and w
# Answer -- Mizoram is growing consistantly and Goa is s
```

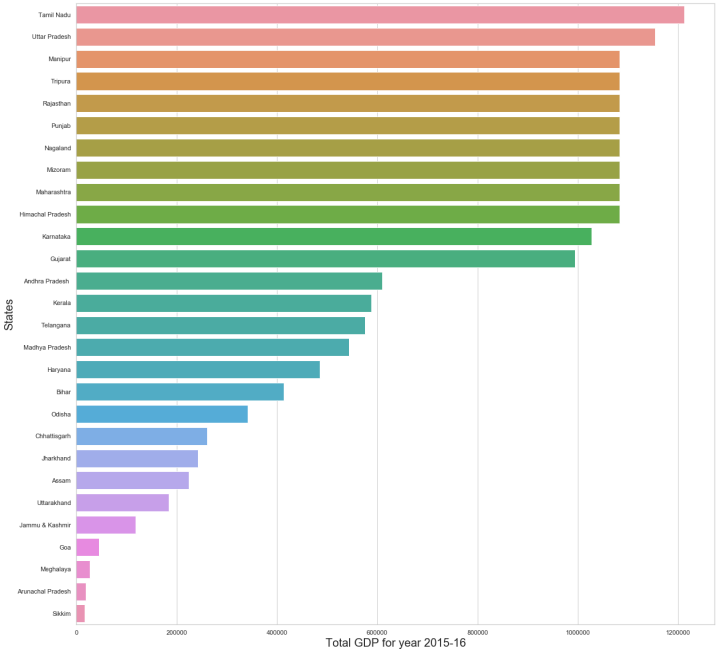


In [479]:

```
#Selecting only GDP data for year 2015-16

df_15_16= df_State.iloc[4:5,1:]

df_ix = df_15_16.set_index('Duration')
df_GDPS_15_16= df_ix.transpose()
df_GDPS_15_16

#fillNan with Mean value of its column mean value

df_GDPS_15_16["2015-16"].fillna(df_GDPS_15_16["2015-16"]

#calculating the mean value for

#df_GDPS_15_16['Total']= df_GDPS_15_16.T(axis=1)
df_GDPS_15_16.sort_values("2015-16", ascending=False, in

#Dropping All_India_GDP
df_GDPS_b = df_GDPS_15_16.drop(['All_India GDP'])
#df_GDPS_b
```

In [480]:

```
#Plot the total GDP of the states for the year 2015-16:

plt.figure(figsize=(20,20))
sns.set(style="whitegrid")
sns.barplot(x="2015-16",y=df_GDPS_b.index,data=df_GDPS_b
plt.ylabel("States",fontsize = 20)
plt.xlabel("Total GDP for year 2015-16",fontsize = 20)
plt.show()
```



Part 1-B Sector and Sub-sector contribution across State GDP

In [305]:

```
#Reading all the CSV file and merging it in combine file

import os
import glob
import pandas as pd
#set working directory
os.chdir("/Users/Divesh/Downloads/GDP_Analysis/Data 1-B"

#find all csv files in the folder
#use glob pattern matching -> extension = 'csv'
#save result in list -> all_filenames
extension = 'csv'
all_filenames = [i for i in glob.glob('*.{}'.format(exte


#combine all files in the list
combined_csv = pd.concat([pd.read_csv(f, encoding = "ISO
combined_csv.to_csv( "combined_csv.csv", index=False, en
```

```
/anaconda3/lib/python3.7/site-packages/ipy
kernel_launcher.py:17: FutureWarning: Sort
ing because non-concatenation axis is not
aligned. A future version
of pandas will change to not sort by defau
lt.

To accept the future behavior, pass 'sort=
False'.

To retain the current behavior and silence
the warning, pass 'sort=True'.
```

In [306]:

```
#Read the combine file
df_combined = pd.read_csv(("/Users/Divesh/Downloads/GDP_
```

In [ ]:

```
#Data profiling
df_combined.describe()
df_combined.info()
df_combined.head()
```

In [412]:

```
#Data cleasning
   # Removing Uniton teritorry
df_UT=df_combined.loc[-df_combined['State'].isin(['Chand
df_UT

#Setting index
df_1h = df_UT.set_index('State','Item')
df_1h = df_1h.drop(['2011-12','2012-13','2013-14','2015-
df_1h["2014-15"].fillna(df_1h["2014-15"].mean(), inplace
```

Base Data to be used for opeation "df_combined_Final"

In [314]:

```
# Selecting the per capita data to plot and sort based 

df_final = df_1h.loc[df_1h['Item']=='Per Capita GSDP (Rs
df_final.sort_values("2014-15", ascending=False, inplace
df_final
```

```
/anaconda3/lib/python3.7/site-packages/ipy
kernel_launcher.py:4: SettingWithCopyWarni
ng:
A value is trying to be set on a copy of a
slice from a DataFrame

See the caveats in the documentation: htt
p://pandas.pydata.org/pandas-docs/stable/i
ndexing.html#indexing-view-versus-copy (ht
tp://pandas.pydata.org/pandas-docs/stable/
indexing.html#indexing-view-versus-copy)
  after removing the cwd from sys.path.
```

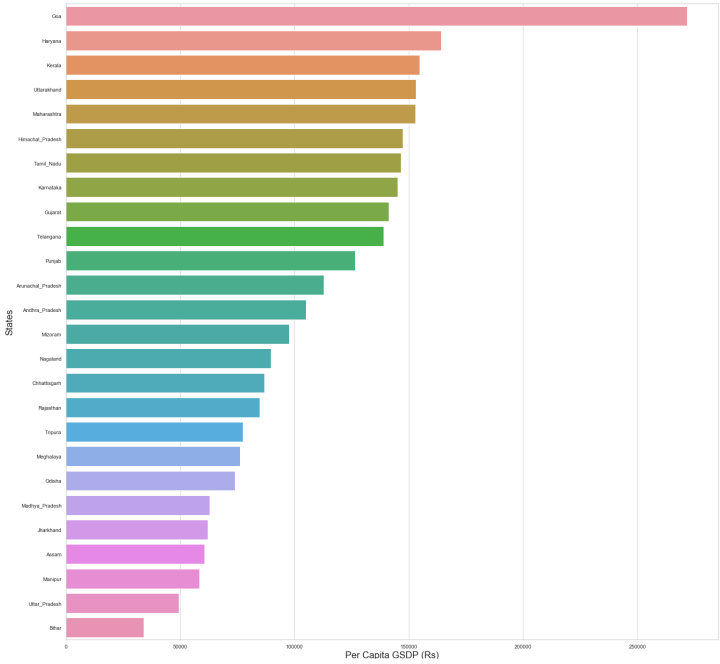
Out[314]:

State	2014-15	Item
Goa	271793.0	Per Capita GSDP (Rs.)
Haryana	164077.0	Per Capita GSDP (Rs.)
Kerala	154778.0	Per Capita GSDP (Rs.)
Uttarakhand	153076.0	Per Capita GSDP (Rs.)
Maharashtra	152853.0	Per Capita GSDP (Rs.)
Himachal_Pradesh	147330.0	Per Capita GSDP (Rs.)
Tamil_Nadu	146503.0	Per Capita GSDP (Rs.)
Karnataka	145141.0	Per Capita GSDP (Rs.)
Gujarat	141263.0	Per Capita GSDP (Rs.)

State	2014-15	Item
Telangana	139035.0	Per Capita GSDP (Rs.)
Punjab	126606.0	Per Capita GSDP (Rs.)
Arunachal_Pradesh	112718.0	Per Capita GSDP (Rs.)
Andhra_Pradesh	104977.0	Per Capita GSDP (Rs.)
Mizoram	97687.0	Per Capita GSDP (Rs.)
Nagaland	89607.0	Per Capita GSDP (Rs.)
Chhattisgarh	86860.0	Per Capita GSDP (Rs.)
Rajasthan	84837.0	Per Capita GSDP (Rs.)
Tripura	77358.0	Per Capita GSDP (Rs.)
Meghalaya	76228.0	Per Capita GSDP (Rs.)
Odisha	73979.0	Per Capita GSDP (Rs.)
Madhya_Pradesh	62989.0	Per Capita GSDP (Rs.)
Jharkhand	62091.0	Per Capita GSDP (Rs.)
Assam	60621.0	Per Capita GSDP (Rs.)
Manipur	58442.0	Per Capita GSDP (Rs.)
Uttar_Pradesh	49450.0	Per Capita GSDP (Rs.)
Bihar	33954.0	Per Capita GSDP (Rs.)

In [316]:

```
#Plot the GDP per capita for all the states.
#Identify the top-5 and the bottom-5 states based on GDI
#Find the ratio of highest per capita GDP to the lowest

plt.figure(figsize=(25,25))
sns.set(style="whitegrid")
sns.barplot(x='2014-15',y=df_final.index,data=df_final)
plt.ylabel("States",fontsize = 20)
plt.xlabel("Per Capita GSDP (Rs)",fontsize = 20)
plt.show()
```



percentage contribution of primary, secondary and tertiary sectors as a percentage of total GDP for all the states.

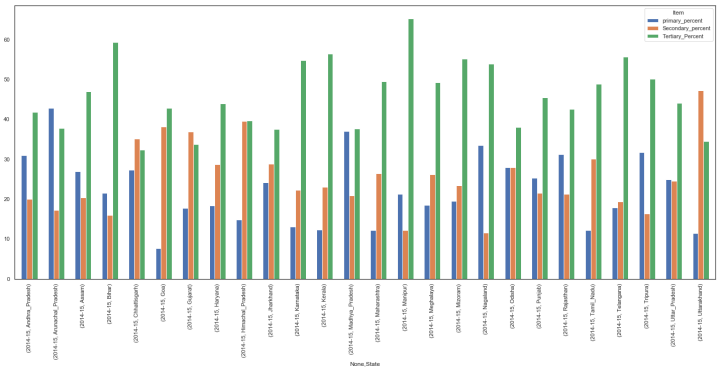
In [340]:

```
#Selecting only required data
df_tmp=df_1h.loc[df_1h['Item'].isin(['Gross State Domest

#Pivot
df_tmp1 = pd.pivot_table(df_tmp, index = ["Item"] , colu
df_pct = df_tmp1.transpose()

#Add perecentage
df_pct['primary_percent'] = (df_pct['Primary'] / df_pct|
df_pct['Secondary_percent'] = (df_pct['Secondary'] / df_
df_pct['Tertiary_Percent']= (df_pct['Tertiary'] / df_pct

#Drop addtional columns
df_pct.drop('Gross State Domestic Product',axis=1,inplac
df_pct.drop('Primary',axis=1,inplace=True)
df_pct.drop('Secondary',axis=1,inplace=True)
df_pct.drop('Tertiary',axis=1,inplace=True)
```

In [361]:

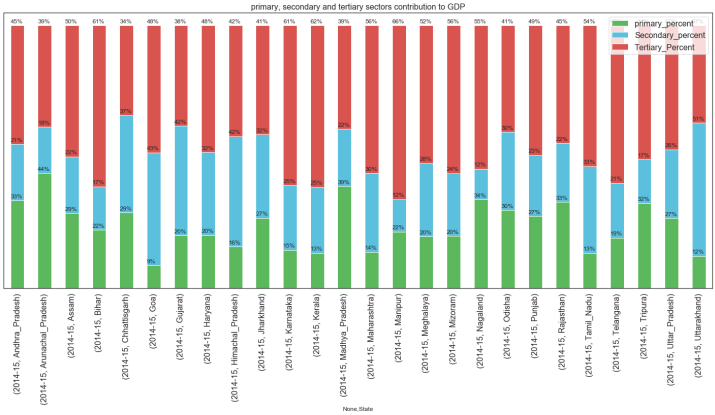
```
#Plot the percentage contribution of primary, secondary
#tertiary sectors as a percentage of total GDP for all t


#Set general plot properties
sns.set_style("white")
sns.set_context({"figure.figsize": (25, 10)})


plt.figure(num=None, figsize=(24,10),dpi=80, facecolor=

df_pct.plot(kind='bar', stacked=False, width= 0.6)

plt.show()
```

```
<Figure size 1920x800 with 0 Axes>
```



In [403]:

```
lt.legend()
lors_list = ['#5cb85c','#5bc0de','#d9534f']

 = (df_pct.div(df_pct.sum(1), axis=0)).plot(kind='bar',s
t.legend(labels=df_pct.columns,fontsize= 16, loc=0)
t.title("primary, secondary and tertiary sectors contribu

t.xticks(fontsize=16)
r spine in plt.gca().spines.values():
  spine.set_visible(True)
t.yticks([])

Add this loop to add the annotations
r p in ax.patches:
  width, height = p.get_width(), p.get_height()
  x, y = p.get_xy()
  ax.annotate('{:.0%}'.format(height), (x, y + height +
```



In [413]:

```
#Adding qurtile based on per capita
df_1h['Category'] = pd.qcut(df_1h[df_1h.Item =='Per Capit
```

In [418]:

```
# Removing Sector , sub sub sectort and other unwated co
df_cat_tmp=df_1h.loc[~df_1h['Item'].isin(['Per Capita GS
```

In [420]:

```
#reset index
df_cat = df_cat_tmp.reset_index()
```

In [422]:

```
#Spliting the categories to seprate df
df_C1 = df_cat.loc[df_cat['Category']=='C1']
df_C2 = df_cat.loc[df_cat['Category']=='C2']
df_C3 = df_cat.loc[df_cat['Category']=='C3']
df_C4 = df_cat.loc[df_cat['Category']=='C4']
```

In [429]:

```
#Data transformation ( grouping by sub sector and summi
df_cat_C1 = df_C1.groupby(['Item'])
df_cat_C1 = pd.DataFrame(df_cat_C1['2014-15'].sum())
df_cat_C1

# calculation there percentage contribution
df_cat_C1['C1_Contribution'] = (df_cat_C1['2014-15'] / 1

#dropping the addtiton columns
df_cat_C1.drop('Gross State Domestic Product',axis=0,inp
df_cat_C1.drop('TOTAL GSVA at basic prices',axis=0,inpla
df_cat_C1.drop('Taxes on Products',axis=0,inplace=True)
df_cat_C1.drop('Subsidies on products',axis=0,inplace=Tr
df_cat_C1.drop('Other services',axis=0,inplace=True)



# Sorting the values
df_cat_C1.sort_values("C1_Contribution", ascending=Falsе


##Cumulative calculation to select sub sectore whose co
df_cat_C1['cumulative'] = df_cat_C1['C1_Contribution'].c
df_cat_C1 =df_cat_C1.loc[(df_cat_C1.cumulative <= 81)]
df_cat_C1.reset_index(inplace= True)
df_cat_C1
```

Out[429]:

	Item	2014-15	C1_Contribution	cumulative
0	Manufacturing	19074348.0	16.357628	16.357628
1	Agriculture, forestry and fishing	15855785.0	13.597479	29.955107
2	Trade, repair, hotels and restaurants	15667697.0	13.436180	43.391287

	Item	2014-15	C1_Contribution	cumulative
3	Real estate, ownership of dwelling & professio...	15496222.0	13.289127	56.680414
4	Construction	12525126.0	10.741198	67.421613
5	Transport, storage, communication & services r...	7837906.0	6.721569	74.143182
6	Trade & repair services*	7763847.0	6.658058	80.801240

In [430]:

```
#Data transformation ( grouping by sub sector and summi
df_cat_C2 = df_C2.groupby(['Item'])
df_cat_C2 = pd.DataFrame(df_cat_C2['2014-15'].sum())
df_cat_C2

# calculation there percentage contribution
df_cat_C2['C2_Contribution'] = (df_cat_C2['2014-15'] / 6

#dropping the addtiton columns
df_cat_C2.drop('Gross State Domestic Product',axis=0,inp
df_cat_C2.drop('TOTAL GSVA at basic prices',axis=0,inpla
df_cat_C2.drop('Taxes on Products',axis=0,inplace=True)
df_cat_C2.drop('Subsidies on products',axis=0,inplace=Tr
df_cat_C2.drop('Other services',axis=0,inplace=True)



# Sorting the values
df_cat_C2.sort_values("C2_Contribution", ascending=Falsе


##Cumulative calculation to select sub sectore whose co
df_cat_C2['cumulative'] = df_cat_C2['C2_Contribution'].c
df_cat_C2 =df_cat_C2.loc[(df_cat_C2.cumulative <= 81)]
df_cat_C2.reset_index(inplace= True)
df_cat_C2
```

Out[430]:

	Item	2014-15	C2_Contribution	cumulativ
0	Manufacturing	108002544.0	17.340647	17.34064
1	Real estate, ownership of dwelling & professio...	95695548.0	15.364663	32.70531

	Item	2014-15	C2_Contribution	cumulativ
2	Agriculture, forestry and fishing	88427015.0	14.197644	46.90295
3	Trade, repair, hotels and restaurants	63729156.0	10.232211	57.13516
4	Construction	43975718.0	7.060643	64.19580
5	Financial services	37812475.0	6.071086	70.26689
6	Transport, storage, communication & services r...	37760099.0	6.062677	76.32957
7	Public administration	20189303.0	3.241549	79.57112

In [431]:

```
#Data transformation ( grouping by sub sector and summi
df_cat_C3 = df_C3.groupby(['Item'])
df_cat_C3 = pd.DataFrame(df_cat_C3['2014-15'].sum())
df_cat_C3

# calculation there percentage contribution
df_cat_C3['C3_Contribution'] = (df_cat_C3['2014-15'] /12

#dropping the addtiton columns
df_cat_C3.drop('Gross State Domestic Product',axis=0,inp
df_cat_C3.drop('TOTAL GSVA at basic prices',axis=0,inpla
df_cat_C3.drop('Taxes on Products',axis=0,inplace=True)
df_cat_C3.drop('Subsidies on products',axis=0,inplace=Tr
df_cat_C3.drop('Other services',axis=0,inplace=True)



# Sorting the values
df_cat_C3.sort_values("C3_Contribution", ascending=Falsе


##Cumulative calculation to select sub sectore whose co
df_cat_C3['cumulative'] = df_cat_C3['C3_Contribution'].c
df_cat_C3 =df_cat_C3.loc[(df_cat_C3.cumulative <= 81)]
df_cat_C3.reset_index(inplace= True)
df_cat_C3
```

Out[431]:

	Item	2014-15	C3_Contribution	cumulative
0	Agriculture, forestry and fishing	27407472.0	21.870070	21.870070
1	Manufacturing	17366065.0	13.857427	35.727497
2	Trade, repair, hotels and restaurants	13011909.0	10.382985	46.110482

	Item	2014-15	C3_Contribution	cumulative
3	Real estate, ownership of dwelling & professio...	11818709.0	9.430859	55.541340
4	Construction	11043032.0	8.811899	64.353240
5	Mining and quarrying	9351471.0	7.462101	71.815341
6	Transport, storage, communication & services r...	7154500.0	5.709006	77.524346

In [432]:

```
#Data transformation ( grouping by sub sector and summi
df_cat_C4 = df_C4.groupby(['Item'])
df_cat_C4 = pd.DataFrame(df_cat_C4['2014-15'].sum())
df_cat_C4

# calculation there percentage contribution
df_cat_C4['C4_Contribution'] = (df_cat_C4['2014-15'] /2

#dropping the addtiton columns
df_cat_C4.drop('Gross State Domestic Product',axis=0,inp
df_cat_C4.drop('TOTAL GSVA at basic prices',axis=0,inpla
df_cat_C4.drop('Taxes on Products',axis=0,inplace=True)
df_cat_C4.drop('Subsidies on products',axis=0,inplace=Tr
df_cat_C4.drop('Other services',axis=0,inplace=True)



# Sorting the values
df_cat_C4.sort_values("C4_Contribution", ascending=Falsе


##Cumulative calculation to select sub sectore whose co
df_cat_C4['cumulative'] = df_cat_C4['C4_Contribution'].c
df_cat_C4 =df_cat_C4.loc[(df_cat_C4.cumulative <= 81)]
df_cat_C4.reset_index(inplace= True)
df_cat_C4
```

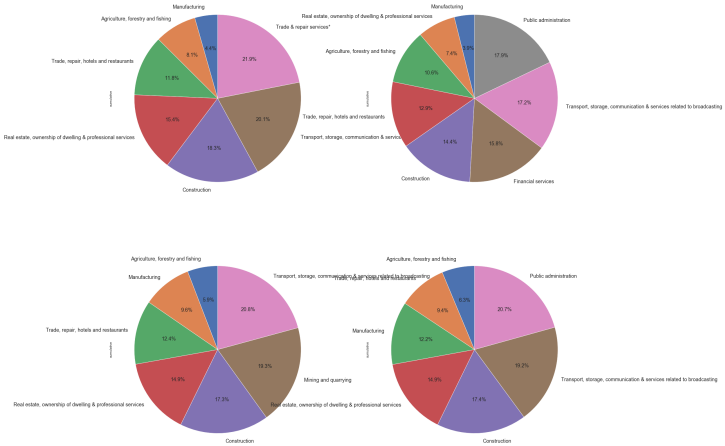
Out[432]:

	Item	2014-15	C4_Contribution	cumulative
0	Agriculture, forestry and fishing	56735044.0	24.323490	24.323490
1	Trade, repair, hotels and restaurants	27484595.0	11.783216	36.106707
2	Manufacturing	24987032.0	10.712459	46.819166

	Item	2014-15	C4_Contribution	cumulative
3	Real estate, ownership of dwelling & professio...	24177534.0	10.365410	57.184576
4	Construction	22775948.0	9.764521	66.949097
5	Transport, storage, communication & services r...	16191800.0	6.941761	73.890858
6	Public administration	13486630.0	5.781998	79.672856

In [433]:

```
# Creates blank canvas
plt.figure(figsize=(30,30))


# plot chart C1
ax1 = plt.subplot(221, aspect='equal')
df_cat_C1.plot(kind='pie', y = 'cumulative', ax=ax1, aut
 startangle=90, shadow=False, labels=df_cat_C1['Item'],

# plot chart C2
ax2 = plt.subplot(222, aspect='equal')
df_cat_C2.plot(kind='pie', y = 'cumulative', ax=ax2, aut
 startangle=90, shadow=False, labels=df_cat_C2['Item'],

# plot chart C3
ax3 = plt.subplot(223, aspect='equal')
df_cat_C3.plot(kind='pie', y = 'cumulative', ax=ax3, aut
 startangle=90, shadow=False, labels=df_cat_C3['Item'],

# plot chart C4
ax4 = plt.subplot(224, aspect='equal')
df_cat_C4.plot(kind='pie', y = 'cumulative', ax=ax4, aut
 startangle=90, shadow=False, labels=df_cat_C4['Item'],


plt.show()
```



Part-II: GDP and Education Drop-out Rates

In [434]:

```
drop_out =  pd.read_csv (r"/Users/Divesh/Downloads/GDP_A
```

In [447]:

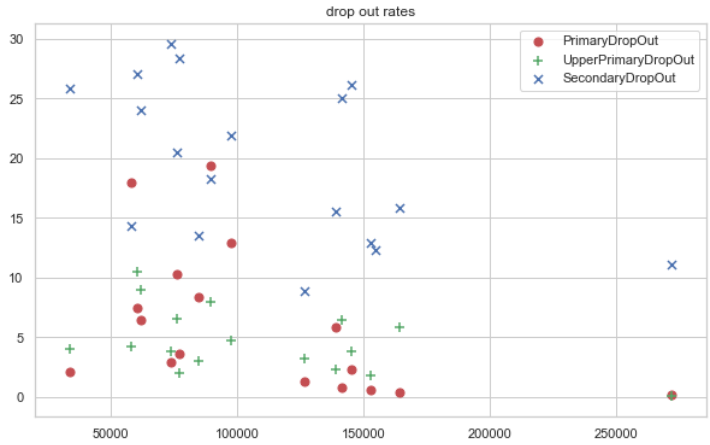
```
_out
_out_1 = drop_out.drop(['Primary - 2012-2013','Primary -
                        'Upper Primary - 2013-2014','Secc
                        'Senior Secondary - 2012-2013','S

p_out_2 = drop_UT(['Chandigarh','Dadra & Nagar Haveli','I

oving all union territory
_ut = drop_out_1.loc[~drop_out_1['Level of Education - St


_ut.reset_index(drop=True)
_ut1= drop_ut.set_index('Level of Education - State')

ame column name for better understanding .
_ut1.rename(columns={'Primary - 2014-2015': 'PrimaryDropC


ning the part 1B DF with part 2 data to compare per capit
oin_1 = drop_ut1.join(df_final, how='inner', sort = False
oin = df_join_1.drop(['Item'], axis=1)
```

In [483]:

```
#Scatter plot to check the co-relation between PerCapita

plt.figure(figsize=(10,6))

p1= plt.scatter(x=df_join['2014-15'] , y=df_join['Primar
p2= plt.scatter(x=df_join['2014-15'] , y=df_join['UpperP
p3= plt.scatter(x=df_join['2014-15'] , y=df_join['Second
plt.title('drop out rates')
plt.legend(loc=0)
```

Out[483]:

```
<matplotlib.legend.Legend at 0x1a1b66a400>
```



In [ ]:

```
#Primary drop out is more in low per capita state compar
```

In [ ]:

```

```

In [ ]:

```
```

Good Job :)

In [ ]:

```
```