

# Assignment

## “GDP Analysis”

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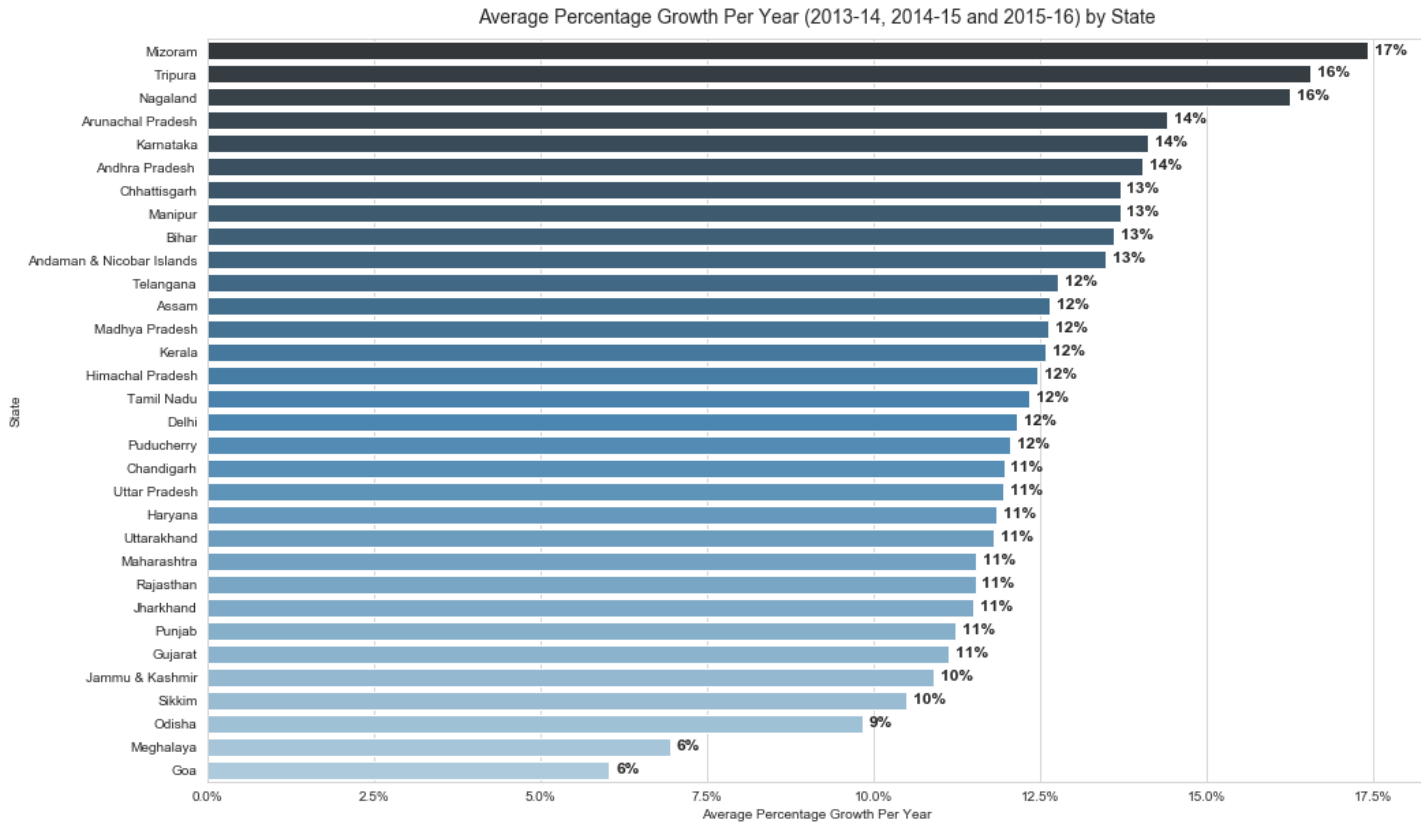
# Overall Approach

- Data Sourcing
  - Download and Load
- Data Understanding & Preparation
  - Handling Missing Data
  - Data Cleaning
  - Transformations
- Data Modelling
  - Derived Metrics
- Data Visualization
- Data Interpretation
  - Key Insights / Derivation
  - Recommendations
  - Hypothesis

# Part I: GDP Analysis of Indian States

## Part I-A

# Average Growth of States 2013-14, 2014-15 and 2015-16



- **North Eastern States of Mizoram, Tripura and Nagaland** depict the highest average growth percentage with over **16% growth**.
  - They seem to have been consistently growing probably due to the developmental attention provided to these states.
  - Their GDP value may not be highest but the growth trend is positive and is a good indication for North-East.
- States of **Goa, Meghalaya and Odisha** seem to be **struggling**. Their GDP was **less than 10%** growth while all other states were over 10%.
- An interesting observation is that while all the states of North-East have shown an upward trend of growth, the state of **Meghalaya** has struggled during this period and needs to be investigated.

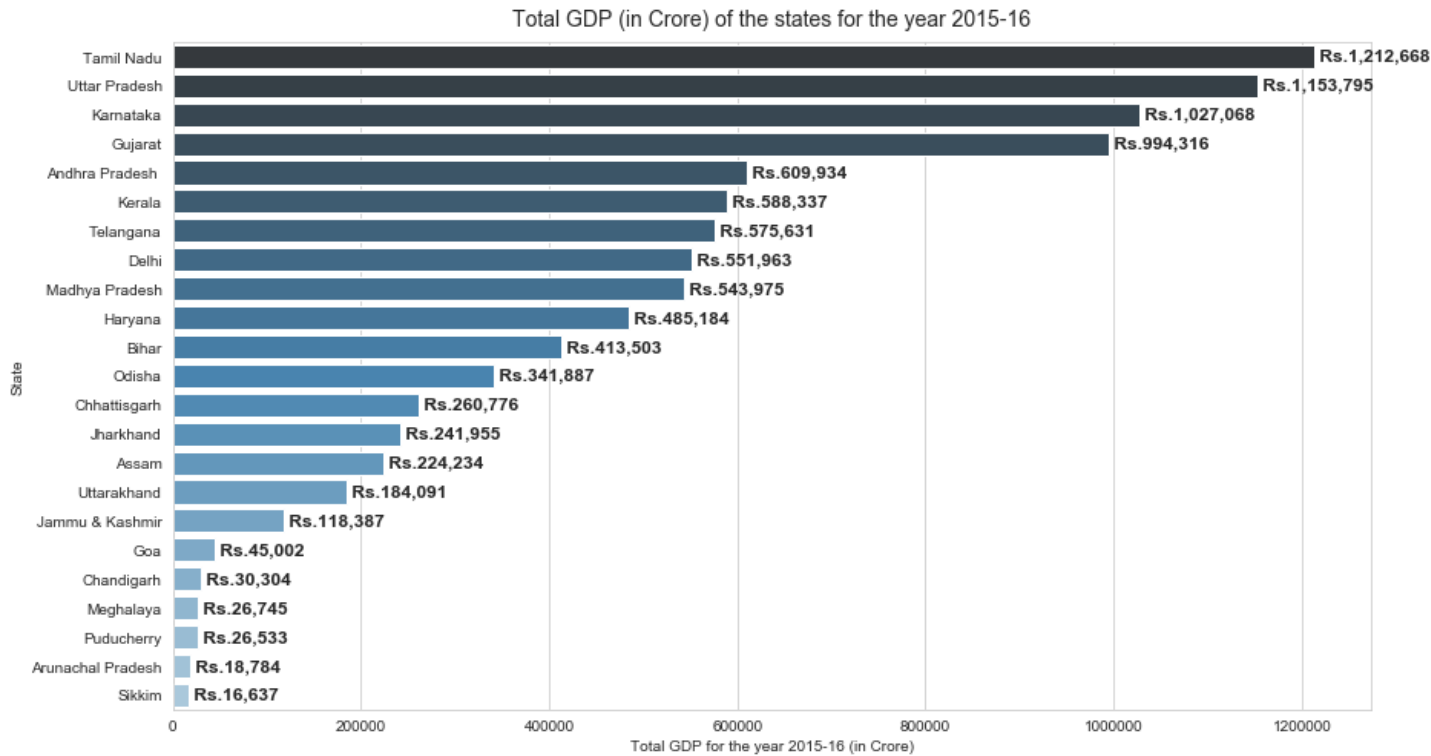
## Average Growth Rate of Home State (Delhi)

All India GDP: 11.2 %

Home State, Delhi's GDP: 12.16 %

*Average Percentage GDP Growth of Delhi is higher than the Average Percentage GDP Growth of India*

# Total GDP of the States of the year 2015-16



## Top 5 States based on GDP for year 2015-16

State	Total GDP Per Capita (Rs.)
Tamil Nadu	1212668
Uttar Pradesh	1153795
Karnataka	1027068
Gujarat	994316
Andhra Pradesh	609934

## Bottom 5 States based on GDP for year 2015-16

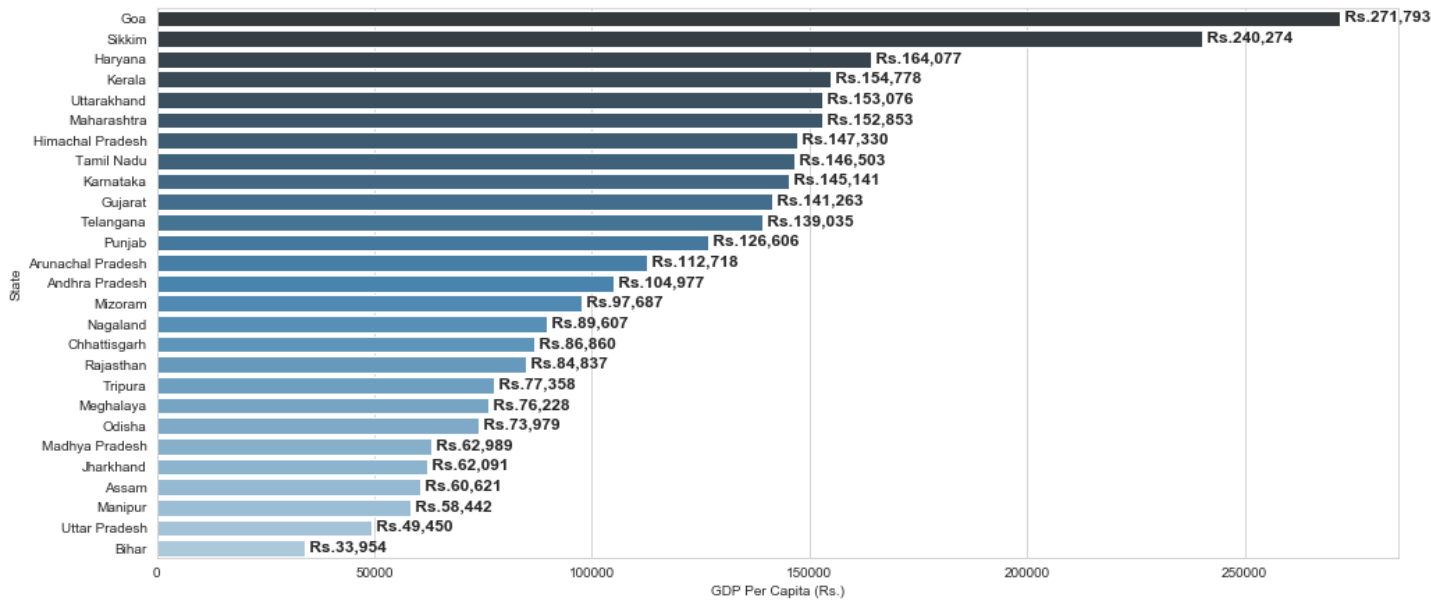
State	Total GDP Per Capita (Rs.)
Chandigarh	30304
Meghalaya	26745
Puducherry	26533
Arunachal Pradesh	18784
Sikkim	16637

# Part I: GDP Analysis of Indian States

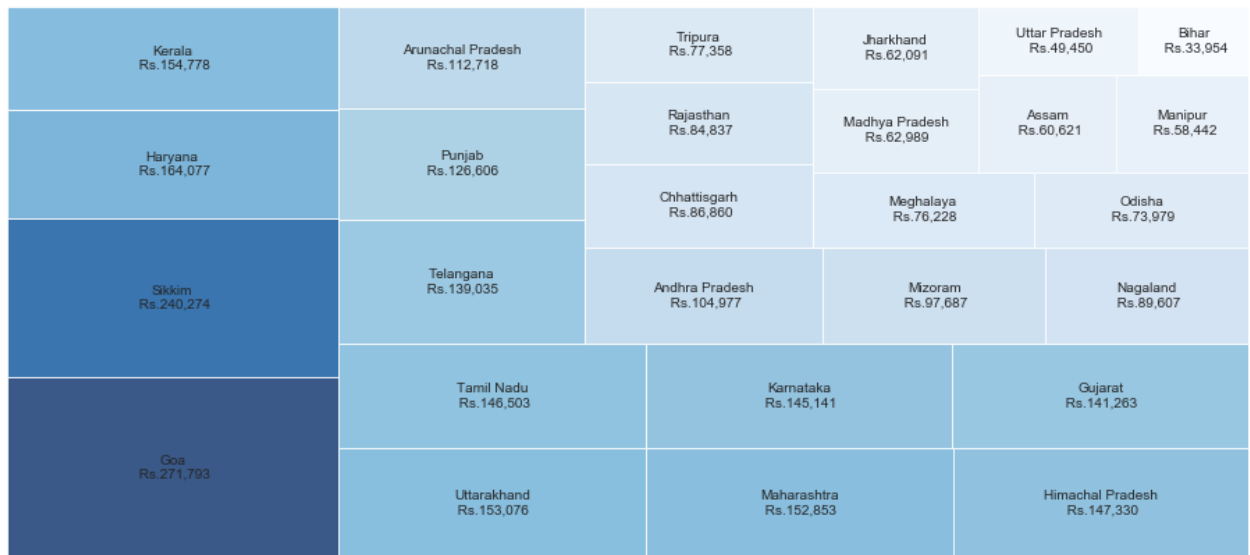
## Part I-B

# GDP per capita for all the states

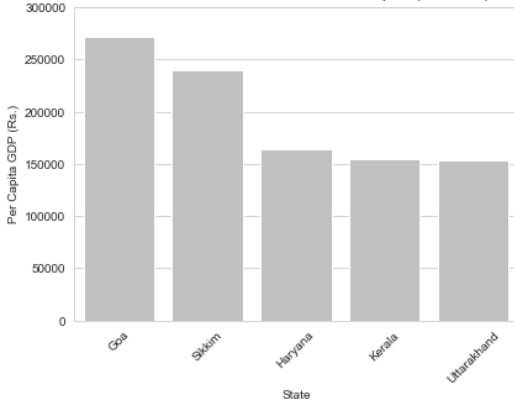
GDP Per Capita (2014-15) by State



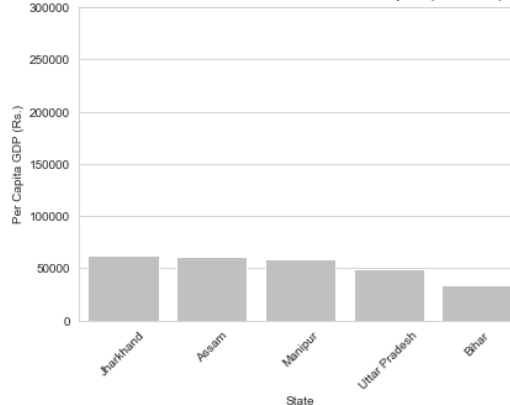
Treemap Representation of GDP Per Capita for Each State



TOP 5 States based on GDP Per Capita (2014-15)



Bottom 5 States based on GDP Per Capita (2014-15)



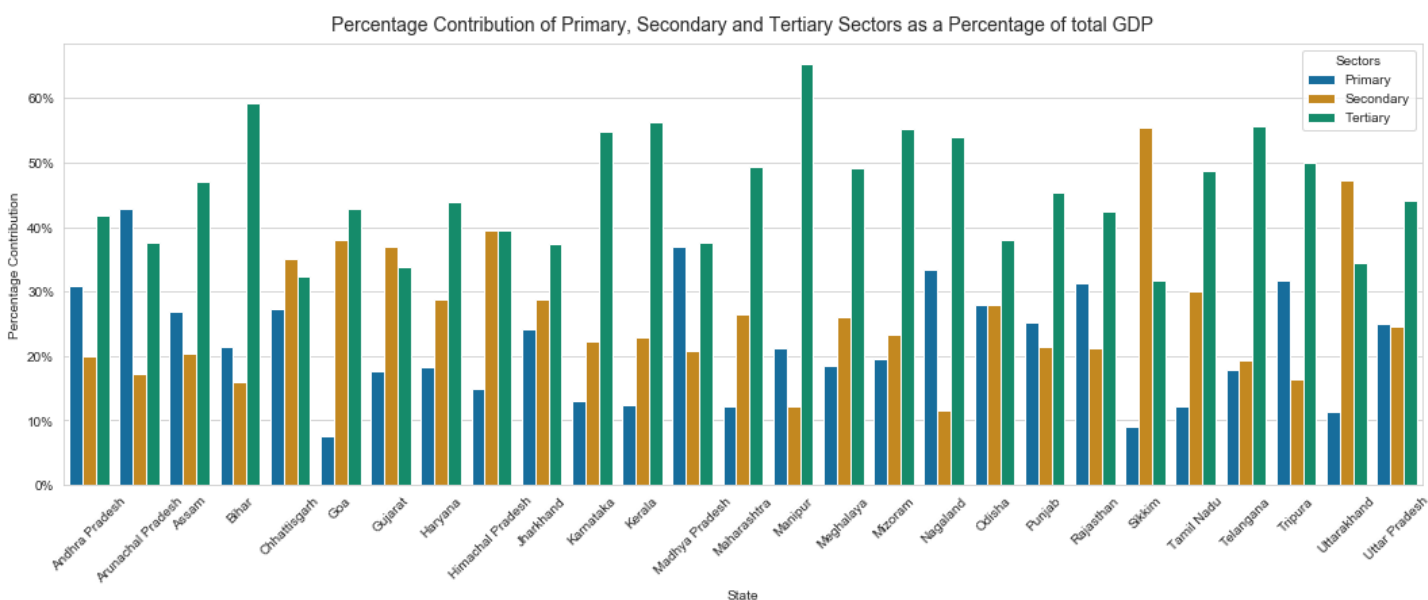
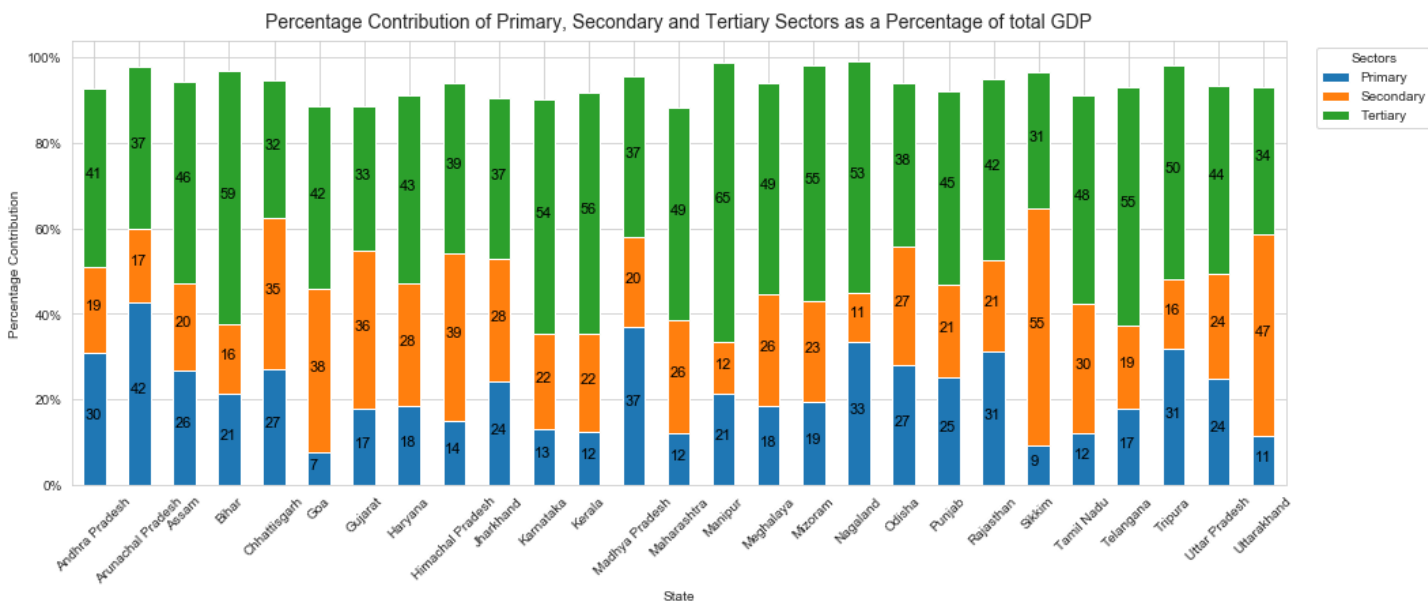
Standard of living is the worst in Bihar whereas it's the best in Goa

Ratio of highest per capita GDP to the lowest per capita GDP.

8 : 1

# Percentage contribution of primary, secondary and tertiary sectors as a % of total GDP for all the states

## Birds Eye View



India seems to be on the fast pace towards becoming a Developed Economy. This is evident as:-

- The Percentage Contribution in the Tertiary Sector is higher than the Primary and Secondary Sector which is followed by Secondary Sector which is followed by Primary Sector
- Sector to State mapping for the **highest percentage contribution** based on the State's Total GDP.
  - Primary Sector - Arunachal Pradesh followed by Madhya Pradesh
  - Secondary Sector - Uttarakhand followed by Himachal Pradesh
  - Tertiary Sector - Manipur followed by Bihar



# Percentage contribution of primary, secondary and tertiary sectors as a % of total GDP for all the states

## Detailed

Percentage Contribution of Primary Sector

Tripura 31%	Manipur 21%	Gujarat 17%	Kerala 12%	Sikkim 9%	Goa 7%
Nagaland 33%	Bihar 21%	Telangana 17%	Karnataka 13%	Uttarakhand 11%	
Madhya Pradesh 37%	Jharkhand 24%	Mizoram 19%	Himachal Pradesh 14%	Tamil Nadu 12%	Maharashtra 12%
Arunachal Pradesh 42%	Chhattisgarh 27%	Assam 26%	Meghalaya 18%	Haryana 18%	
	Rajasthan 31%	Andhra Pradesh 30%	Punjab 25%	Uttar Pradesh 24%	
				Odisha 27%	

Percentage Contribution of Secondary Sector

Goa 36%	Mizoram 23%	Assam 20%	Tripura 16%	Manipur 12%	Nagaland 11%
Himachal Pradesh 30%	Uttar Pradesh 24%	Madhya Pradesh 20%	Arunachal Pradesh 17%	Bihar 16%	
Uttarakhand 47%	Meghalaya 26%	Rajasthan 21%	Andhra Pradesh 19%	Telangana 19%	
Sikkim 55%	Jharkhand 28%	Kerala 22%	Karnataka 22%	Punjab 21%	
		Haryana 28%	Odisha 27%	Maharashtra 26%	
	Gujarat 36%	Chhattisgarh 35%	Tamil Nadu 30%		

Percentage Contribution of Tertiary Sector

Mizoram 55%	Goa 42%	Himachal Pradesh 30%	Gujarat 33%	Sikkim 31%
Telangana 55%	Haryana 43%	Andhra Pradesh 41%	Uttarakhand 34%	Chhattisgarh 32%
Kerala 56%	Uttar Pradesh 44%	Rajasthan 42%	Madhya Pradesh 37%	Jharkhand 37%
Bihar 59%	Meghalaya 40%	Tamil Nadu 48%	Odisha 38%	Arunachal Pradesh 37%
Manipur 65%	Karnataka 54%	Nagaland 53%	Assam 46%	Punjab 45%
			Tripura 50%	Maharashtra 46%

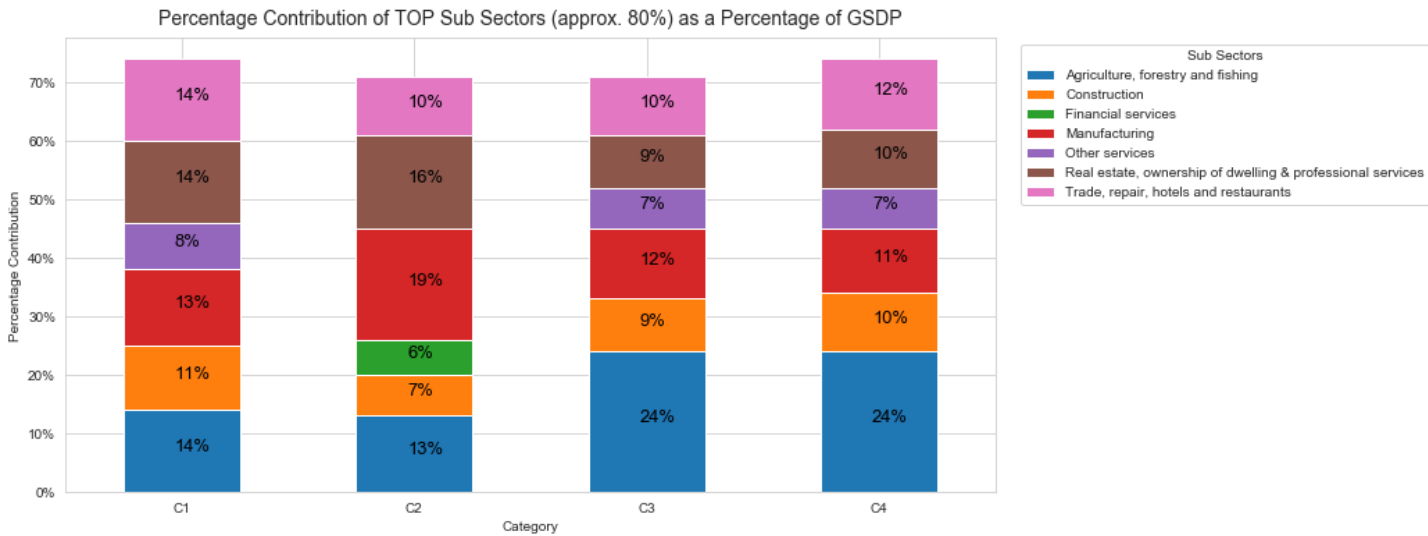
Percentage Contribution is highest for the Tertiary, then Secondary and then Primary Sectors. This signifies India's progress towards a Developed economy where the Tertiary Sector involved with the service industry and Secondary sector involved with machinery has higher percentage contribution and higher skilled labour in comparison to Primary sector.

- **Sikkim has highest Secondary Sector Contribution but lowest Primary and Tertiary Sector Contribution**
  - Highly dependent on Secondary Sectors for it's GDP growth. Focus on Primary and Tertiary Sectors will help improve GDP
- **Goa (having highest GDP Per Capita in 2014-15) has lowest Primary Sector Contribution but does well in the Secondary and Tertiary Sectors**
  - This suggests the state is highly dependent on Secondary and Tertiary Sectors for it's GDP growth. Focus on Primary Sector can help increase the overall GDP further.
- **Bihar (having lowest GDP Per Capita in 2014-15) has low Primary and Secondary Sector Contribution but does well in the Tertiary Sectors**
  - This suggests the state is highly dependent on Tertiary Sectors for it's GDP growth.
  - The **Standard of living of people can improve** if the focus on Primary and Secondary sectors like "Agriculture, forestry and fishing" and "Manufacturing" is improved.

## Categorization based on GDP per capita (C1, C2, C3, C4)

	State	2014-15. GDP Per Capita (Rs.)	Category
0	Goa	271793	C1
1	Sikkim	240274	C1
2	Haryana	164077	C1
3	Kerala	154778	C1
4	Uttarakhand	153076	C2
5	Maharashtra	152853	C2
6	Himachal Pradesh	147330	C2
7	Tamil Nadu	146503	C2
8	Karnataka	145141	C2
9	Gujarat	141263	C2
10	Telangana	139035	C2
11	Punjab	126606	C2
12	Arunachal Pradesh	112718	C2
13	Andhra Pradesh	104977	C3
14	Mizoram	97687	C3
15	Nagaland	89607	C3
16	Chhattisgarh	86860	C3
17	Rajasthan	84837	C3
18	Tripura	77358	C3
19	Meghalaya	76228	C3
20	Odisha	73979	C3
21	Madhya Pradesh	62989	C4
22	Jharkhand	62091	C4
23	Assam	60621	C4
24	Manipur	58442	C4
25	Uttar Pradesh	49450	C4
26	Bihar	33954	C4

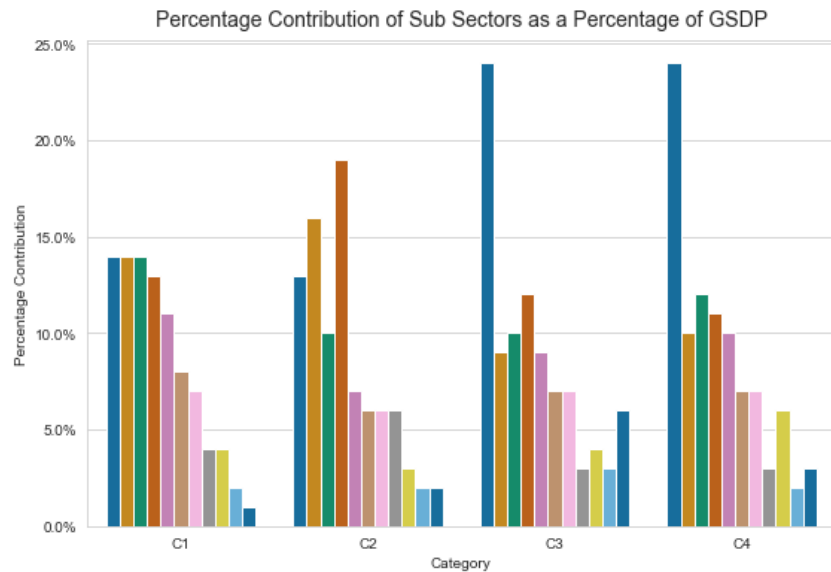
# Top 3/4/5 sub-sectors



*Common Top 5 Sub-Sectors (approx. 80%) in Each Category (C1, C2, C3 and C4) are:-*

- Agriculture, forestry and fishing
- Real estate, ownership of dwelling & professional services
- Trade, repair, hotels and restaurants
- Manufacturing
- Construction

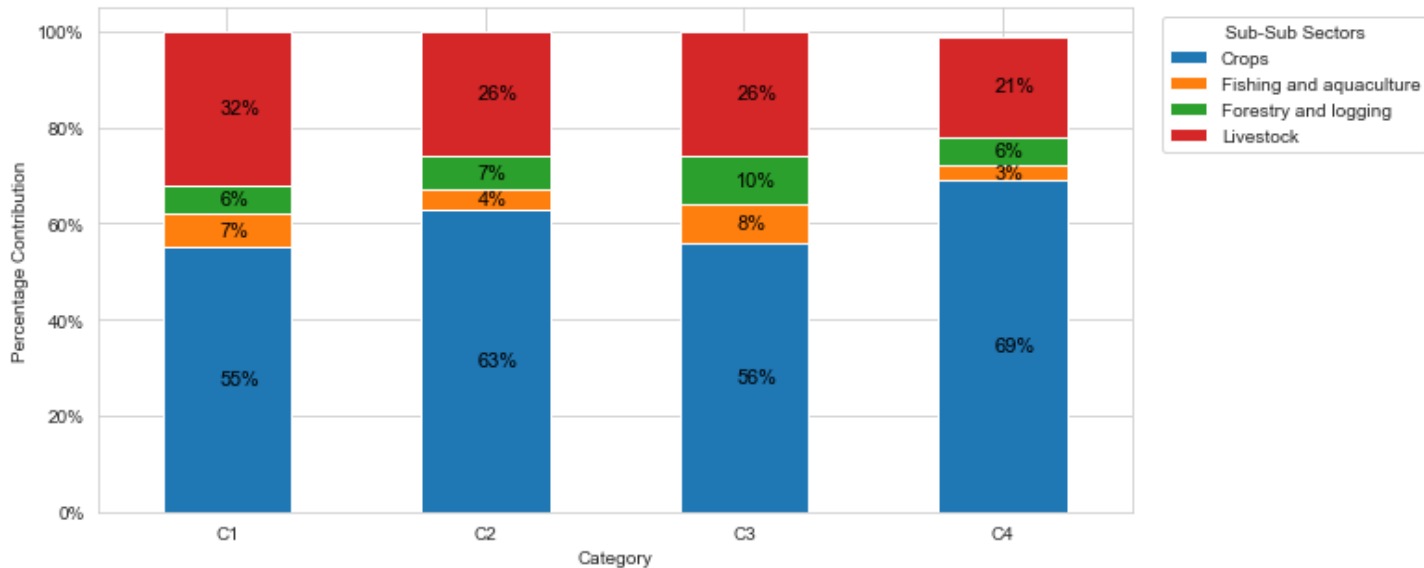
# Plot Contribution of the sub-sectors as a Percentage of the GSDP of each category



- Category C1, C2, C3 and C4 wise commonalities
  - Top 5: **The sub-sectors which seem to be correlated with high GDP**
    - Agriculture, forestry and fishing
    - Real estate, ownership of dwelling & professional services
    - Trade, repair, hotels and restaurants
    - Manufacturing
    - Construction
  - Bottom 4: **The Sub-Sectors which various categories need to focus on**
    - Mining and quarrying
    - Electricity, gas, water supply & other utility services
    - Public Administration
    - Financial Services
- Categories C3 and C4 seem to be highly dependent on "Agriculture, forestry and fishing" Sector.**
- Category C1 has almost equal percentage contribution in the top 5 sectors.** This signifies equal focus on development across top performing Sectors.
- Similar to Category C1, the category C2 seems consistent in the percentage contribution by the top 5 sectors.

# Which Sub-Sub-Sector within the Sub-Sector, "Agriculture, forestry and fishing" has high percentage contribution

Percentage Contribution of Sub Sub Sectors for Sub Sector (Agriculture, forestry and fishing)



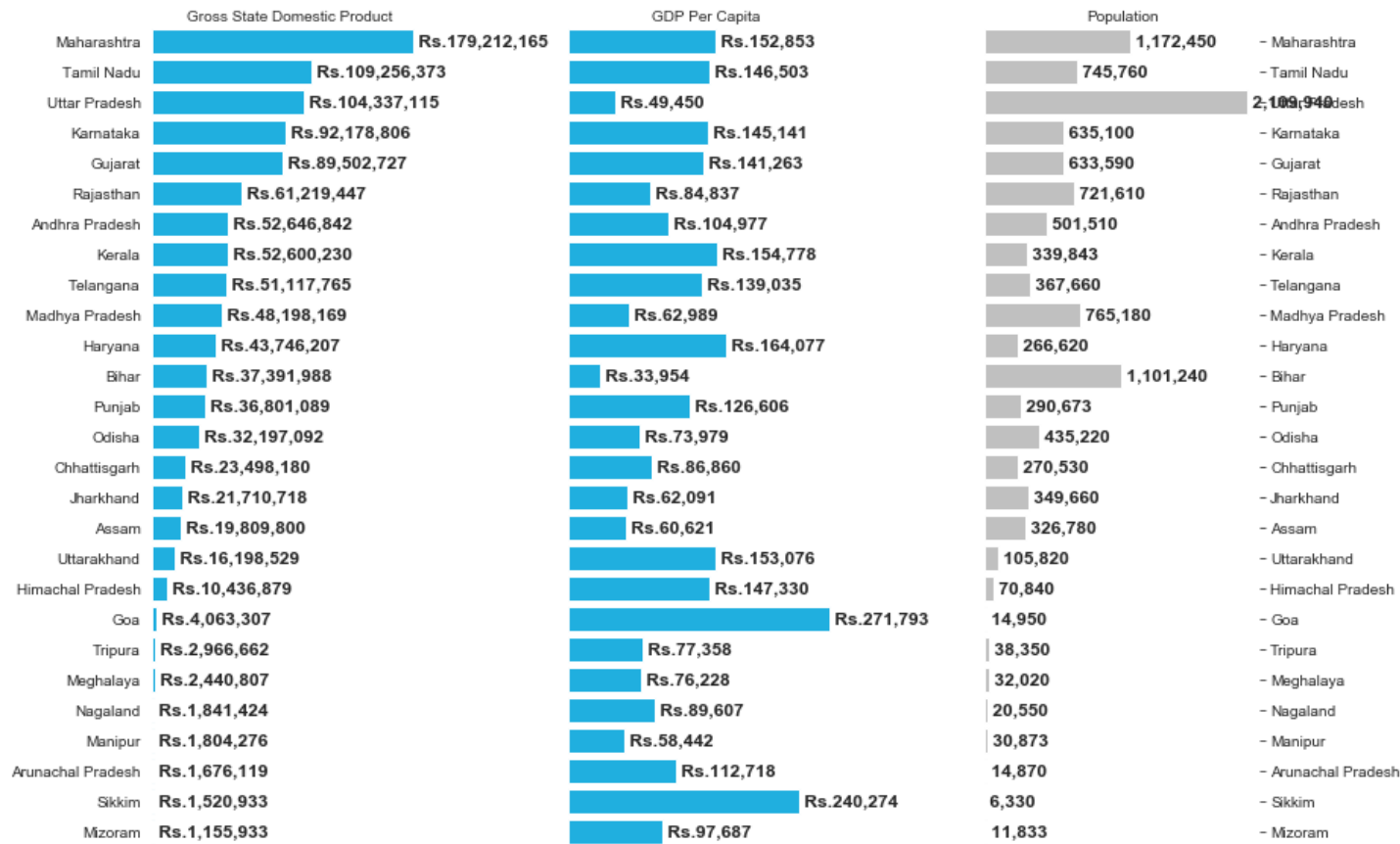
- **Sub Sub Sector, Crops contributes to about 61%**
- **Sub Sub Sector, Livestock contributes to about 26%**
- The above Sub-Sub Sectors are the dominant influencers within the "Agriculture, forestry and fishing" Sector.
- There is no variance between Categories in terms of variations in Sub-Sub Sectors contribution

# Two recommendations for each category to improve the per capita GDP

- Category C1
  - Focus on the low contributing Sub Sectors - "Mining & Quarrying (1%)", "Electricity, gas, water supply & other utility services (2%)", "Public Administration (4%)" and "Financial Services (4%)". Development of **skills through education, funds, subsidies and schemes** to support growth of these Sub-Sectors.
  - To ensure sustained GDP growth in the Top 3 Sub-Sectors - "Agriculture, forestry and fishing (14%)", "Real estate, ownership of dwelling & professional services (14%)" and "Trade, repair, hotels and restaurants (14%)", beneficial **funds and schemes** should be launched by the government.
- Category C2
  - Focus on **development of Infrastructure** that would lead to increase in Construction Sub-Sector (7%) and other Tertiary Sectors.
  - Focus on the low contributing Sub Sectors - "Mining & Quarrying (2%)", "Electricity, gas, water supply & other utility services (2%)" and "Public Administration (3%)". Development of **skills through education, funds, subsidies and schemes** to support growth of these Sub-Sectors.
- Category C3
  - The Category is highly dependent on Primary Sector with "Agriculture, forestry and fishing" Sub-Sector contributing to 24% contribution. In order for further development of these states to move towards Manufacturing, Automation and eventually services industry will be the key to move them to Developed States. **Attractive and flexible business policies to attract industrial development and investments.**
  - Focus on the low contributing Sub Sectors - "Financial Services (3%)", "Electricity, gas, water supply & other utility services (3%)" and "Public Administration (4%)". Development of **skills through education, funds, subsidies and schemes** to support growth of these Sub-Sectors.
- Category C4
  - Focus on upcoming / mid contributing Sub Sectors - "Transport, storage, communication & services related to broadcasting (7%)" and "Other Services (7%)" by increasing it's budget.
  - **Increase Investment Climate Index to attract investments in Secondary and Tertiary Sectors.** The Category is currently highly dependent on Primary Sector with "Agriculture, forestry and fishing" Sub-Sector contributing to 24% contribution.

# Correlation of GSDP and GDP Per Capita and Population

Correlation of GSDP, GDP Per Capita and Population (2014-15)



- Population of Bihar and Uttar Pradesh is very high. Their low GDP Per Capita makes them the poorest states in the country having **GDP per Capita less than Rs. 50,000**
- Maharashtra having high Population and done well in terms of their GDP growth and hence high GDP Per Capita

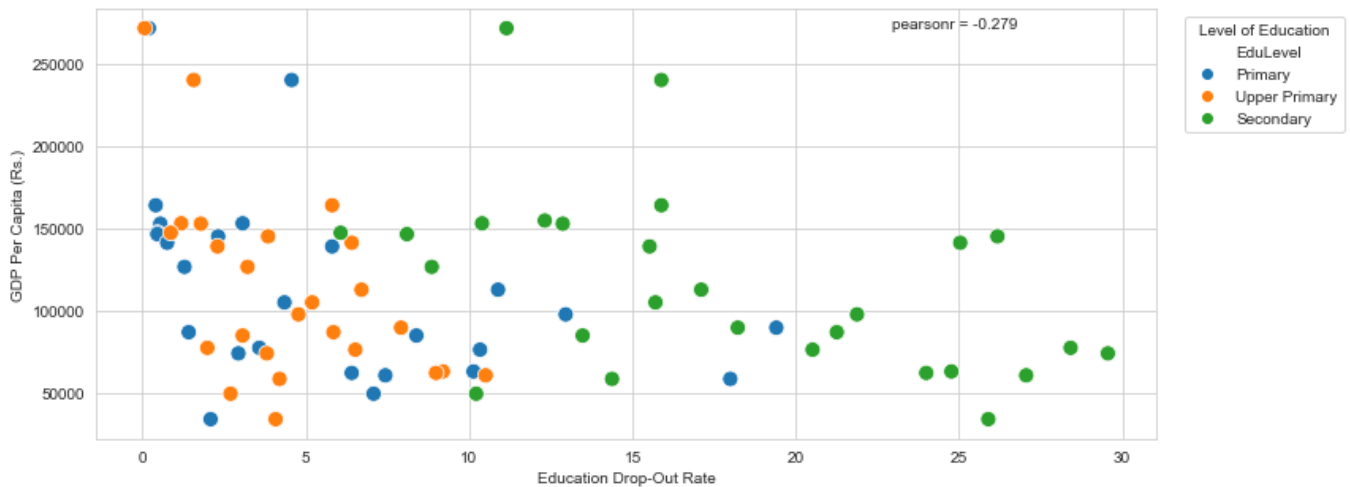
# Part 2: GDP and Education

## Drop-Out Rates



# Correlate GDP Per Capita with Overall Education Drop-Out Rate

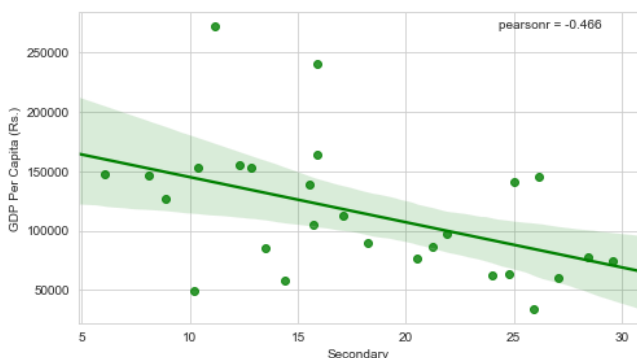
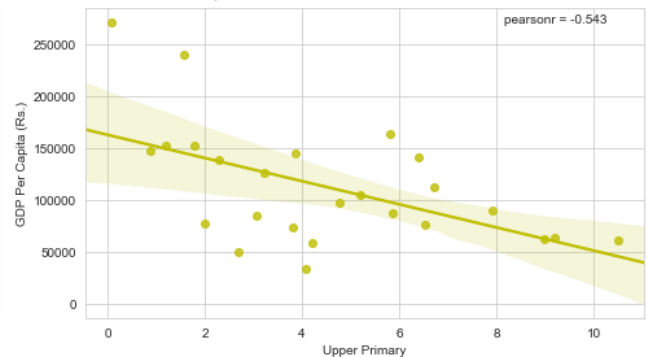
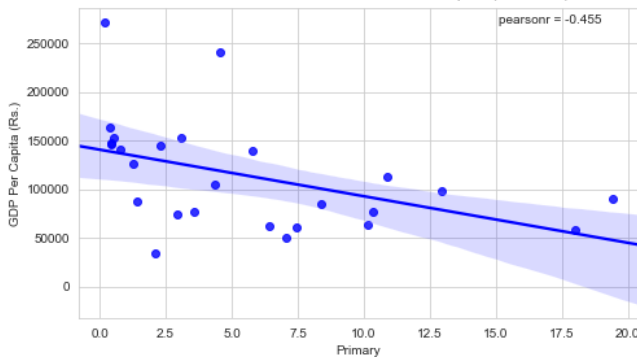
Correlation of GDP Per Capita (2014-15) with Education Drop-Out Rate



*Correlation Coefficient = -0.279 indicates Negative Association*

- Secondary Level of Education seems to have the highest Drop-Out Rate. And the corresponding states have a low GDP Per Capita.
- States having highest Per Capita GDP's are the ones having the Education Drop-Out Rate under 16. Density of GDP Per Capita and Education Drop-Out Rate is greater where the value of GDP Per Capita is low, having low Education Drop-Out Rate.

GDP Per Capita (2014-15) with Each Level of Education's Drop-Out Rate



Regression for Primary, Upper Primary and Secondary demonstrate that **Higher Education Drop-Out Rate resulted in Lower GDP Per Capita - NEGATIVE ASSOCIATION**

Correlation Coefficients:

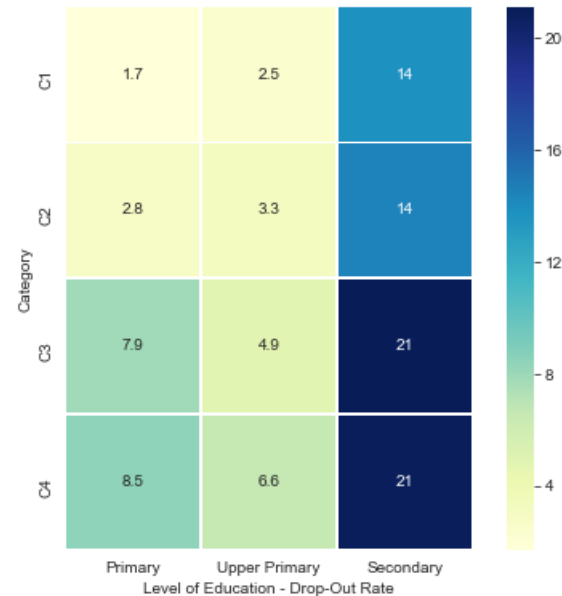
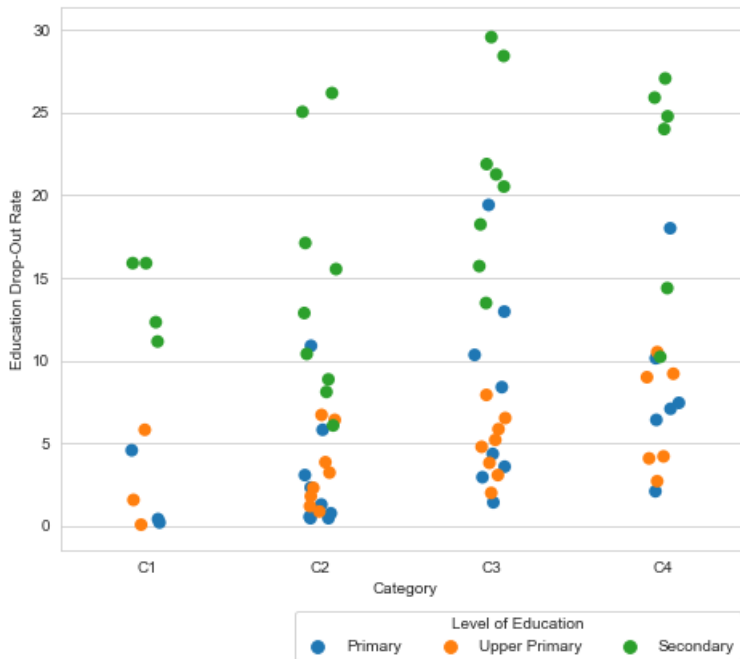
*GDP Per Capita with Primary = -0.455*

*GDP Per Capita with Upper Primary = -0.543*

*GDP Per Capita with Secondary = -0.466*

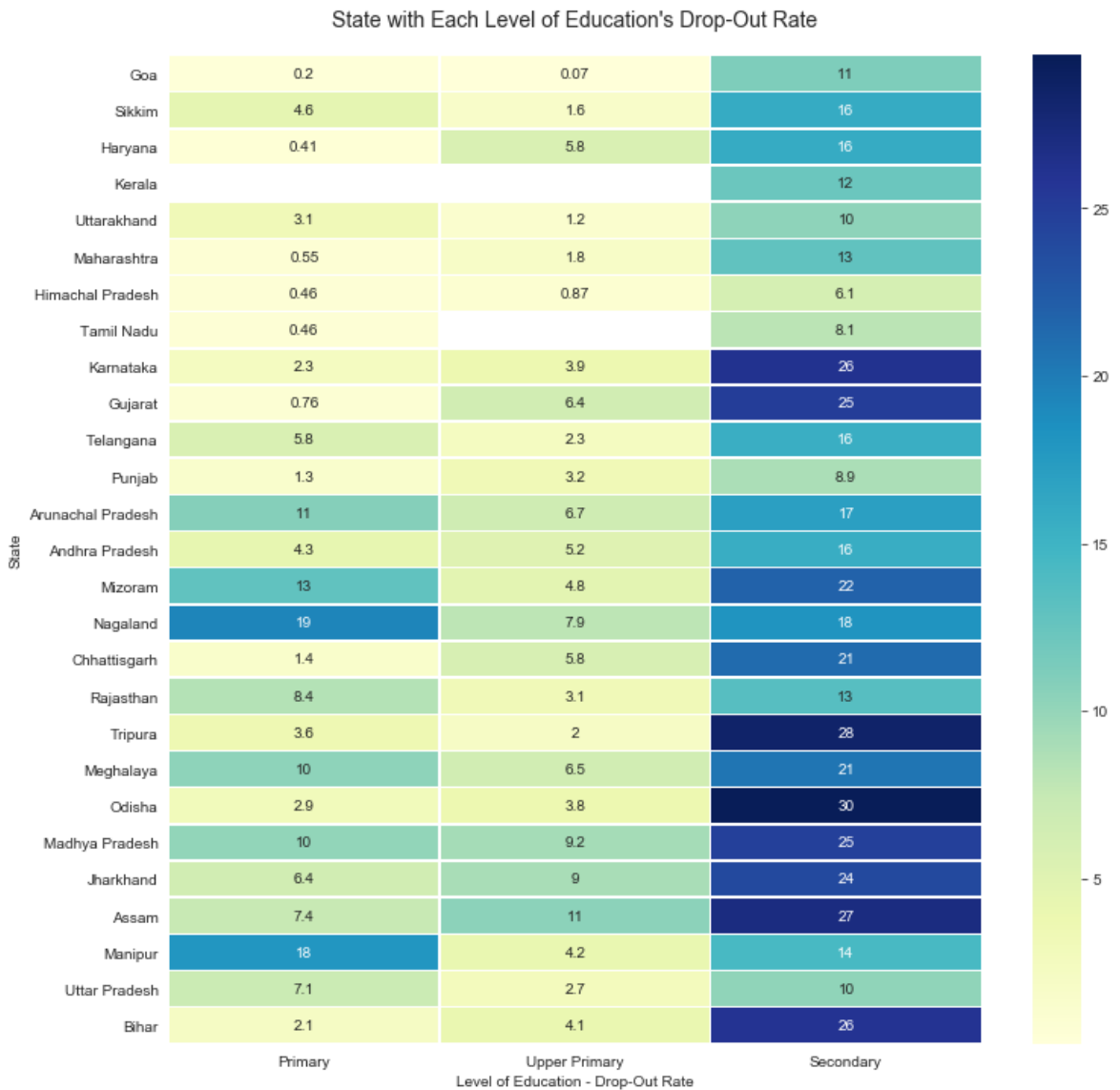
# Correlate Category (C1, C2, C3, C4) with Overall and Each Level of Education Drop-Out Rate

Category(C1,C2,C3,C4) with Each Level of Education's Drop-Out Rate



- **Highest Per Capita GDP, C1 has the lowest Education Drop-Out Rate - [NEGATIVE ASSOCIATION](#)**
- C2, C3 and C4 have higher Education Drop-Out Rate
- **Secondary Level of Education has highest Drop-Out Rate**
- **Categories C3 and C4 have the highest Drop-Out Rate and Lowest GDP Per Capita**
- The higher drop out rate for Secondary Level of Education has had an adverse effect on the GDP Per Capita of C3 and C4.
- **Lower Drop out rate in Primary and Upper Primary level also ensures that the drop out rate at Secondary level gets lowered.**
- **Recommendation: Focus on ensuring children don't drop out at the Secondary Level will ensure that the GDP of our country grows.**

# Correlate States with Each Level of Education Drop-Out Rate



- Secondary Level of Education has the highest Drop-Out Rate across States.
- **The Lower the Secondary level of Education Drop-Out Rate the Higher the GDP Per Capita for a State - NEGATIVE ASSOCIATION**
- **Odisha, Tripura and Assam** have higher Secondary Level of Education Drop-Out Rate and impacting their GDP Per Capita
- Primary and Upper Primary Drop-Out Rate is lower for States having Higher GDP Per Capita. **Manipur** had high Primary Drop-Out Rate. It seems to lead to lower GDP Per Capita **Goa, Haryana, Maharashtra, Himachal Pradesh and Tamil Nadu** had Primary Drop-Out Rate under 1, helping them perform high on GDP Per Capita.

# Hypothesis

## Hypothesis #1

- **IF** the Drop-Out Rate at Secondary Education Level is reduced / controlled **THEN** it will increase State's GDP Per Capita

## Hypothesis #2

- **IF** the Drop-Out Rate at Primary Education Level reduced / controlled **THEN** it will reduce the Drop-Out Rate at Upper Primary Level and THEN eventually reduce at Secondary Education Level