



GDP Analysis

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Roll Number -
DDS1930106

Problem Statement

- Analyze and compare the GDPs of various Indian states (both total and per capita).
- Divide the states into four categories based on the GDP per capita, and for each of these four categories, analyze the sectors that contribute the most to the GDP (such as agriculture, real estate, manufacturing, etc.).
- Analyze whether GDP per capita is related to dropout rates in schools and colleges.
- Provide state specific recommendations, if any, to improve GDP.

Data Exploration

- **Source:** <https://data.gov.in/> - an Open Government Data (OGD) platform of India.
- **Datasets:**
 - State-wise Gross Domestic Product (GDP) at current price on yearly basis
 - GSVA by Economic Activity at Current Prices
 - Dropout rates data

State-wise Gross Domestic Product (GDP) at current price on yearly basis:

- Contains data for 28 states and 4 union territories
- Data for West Bengal is not available (Excluded from analysis)
- GSDP - CURRENT PRICES (` in Crore) for Year 2011 thru 2017
- GSDP is in Crores
- (% Growth over previous year) for Year 2011 thru 2017

GSVA by Economic Activity at Current Prices:

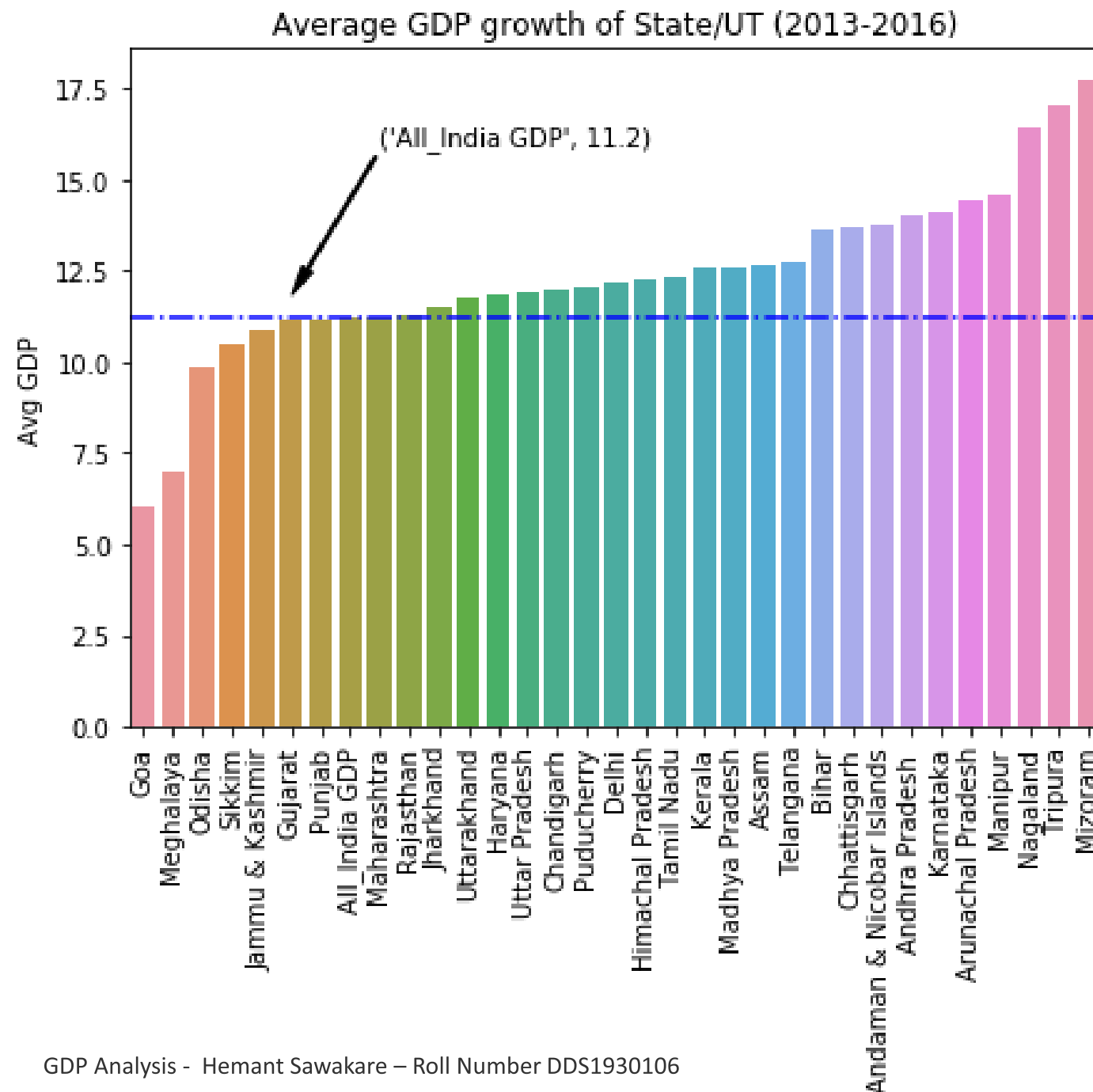
- Data available as individual datasets for 28 states and 4 union territories
- Data represents GDP contribution by various Sectors/Sub-Sectors
- Per Capita GSDP is available for various years.
- GSDP is in lacks

Dropout rates data :

- Contains drop out rates for Primary, Upper Primary, Secondary and Senior Secondary class.
- Data is available for 2012 thru 2015
- Primary 2014-2015 occurs twice in the data. This appears to be Typo - First occurrence appears to be Primary 2013-2014. We will ignore the first occurrence and consider second occurrence (Primary - 2014-2015.1) for our processing

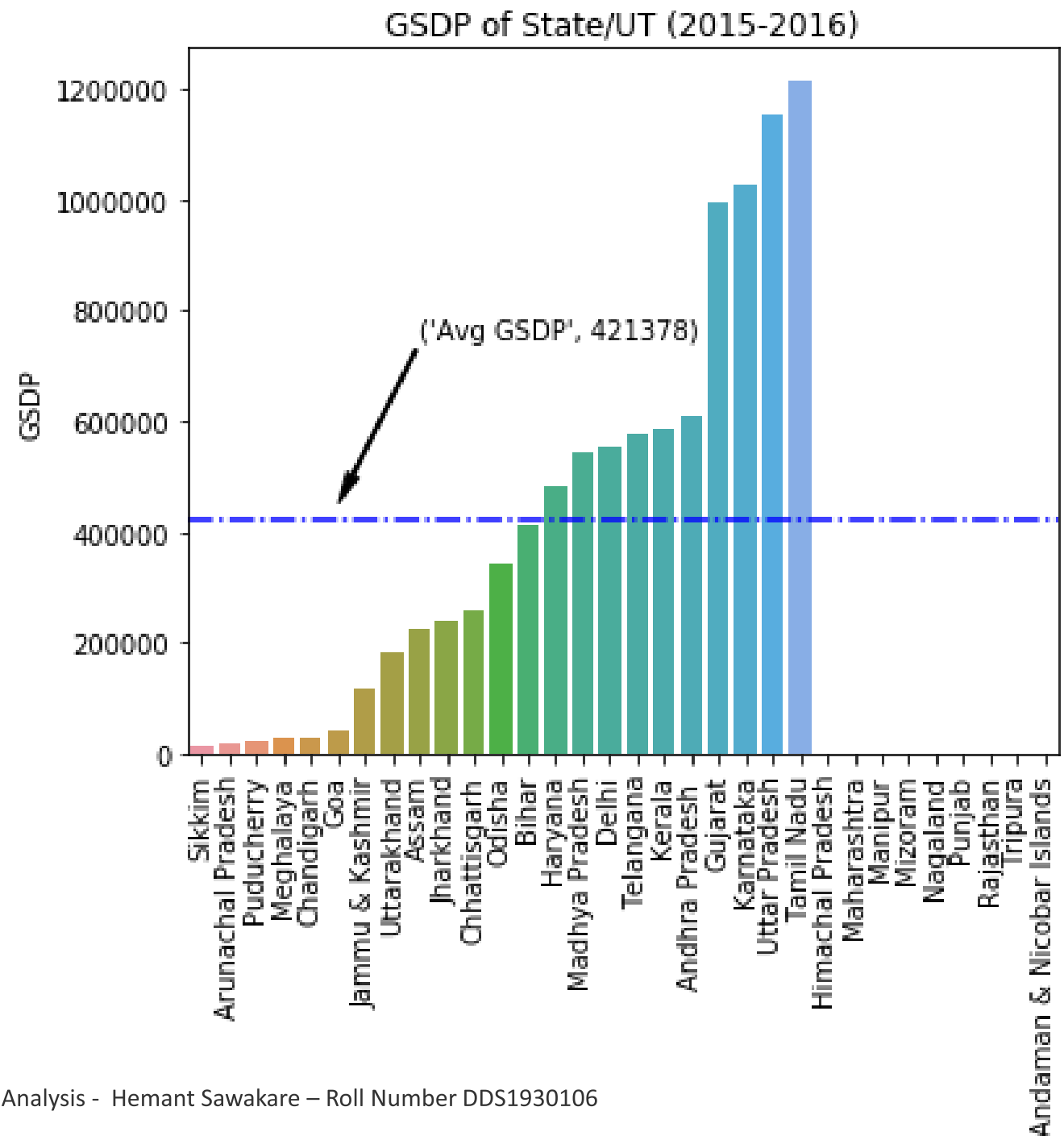
Average '(% Growth over previous year)' for the duration 2013-14, 2014-15 and 2015-16

- There is no data for West Bengal.
- Mizoram, Tripura, Nagaland, Manipur and Arunachal Pradesh have the highest average GDP growth over previous year.
- Goa, Meghalaya, Odisha, Sikkim and J&K have the lowest average GDP growth.
- Goa, Meghalaya, Odisha, Sikkim, J&K, and Gujrat are below Nation average GDP growth.
- **Note – Union Territories are included in the analysis.**



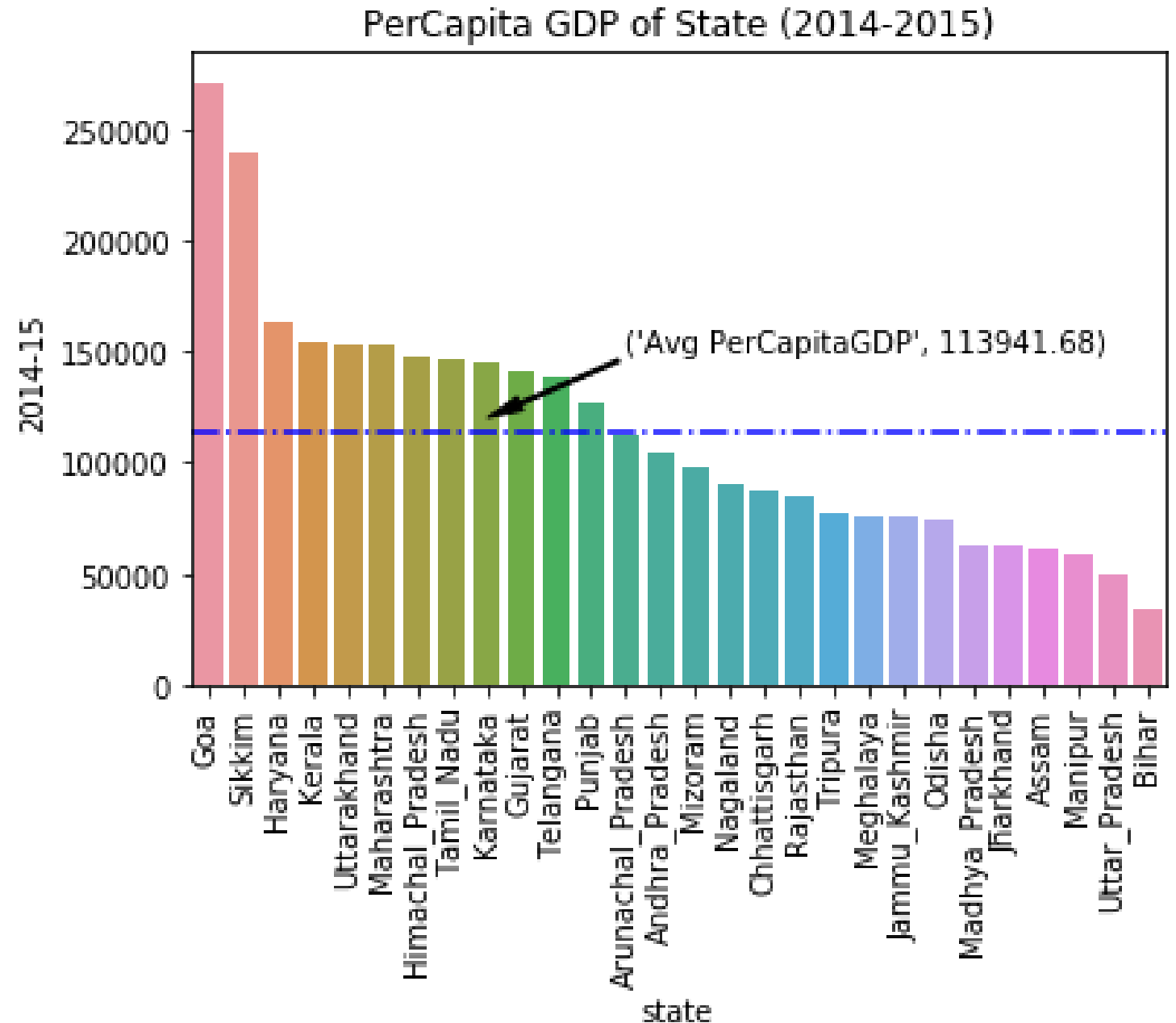
Total GDP of the states for the year 2015-16

- Tamil Nadu, Uttar Pradesh, Karnataka, Gujarat and Andhra Pradesh have the highest GDP.
- Chandigarh, Meghalaya, Puducherry, Arunachal Pradesh and Sikkim have the lowest GDP.
- There is no data to plot for below states
 - West Bengal.
 - Himachal Pradesh
 - Maharashtra
 - Manipur
 - Mizoram
 - Nagaland
 - Punjab
 - Rajasthan
 - Tripura
 - Andaman & Nicobar Islands
- Note – Union Territories are included in the analysis.



GDP per capita for all the states for the year 2014-15

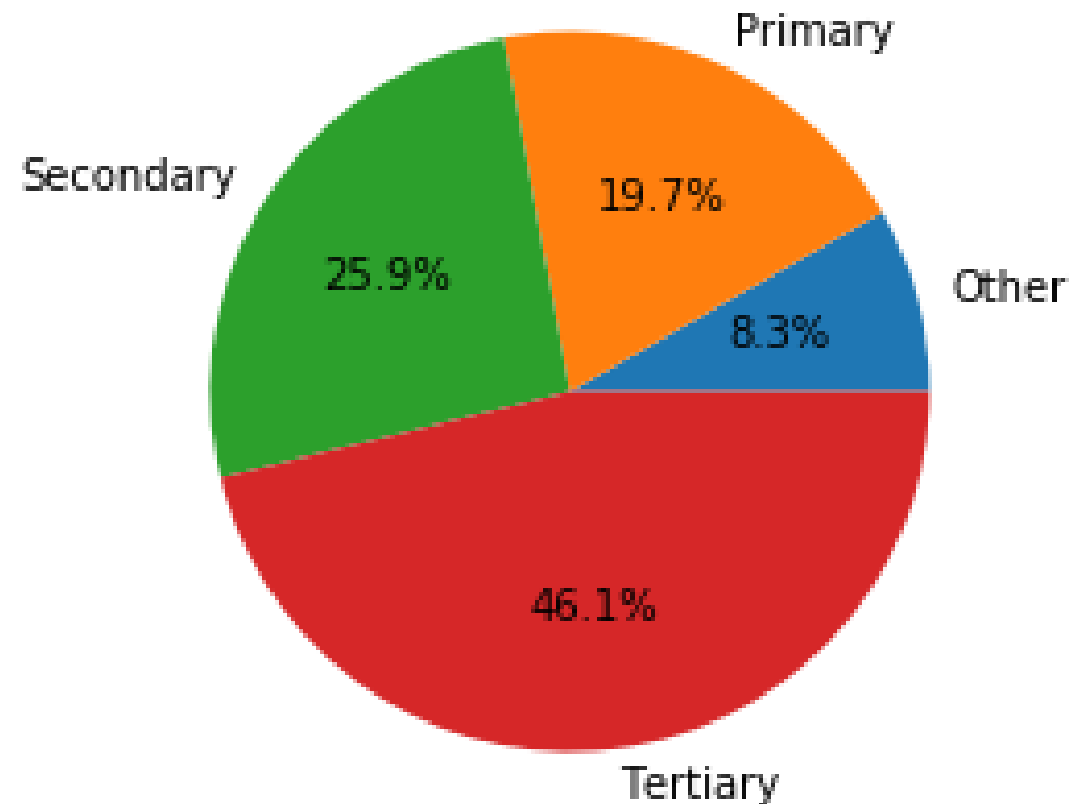
- Top 5 states with Per Capital GDP are - Goa, Sikkim, Haryana, Kerala and Uttarakhand.
- Bottom 5 states with Per Capital GDP are - Bihar, Uttar Pradesh, Manipur, Assam and Jharkhand.
- Ratio of the highest per capita GDP (Goa) to the lowest per capita GDP (Bihar) is 8.0
- Union Territories are not considered for the analysis
- Ratio of the highest per capita GDP (Goa) to the lowest per capita GDP (Bihar) is 8.0.



% GDP Contribution from sectors (2014-15).

- Overall contribution from Tertiary sector is higher followed by Secondary and Primary.
- Note - For simplicity We are deriving a field "others" = Taxes on Products - Subsidies on products
- Only Sikkim, Chhattisgarh, Gujrat, Nagaland and Uttarakhand have higher contribution from Secondary sector.

Average % contribution from sectors



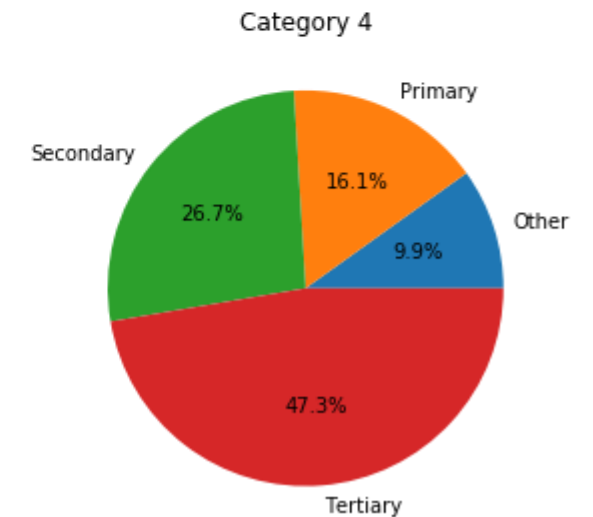
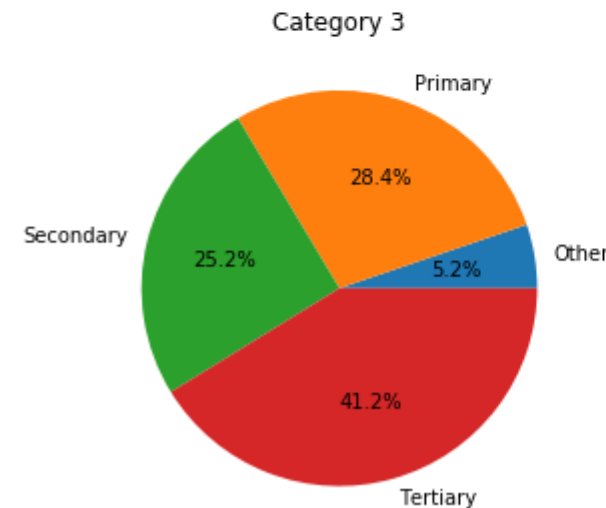
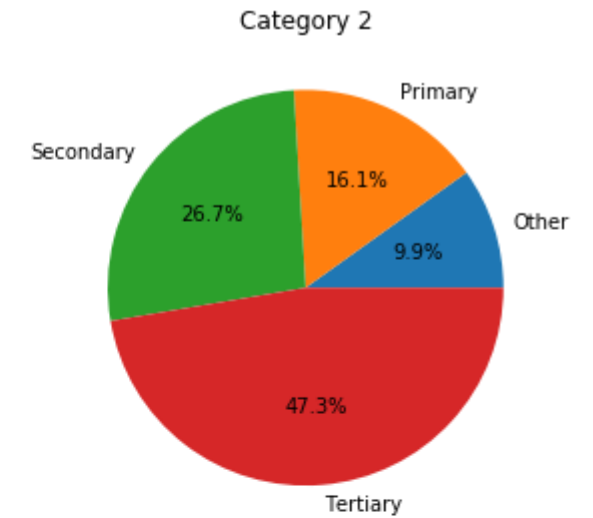
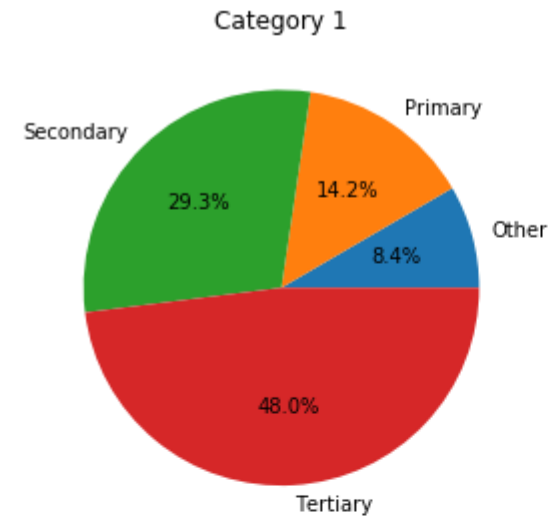
Categorize Data for Analysis

Quantile Calculation

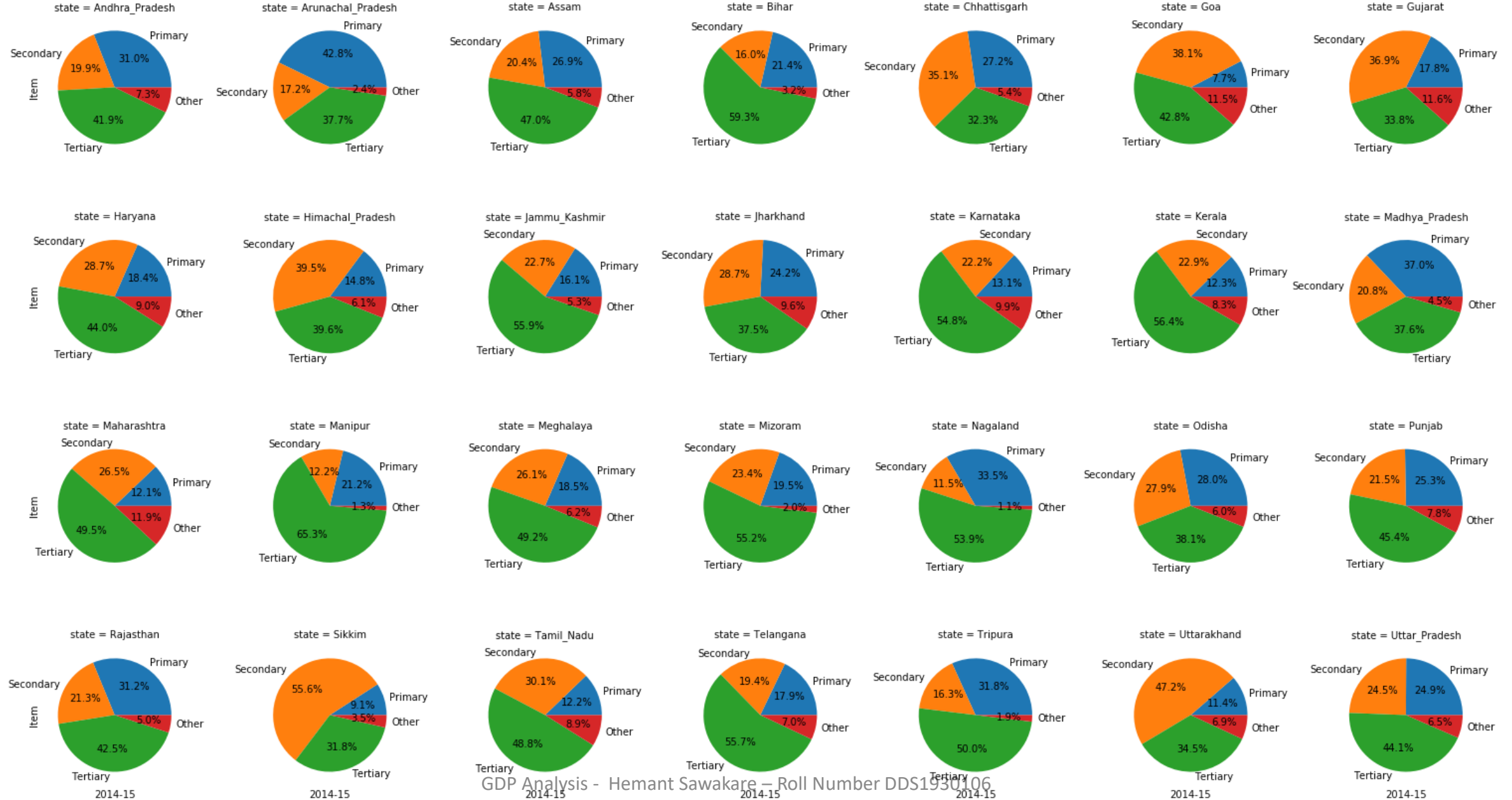
- Category1 - Greater than 85 percentile
- Category2 - Greater than 50 and Less than or equal to 85 percentile
- Category3 - Greater than 20 and Less than or equal to 50 percentile
- Category4 - Less than or equal to 20 percentile

% GDP Contribution by sectors for all Categories (2014-15)

- These top 6 sub-sectors contribute to approximately 80% of the GDP
 - Manufacturing
 - Agriculture, forestry and fishing
 - Trade, repair, hotels and restaurants Manufacturing
 - Real estate, ownership of dwelling & professional services
 - Construction
 - Taxes on Products
- Derived field “Other” represents “Taxes on Products” – “Subsidies on products”
- Contribution from individual states on next slide.



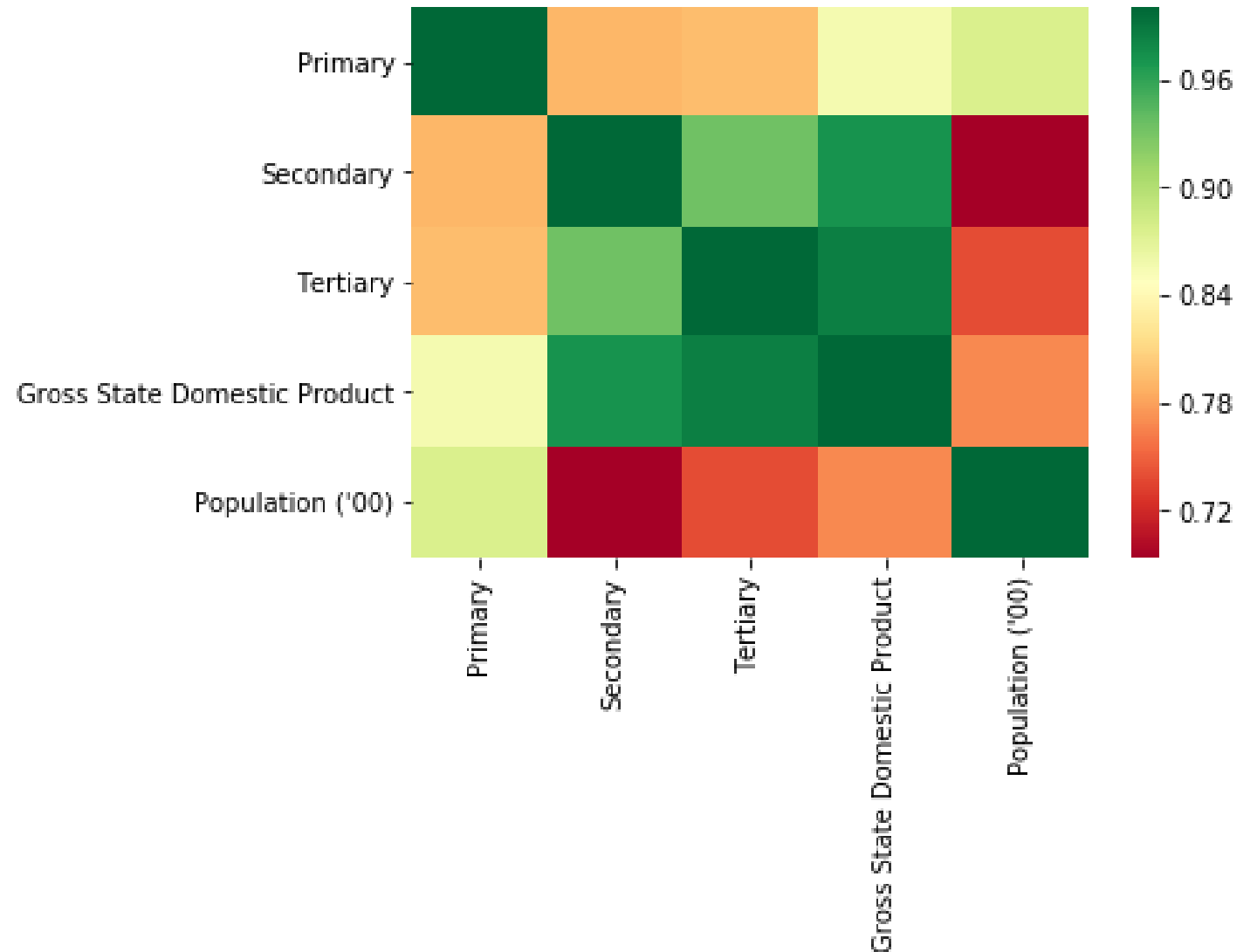
% Contribution from individual states (2014-15)



Correlation between sectors (Duration – 2014-15)

Observations:-

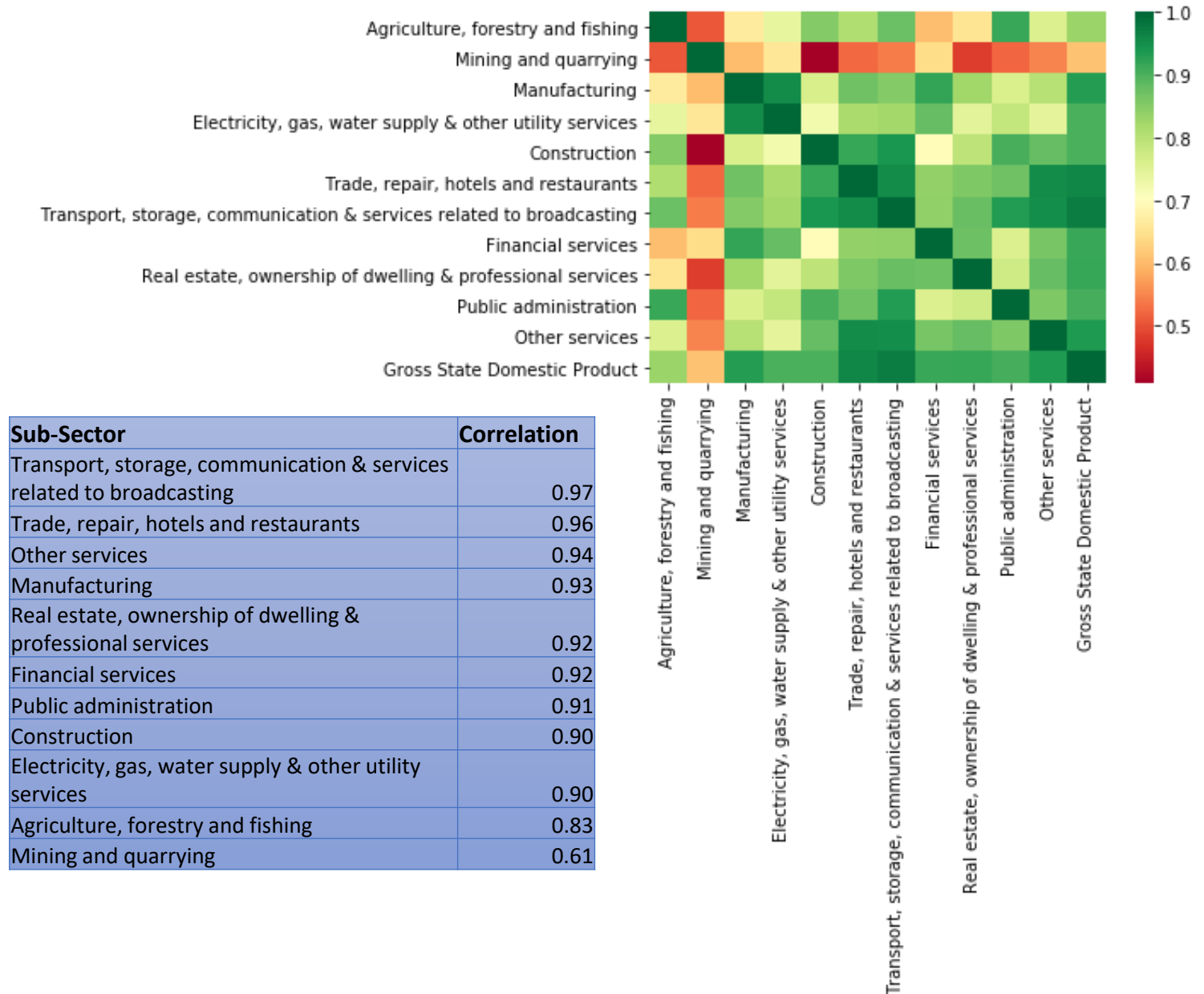
- GDP rises with increase in contribution from Tertiary sector (Strongly correlation)
- GDP is weakly correlated to population
- Moderate correlation between secondary and tertiary section



Plot correlation between sub-sectors (Duration – 2014-15)

Observations:-

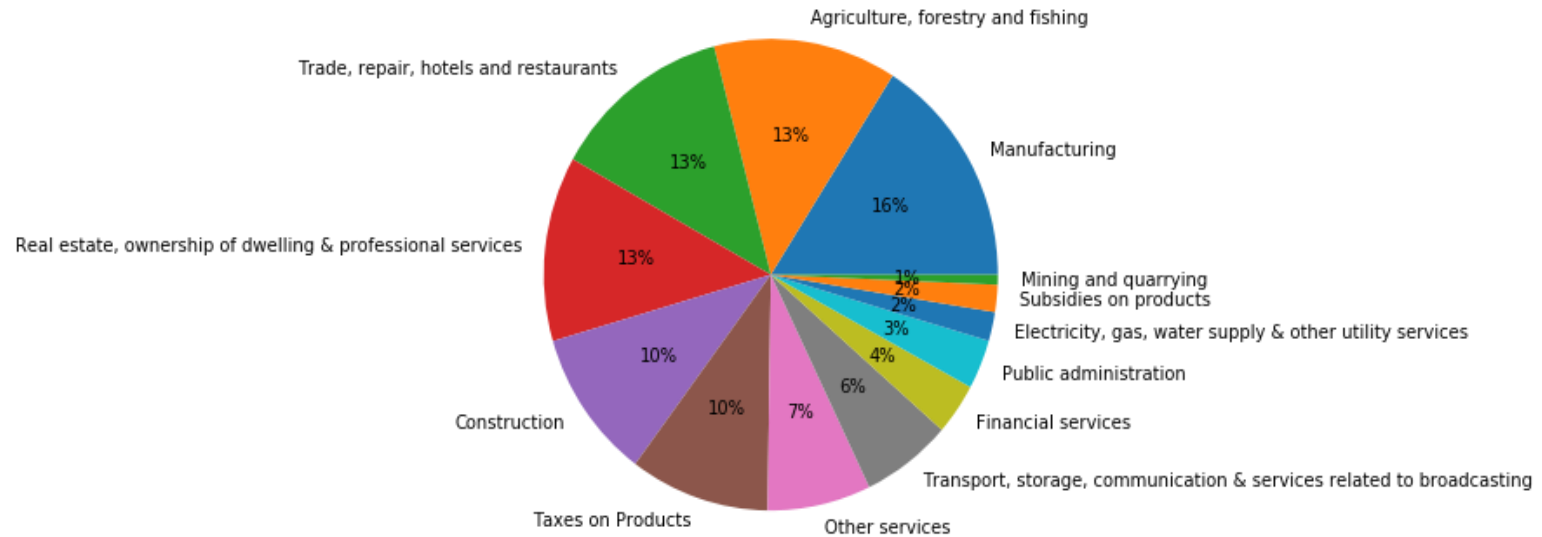
- Focus on below 2 sub-sector because of strong correlation
 - Transport, storage, communication & services related to broadcasting
 - Trade, repair, hotels and restaurants
- Weak correlation with “Mining and quarrying” sub-sector.



% Contribution of sub-sectors for C1 Category (Category1 - Greater than 85 percentile)

C1 Category states – Goa, Sikkim, Haryana, Kerala, Uttarakhand
Duration – 2014-15

- These top 6 sub-sectors contribute to approximately 80% of the GDP
 - Manufacturing
 - Agriculture, forestry and fishing
 - Trade, repair, hotels and restaurants
 - Real estate, ownership of dwelling & professional services
 - Construction
 - Other services
- **Recommendation –**
 - Focus on “Real estate, ownership of dwelling & professional services” since it has strong correlation and contributes significantly to GDP.
 - Increased focus “Trade, repair, hotels and restaurants” may result in higher per Capita GDP because of tourism.

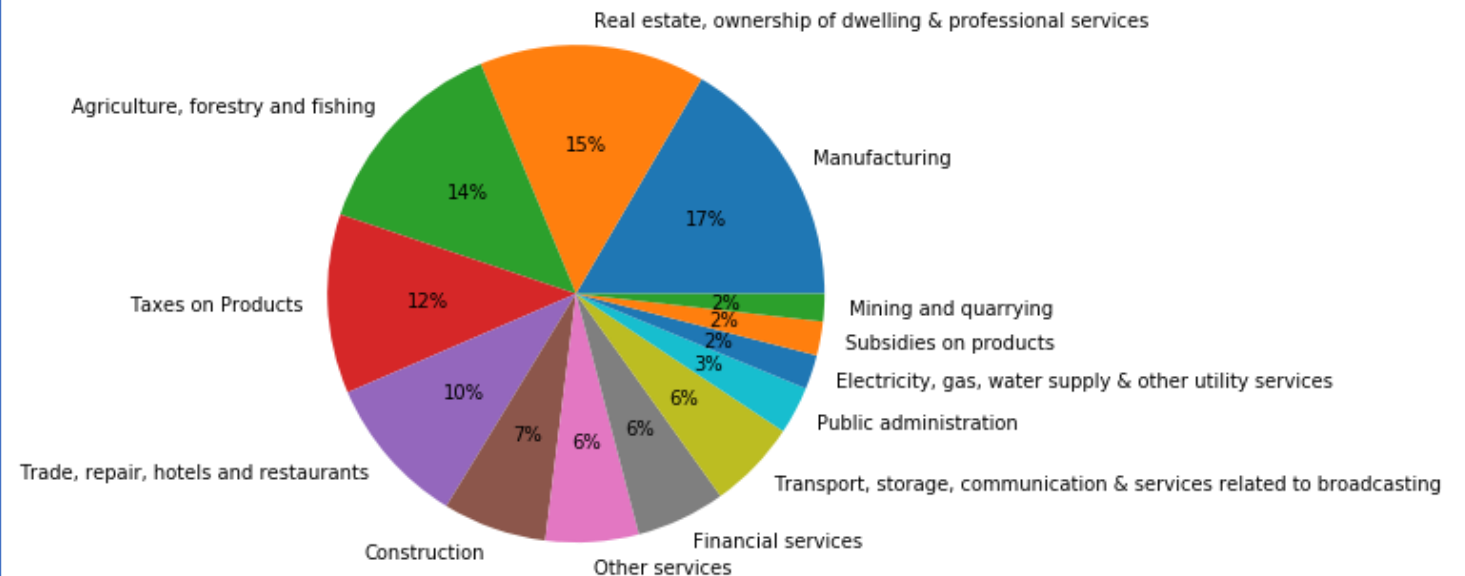


% Contribution of sub-sectors for C2 Category (Category2 - Greater than 50 and Less than or equal to 85 percentile)

C2 Category states – Maharashtra, Himachal Pradesh, Tamil Nadu, Karnataka, Gujarat, Telangana, Punjab, Arunachal Pradesh, Andhra Pradesh.

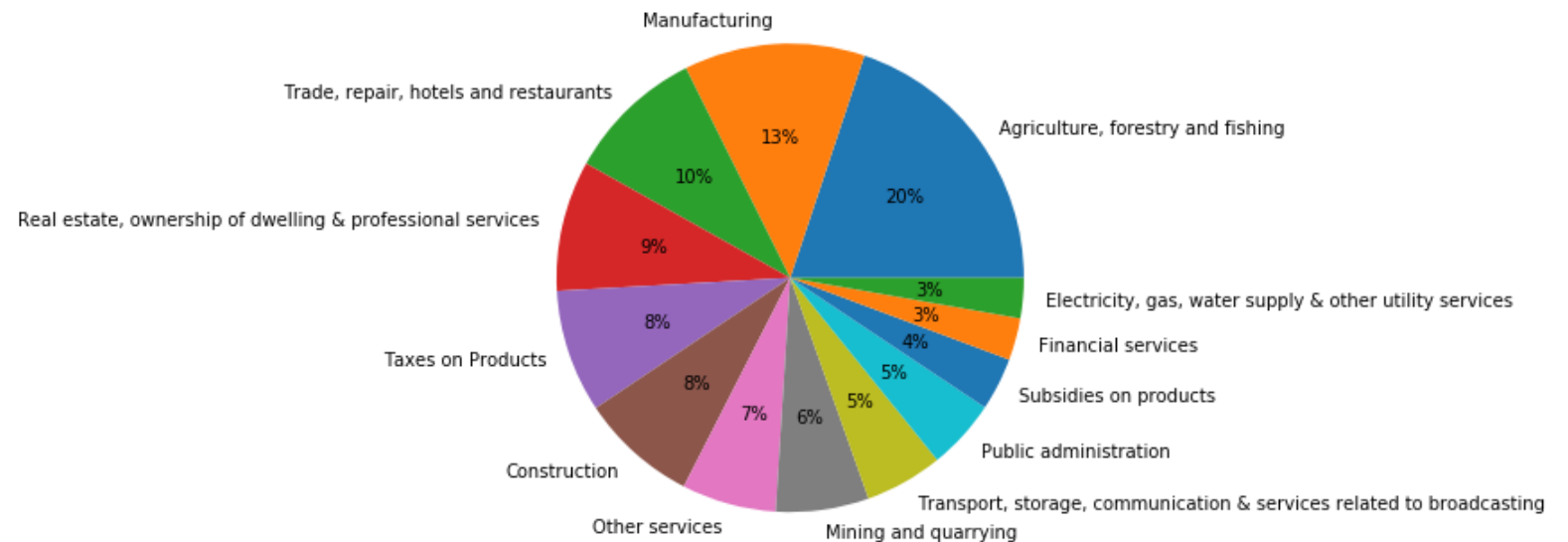
Duration – 2014-15

- These top 6 sub-sectors contribute to approximately 80% of the GDP
 - Manufacturing
 - Real estate, ownership of dwelling & professional services
 - Agriculture, forestry and fishing
 - Trade, repair, hotels and restaurants
 - Construction
 - Other services
 - Financial services
- **Recommendation –**
 - Category 2 contributes most to the GDP but has lesser per Capita GDP because of population. With increasing population there is increased demand of housing. Focus on Real estate, ownership of dwelling & professional services may boost per Capita GDP.
 - Continued focus on Manufacturing because of strong correlation with GDP.
 - Increased focus on “Trade, repair, hotels and restaurants” may results in higher per Capita GDP because of spending capacity of people and higher correlation.



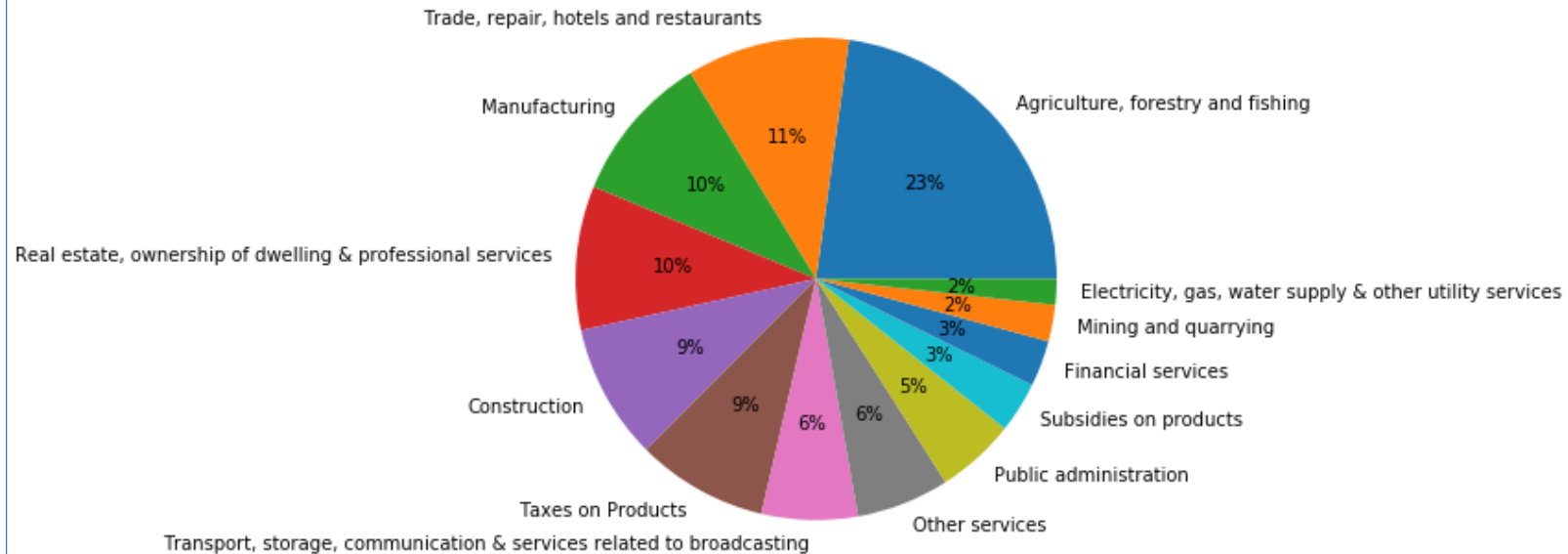
% Contribution of sub-sectors for C3 Category (Category3 - Greater than 20 and Less than or equal to 50 percentile) C3 Category states – Mizoram, Nagaland, Chhattisgarh, Rajasthan, Tripura, Meghalaya, Jammu Kashmir, Odisha Duration – 2014-15

- These top 6 sub-sectors contribute to approximately 80% of the GDP
 - Agriculture, forestry and fishing
 - Manufacturing
 - Trade, repair, hotels and restaurants
 - Real estate, ownership of dwelling & professional services
 - Construction
 - Other services
 - Mining and quarrying
- **Recommendation –**
 - Continued focus on “Agriculture, forestry and fishing” sub-sector because of higher contribution to GDP and strong correlation with GDP.
 - Increase focus on Tertiary sector (Real estate, ownership of dwelling & professional services) may result in higher GDP and thus higher per Capita GDP.
 - Increase focus on “Construction “ sub-sector because of strong correlation with GDP.
 - Highest subsidies on product resulting in loss of GDP.



% Contribution of sub-sectors for C4 Category (Category4 - Less than or equal to 20 percentile) C4 Category states – Madhya Pradesh, Jharkhand, Assam, Manipur, Uttar Pradesh, Bihar Duration – 2014-15

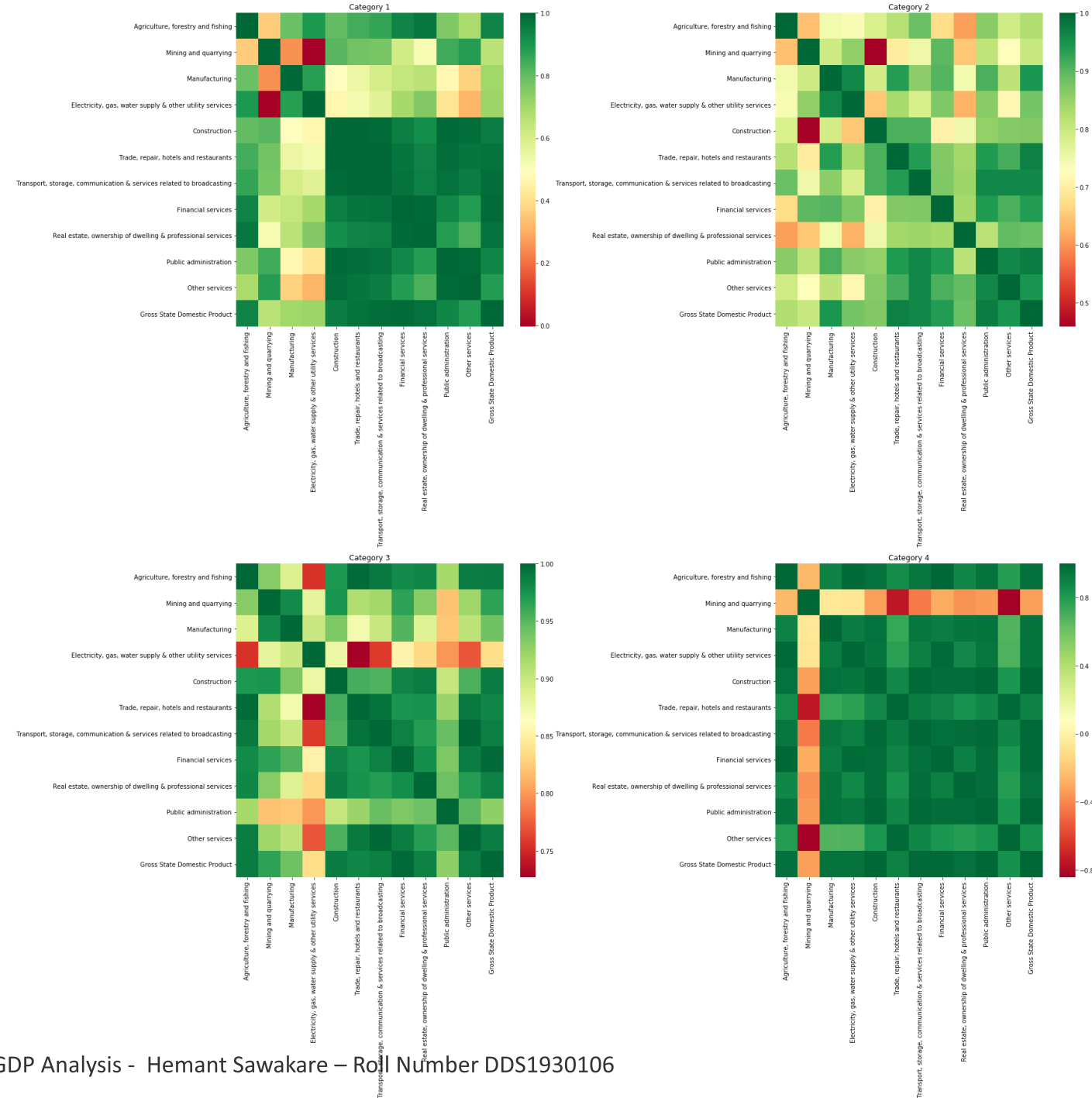
- These top 6 sub-sectors contribute to approximately 80% of the GDP
 - Agriculture, forestry and fishing
 - Trade, repair, hotels and restaurants
 - Manufacturing
 - Real estate, ownership of dwelling & professional services
 - Construction
 - Transport, storage, communication & services related to broadcasting
- **Recommendation –**
 - Increased focus on “Construction” sub-sector because of contribution to GDP and strong correlation.
 - Most of the GDP is driven by Agriculture, Forestry and Fishing. Diversification is needed to increase the employment opportunity and mitigate risk.
 - Focus on sectors like Manufacturing, Real estate, ownership of dwelling & professional services will increase per Capita GDP.
 - Reduce focus from “Mining and quarrying” sub-sector since it does not contribute significantly to GDP and has negative correlation.



Plot correlation between sub-sectors (Duration – 2014-15)

Observations:-

- Focus on below 2 sub-sector because of strong correlation
- Transport, storage, communication & services related to broadcasting
- Trade, repair, hotels and restaurants
- Weak correlation with “Mining and quarrying” sub-sector.



Observations

- “Manufacturing” is major contributor in GDP for states in Category 1 as well as Category 2(Higher Per Capita GDP).
- “Agriculture, forestry and fishing” is major contributor in GDP for states in Category 3 and Category 4.
- Category 2 contributes most towards the GDP however because of population category’s Per Capita GDP is down.
- States should continue to focus on “Manufacturing” and “Trade, repair, hotels and restaurants Manufacturing” sub-sectors because
 - They play major contribution to total GDP
 - Strong correlation with GDP



[% Contribution by each Category to Sector](#)

[Legends](#)

C1 = Category 1
C2 = Category 2
C3 = Category 3
C4 = Category 4

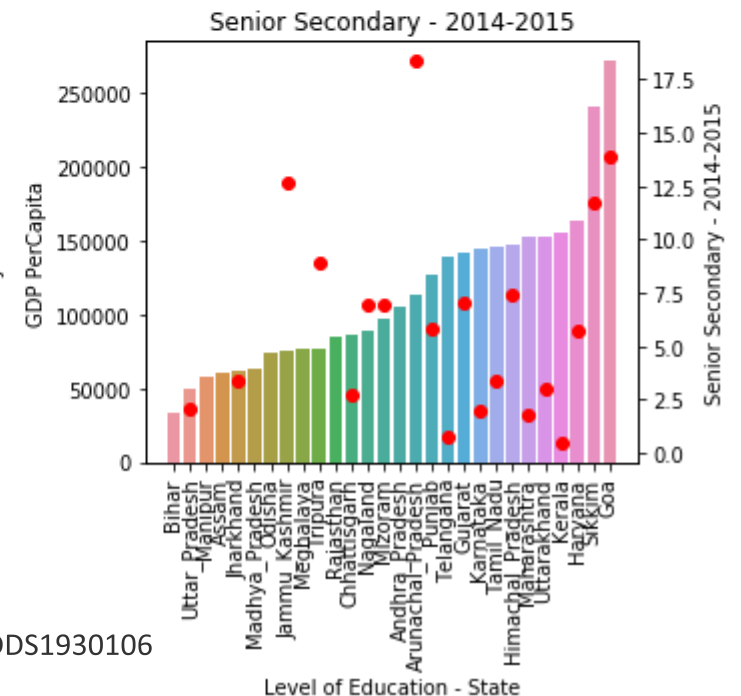
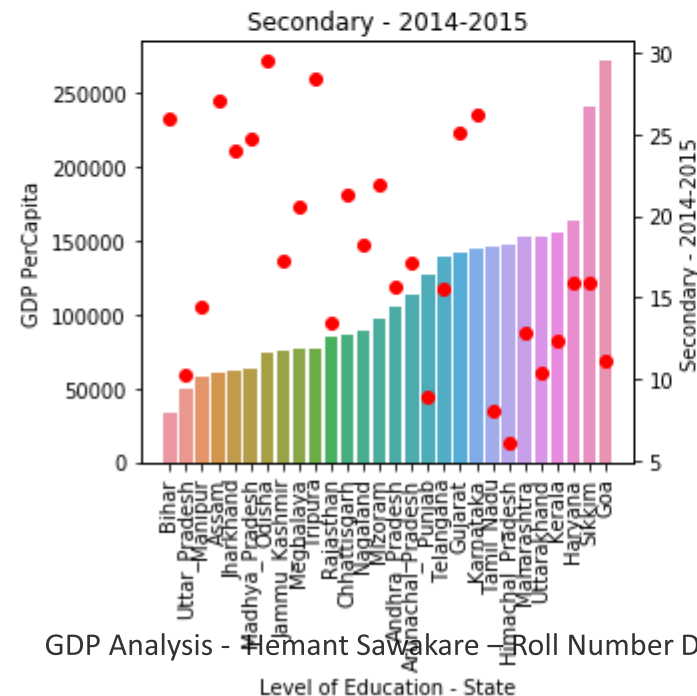
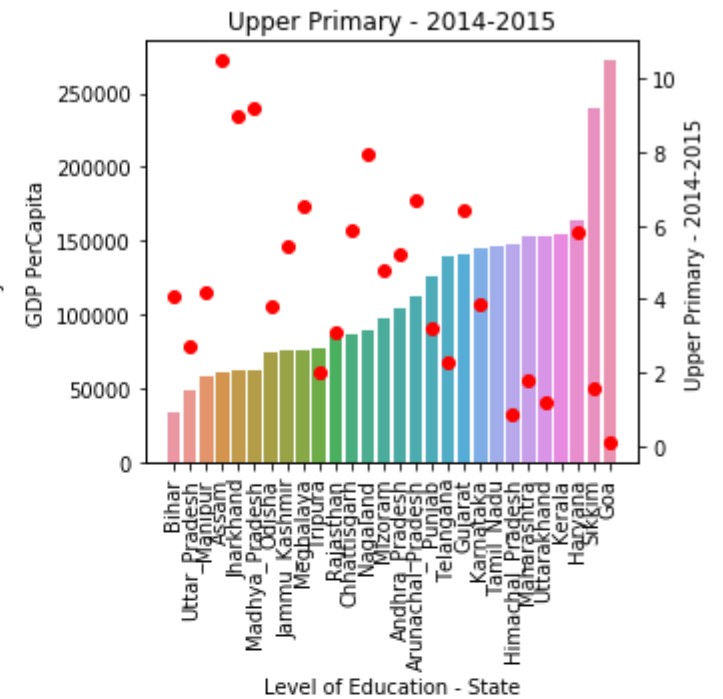
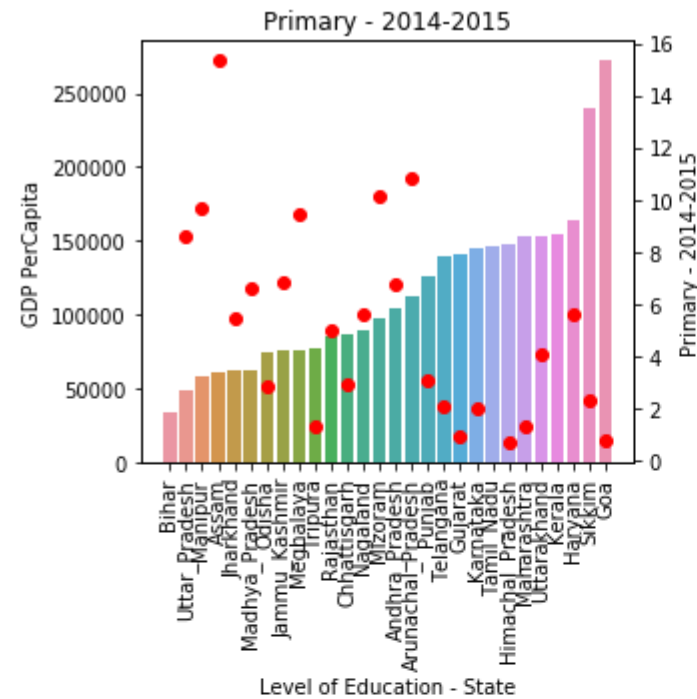
Dropout rates for education and Per Capita GDP – 2014-2015

- Per Capita GDP is strongly impacted by dropout for Primary, Upper Primary and Secondary education. Increase in dropout rates results in decrease in Per Capita GDP.
- Senior Secondary education has slight correlation with Per Capita GDP.
- Dropouts from senior secondary potentially start contributing towards the GDP and hence we see positive correlation.
- Note - Primary 2014-2015 occurs twice in the data. This appears to be Typo - First occurrence appears to be Primary 2013-2014. We will ignore the first occurrence and consider second occurrence (Primary - 2014-2015.1) for our processing

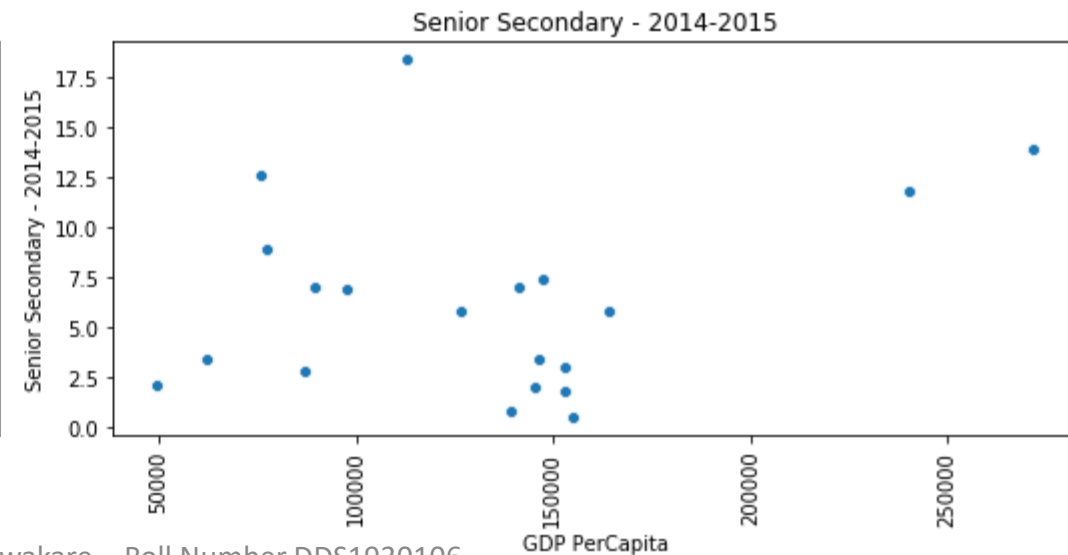
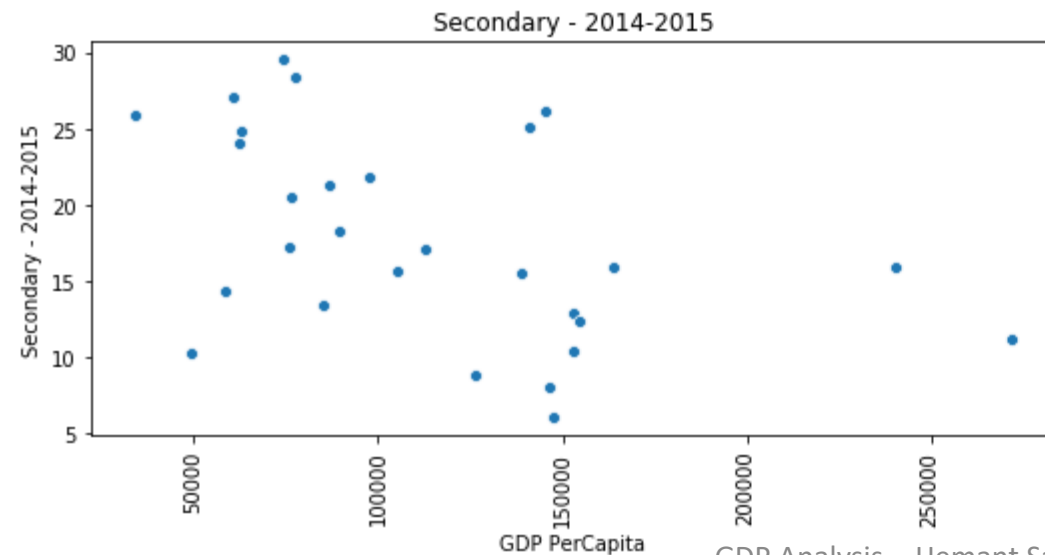
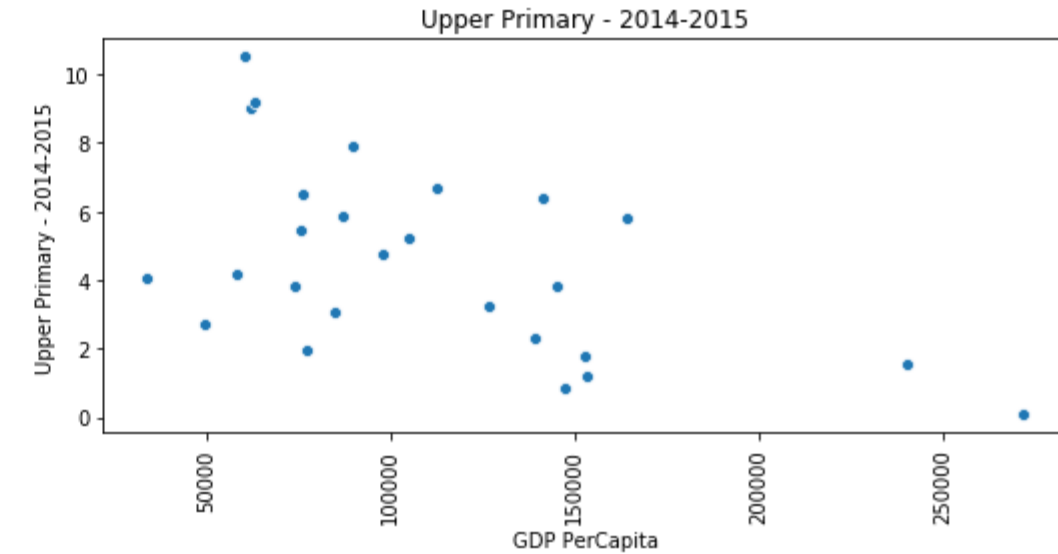
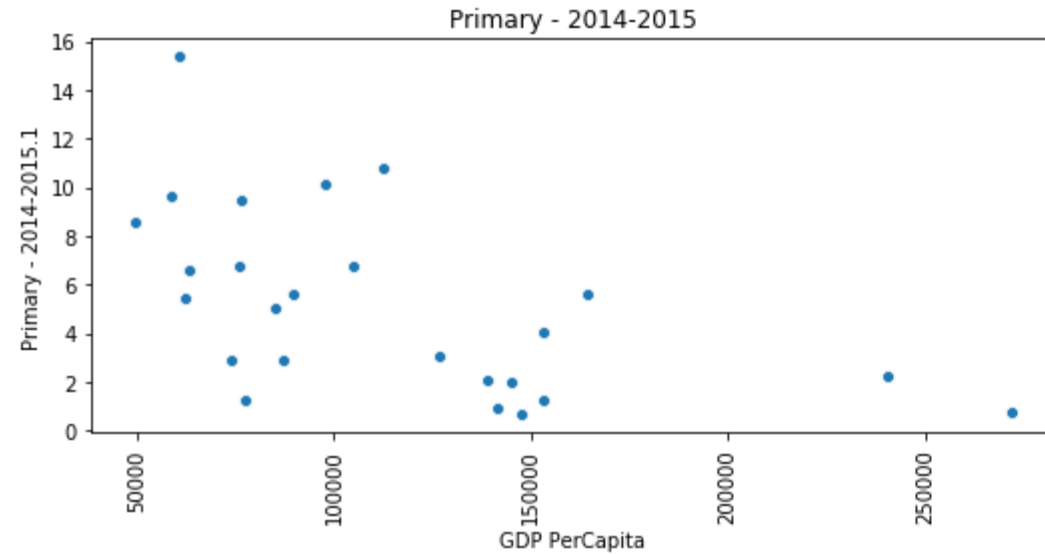


Dropout rates for Education vs Per Capita GDP – 2014-2015

- Red dot denotes the dropout rate.
- Lower dropout indicates educated population resulting in good employment opportunities.
- Higher the per capita GDP is observed for Primary, Upper Primary and Secondary because of the employment opportunity.
- For senior secondary, as dropout rate increases the Per Capita GDP also increases.



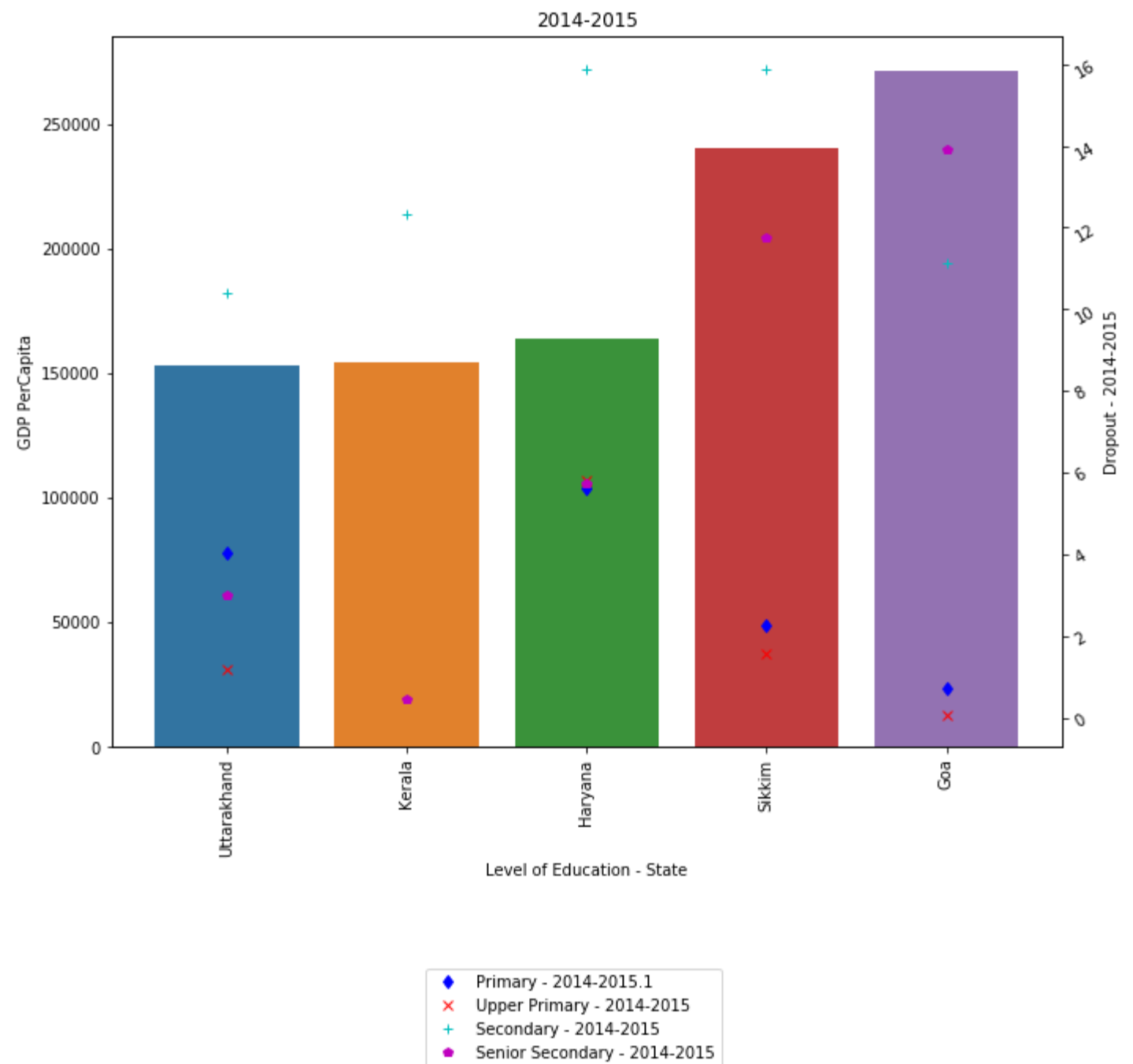
Dropout rates for Education vs Per Capita GDP – 2014-2015



Dropout rates vs Per Capita (2014-15) – Category 1

- Low dropout rate for Primary and Upper Primary education
- High dropout rate for Secondary and Senior Secondary.
- Summary:

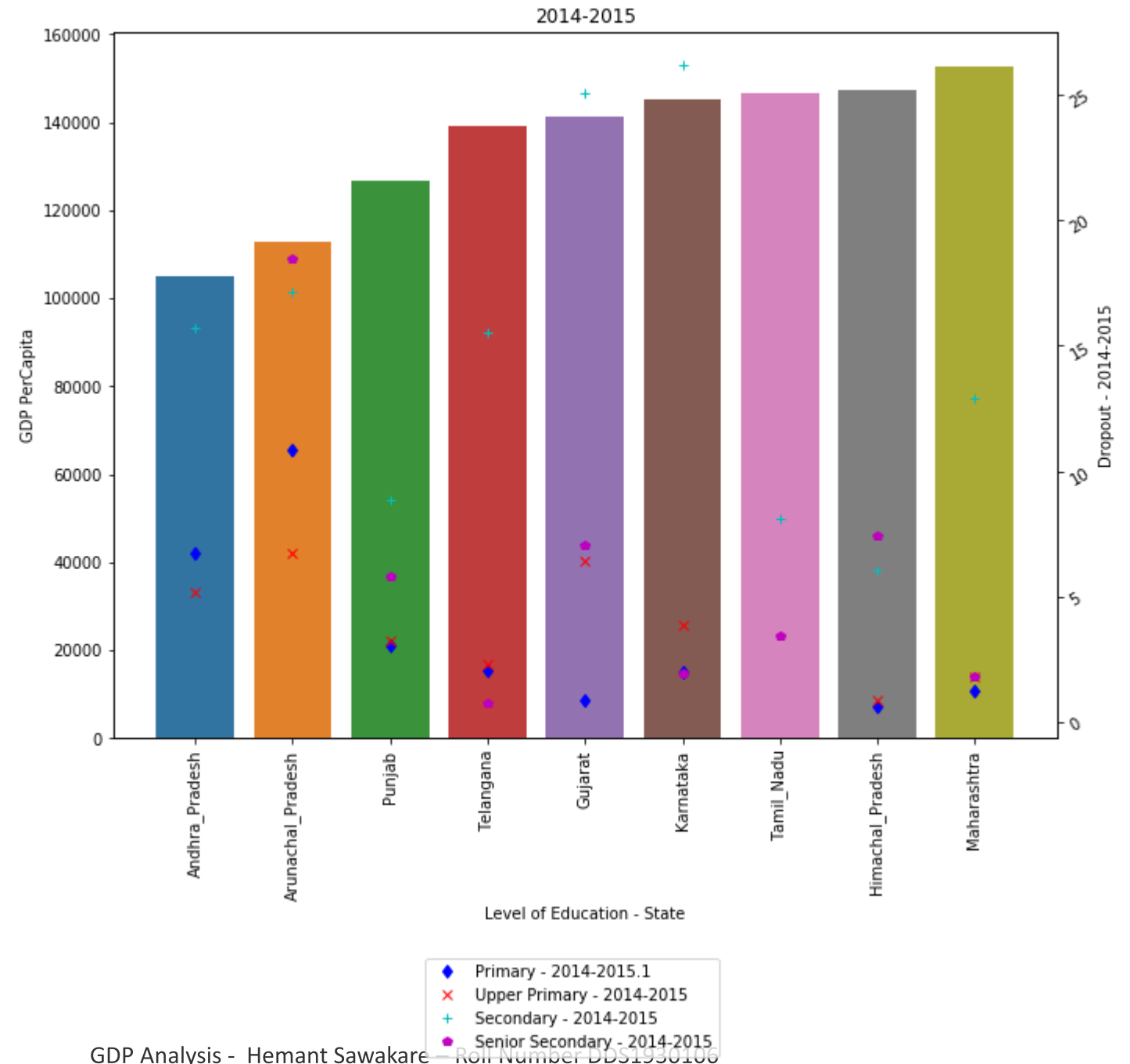
| Education Level | Average Dropout |
|------------------------------|-----------------|
| Primary - 2014-2015 | 3.16 |
| Upper Primary - 2014-2015 | 2.16 |
| Secondary - 2014-2015 | 13.13 |
| Senior Secondary - 2014-2015 | 6.98 |
| GDP PerCapita | 196799.6 |



Dropout rates vs Per Capita (2014-15) – Category 2

- Drop out rates for category C2 is greater than category C1.
- Low dropout rate for Primary and Upper Primary education
- High dropout rate for Secondary and Senior Secondary.
- Summary:

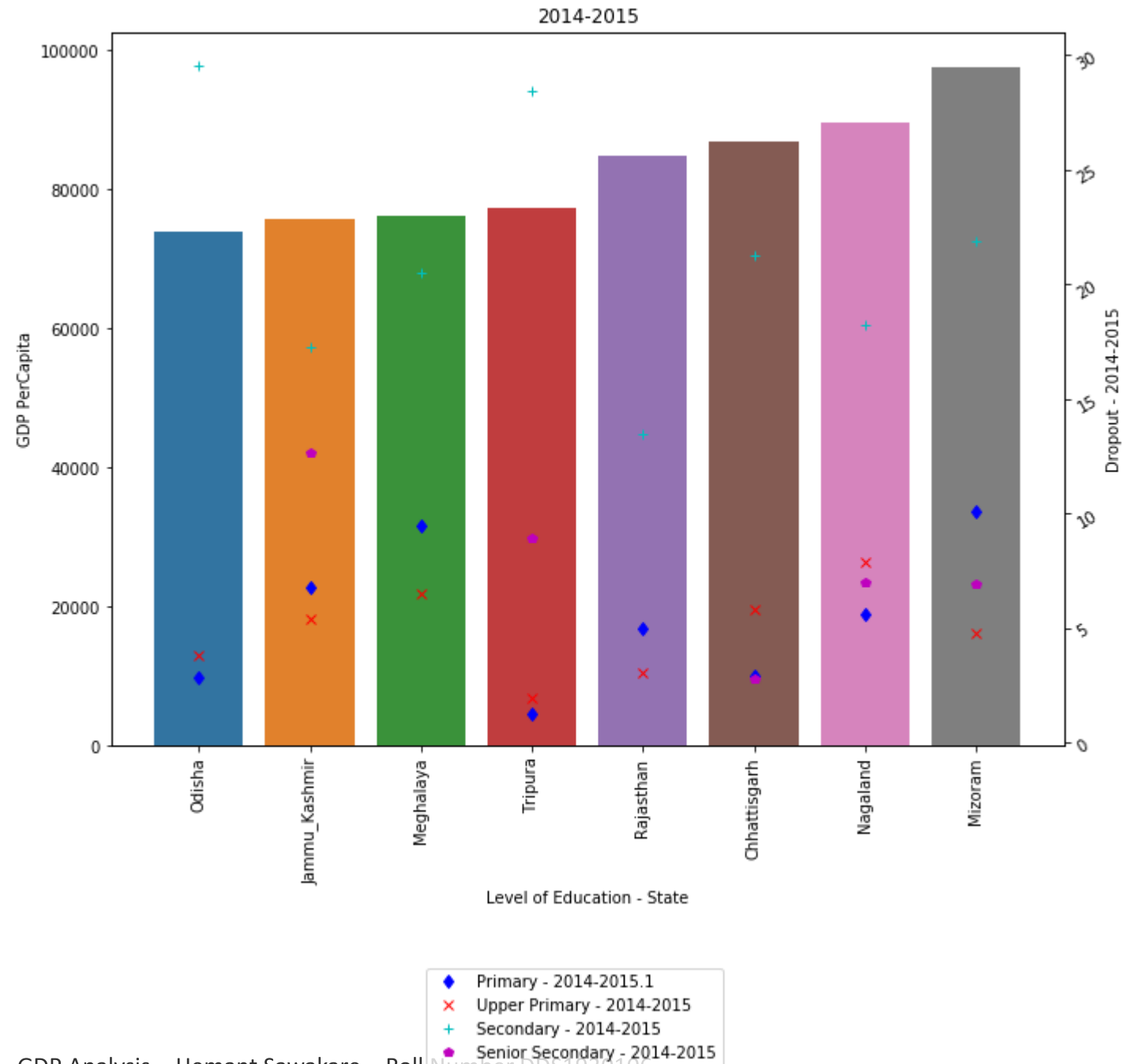
| Education Level | Average Dropout |
|------------------------------|-----------------|
| Primary - 2014-2015 | 3.44 |
| Upper Primary - 2014-2015 | 3.79 |
| Secondary - 2014-2015 | 15.05 |
| Senior Secondary - 2014-2015 | 5.83 |
| GDP PerCapita | 135158.44 |



Dropout rates vs Per Capita (2014-15) – Category 3

- Drop out rates for category C3 is greater than category C3.
- Dropout rate for Primary significantly greater than Upper Primary.
- High dropout rate for Secondary and Senior Secondary.

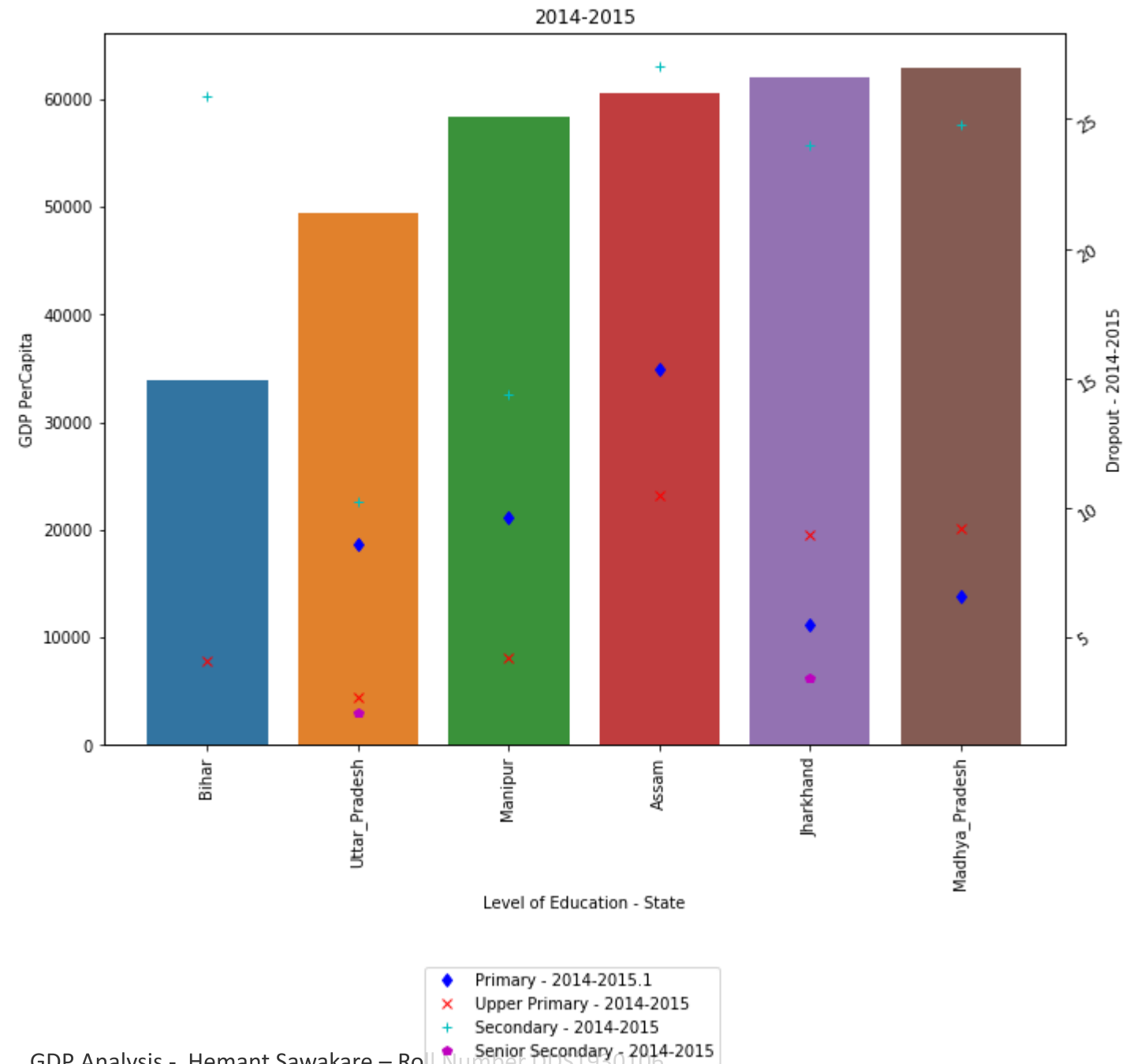
| Education Level | Average Dropout |
|------------------------------|-----------------|
| Primary - 2014-2015 | 5.50 |
| Upper Primary - 2014-2015 | 4.92 |
| Secondary - 2014-2015 | 21.33 |
| Senior Secondary - 2014-2015 | 7.64 |
| GDP PerCapita | 82799.50 |



Dropout rates vs Per Capita (2014-15) – Category 4

- Low dropout rate for Primary and Upper Primary education
- High dropout rate for Secondary and Senior Secondary.
- Summary:

| Education Level | Average Dropout |
|------------------------------|-----------------|
| Primary - 2014-2015 | 9.13 |
| Upper Primary - 2014-2015 | 6.61 |
| Secondary - 2014-2015 | 21.05 |
| Senior Secondary - 2014-2015 | 2.76 |
| GDP PerCapita | 54591.17 |



Dropout Rate Comparison

C1 Category

| Education Level | Average Dropout |
|------------------------------|-----------------|
| Primary - 2014-2015 | 3.16 |
| Upper Primary - 2014-2015 | 2.16 |
| Secondary - 2014-2015 | 13.13 |
| Senior Secondary - 2014-2015 | 6.98 |
| GDP PerCapita | 196799.6 |

C2 Category

| Education Level | Average Dropout |
|------------------------------|-----------------|
| Primary - 2014-2015 | 3.44 |
| Upper Primary - 2014-2015 | 3.79 |
| Secondary - 2014-2015 | 15.05 |
| Senior Secondary - 2014-2015 | 5.83 |
| GDP PerCapita | 135158.44 |

C3 Category

| Education Level | Average Dropout |
|------------------------------|-----------------|
| Primary - 2014-2015 | 5.87 |
| Upper Primary - 2014-2015 | 4.79 |
| Secondary - 2014-2015 | 21.34 |
| Senior Secondary - 2014-2015 | 8.86 |
| GDP PerCapita | 82219.43 |

C4 Category

| Education Level | Average Dropout |
|------------------------------|-----------------|
| Primary - 2014-2015 | 9.13 |
| Upper Primary - 2014-2015 | 6.61 |
| Secondary - 2014-2015 | 21.05 |
| Senior Secondary - 2014-2015 | 2.76 |
| GDP PerCapita | 54591.17 |

Hypothesis – Education Dropout Rate

- Decrease in dropout rate for Primary and Upper primary results in increase in Per Capita GDP. It can be inferred that this attributes to qualified individuals contributing greatly to GDP, predominantly Tertiary and Secondary sector.
- Higher dropout rate for Higher secondary does not impact Per Capita GDP since they can start contributing to GDP.
- Dropout for Secondary level is highest and is consistent across categories. Categories/States with high secondary drop out rates show majority of their contribution to GDP coming from “Agriculture, forestry and fishing” sub-sector.
- Reducing dropout rates for category3 and category4 will result in higher GDP based on data analyzed.

Summary

- Entire analyses and plots are done using Python3.
- West Bengal data is missing and hence excluded from analysis.
- Data is not imputed for missing values since it might lead to discrepancy.
- Education dropout is pressing issue for Category 3 and category 4.
- Bottom 5/6 sub-sectors contribute only 20% to GDP based on analysis done for 2014-15.