Module 6:

Assignment on GDP Analysis

By

Syed Furqan Azeez

Project Brief

The overall goal of this project is to help the CMs focus on areas which will foster economic development for their respective states. Since the most common measure of economic development is the GDP, you will analyze the GDP of the various states of India and suggest ways to improve it.

Understanding GDP

Gross domestic product (GDP) at current prices is the GDP at the market value of goods and services produced in a country during a year. In other words, GDP measures the 'monetary value of final goods and services produced by a country/state in a given period of time'.

GDP can be broadly divided into goods and services produced by three sectors: the primary sector (agriculture), the secondary sector (industry), and the tertiary sector (services).

It is also known as nominal GDP. More technically, (real) GDP takes into account the price change that may have occurred due to inflation. This means that the real GDP is nominal GDP adjusted for inflation. We will use the nominal GDP for this exercise. Also, we will consider the financial year 2015-16 as the base year since most of the data required for this exercise is available for the above period.

Per Capita GDP and Income

Total GDP divided by the population gives the **per capita GDP** (which roughly measures the average value of goods and services produced per person). The **per capita income** is closely related to per capita GDP (though they are not the same). In general, the per capita income increases when per capita GDP increases and vice-versa. For instance, in the financial year 2015-16, the per capita income of India was Rs 93,293, whereas the per capita GDP of India was $1717 which roughly translates to Rs 1,11,605.

India ranks 11th in the world in terms of total GDP though it lies at the 139th position in terms of per capita GDP.

Data:

The data is sourced from https://data.gov.in/ - an Open Government Data (OGD) platform of India. The download instructions are provided in the next segment. The data for GDP Analysis of Indian States is divided into two parts:

- **Data I-A:** This dataset contains the GSDP (Gross State Domestic Product) data for the states and union territories.
- **Data I-B:** This dataset contains the distribution of GSDP among three sectors: the primary sector (agriculture), the secondary sector (industry), and the tertiary sector (services) along with taxes and subsidies. There is separate dataset for each of the states. You are expected to read the dataset for the available states and join these (in Python) if needed.

Approach to the problem:

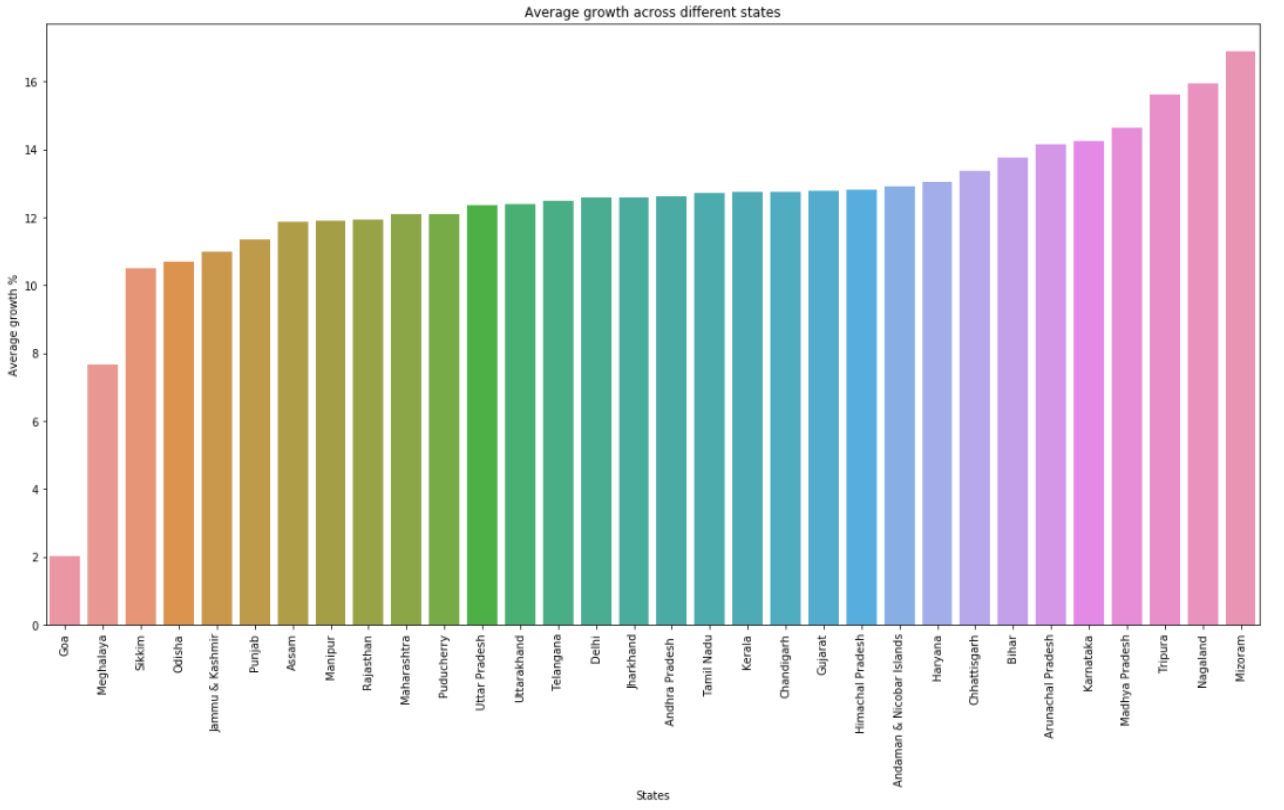
There are two parts to this project. In the first part,we will analyse and compare the GDPs of various Indian states (both total and per capita). The GDP of a state is referred to as **the GSDP (Gross State Domestic Product)**. Then,we will categorise the states into four categories based on GDP per capita and, for each of these four categories, we will analyse the sectors which contribute most to the GDP (such as agriculture, real estate, manufacturing, etc.).

In the second part, we will analyse whether GDP per capita is related to drop out rates in schools and colleges.

Part-I: GDP Analysis of Indian States

Part I-A:

- For the analysis below,we use the Data I-A.
- Data I-A: This dataset contains the GSDP (Gross State Domestic Product) data for the states and union territories.
- We read the data into a dataframe:df
- We remove the rows: '(% Growth over the previous year)' and 'GSDP - CURRENT PRICES (` in Crore)' for the year 2016-17.
- We remove the columns with all null values(i.e. West Bengal)
- We then fill the null values,by taking the mean of % Growth and GSDP of different states and fill it accordingly for that particular state.
- We then calculate the average growth of states over the duration 2013-14, 2014-15 and 2015-16 by taking the means of % growth of different states across the given duration.
- We then plot a Graph to compare the average growth of different states



- From the given graph we find that:
  - Lowest growth rate is of Goa state: 2.02 and Highest growth rate is of Mizoram state: 16.87
  - States with lowest average growth rates are:

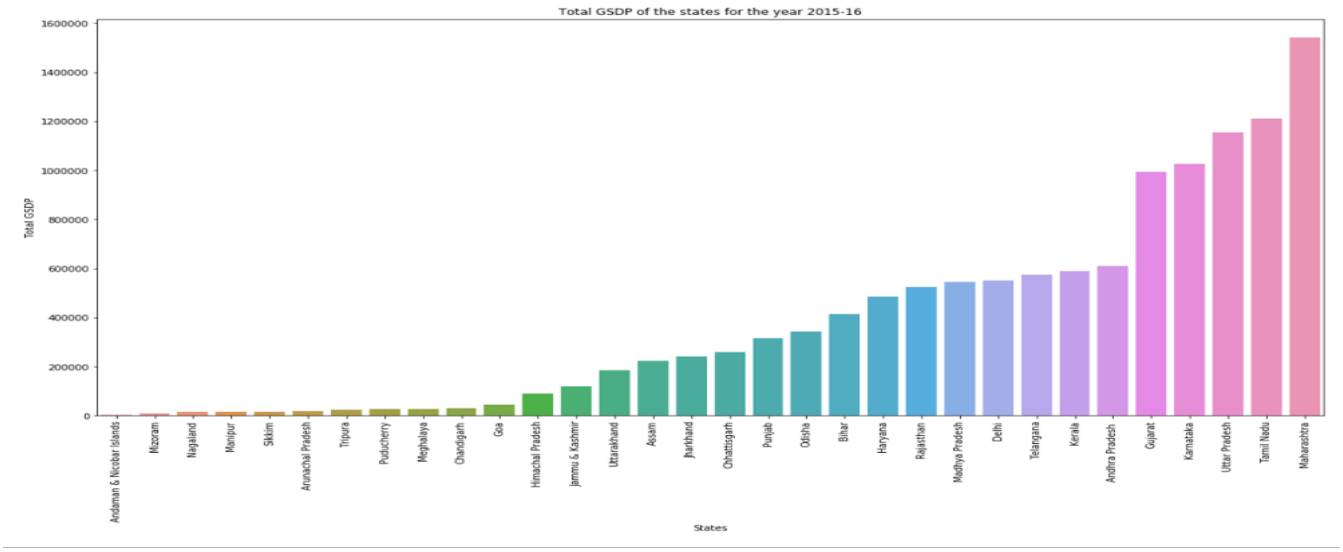
	Average growth %
Goa	2.02
Meghalaya	7.67
Sikkim	10.49
Odisha	10.71
Jammu & Kashmir	11

  - States with highest average growth rates are:

	Average growth %
Karnataka	14.23
Madhya Pradesh	14.65
Tripura	15.61
Nagaland	15.95
Mizoram	16.87

  - My home state is Karnataka
  - Growth rate of my home state-Karnataka is: 14.23%
  - Growth rate across All-India is: 11.87%

- We then plot the total GSDP of the states for the year 2015-16



- From the given graph we find that:

    - Maharashtra has the highest GSDP and Andaman and Nicobar Islands have the lowest GSDP in 2015-26

    - States with lowest GSDP in the year 2015-16:

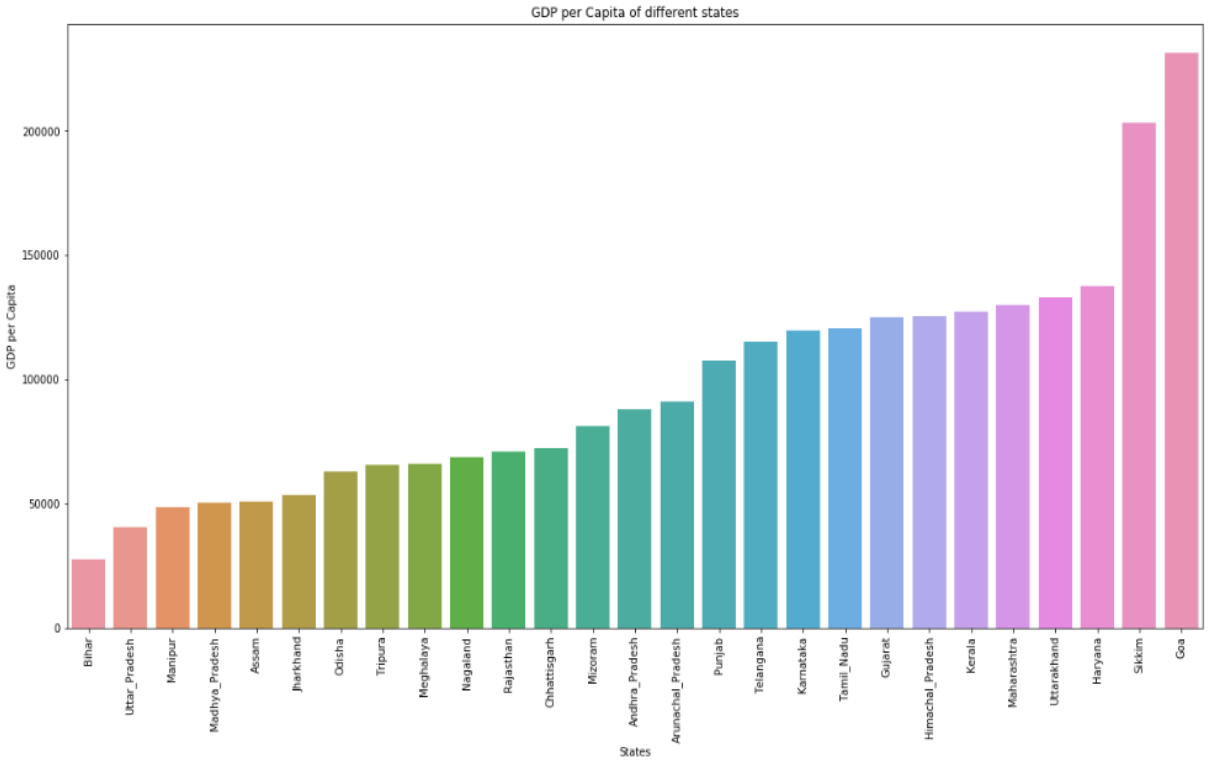
	GSDP - CURRENT PRICES (` in Crore)
Andaman & Nicobar Islands	4820
Mizoram	9368.25
Nagaland	15121
Manipur	15226
Sikkim	16637

- States with highest GSDP in the year 2015-16:

	GSDP - CURRENT PRICES (` in Crore)
Gujarat	994316
Karnataka	1.02707e+06
Uttar Pradesh	1.1538e+06
Tamil Nadu	1.21267e+06
Maharashtra	1.54027e+06

Part 1-B:

- For the analysis below,we use Data 1-B
- We only extract data of different states,leaving out the Union territories
- We merge all the data into one dataframe by iterating over the files placed in one folder and by extracting the data only for the year 2014-15
- We then plot the GDP per capita for all the states



- From the graph we find that:
    1. State with highest GDP per capita is: Goa
    2. State with lowest GDP per capita is: Bihar
    3. Ratio of highest and lowest per capita GDP is:8
    4. Bottom 5 states based on GDp per Capita are:

	Per Capita GSDP (Rs.)
Bihar	27675
Uttar_Pradesh	40469
Manipur	48684
Madhya_Pradesh	50183
Assam	51016

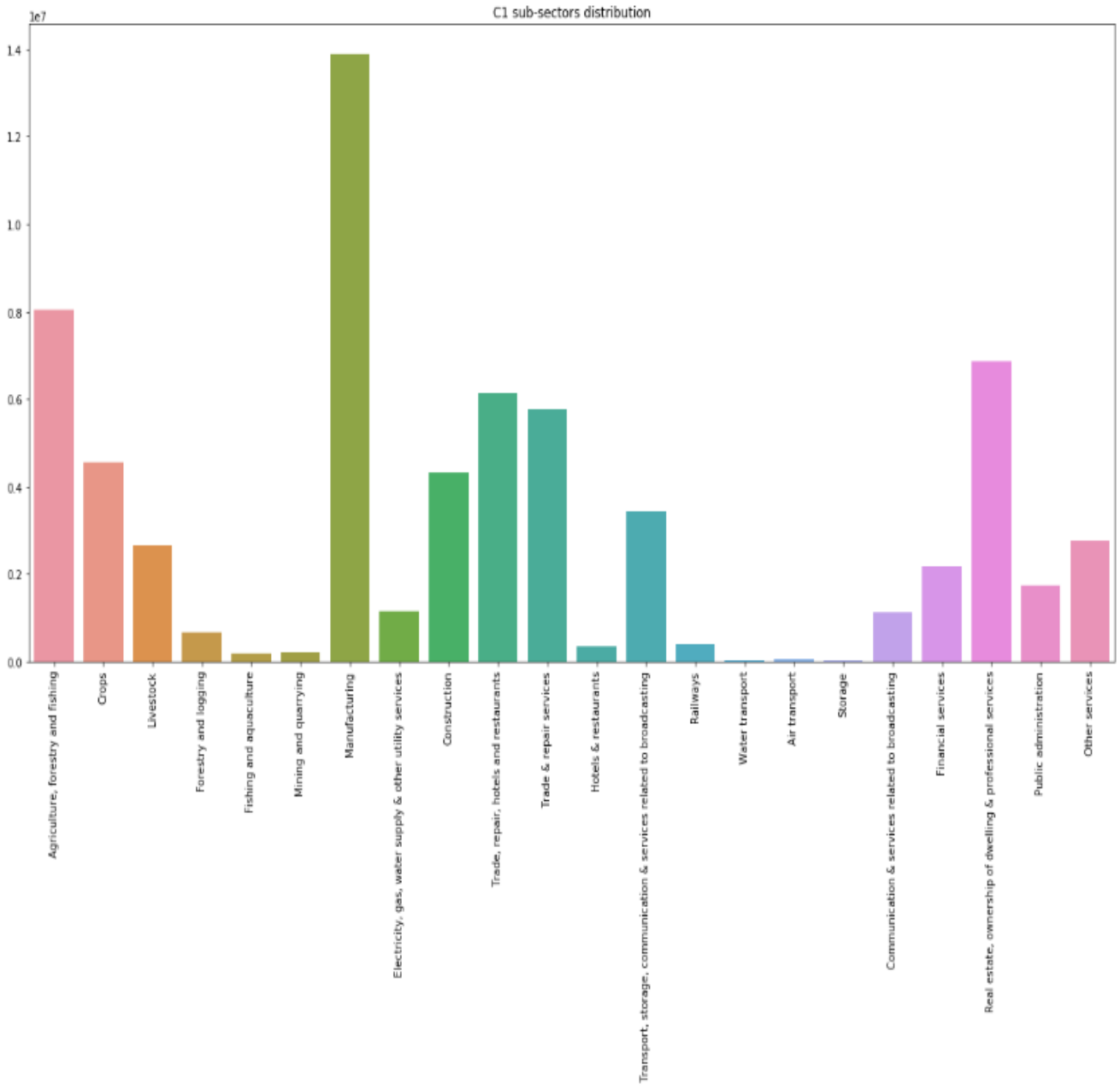
    5. Top 5 states based on GDP per Capita are:

	Per Capita GSDP (Rs.)
Maharashtra	130056
Uttarakhand	133047
Haryana	137513
Sikkim	203515
Goa	231509

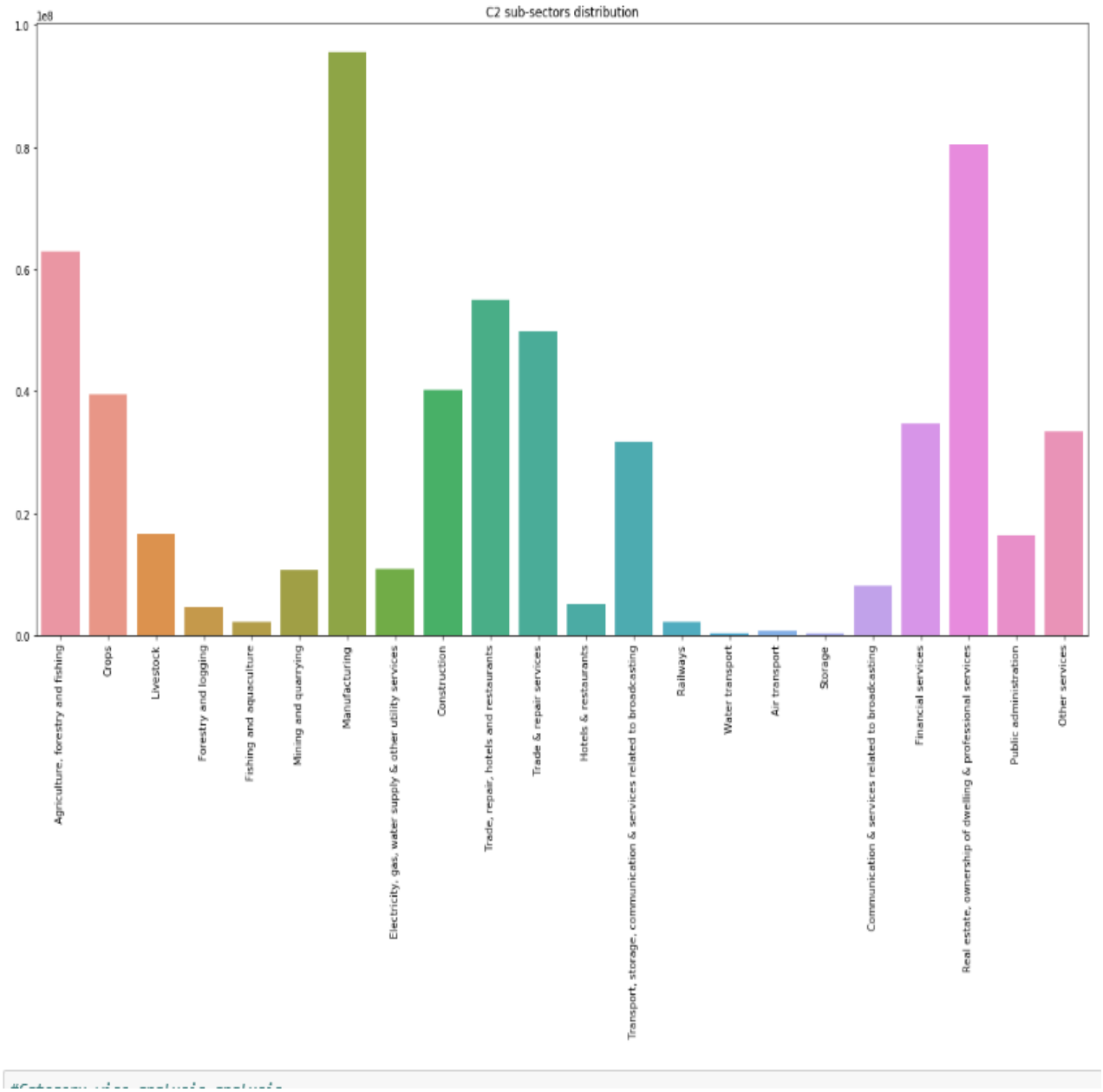
- We then plot the percentage contribution of primary, secondary,tertiary sectors along with taxes and subsidies as they are also a contributing factors to the GDP for all the states.
- Here,others is calculated using=taxes-subsidies
- From the given plot we find that percentage contribution of **tertiary sector** is relatively higher compared to other sectors.
- We then categorize the states into C1,C2,C3,C4 based on GDP per capita based on quantile values 0.20,0.5, 0.85, 1 such that the states lying between the 85th and the 100th percentile are in C1, those between 50th and 85th percentile are in C2 and so on.

- States belonging to C1: Uttarakhand, Haryana, Sikkim, Goa
- States belonging to C2: Arunachal_Pradesh, Punjab, Telangana, Karnataka, Tamil_Nadu, Gujarat, Himachal_Pradesh, Kerala, Maharashtra
- States belonging to C3: Odisha, Tripura, Meghalaya, Nagaland, Rajasthan, Chhattisgarh, Mizoram, Andhra_Pradesh
- States belonging to C4: Bihar, Uttar_Pradesh, Manipur, Madhya_Pradesh, Assam, Jharkh and
- We then find top 3/4/5 sub-sectors which contribute to nearly 80% of the GSDP of each category.
- As none of the top 3/4/5 subsectors in each category contributed 80% of the GSDP,we had to go beyond 6-7 subsectors to reach nearly 80% of GDP

- **For C1:**
    1. Top 6 sectors of C1 contribute to: 81.56% of GSDP
    2. Top 6 sectors of C1 are:
       1) Manufacturing
       2) Agriculture, forestry and fishing
       3) Real estate, ownership of dwelling & professional services 4) Trade, repair, hotels and restaurants
       5) Trade & repair services
       6) Crops

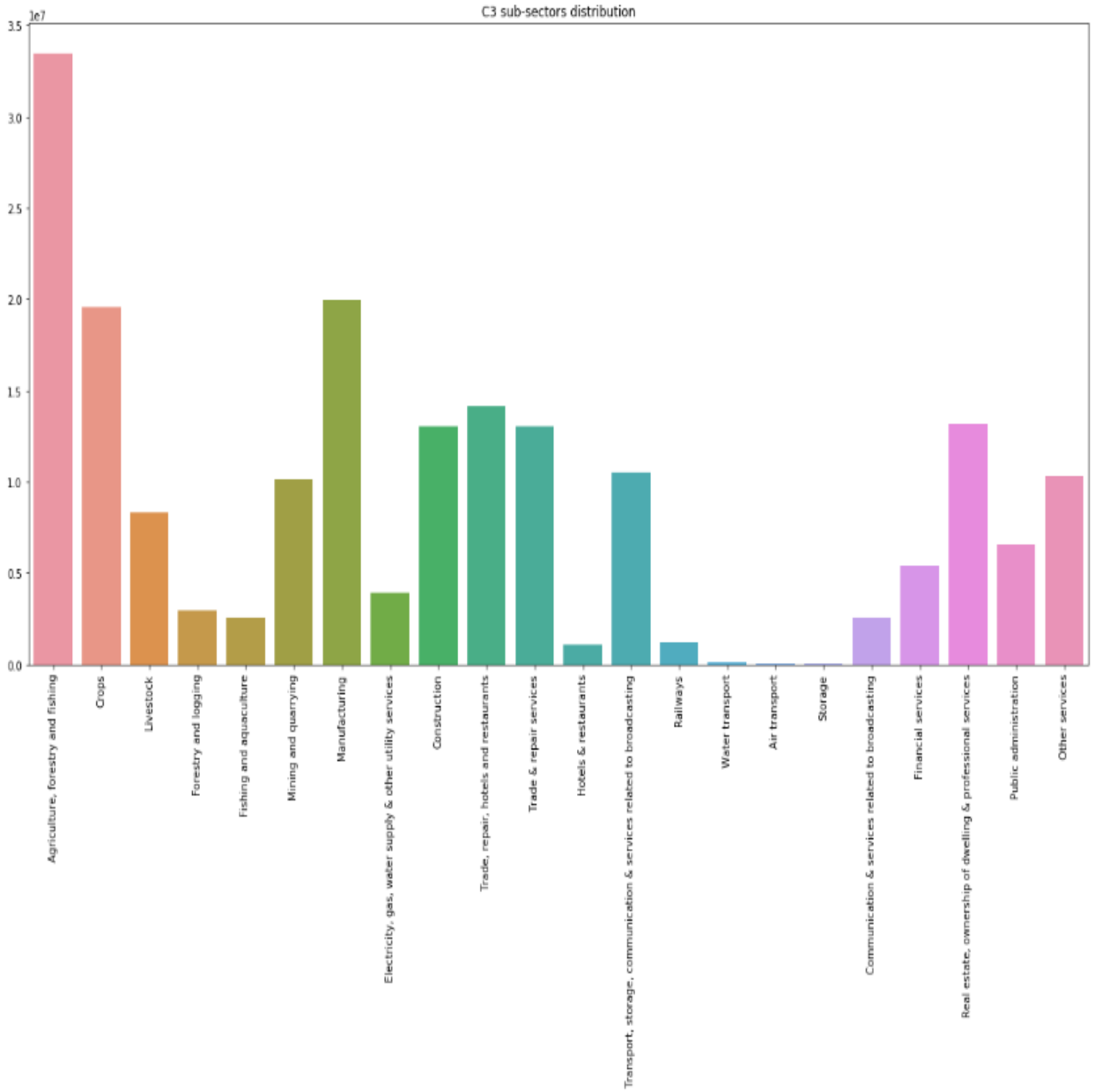


- **For C2:**
  1. Top 7 sectors of C2 contribute to: 80.68% of GSDP
  2. Top 7 sectors of C2 are:
     1) Manufacturing
     2) Real estate, ownership of dwelling & professional services
     3) Agriculture, forestry and fishing
     4) Trade, repair, hotels and restaurants
     5) Trade & repair services
     6) Construction
     7) Crops

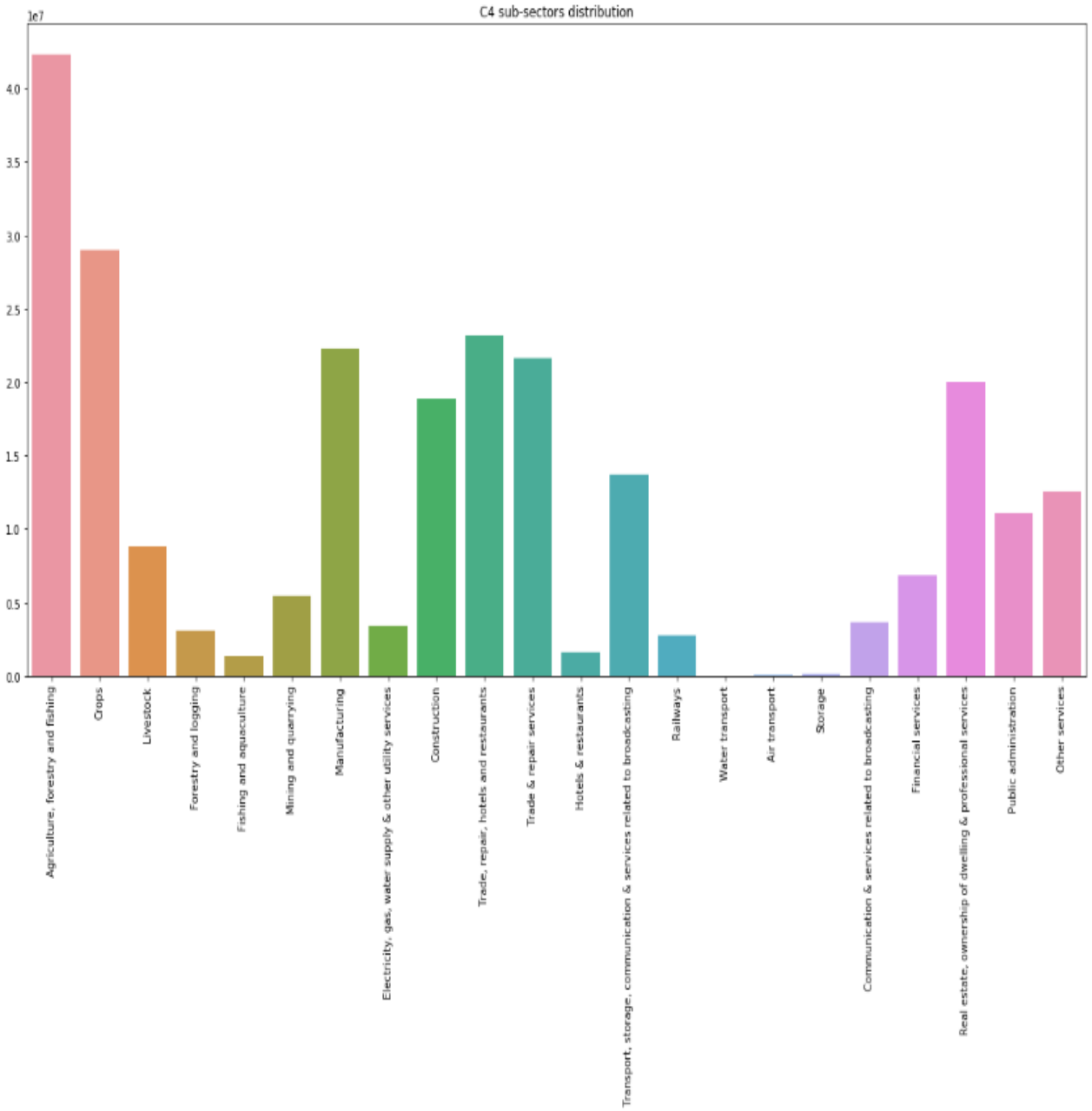


- **For C3:**
    1. Top 7 sectors of C3 contribute to: 84.6% of GSDP
    2. Top 7 sectors of C3 are:

        1) Agriculture, forestry and fishing
        2) Manufacturing
        3) Crops
        4) Trade, repair, hotels and restaurants
        5) Real estate, ownership of dwelling & professional services
        6) Construction
        7) Trade & repair services



- **For C4:**
    1. Top 6 sectors of C4 contribute to: 82.89% of GSDP
    2. Top 6 sectors of C4 are:
        1) Agriculture, forestry and fishing
        2) Crops
        3) Trade, repair, hotels and restaurants
        4) Manufacturing
        5) Trade & repair services
        6) Real estate, ownership of dwelling & professional services



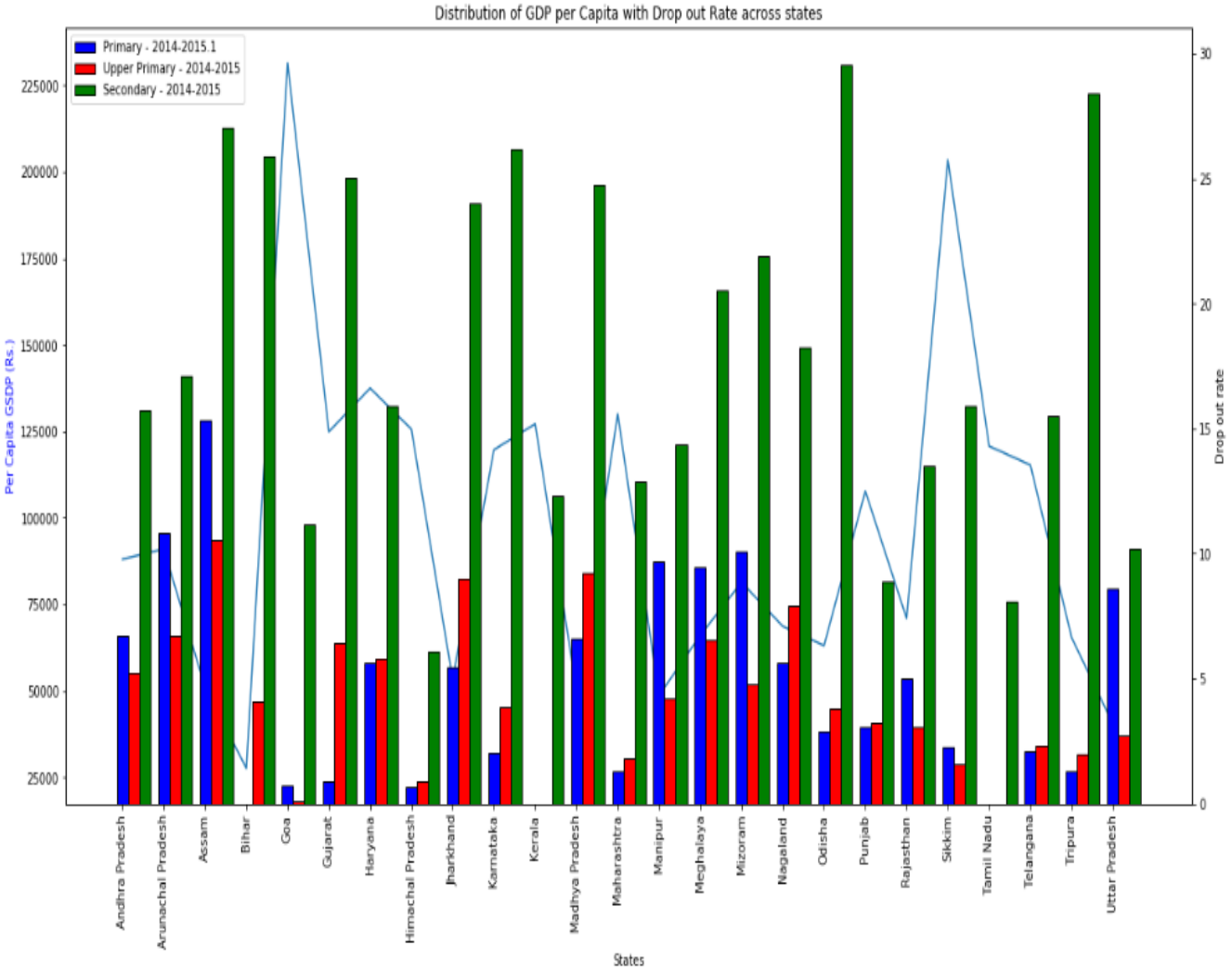
Data Insight:

- C1 category states have a higher percentage of contribution from manufacturing,agriculture,real-estate subsectors compared to other category of states
- C1 category states have a relatively lower contribution from agriculture compared to C2,C3 states depicting the affect of rapid urbanization
- C1 category states also have low contribution from mining and quarrying maybe due to the lack of natural resources found in these regions.
- Sectors that were found to be corelated to a higher GDP:
    - Communication & services related to broadcasting
    - Transport, storage, communication & services related to broadcasting
    - Trade, repair, hotels and restaurants
    - Trade & repair services
    - Manufacturing
    - Other services
    - Financial services
    - Real estate, ownership of dwelling & professional services
    - Construction
    - Public administration
- The contribution from railways,airtransport,water transport,storage,communication and services is less in almost every category.
- This might be due to the privatization of sub-sectors barring railways,hence,there is a dire need of concentration on these sub-sectors as there are directly proportional to a larger contribution of GDP
- From what can be seen from the graph C1,C2ategory states have a higher contribution from real estates and ownership of dwelling, depicting the rapid urbanization in these states and states moving towards rapid influx of population.
- C3,C4 category states have larger contribution from agriculture signifying the traditional livelihood of income in the rural areas.
- A balance needs to be striked between the urbanization and cultural development as both tend to strike a chord with a high GDP.
- Tourism is lacking which is visible from the less contribution from hotels and restaurant subsectors
- C1 ,C2 category states need to focus on agriculture,fishing sectors along with transport,storage,communication & services related to broadcasting.
- C3,C4 category states need to focus on railways,airtransport,water transport,storage as they have higher potential owing to the larger population in C3,C4 category states.

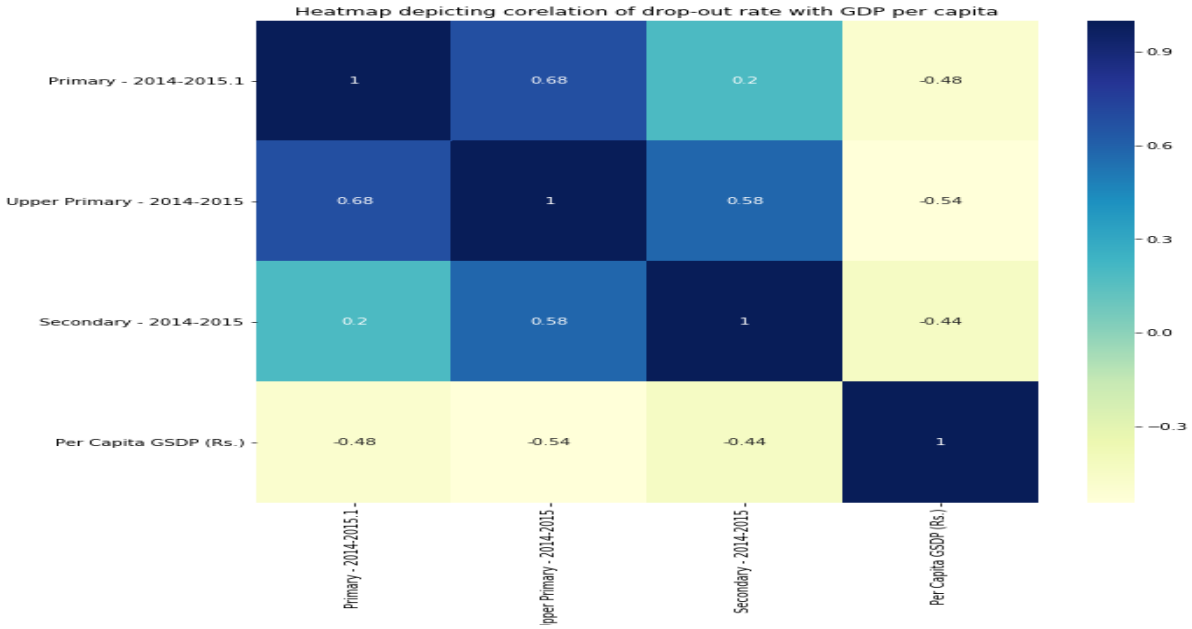
Part-II: GDP and Education Drop-out Rates

In this part of the analysis, we will investigate whether there is any relationship between per capita GDP with drop-out rates in education.

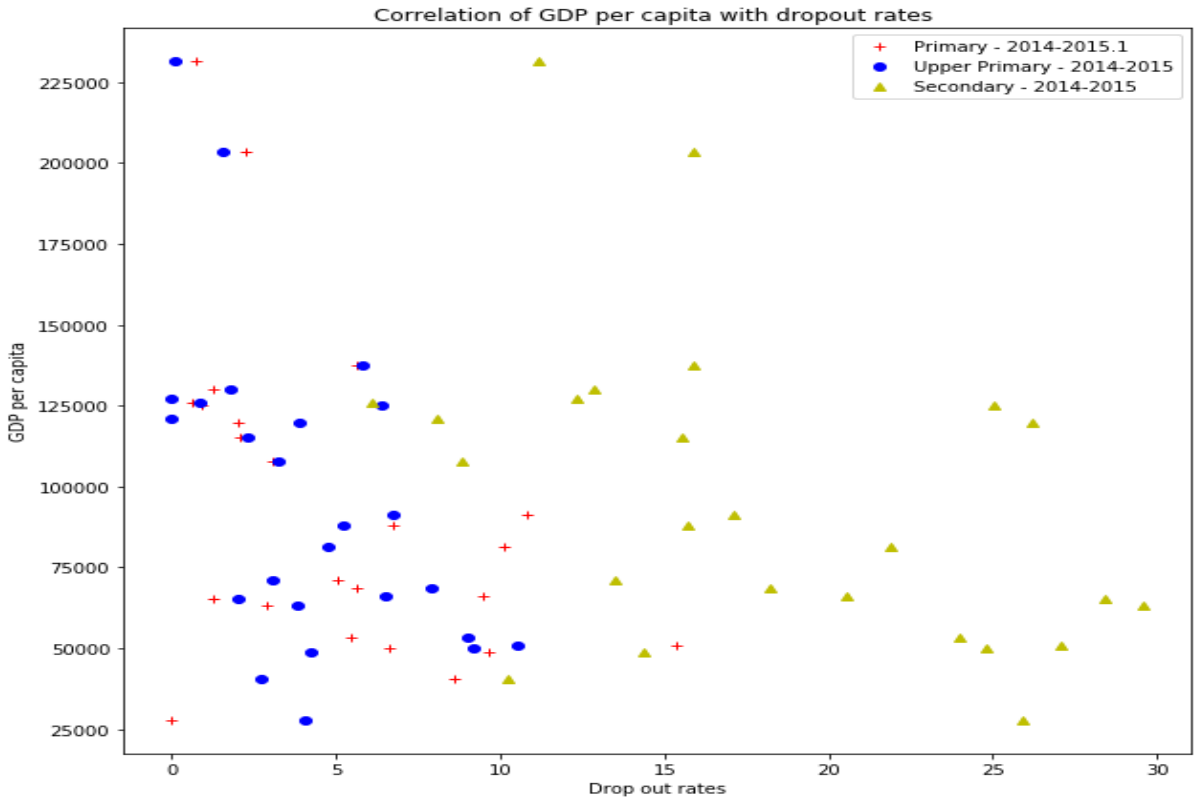
- We will import the drop-out rate dataset into a new dataframe
- We will only extract data for 2014-15
- We will only observe Primary,Secondary and Upper primary education levels.
- We make necessary changes to incorporate only those states data which were found in PART1-B.
- We then analyse if there is any correlation of GDP per capita with dropout rates in education (primary, upper primary and secondary) for the year 2014-2015 for the states.
- We do this by plotting different graphs.



Heat Map



Scatter plot



- From the above graphs,it is observed that whenever the drop-out rate is low,GDP per capita is high,however,when the drop-out rate is high,GDP per capita is low.
- This is mainly due to the fact that states with high GDP have a major contribution from tertiary and secondary sectors whose subsectors are more inclined towards urbanization which directly have a relation with the education level.
- What can be observed is that drop-out rate increases at the secondary level where most students attain adulthood,as such,because of this drop-out at this level,people become more job-oriented and are open to oppurtunities that require less education skill because of which they move out primary sector.
- A shift from primary onto any other sector requires the right skill because of which the amalgamation of people increases at this sector level,therefore,states with a larger population,tend to get a major chunk of their GDP from primary sector.
- As seen from previous analysis,major contribution comes from the tertiary sector,hence GDP per capita becomes less whenever there is a high drop-out rate.