Initial Analysis: Movies (CS&SS 321)

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Introduction

According to the United States Bureau of Economic Analysis, the Gross Domestic Product, or GDP, is "a comprehensive measure of economic activity... [and] the most popular indicator of the nation's overall economic health" (USBEA 2023). GDP measures the total monetary value of goods and services produced in the US in any given year, so it can be used to compare between years or countries to reveal economic productivity. Countries are given a label of high-income, upper-middle income, lower-middle income, and low income depending on what range the GDP of the given country falls into. Economic prosperity of a given country and the successful industries within that country are related, as industry directly influences the economy and vice versa.

The global film industry "brings jobs, revenue, and related infrastructure development" created by the numerous departments within film, such as construction, production, and even tourism, "providing an immediate boost to local economies" (Motion Pictures Association, Inc. 2023). The potential for film industries to thrive relies on the accessibility to basic infrastructure. While the film industry provides essential work for thousands of people, it is not part of the basic and essential industries that fuel the economy's growth as healthcare, construction, technology, and manufacturing are. Thus, the film industry can be viewed as one indicator of a nation's economic prosperity based on its size and scale. When considering the countries included in the top 10 GDPs globally, the top five film industries in the world–the United States, China, United Kingdom, Japan, and India–are within the top six GDP (World Atlas 2018).

In this research project, we are investigating GDP and ratings of film in a given country. Ratings may be another indicator to inform how successful a given country's film industry is among the citizens, those who actually watch the film that their country produces. It is important to note that, in this context, film includes both movies and television shows.

The main data set we use consists of listings of all the movies and TV shows available on Netflix, along with details such as genre, cast, rating, release year, etc.

Hypotheses

We suspect that countries in higher GDP ranges will have higher film ratings, and countries in lower GDP ranges will have lower film ratings. Additionally, we speculate that countries in a higher GDP range on average produce more movies than countries in a lower GDP range.

Research Design (Part 1)

We decided to look at four of the higher producing entertainment countries in the world, two being high income and two being lower middle income, choosing these countries as those in the two income groups that produced the most movies. We wanted to see if countries that are not high income have a different movie genre proportion than lower income countries.

In order to do so, we first merged our income and movie data sets, and created data subsets for the 3 primary entertainment genres we chose to focus on: action, drama, and comedy.

```
gdp_data$country = gdp_data$TableName
merged_data <- data %>% left_join(gdp_data)
```

```
## Joining with `by = join_by(country)`
```

```
merged_data <- merged_data %>% rowwise() %>% mutate(Drama = ifelse(("Dramas" %in% listed_in) | ("TV Dra
merged_data <- merged_data %>% rowwise() %>% mutate(Comedy = ifelse(("Comedies" %in% listed_in) | ("TV 
merged_data <- merged_data %>% rowwise() %>% mutate(Action = ifelse(("Action & Adventure" %in% listed_i
merged_data <- merged_data %>% filter(!is.na(IncomeGroup) & IncomeGroup != "")

drama_data_set <- merged_data %>% mutate(Drama1 = grepl("Dramas", listed_in))
comedy_data_set <- merged_data %>% mutate(Comedy1 = grepl("Comedies", listed_in))
action_data_set <- merged_data %>% mutate(Action1 = grepl("Action & Adventure", listed_in))

drama_plot <- ggplot(drama_data_set, mapping = aes(x = IncomeGroup, fill = Drama1)) +
  geom_bar() +
  theme_classic() +
  labs(title = "Proportion of Drama Movies and TV shows by Income Group", x = "Income Group", y = "Total
ggplotly(drama_plot)
```

```
comedy_plot <- ggplot(comedy_data_set, mapping = aes(x = IncomeGroup, fill = Comedy1)) +
  geom_bar() +
  theme_classic() +
  labs(title = "Proportion of Comedy Movies and TV shows by Income Group",x = "Income Group", y = "Total
ggplotly(comedy_plot)
```

```
action_plot <- ggplot(action_data_set, mapping = aes(x = IncomeGroup, fill = Action1)) +
  geom_bar() +
  theme_classic() +
  labs(title = "Proportion of Action Movies and TV shows by Income Group", x = "Income Group", y = "Tota
ggplotly(action_plot)
```

After looking at this data, we then wanted to test each country's proportion of Drama movies and Tv shows produced to see if lower middle income countries were more inclined to produce Dramas as it may relate to their population more. We then did the same with comedies to see if higher income countries had a similar trend in the other direction.

We filtered these four producers of film and then individually compared their drama and comedy-producing proportions.

```
US_data_set <- drama_data_set %>% filter(TableName == "United States")
Nigeria_data_set <- drama_data_set %>% filter(TableName == "Nigeria")
India_data_set <- drama_data_set %>% filter(TableName == "India")
UK_data_set <- drama_data_set %>% filter(TableName == "United Kingdom")
US_drama_proportion <- table(US_data_set$Drama1)
Nigeria_drama_proportion <- table(Nigeria_data_set$Drama1)
India_drama_proportion <- table(India_data_set$Drama1)
UK_drama_proportion <- table(UK_data_set$Drama1)

(US_drama_proportion[2] / (US_drama_proportion[1] + US_drama_proportion[2]))
```

```
##      TRUE
## 0.2767921
```

```
(Nigeria_drama_proportion[2] / (Nigeria_drama_proportion[1] + Nigeria_drama_proportion[2]))
```

```
##      TRUE
## 0.6736842
```

```
(India_drama_proportion[2] / (India_drama_proportion[1] + India_drama_proportion[2]))
```

```
##      TRUE
## 0.6656379
```

```
(UK_drama_proportion[2] / (UK_drama_proportion[1] + UK_drama_proportion[2]))
```

```
##      TRUE
## 0.1622912
```

```
US_data_set1 <- comedy_data_set %>% filter(TableName == "United States")
Nigeria_data_set1 <- comedy_data_set %>% filter(TableName == "Nigeria")
India_data_set1 <- comedy_data_set %>% filter(TableName == "India")
UK_data_set1 <- comedy_data_set %>% filter(TableName == "United Kingdom")
US_comedy_proportion <- table(US_data_set1$Comedy1)
Nigeria_comedy_proportion <- table(Nigeria_data_set1$Comedy1)
India_comedy_proportion <- table(India_data_set1$Comedy1)
UK_comedy_proportion <- table(UK_data_set1$Comedy1)

(US_comedy_proportion[2] / (US_comedy_proportion[1] + US_comedy_proportion[2]))
```

```
##      TRUE
## 0.2689851
```

```
(Nigeria_comedy_proportion[2] / (Nigeria_comedy_proportion[1] + Nigeria_comedy_proportion[2]))
```

```
##      TRUE
## 0.4315789
```

```
(India_comedy_proportion[2] / (India_comedy_proportion[1] + India_comedy_proportion[2]))
```

```
##      TRUE
## 0.3436214
```

```
(UK_comedy_proportion[2] / (UK_comedy_proportion[1] + UK_comedy_proportion[2]))
```

```
##      TRUE
## 0.1622912
```

Research Design (Part 2)

The research design for this portion of our analysis is breaking down how ratings change in one country as GDP fluctuates in order to to analyze without the different impacts studying countries different countries can have.

In order to do this we created a merged data file that was merged with both country and year/ year of release as the common factor.

```
datax <- read_csv("netflix_titles.csv") %>%
  mutate(year = release_year) %>%
  filter(country %in% c("United States","India","United Kingdom"))
```

```
## Rows: 8807 Columns: 12
## -- Column specification --------------------------------------------------------
## Delimiter: ","
## chr (11): show_id, type, title, director, cast, country, date_added, rating,...
## dbl  (1): release_year
##
## i Use `spec()` to retrieve the full column specification for this data.
## i Specify the column types or set `show_col_types = FALSE` to quiet this message.
```

```
gdpchange <- read_csv("gdpchange.csv") %>%
  filter(country %in% c("United States","India","United Kingdom"))  %>%
  pivot_longer(GDP_1960:GDP_2021, names_to = "year", values_to = "gdp") %>%
  mutate(year = as.numeric(str_sub(year, 5L, -1L))) %>%
  select(-`2022`)
```

```
## Rows: 266 Columns: 67
## -- Column specification --------------------------------------------------------
## Delimiter: ","
## chr  (4): country, Country Code, Indicator Name, Indicator Code
## dbl (61): GDP_1961, GDP_1962, GDP_1963, GDP_1964, GDP_1965, GDP_1966, GDP_19...
## lgl  (2): GDP_1960, 2022
##
## i Use `spec()` to retrieve the full column specification for this data.
## i Specify the column types or set `show_col_types = FALSE` to quiet this message.
```

```
mergeddata <- datax %>%
  left_join(gdpchange)
```

```
## Joining with `by = join_by(country, year)`
```

Then we created a new column labeled ' GDPcategory ' which was labelled 1, 2, 3, or 4 based on which quartile the country's GDP was in that year.

```
usa <- mergeddata %>% filter(country == "United States")
summary(usa$gdp)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.    NA's
##  -2.768   1.667   2.288   1.900   2.945   7.237      21
```

```
usa <- usa %>%
  mutate(GDPcategory = case_when(gdp <1.667 ~ 1,
                                  between(gdp, 1.667, 2.288)~ 2,
                                 between(gdp, 2.288, 2.945)~ 3,
                                 TRUE ~ 4 ))
```

Then we made 4 different graphs showing the percent break down of rating dependent on for the years in which the US was either in quartile 1, 2, 3, or 4.

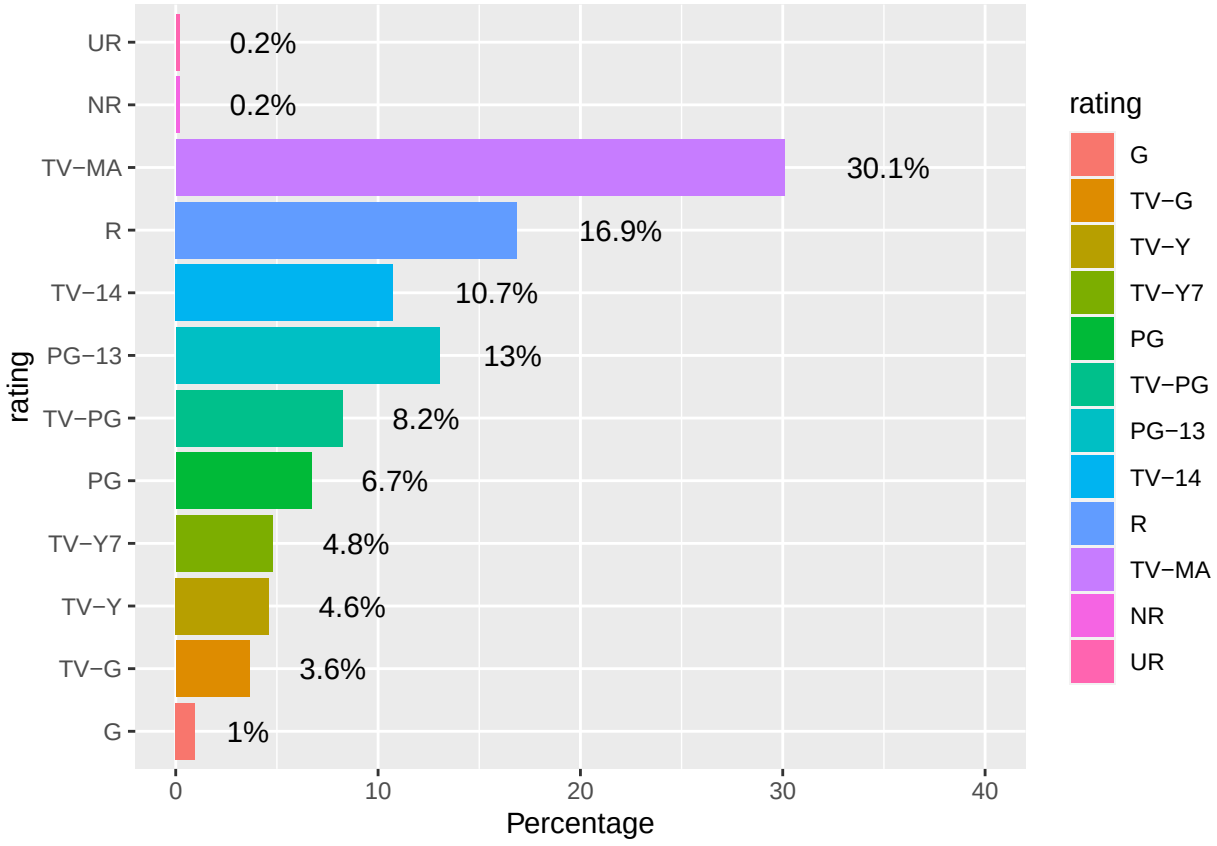
We will be looking at the differences in these graphs to view change.

```
lowestquartileUSA <- usa %>%
  filter(GDPcategory == 1)

rating_counts <- lowestquartileUSA %>%
  count(rating) %>%
  mutate(percentage = n / sum(n)*100)
print(rating_counts)
```

```
## # A tibble: 12 x 3
##    rating     n percentage
##    <chr>  <int>      <dbl>
##  1 G          5      0.958
##  2 NR         1      0.192
##  3 PG        35      6.70
##  4 PG-13     68     13.0
##  5 R         88     16.9
##  6 TV-14     56     10.7
##  7 TV-G      19      3.64
##  8 TV-MA    157     30.1
##  9 TV-PG     43      8.24
## 10 TV-Y      24      4.60
## 11 TV-Y7     25      4.79
## 12 UR         1      0.192
```

```
  rating_counts %>%
    rename(Percentage = percentage) %>%
    mutate(pct_label = paste0(round(Percentage, 1), "%")) %>%
  mutate(rating = factor(rating,
                         levels = c("G","TV-G","TV-Y",
                                    "TV-Y7","PG","TV-PG",
                                       "PG-13","TV-14", "R","TV-MA", "NR","UR"))) %>%
  ggplot(aes(x = Percentage, y= rating,
             fill = rating, label = pct_label)) +
  geom_col() +
    geom_text(hjust = -0.75) +
    scale_x_continuous(limits = c(0, 40))
```

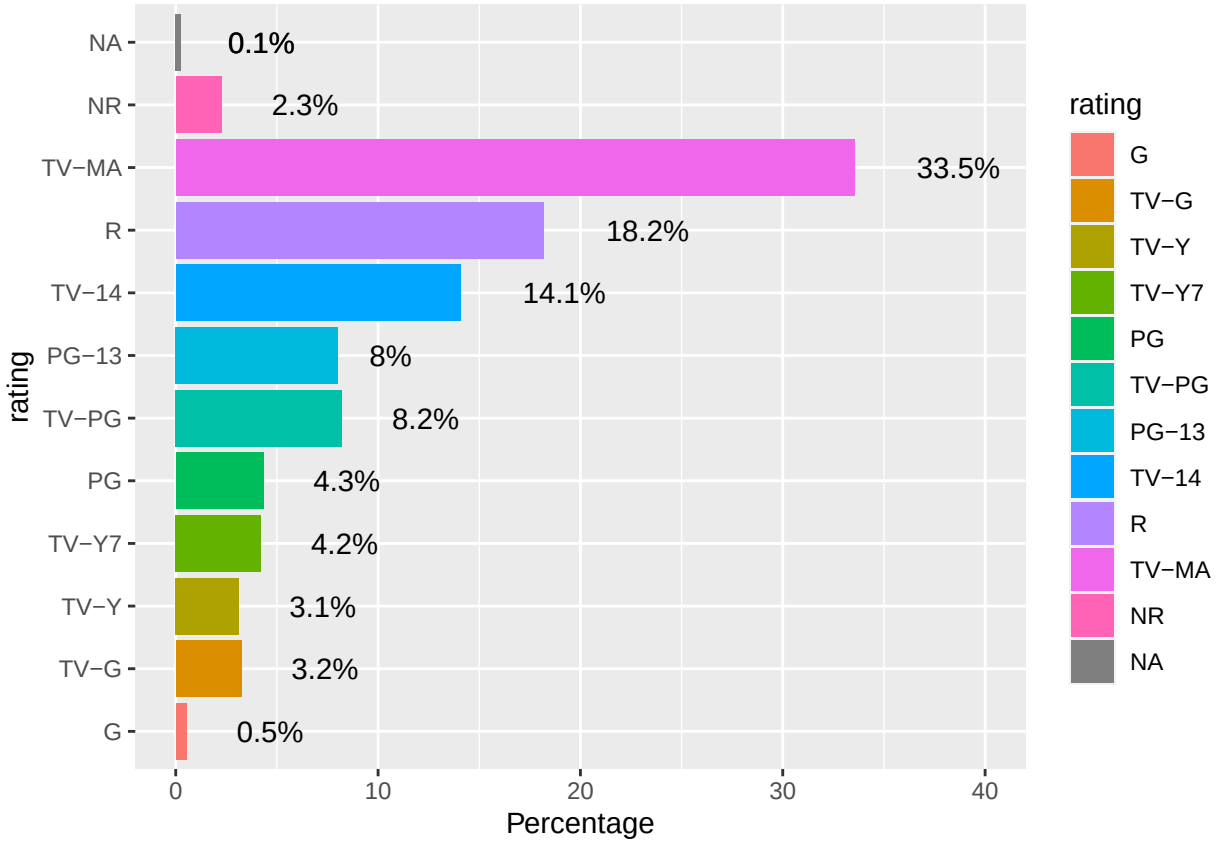



```
secondquartileUSA <- usa %>%
  filter(GDPcategory == 2)

rating_counts2 <- secondquartileUSA %>%
  count(rating) %>%
  mutate(percentage = n / sum(n)*100)
print(rating_counts2)
```

```
## # A tibble: 13 x 3
##    rating       n percentage
##    <chr>    <int>      <dbl>
##  1 74 min       1      0.108
##  2 G            5      0.541
##  3 NR          21      2.27
##  4 PG          40      4.33
##  5 PG-13       74      8.01
##  6 R          168     18.2
##  7 TV-14      130     14.1
##  8 TV-G        30      3.25
##  9 TV-MA      310     33.5
## 10 TV-PG       76      8.23
## 11 TV-Y        29      3.14
## 12 TV-Y7       39      4.22
## 13 TV-Y7-FV     1      0.108
```

```
rating_counts2 %>%
  rename(Percentage = percentage) %>%
  mutate(pct_label = paste0(round(Percentage, 1), "%")) %>%
  mutate(rating = factor(rating,
                         levels = c("G","TV-G","TV-Y",
                                    "TV-Y7","PG","TV-PG",
                                    "PG-13","TV-14", "R","TV-MA", "NR","UR"))) %>%
  ggplot(aes(x = Percentage, y= rating,
             fill = rating, label = pct_label)) +
  geom_col() +
  geom_text(hjust = -0.75) +
  scale_x_continuous(limits = c(0, 40))
```



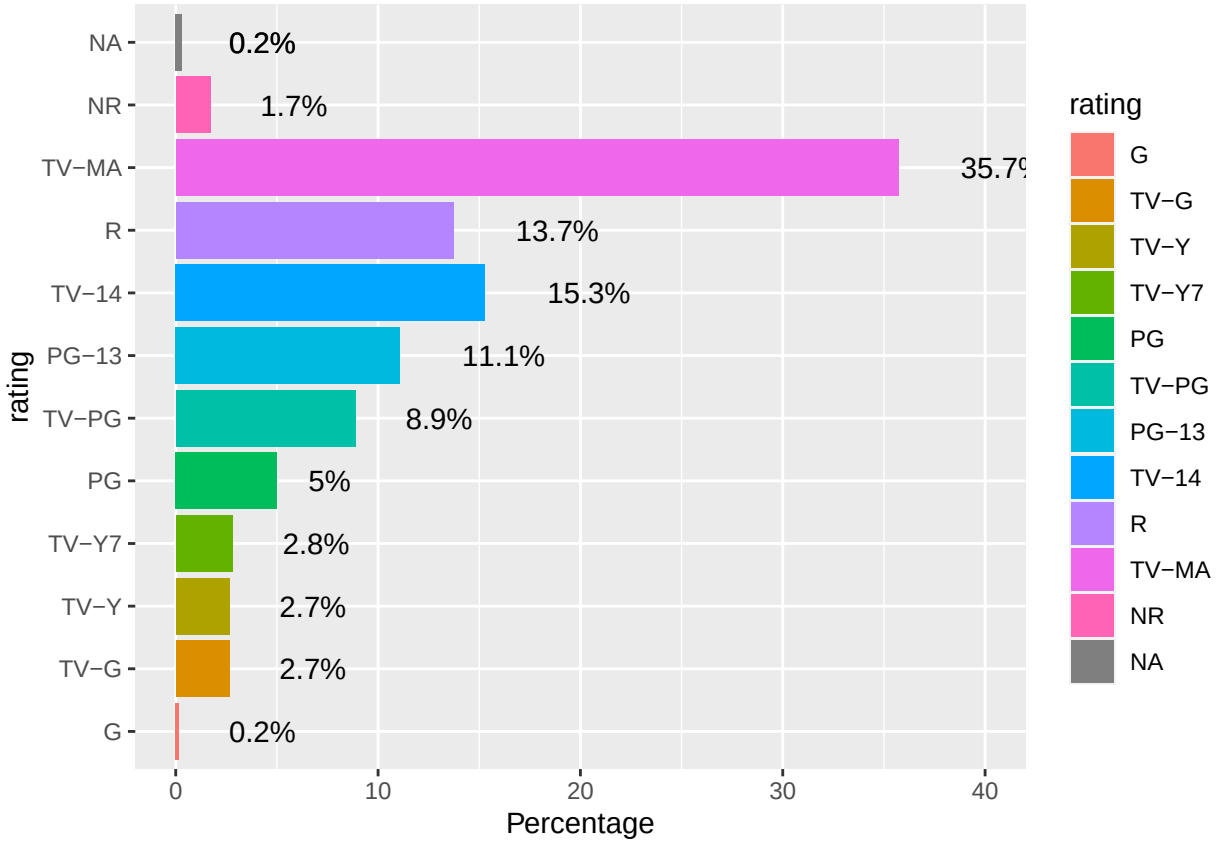

```
thirdquartileUSA <- usa %>%
  filter(GDPcategory == 3)

rating_counts3 <- thirdquartileUSA %>%
  count(rating) %>%
  mutate(percentage = n / sum(n)*100)
print(rating_counts3)
```

```
## # A tibble: 13 x 3
##    rating     n percentage
##    <chr>  <int>      <dbl>
##  1 66 min     1      0.156
```

```
##  2 84 min     1      0.156
##  3 G          1      0.156
##  4 NR        11      1.72
##  5 PG        32      4.99
##  6 PG-13     71     11.1
##  7 R         88     13.7
##  8 TV-14     98     15.3
##  9 TV-G      17      2.65
## 10 TV-MA    229     35.7
## 11 TV-PG     57      8.89
## 12 TV-Y      17      2.65
## 13 TV-Y7     18      2.81
```

```
rating_counts3 %>%
  rename(Percentage = percentage) %>%
  mutate(pct_label = paste0(round(Percentage, 1), "%")) %>%
  mutate(rating = factor(rating,
                         levels = c("G","TV-G","TV-Y",
                                    "TV-Y7","PG","TV-PG",
                                    "PG-13","TV-14", "R","TV-MA", "NR","UR"))) %>%
  ggplot(aes(x = Percentage, y= rating,
             fill = rating, label = pct_label)) +
  geom_col() +
  geom_text(hjust = -0.75) +
  scale_x_continuous(limits = c(0, 40))
```

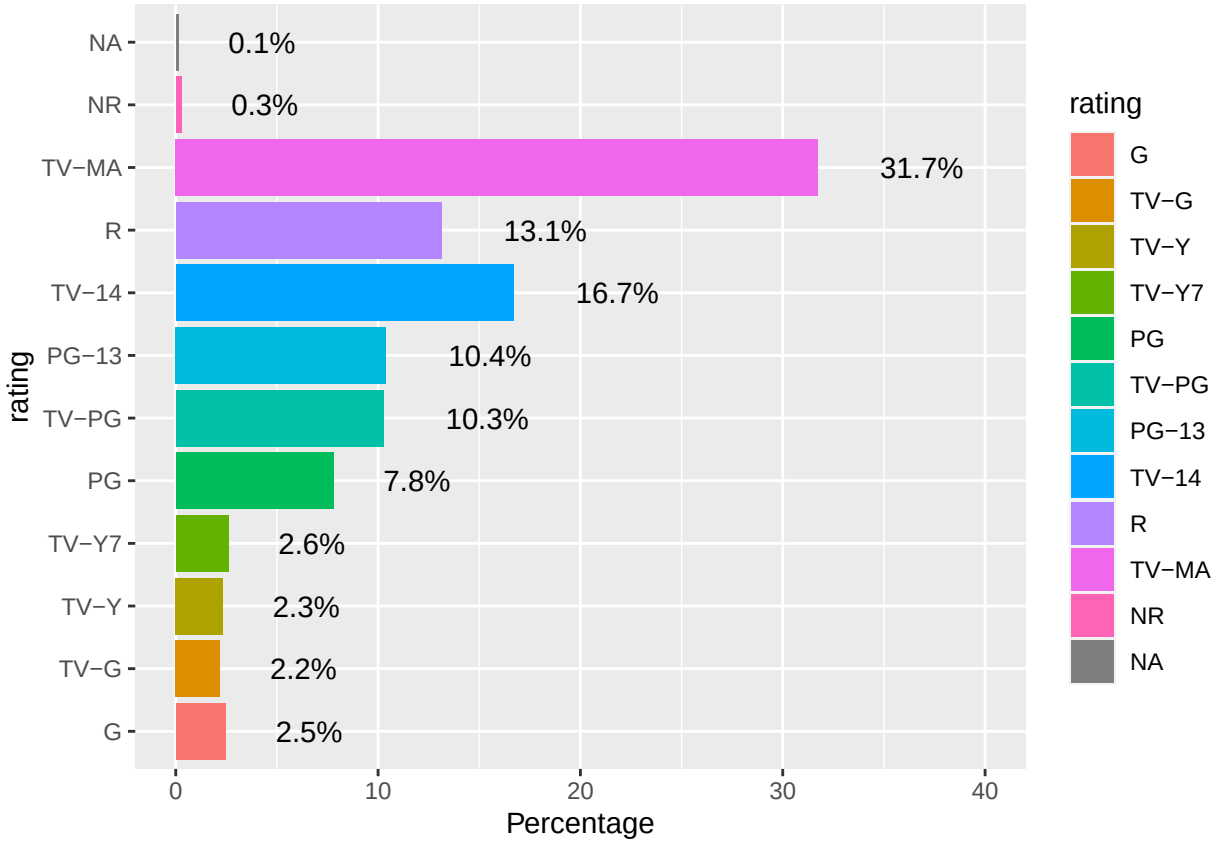


```r
fourthquartileUSA <- usa %>%
  filter(GDPcategory == 4)

rating_counts4 <- fourthquartileUSA %>%
  count(rating) %>%
  mutate(percentage = n / sum(n)*100)
print(rating_counts4)
```

```
## # A tibble: 12 x 3
##    rating     n percentage
##    <chr>  <int>      <dbl>
##  1 G         18      2.46
##  2 NC-17      1      0.137
##  3 NR         2      0.274
##  4 PG        57      7.80
##  5 PG-13     76     10.4
##  6 R         96     13.1
##  7 TV-14    122     16.7
##  8 TV-G      16      2.19
##  9 TV-MA    232     31.7
## 10 TV-PG     75     10.3
## 11 TV-Y      17      2.33
## 12 TV-Y7     19      2.60
```

```r
rating_counts4 %>%
  rename(Percentage = percentage) %>%
  mutate(pct_label = paste0(round(Percentage, 1), "%")) %>%
  mutate(rating = factor(rating,
                         levels = c("G","TV-G","TV-Y",
                                    "TV-Y7","PG","TV-PG",
                                    "PG-13","TV-14", "R","TV-MA", "NR","UR"))) %>%
  ggplot(aes(x = Percentage, y= rating,
             fill = rating, label = pct_label)) +
  geom_col() +
  geom_text(hjust = -0.75) +
  scale_x_continuous(limits = c(0, 40))
```


rating
NA
NR
TV−MA
R
TV−14
PG−13
TV−PG
PG
TV−Y7
TV−Y
TV−G
G
0.1%
0.3%
31.7%
13.1%
16.7%
10.4%
10.3%
7.8%
2.6%
2.3%
2.2%
2.5%
0
10
20
30
40
Percentage
rating
G
TV−G
TV−Y
TV−Y7
PG
TV−PG
PG−13
TV−14
R
TV−MA
NR
NA

Works Cited

https://www.worldatlas.com/articles/largest-film-industries-in-the-world.html

https://www.kaggle.com/datasets/shivamb/netflix-shows

https://www.motionpictures.org/what-we-do/driving-economic-growth/

https://www.bea.gov/data/gdp/gross-domestic-product

Appendix: R Code

```
knitr::opts_chunk$set(echo = TRUE)

setwd("D:/university/SOC321/proj/321MovieProject")

# load libraries:
library(tidyverse)
library(ggplot2)
library(dplyr)
library(plotly)
# load data:
data <- read.csv("netflix_titles.csv")
gdp_data <- read.csv("CountryIncomeBrakcets.csv")
gdp_data$country = gdp_data$TableName
merged_data <- data %>% left_join(gdp_data)
merged_data <- merged_data %>% rowwise() %>% mutate(Drama = ifelse(("Dramas" %in% listed_in) | ("TV Dra
merged_data <- merged_data %>% rowwise() %>% mutate(Comedy = ifelse(("Comedies" %in% listed_in) | ("TV 
merged_data <- merged_data %>% rowwise() %>% mutate(Action = ifelse(("Action & Adventure" %in% listed_i
merged_data <- merged_data %>% filter(!is.na(IncomeGroup) & IncomeGroup != "")

drama_data_set <- merged_data %>% mutate(Drama1 = grepl("Dramas", listed_in))
comedy_data_set <- merged_data %>% mutate(Comedy1 = grepl("Comedies", listed_in))
action_data_set <- merged_data %>% mutate(Action1 = grepl("Action & Adventure", listed_in))

drama_plot <- ggplot(drama_data_set, mapping = aes(x = IncomeGroup, fill = Drama1)) +
  geom_bar() +
  theme_classic() +
  labs(title = "Proportion of Drama Movies and TV shows by Income Group", x = "Income Group", y = "Total
ggplotly(drama_plot)

comedy_plot <- ggplot(comedy_data_set, mapping = aes(x = IncomeGroup, fill = Comedy1)) +
  geom_bar() +
  theme_classic() +
  labs(title = "Proportion of Comedy Movies and TV shows by Income Group",x = "Income Group", y = "Total
ggplotly(comedy_plot)

action_plot <- ggplot(action_data_set, mapping = aes(x = IncomeGroup, fill = Action1)) +
  geom_bar() +
  theme_classic() +
  labs(title = "Proportion of Action Movies and TV shows by Income Group", x = "Income Group", y = "Tota
ggplotly(action_plot)
US_data_set <- drama_data_set %>% filter(TableName == "United States")
Nigeria_data_set <- drama_data_set %>% filter(TableName == "Nigeria")
```

```
India_data_set <- drama_data_set %>% filter(TableName == "India")
UK_data_set <- drama_data_set %>% filter(TableName == "United Kingdom")
US_drama_proportion <- table(US_data_set$Drama1)
Nigeria_drama_proportion <- table(Nigeria_data_set$Drama1)
India_drama_proportion <- table(India_data_set$Drama1)
UK_drama_proportion <- table(UK_data_set$Drama1)

(US_drama_proportion[2] / (US_drama_proportion[1] + US_drama_proportion[2]))

(Nigeria_drama_proportion[2] / (Nigeria_drama_proportion[1] + Nigeria_drama_proportion[2]))

(India_drama_proportion[2] / (India_drama_proportion[1] + India_drama_proportion[2]))

(UK_drama_proportion[2] / (UK_drama_proportion[1] + UK_drama_proportion[2]))


US_data_set1 <- comedy_data_set %>% filter(TableName == "United States")
Nigeria_data_set1 <- comedy_data_set %>% filter(TableName == "Nigeria")
India_data_set1 <- comedy_data_set %>% filter(TableName == "India")
UK_data_set1 <- comedy_data_set %>% filter(TableName == "United Kingdom")
US_comedy_proportion <- table(US_data_set1$Comedy1)
Nigeria_comedy_proportion <- table(Nigeria_data_set1$Comedy1)
India_comedy_proportion <- table(India_data_set1$Comedy1)
UK_comedy_proportion <- table(UK_data_set1$Comedy1)

(US_comedy_proportion[2] / (US_comedy_proportion[1] + US_comedy_proportion[2]))

(Nigeria_comedy_proportion[2] / (Nigeria_comedy_proportion[1] + Nigeria_comedy_proportion[2]))

(India_comedy_proportion[2] / (India_comedy_proportion[1] + India_comedy_proportion[2]))

(UK_comedy_proportion[2] / (UK_comedy_proportion[1] + UK_comedy_proportion[2]))
datax <- read_csv("netflix_titles.csv") %>%
  mutate(year = release_year) %>%
  filter(country %in% c("United States","India","United Kingdom"))

gdpchange <- read_csv("gdpchange.csv") %>%
  filter(country %in% c("United States","India","United Kingdom"))  %>%
  pivot_longer(GDP_1960:GDP_2021, names_to = "year", values_to = "gdp") %>%
  mutate(year = as.numeric(str_sub(year, 5L, -1L))) %>%
  select(-`2022`)


mergeddata <- datax %>%
  left_join(gdpchange)

usa <- mergeddata %>% filter(country == "United States")
summary(usa$gdp)

usa <- usa %>%
  mutate(GDPcategory = case_when(gdp <1.667 ~ 1,
                                 between(gdp, 1.667, 2.288)~ 2,
                                between(gdp, 2.288, 2.945)~ 3,
```

```
                                  TRUE ~ 4 ))
lowestquartileUSA <- usa %>%
  filter(GDPcategory == 1)

rating_counts <- lowestquartileUSA %>%
  count(rating) %>%
  mutate(percentage = n / sum(n)*100)
print(rating_counts)


  rating_counts %>%
    rename(Percentage = percentage) %>%
    mutate(pct_label = paste0(round(Percentage, 1), "%")) %>%
  mutate(rating = factor(rating,
                         levels = c("G","TV-G","TV-Y",
                                    "TV-Y7","PG","TV-PG",
                                       "PG-13","TV-14", "R","TV-MA", "NR","UR"))) %>%
  ggplot(aes(x = Percentage, y= rating,
             fill = rating, label = pct_label)) +
  geom_col() +
    geom_text(hjust = -0.75) +
    scale_x_continuous(limits = c(0, 40))


  secondquartileUSA <- usa %>%
    filter(GDPcategory == 2)

  rating_counts2 <- secondquartileUSA %>%
    count(rating) %>%
    mutate(percentage = n / sum(n)*100)
  print(rating_counts2)


  rating_counts2 %>%
    rename(Percentage = percentage) %>%
    mutate(pct_label = paste0(round(Percentage, 1), "%")) %>%
    mutate(rating = factor(rating,
                           levels = c("G","TV-G","TV-Y",
                                      "TV-Y7","PG","TV-PG",
                                      "PG-13","TV-14", "R","TV-MA", "NR","UR"))) %>%
    ggplot(aes(x = Percentage, y= rating,
               fill = rating, label = pct_label)) +
    geom_col() +
    geom_text(hjust = -0.75) +
    scale_x_continuous(limits = c(0, 40))


  thirdquartileUSA <- usa %>%
    filter(GDPcategory == 3)

  rating_counts3 <- thirdquartileUSA %>%
    count(rating) %>%
    mutate(percentage = n / sum(n)*100)
```

```
  print(rating_counts3)


  rating_counts3 %>%
    rename(Percentage = percentage) %>%
    mutate(pct_label = paste0(round(Percentage, 1), "%")) %>%
    mutate(rating = factor(rating,
                           levels = c("G","TV-G","TV-Y",
                                      "TV-Y7","PG","TV-PG",
                                      "PG-13","TV-14", "R","TV-MA", "NR","UR"))) %>%
    ggplot(aes(x = Percentage, y= rating,
               fill = rating, label = pct_label)) +
    geom_col() +
    geom_text(hjust = -0.75) +
    scale_x_continuous(limits = c(0, 40))


  fourthquartileUSA <- usa %>%
    filter(GDPcategory == 4)

  rating_counts4 <- fourthquartileUSA %>%
    count(rating) %>%
    mutate(percentage = n / sum(n)*100)
  print(rating_counts4)


  rating_counts4 %>%
    rename(Percentage = percentage) %>%
    mutate(pct_label = paste0(round(Percentage, 1), "%")) %>%
    mutate(rating = factor(rating,
                           levels = c("G","TV-G","TV-Y",
                                      "TV-Y7","PG","TV-PG",
                                      "PG-13","TV-14", "R","TV-MA", "NR","UR"))) %>%
    ggplot(aes(x = Percentage, y= rating,
               fill = rating, label = pct_label)) +
    geom_col() +
    geom_text(hjust = -0.75) +
    scale_x_continuous(limits = c(0, 40))

# Notice, eco=TRUE and eval=FALSE
```